



UNDERSTANDING RWANDA'S SCIENCE, TECHNOLOGY, AND INNOVATION LANDSCAPE IN YOUTH EMPLOYMENT CREATION

**African Technology Policy Studies Network (ATPS)
TECHNOPOLICY BRIEF NO. 67**

**Nicholas Ozor
Alfred Nyambane**



UNDERSTANDING RWANDA'S SCIENCE, TECHNOLOGY, AND INNOVATION LANDSCAPE IN YOUTH EMPLOYMENT CREATION

Nicholas Ozor
Alfred Nyambane

African Technology Policy Studies Network (ATPS)



The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and the civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa’s capabilities in STI policy research, policymaking and implementation for sustainable development.



Published by the African Technology
Policy Studies Network (ATPS)
P. O. Box 10081, 00100- GPO,
Nairobi, Kenya
©2024
ISBN: 978-9966-124-69-2



Table of Contents

About the Project	iv
About Africa Technology Policy Studies Network (ATPS).....	v
Acknowledgement.....	vi
Key Messages.....	vii
1. Introduction	1
2. Rationale for STI application in Youth Employment	2
3. Methodology	3
4. Major Findings.....	5
4.1 STI Policies and Programmes for Youth Employment in Rwanda.....	5
4.2 STI Institutional Framework for Youth Employment in Rwanda.....	7
4.3 Challenges and Opportunities for Youth Employment in Rwanda	10
4.4 Best Practices and Impacts for Youth Employment in Rwanda.....	13
Conclusion.....	23
6. Policy Recommendations.....	24
References.....	26
ATPS TechnoPolicy Briefs Series.....	28

About the Project

This project was launched amid Africa’s burgeoning youth population, offering immense potential for productivity and inclusive economic growth. However, a significant portion of this demographic faces unemployment challenges exacerbated by the COVID-19 pandemic, necessitating sustainable solutions through effective policy interventions and institutional strengthening. Focusing on Ethiopia, Ghana, Kenya, Nigeria, Rwanda, Senegal, Uganda, and Zimbabwe, the initiative reviews Science, Technology, and Innovation (STI) policies to understand the current landscape, identify successes and failures, and provide evidence-based insights for decision-making in critical sectors for youth employment and wealth creation. Aligned with continental strategies such as the Agenda 2063 and initiatives such as the Mastercard Foundation’s Young Africa Works strategy and the Afreximbank’s campaign for young people’s participation in the implementation of the African Continental Free Trade Area (AfCFTA) and youth mainstreaming in policy engagements and cross-regional dialogues among others, the project aims to inform policymaking and foster stronger linkages among stakeholders to address youth unemployment, skills development, and entrepreneurship. Through rigorous research and stakeholder engagements, the project is catalyzing evidence-based policy discussions and contributing to the formulation of effective strategies for job creation and youth empowerment across Africa.

About Africa Technology Policy Studies Network (ATPS)

The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and civil society promoting the generation, dissemination, use and mastery of STI for African development, environmental sustainability and global inclusion. ATPS has over 5,000 members and 3,000 stakeholders in over 51 countries in 5 continents with institutional partnerships worldwide. We implement our programs through members in national chapters established in 30 countries (27 in Africa and 3 Diaspora chapters in Australia, the United States of America, and the United Kingdom). In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.

Acknowledgement

The African Technology Policy Studies Network (ATPS) takes this special opportunity to thank the Mastercard Foundation, Afreximbank, and other national partners for partnering with us and supporting this study. The ATPS and partners also wish to appreciate all the respondents led by the ATPS National Chapter Coordinator for Rwanda for their contributions to this study.

Key Messages

- The government of Rwanda has prioritised Information Communication Technology (ICT), and Science, Technology, and Innovation (STI) to be the essential drivers to attain the development goals in the priority areas such as high-value and competitive jobs for the youth and critical sectors, modern infrastructure development, productive livelihood, and positive contribution to international peace.
- Like other countries in Africa, Rwanda faces major youth unemployment challenges in an economy largely dominated by the informal sector. This has triggered responses from the government in the last two decades where it embarked on structural transformation by implementing policies and establishing institutions geared towards economic diversification.
- The Education sector and STI policy reforms in Rwanda have targeted youth skilling to match the needs of the labour market as well as encourage young women to enrol in Science, Technology, Engineering and Mathematics (STEM). This has contributed to more women being empowered and appointed to prominent positions, especially in government. However, the educational level in the country still remains very low and that presents a major challenge in the economy as the youth are unable to match the skills required in the highly diversifying and increasingly complex economy.
- The STI policies and institutions have led to the launch and implementation of many programmes that have yielded mixed results in terms of developing skills, creating jobs for the youth and encouraging entrepreneurship. Many have been successful while others have provided various lessons and displayed gaps that different stakeholders in the ecosystem may consider addressing.

1. Introduction

Rwanda's youth unemployment rate increased by 6.5 percentage points from 17% in February 2021 to 23.5% in May 2021¹. The unemployment rate remained relatively higher among women (26.7%) as compared to men (19.9%). The private sector has registered substantial growth over the last six years. Private investments' contribution to Gross Domestic Product (GDP) doubled from 5.8% in 2006 to 11.6% in 2020 (Government of Rwanda [GoR], 2021a). Small and medium-sized enterprises (SMEs) still dominate Rwanda's private sector. The informal sector in Rwanda accounts for 89.5% of total employment, and it is estimated that youth and women make up a significant portion of this workforce. According to the 2019 Labour Force Survey, 21% of youth in Rwanda are unemployed, but of those who are employed, 60% are working in the informal sector (National Institute of Statistics of Rwanda [NISR], 2019). The informal sector contributes over 60% of Rwanda's GDP thereby underlining its importance. Rwanda has the ambition to leverage the transformative potential of Science, Technology, and Innovation (STI) to position itself as a globally competitive knowledge-based economy.

The impact of STI policies on youth employment in Rwanda has been significant both in the formal and informal sectors. The growth of the digital economy has created new opportunities for young people in Rwanda, with the ICT sector growing at an annual rate of 17%, according to the Rwanda Development Board (RDB) (Akamanzi, 2019). This strategic orientation is founded on the premise that knowledge is essential to addressing socioeconomic challenges, is a key driver of growth competitiveness, and is indispensable in achieving a high quality of living. Despite Rwanda making significant strides in promoting STI policies aimed at creating job opportunities for its youth population, the youth unemployment challenges still persist. This policy brief highlights some of the key STI policies and programmes, their impacts, challenges and possible opportunities for youth employment through skills development, technological innovation, and entrepreneurship in Rwanda.

¹ <https://www.statistics.gov.rw/publication/trends-labour-market-performance-indicator-rwandamay-2021>

2. Rationale for STI Application for Youth Employment

Rwanda faces similar socioeconomic and developmental challenges common to other developing countries. It still faces low formal wage employment, a small domestic market, a developing human capital base, and nascent financial markets. However, the country embarked on structural transformation in the last 20 years and the economic structure needs diversification. Rwanda was ranked 1st in EAC and 5th in Africa for Information Technology (IT) readiness infrastructure with 95% 4th Generation Long Term Evolution (4G LTE) network coverage and 7,000km fibre domestically. This makes it ideal for STI development and diversification of economic activities. The education sector is often blamed for not supplying the appropriate skills to meet labour market demand. High unemployment is often assigned to skills mismatches or deficits. Rwanda has ratified most regional economic integration and cooperation protocols and agreements, and this regional integration offers it a larger market, trade facilitation, knowledge, skills and technology transfers.

The country ranks second in Africa behind Mauritius on the World Bank Ease of Doing Business index. It is also ranked first in Africa on the Country Policy and Institutional Assessment (CPIA) by the African Development Bank and the World Bank in 2018 (RDB, 2022). This makes it the most favourable destination for private-sector investment. The country also tops in closing the gender gap in sub-Saharan Africa (SSA), with a 79.6% score in 2020, hence providing equal opportunities for youth, young women and marginalised groups. A study by the Rwanda Development Board found that youth in Rwanda are highly optimistic about the potential of STI to create jobs and boost the economy. The study found that 85% of youth believe that STI is essential for Rwanda's economic development, and 75% believe that STI will create more jobs in the future (RDB, 2018). The same study found that 65% of youth in Rwanda are interested

in pursuing careers in STI. This is a significant number, given that Rwanda's overall unemployment rate is 15% (Ibid). The study also found that youth are more likely to be interested in STI careers if they have access to quality education and training.

3. Methodology

This policy brief was developed from a comprehensive study that delved into STI policies, institutions, stakeholder mapping, and an analysis of youth employment within the realm of technological innovation, skill enhancement, and entrepreneurship development. The study was conducted across seven Sub-Saharan African (SSA) countries, namely Ethiopia, Ghana, Kenya, Nigeria, **Rwanda**, Senegal, and Uganda. The study adopted a mixed-methods approach, which enabled the collection of both qualitative and quantitative data. The data-gathering process commenced with thorough desk studies of existing literature and secondary data. Subsequently, key informant interviews (KIIs) were conducted, involving 20 carefully selected respondents, to obtain primary data that encompassed both qualitative and quantitative aspects. To further enrich the dataset and cross-verify information obtained through other methods, focus group discussions (FGD) were carried out. The study engaged participants from a diverse range of stakeholder categories, including government officials and policymakers, representatives from the private sector and industry, members of civil society and non-governmental organizations (NGOs), researchers, development partners, and individuals from the media. Special attention was given to ensuring inclusivity and gender balance in the selection of respondents, with a particular focus on representing the voices of youth and other marginalized groups.

4. Major Findings

The findings of the study in Rwanda are discussed below. The STI policies, institutions, best practices, challenges and opportunities for skills development, youth employment and entrepreneurship are highlighted.

4.1 STI Policies and Programmes for Youth Employment in Rwanda

The Government of Rwanda (GoR) has been at the forefront of the development and implementation of STI-related policies over the years. The policies have had impacts on the STI sector as well as on other priority sectors of the government. Some of the policies have directly and indirectly generated jobs for the youth, women and people living with disabilities (PWDs). In 2013, the National Commission for Science and Technology (NCST) was established with a mandate to regulate national science, technology, research and innovation activities and advise the government on policy and legislation on STI. Its establishment was part of the national focus placed on using STI as a catalyst for the country's development. The development trajectory of Rwanda is based on its ambitious Vision 2050 as stated in its National Transformation Strategy (NST1).

Rwanda aspires to be an upper-middle-income country by 2035 and a higher-income country by 2050. It is believed that realising this Vision 2050 will provide equal access for all Rwandans to high-quality living standards and chances to engage in a productive economy. The Vision also aims to create high-value and competitive jobs and sectors, modern infrastructure and productive livelihoods, and a positive contribution to international peace and prosperity, with information and communication technology (ICT) and STI serving as key drivers in achieving the development goals in priority areas (GoR, 2017).

In 2021, Rwanda's gross domestic expenditure on research and development (GERD) was 0.69% of GDP, a slight increase from

0.66% in 2020 (GoR, 2021b). This puts Rwanda ahead of many other African countries, but still well below the global average of 2.2%. The majority of Rwanda's Research and Development (R&D) expenditure is funded by the government, with the private sector contributing a small share of about 5.5% of Rwanda's GERD. Rwanda has renewed its commitment to meeting the 1% R&D share of GDP by 2024 as provided by the revised STI Policy of 2020 (GoR, 2020). The STI Policy of 2020 is supported by other key policies that promote Research and Innovation (R&I), skills development, and entrepreneurship. These include the Education Sector Policy of 2003 set out to strengthen scientific and technological research in research centres and universities by advocating for the establishment of a national body for technological research, the promotion of research and technical training, the mobilisation of resources for scientific and technological research and the provision of research equipment.

The Ministry of Youth and ICT's 2016 National Digital Talent Policy addresses the mismatch between supply and demand for ICT skills, strives to increase the number of ICT employees with market-oriented, specialised ICT skills, and encourages digital literacy among youth. Lack of or inadequacy of these skills has significantly curtailed progress in the ambition of the government to embrace STI as the main enabler for socio-economic development. Along with other sectoral policies, the primary STI policies and strategies have established several institutions, programmes, and initiatives that have greatly assisted youngsters in acquiring skills and funds, as well as creating jobs and owning enterprises.

The Rwandan government has taken steps to formalize the informal sector, such as by providing training and support to informal businesses. However, more needs to be done to ensure that workers in the informal sector are protected and that they have access to opportunities for economic advancement. Some of the key STI policies, strategies and programmes have been highlighted in Table 1.

4.2 STI Institutional Framework for Youth Employment in Rwanda

The National Council for Science and Technology (NCST) is the principal body mandated to coordinate and monitor national science, technology, research and innovation activities, although the coordination of innovation policy was shifted to the Ministry of ICT and Innovation. The NCST is governed by the Council, co-chaired by the Minister of Education, which is mandated to set up a firm research and innovation system that ensures the alignment of STI with the national development goals (Ministry of Education [MINEDUC], 2017). Nonetheless, the NCST remains a semi-autonomous agency that implements STI policy and coordinates and funds other STI-related activities, reporting directly to the Office of the President of the Republic of Rwanda. The NCST promotes youth employment through the National Research and Innovation Fund (NRIF).

The NCST has also established the National Science and Technology Awards, which recognize and reward individuals and organizations that have made significant contributions to research and development in the country. The awards have encouraged young people to pursue careers in science and technology and have provided a platform for them to showcase their innovative ideas and projects. Furthermore, the NCST has collaborated with various institutions to provide training and mentorship programs for young researchers and innovators. For example, the NCST has partnered with the University of Rwanda to establish the Rwanda Biomedical Center (RBC), which provides training and research opportunities in the field of biomedical sciences. The decision to base research on one university in Rwanda has had both positive and negative effects on the quality of research and skill training in the country.

The concentration of research resources at the University of Rwanda has led to the attraction of top researchers from around the world, and it has been able to invest in state-of-the-art facilities. As a result, the university has produced a number of high-quality research papers, and it has helped to train a new generation of Rwandan

scientists and engineers. On the other hand, the concentration of research resources has also led to some problems. For example, it has made it difficult for researchers at other universities to access the latest research findings, and it has also made it difficult for them to collaborate with researchers at the University of Rwanda. Tracking and evaluating the quality of research in the country by the government has become more difficult due to the concentration of research resources in one institution. RBC has provided training to over 3,000 young people, leading to job creation and economic development in the country. Furthermore, the NRIF has established the National Research and Innovation Fellowship for Women, which provides support to female researchers and innovators to develop and implement their ideas. The fellowship program has provided funding to over 50 female researchers and innovators, leading to the creation of job opportunities for women in various sectors.

Rwanda Governance Board (RGB) also plays a critical role in STI implementation. It promotes the principles of good governance and decentralisation, conducts research and policy analysis related to governance, monitors practices of good governance, coordinates and supports media sector development, registers political organisations, provides policy advocacy to the government, and enhances citizen participation in the implementation of various governance initiatives.

One of the key initiatives undertaken by the RGB to promote youth employment is the YouthConnekt program. This is a youth empowerment program that provides training, mentorship, and networking opportunities to young people to help them develop the skills and knowledge needed to start and grow businesses. Since its launch in 2012, the program has reached over 1.5 million young people, with over 40,000 of them receiving training and mentorship to start businesses. The program has contributed to the creation of over 22,000 jobs, of which a significant proportion are for young people. The RGB has also established the National Youth Council (NYC), which serves as a platform for young people to participate

in decision-making processes, project youth voices and influence policies that affect their lives.

A host of other Ministries, Departments and Agencies (MDAs) drawn from the key priority sectors play other roles to support NCST. These roles are well defined under the National Innovation System (NIS) contributing to STI implementation resulting in technological development, youth employment and entrepreneurship. Other actors in the ecosystem include research institutions (Universities, TVETs), private sector/industry, CSOs/NGOs as well as development partners. These play specific roles as mandated in line with their interests, wielding different levels of power and influence within the realm of STI. Some of the roles include capacity building and development of skills among the youth, mentorship, creation of opportunities for employment through social innovation, and provision of funds for research through loans, scholarships and grants among others. For instance, the NRIF in 2018, launched a US\$30 million² to support youth in job creation thanks to a loan from the African Development Bank. NRIF has moved away from the original mandate of supporting and disseminating research and now focuses more heavily on providing equity financing for tech-enabled SMEs, training tech-oriented entrepreneurs, and increasing awareness of intellectual property rights.

The NRIF has also collaborated with various institutions to provide training and mentorship programs for young innovators. For example, the NRIF has partnered with the African Innovation Foundation to provide the Innovation Prize for Africa, which recognizes and supports African innovators with the potential to create social and economic impact. The establishment of these critical institutions is important in addressing some of the fundamental challenges in STI governance. It is however important to note that the mere existence of these institutions does not eliminate the myriad of challenges in the sector.

² <https://www.afdb.org/en/news-and-events/rwanda-innovation-fund-project-to-receive-us-30-million-loan-from-african-development-bank-17956>

Issues of technical capacity among appointed officers and employees are glaring thereby increasing bureaucracy and inefficiencies that are sadly negatively affecting performance.

Young Professionals for Agricultural Development (YPARD³) has been supporting youth in Rwanda. For instance, Niyokwiringirwa Priscilla, a member with an educational background in Agricultural and Environmental Management from the University of Rwanda, who is a beneficiary recommended that youth who live in rural areas need more attention. She said:

“Paying attention to the opportunities that exist in the urban areas and comparing them with those in rural areas, one realizes that they are different. Some young people are doing amazing work in agriculture and livestock in rural areas. We do have agro-entrepreneurs from these marginalized locations. I, therefore, point out the need for this category of young people to be reached and for all policies and programs to be inclusive. I am sure this will reduce the number of young people who left behind farming and come to urban cities to look for jobs.”

The other stakeholders in the ecosystem also collaborate with the government to initiate and implement programmes aimed at enhancing youth employment. Some of the key institutions, roles and impacts on youth employment are highlighted in Table 2.

4.3 Challenges and Opportunities for Youth Employment in Rwanda

In Rwanda, the challenges and opportunities in Science, Technology, and Innovation (STI) for youth employment are multi-faceted. One of the foremost challenges is the inadequate access to quality education and training in STI for many young people. This educational gap can hinder their ability to acquire the necessary skills demanded by the job market. There is a scarcity of opportunities for young individuals to apply their STI skills in real-world workplaces, partly attributed to a shortage of STI-related jobs and a lack of awareness

³ <https://www.ypard.net/>

among employers regarding the advantages of hiring youth with STI competencies. Furthermore, gender inequality still persists in STI fields, with young women being underrepresented due to prevailing gender stereotypes and societal norms. However, there has been a recent shift in government where more and more women with requisite skills and qualifications are being appointed to prominent positions in government. Conversely, there are promising opportunities on the horizon. Rwanda's rapidly growing economy is increasingly reliant on STI, resulting in new job prospects for youth with STI skills. The government's substantial commitment to promoting STI and innovation is evident through investments in research and development, educational enhancements, and infrastructure improvements. Moreover, the demand for STI skills is on the rise in both the public and private sectors as STI becomes more integral to various segments of the economy. These opportunities signify the potential for STI to play a pivotal role in addressing youth unemployment challenges and fostering economic development in Rwanda.

There are concerns over the availability and reliability of electricity. Almost one-third (31.5%) of enterprises participating in the Integrated Business Enterprise Survey (IBES) identified a main difficulty as a lack of reliable energy (NISR, 2017). These issues are reflected in Rwanda's position (68) on the Doing Business indicators component "getting electricity" (World Bank and Government of Rwanda, 2020). Despite a good aggregate score on the Doing Business Indicators, there is a high regulatory cost and complexity in starting and running a business in Rwanda. The country still has opportunities to reduce the regulatory expenses of starting a business, resolving insolvency, enforcing contracts, trading across borders, and acquiring building licenses and electrical connections. Several challenges in creating a conducive environment for businesses to thrive, remain. One of the foundations for inclusive digital development is sound ICT infrastructure which overcomes social, spatial and economic gaps. These gaps are glaring in Rwanda as evidence shows that the part of the Rwandan population with access to electricity has been increasing

since 2010, from 9.7% to 68.17% in 2021, however, progress in access to electricity remains far below the universal access target of 100% by 2024⁴. Moreover, the rural-urban divide continues to widen, with the urban access rate at 97% in 2020 and only 44% in the rural areas. In addition, gender disparities persist, with more male-headed households (31.2%) accessing electricity compared to 21.1% of their female-headed counterparts (Gihana and Kooijman, 2020).

In terms of skillsets and literacy levels, the literacy rate among those aged 15 and above was 72.4%, with women accounting for 69.3% and males accounting for 76.1% in 2020 (Twinoburyo et al, 2022). However, the computer literacy rate among people aged 15 and up was as low as 11.9% (males 14.7% and females 9.6%). The total predicted adoption rate of digital skills in Rwanda in 2019 was 20-25%, with the services sector having the highest adoption rate at 30-35% and the agriculture sector having the lowest adoption rate at 5-10% (International Finance Corporation [IFC], 2021). The affordability of digital skills training varies by household, with foundational/basic skills projected to be affordable for 20-25% of households but dropping to less than 5% for advanced and highly specialized skills such as computer science skills, Big data analytics, IT systems and networks as well as software development skills (IFC, 2021).

In contrast to the good conditions on offer for foreigners, there is a lack of an efficient investment framework with a clear incentive for local investors, particularly in the informal sector, as well as a very high level of interest rates for loans accessible in banks (16-17%). As a result of the government's efforts to encourage foreign investment, the country has seen a surge in FDI in recent years. However, no structure for efficient investment with clear incentives for local investors exists. One of the key reasons for this is that local investors have restricted access to capital. An example is the Rwanda Development Board's (RDB) One-Stop Center for foreign investors. However, there is lack of similar policies to support local investors. This creates an uneven playing field, where foreign investors have

⁴ Rwanda's 100% electrification target by 2024 receives frw 82.1 billion financing boost (reg.rw)

more advantages over local investors. According to the 2022 annual report by the International Finance Corporation (IFC), Rwanda has one of the lowest levels of domestic private investment in SSA hence, harming local investment. This provides an opportunity for stronger policy advocacy from the local private sector.

Despite progress in STI policy, governance and actors' interactions in Rwanda, the challenge of weak interactions among R&I actors and the broader STI ecosystem persists. This is exemplified by some of the initiatives and programmes such as the National Internship Program (NIT), which has achieved less than a 60% employment rate, suggesting the need for restructuring. The NIT program was adopted to equip students with practical skill sets to smoothen their transition from school to the labour market. Since its launch, 7,500 graduates have transitioned through the program, 58.3% of them being employed, while the remaining 41.3% are still jobless. This is partly because interns are not able to get the best experience on the job, as most of the tasks given to them are "clerical" and employers invest little time in their development.

4.4 Best Practices and Impacts for Youth Employment in Rwanda

Rwanda, as previously mentioned in this brief, has been credited with taking aggressive measures in embracing STI in comparison to other SSA countries. Rwanda's market economy must become increasingly complicated as it achieves middle-income status. Strong government support will still be required, but its mission will increasingly be to encourage private investment and develop strong market institutions that ensure the private (formal and informal) sector follows predictable rules of the game. Enterprise development in Rwanda should continue to alleviate market failures and stimulate private sector development, especially given Rwanda's private sector poor investment capability. The government has established a solid track record of reforms to foster the development of innovative and viable businesses. This is evidenced by its rapidly improved ranking in the Ease of Doing Business Index. The work is by no means finished. Many

private-sector firms are small and informal and have limited-scale economies critical for competitiveness and limited export presence and capacity for innovation. The government has for instance automated key government services using the e-governance platform “IREMBO⁶” as well as implementing the use of ICT to increase access to financial services using mobile phones and in connection with the banks (Mobile banking system).

The development of a set of Governance and Home-Grown Initiatives (GHI) has translated culturally owned practices into research programmes through RGB to foster accountability in governance, democracy and decentralisation for sustainable development and has been a major success in Rwanda. These initiatives have yielded significant achievements, especially in the informal sector where youth and women have hugely benefitted. The Made in Rwanda Policy of 2017 has improved competitiveness, enhanced demand for Rwandan value-added products, narrowed the trade balance, and generated jobs for youth and women, especially in the informal sector. It brings together existing government interventions under a clear policy framework. It has also addressed supply-side bottlenecks via targeted interventions to improve quality, boost cost competitiveness, deepen domestic supply chains, and develop action plans for specific high-potential value chains.

The Rwanda Innovation Hub has helped to launch several successful youth-led STI initiatives that have created jobs in the informal sector. The Hub has supported the establishment and growth of FabLab Rwanda, which has provided training and mentorship to youth interested in entrepreneurship, innovation, and manufacturing. Through its support, HeHe Labs has been able to expand its operations, offering services such as mobile applications and payment solutions by employing local talent and providing training opportunities. Through these initiatives, young Rwandans have gained skills and knowledge in various technological areas, fostering job creation in both the formal and informal sectors.

⁶ https://irembo.gov.rw/home/citizen/all_services

Strategic partnerships and scientific programs have been initiated that have supported STI development through capacity building and grants. In July 2021, NCST became a member of GloPID-R to collaborate with global partners on epidemics and pandemics. It is also a member of the Science Granting Councils Initiative (SGCI), which develops the capacity of 15 science granting councils in SSA. The government working with the private sector has also been developing programmes under public-private partnership (PPP) agreements that have been very successful in providing skills and job opportunities for the youth and marginalized groups. For instance, the YouthConnekt, a PPP initiative discussed in the previous section was a collaboration of UNDP with the government through the Ministry of Youth and ICT that has created jobs and trained young people. The Business Development Fund (BDF) is also a PPP initiative aimed at promoting economic growth and job creation in Rwanda. According to its 2020 annual report, BDF has supported the creation of over 4,000 jobs in various sectors, including manufacturing, agriculture, and tourism. Additionally, the initiative has provided over 32,000 loans to SMEs, resulting in the creation of over 20,000 jobs. Also, Kepler has partnered with organizations such as Mastercard Foundation and Acumen to provide funding and support to young entrepreneurs.

The Mastercard Foundation also launched the Young Africa Works Strategy in Rwanda in 2018, with the aim of equipping 30,000 young individuals with skills for employment in the tourism and hospitality sector. The strategy also emphasises on enhancing secondary school education quality in order to improve young people's overall skills and capabilities. The Foundation works with a variety of stakeholders, including the government, business sector, civil society, and young people themselves, to develop effective initiatives that are in line with Rwanda's objectives. The Foundation through its strategy sought to capitalise on Rwanda's economic growth, social development, and political reform in order to generate and sustain opportunities for youth.

⁷ <https://www.glopid-r.org/>

Table 1: A summary of key STI Policies, their roles and impact on skills development and youth employment in Rwanda

STI Policies and Programmes	Roles in skills development and youth employment	Impact on skills development and youth employment	Remarks
<p>Vision 2050 and National Strategy for Transformation (NST1) 2017-2024</p>	<p>- Develop market-driven and competency-based education system that prioritises innovative jobs in ICT, tourism, aeronautics, computer programming and venture capital; Build a productive society through TVET and tertiary education; Scale up the percentage of TVET graduates from 31.1% to 60% by 2024; and establish and maintain new and existing Centres of Excellence in STI.</p>	<ul style="list-style-type: none"> - Has achieved free universal basic education resulting in a net enrolment of almost 100% in primary school. - Has encouraged private sector companies to give youth on-the-job worker training and work placements. 	<ul style="list-style-type: none"> - It will be important to prioritise sectors such as tourism, information technology, and manufacturing; reform the education system to prioritize skills development that is relevant to the needs of the job market, including practical training and internship programs. - Provide incentives and support for young entrepreneurs, including access to financing, business development services, and mentorship programs.
<p>National Science, Technology, and Innovation Policy (NSTIP) of 2020</p>	<p>- Focuses on promoting science, technology, and innovation to drive economic growth and development, with a particular</p>	<ul style="list-style-type: none"> - Contributed to the decline of the unemployment rate among youth aged 16-30 from 18.2% in 2019 to 	<ul style="list-style-type: none"> - Need to prioritize the teaching of science, technology, engineering, and mathematics (STEM) subjects

<p>National Skills Development and Employment Promotion Strategy (2019-2024)</p>	<p>emphasis on creating employment opportunities for young people. Accelerates and strengthens performance indicators within the national innovation system in line with the national strategy for transformation.</p>	<p>15.3% in 2021. In 2021, over 2,000 young people participated in the annual National Science and Technology Exhibition, showcasing their innovative ideas and solutions.</p>	<p>to equip young people with the skills and knowledge needed for the job market. Provide incentives and support for innovation, including research and development funding, technology transfer, and commercialization support.</p>
	<ul style="list-style-type: none"> - Aims to equip young people with relevant skills and knowledge to improve their employability and create employment opportunities in the country. The National Training and Education Excellence Programme will measure TVET and Higher Education performance, identify best practices and solve problems. The market-led education initiative elevates the private sector's voice, reinvigorates Sector Skills Councils, and ensures that the sectoral skills gaps are 	<ul style="list-style-type: none"> - Has had a positive impact on youth employment, contributing to a reduction in youth unemployment rates and creating opportunities for young people to gain relevant skills and knowledge and engage in entrepreneurship and self-employment. Has also created a conducive environment for entrepreneurship and self-employment. - The strategy has set a target of increasing the participation of young women in the labour force from 33% to 50% by 2024. 	<ul style="list-style-type: none"> - Need to be more investor-focused to attract larger enterprises and scale the training, this can be through targeted efforts from the RDB.

<p>Revised National Employment Policy of 2019 and the Rwanda National Youth Policy of 2015</p>	<p>addressed. Capacity Development Programme will be responsive to investors and the government's development priorities (e.g., financial hub, health tourism, etc.)</p>	<p>- NEP focuses on creating a conducive environment for job creation and improving the quality of employment opportunities, with a particular emphasis on young people. Youth are given access to education, especially secondary education. Enhance TVET quality with a focus on more practical hands-on training. TVET and quality vocational training to provide hands-on/practical training. A responsive education and training system to meet current and future youth needs. Develop demand-driven skills.</p>	<p>- The Revised NEP has created opportunities for young people to gain relevant skills and knowledge through various training programs and initiatives. For example, the Rwanda Polytechnic, a vocational and technical training institution, has established centres of excellence in various fields such as ICT, engineering, and health sciences, providing training to over 6,000 young people annually therefore helping in bridging the gap in skills among the youth in Rwanda.</p>	<p>- The government should ensure that policies and programs are designed to promote gender equality and ensure that women have equal access to education, training, and employment opportunities. It will be good to consolidate the policies and programmes around youth employment instead of having too many of them doing the same things.</p> <ul style="list-style-type: none"> - Reform the TVET and higher education systems to respond to labour market demand. - Prioritize the development of digital literacy programs in schools and communities to ensure that young people have the necessary digital skills to participate in the digital economy.
--	--	--	---	---

<p>Rwanda Digital Talent Policy of 2016</p>	<ul style="list-style-type: none"> - A five-year priority skills development programme in telecommunications, computer networking, database, software engineering and mobile applications, multimedia, digital design, information security and IT project management. - It will implement the national digital skills and literacy programme to create 200,000 new jobs. 	<p>The ICT sector in Rwanda has created over 44,000 jobs, with a significant portion of these jobs being filled by young people. The sector has also contributed to the country's economic growth, accounting for 3.5% of the GDP in 2019. Has created opportunities for young people to gain digital skills and knowledge through various training programs and initiatives. For example, the Ministry of ICT and Innovation established the Rwanda Coding Academy, which provides training in software development, robotics, and data science to young people aged 18-30. The policy has also prioritized the promotion of entrepreneurship and innovation among young people. The government has established the National Youth Council Innovation Fund, providing financial and technical support to young entrepreneurs and innovators in the ICT sector. The fund has supported over 200 projects, creating over 800 jobs for young people.</p>	<ul style="list-style-type: none"> - Invest in the development of technology and infrastructure in rural areas to ensure that young people have access to the tools necessary to develop digital skills and participate in the digital economy. - The government should provide incentives and support for young digital entrepreneurs, including access to financing, business development services, and mentorship programs. - The government should partner with the private sector to create opportunities for young people to leverage their digital skills and contribute to the growth of the digital economy. - The government should develop policies and programs to provide information on job opportunities, training programs, and entrepreneurship support services to young people, including those in rural areas.
---	---	--	--

Table 2: Summary of key institutions, their roles and impact on youth employment and youth employment in Rwanda

STI Institutions	STI Institutions Roles in skills development and youth employment	Impacts on skills development and youth employment
<p>Government: Ministries, Agencies and Departments (MDAs)</p> <p>Ministry of Education (MINEDUC) and Ministry of ICT and Innovation (MINICT)</p>	<p>MINEDUC is responsible for implementing policies and initiatives that support the development of the education sector and provide young people with the skills and knowledge needed to succeed in the workforce.</p> <p>MINICT is responsible for implementing policies and initiatives that support the growth of the ICT sector, which has been a major source of job creation for young people.</p>	<p>The Workforce Development Authority (WDA), under the supervision of MINEDUC, has established vocational training centres and provided training to young people in various sectors such as construction, hospitality, and agriculture. Over 130,000 young people have been trained in vocational skills since 2013, and over 70% of these graduates have found employment or started their own businesses.</p>
<p>National Council for Science and Technology (NCST)</p>	<p>NCST is responsible for coordinating and implementing policies and initiatives that promote the development of science and technology in Rwanda.</p>	<p>NCST has implemented various programs and initiatives aimed at promoting innovation and entrepreneurship among young people. For example, the council has established the National Innovation Fund, which provides financial and technical support to young innovators and entrepreneurs in Rwanda. The fund has supported over 200 projects, creating over 2,000 jobs for young people. NCST has established the National Science and Technology Award, which recognizes and rewards young scientists and innovators for their contributions to the development of S&T in Rwanda. Has established partnerships with private sector organizations and academic institutions to promote the development of S&T in Rwanda eg it collaborated with the African Institute for Mathematical Sciences (AIMS) to establish an AIMS centre in Rwanda. The Council has contributed to the creation of over 10,000 jobs in the science and technology sector since its establishment in 2008.</p>

<p>Rwanda Governance Board (RGB)</p>	<p>Responsible for implementing policies and regulations that promote good governance and accountability in Rwanda.</p>	<p>RGB has established the Rwanda Business Development Fund (BDF), which provides financial and technical support to SMEs. The fund has supported over 1,500 SMEs, creating over 20,000 jobs for young people since its establishment in 2011. Established the Rwanda Youth in Business Program (RYBP), which provides training and support to young entrepreneurs. It has trained over 10,000 young people in entrepreneurship skills and provided over 500 grants to young entrepreneurs to start or expand their businesses.</p>
<p>National Youth Council (NYC)</p>	<p>NYC is a government institution responsible for promoting the development and participation of young people in various sectors of national development. The council has established various programs and initiatives aimed at promoting entrepreneurship and employment among young people</p>	<p>Established the YouthConnect program, which provides training and support to young people, helping them to develop the skills and knowledge necessary to succeed in the job market. The program has trained over 50,000 young people since its establishment in 2012. NYC also established the Youth Empowerment Fund, which provides financial support to young entrepreneurs. The fund has provided over 200 loans to young entrepreneurs, creating over 1,000 jobs for young people.</p>
<p>National Industrial Research and Development Agency (NIRDA)</p>	<p>NIRDA is a government institution responsible for promoting research and development in various industries, including manufacturing, construction, and agriculture. The agency has established various programs and initiatives aimed at supporting the growth and development of the country's industrial sector.</p>	<p>Has established partnerships with private sector organizations and international development partners to promote job creation and entrepreneurship among young people eg. NIRDA has collaborated with the United Nations Industrial Development Organization (UNIDO) to establish the Rwanda Youth in Industry Program, which provides training and support to young people in the industrial sector. NIRDA also established the Rwanda Standards Board, which is responsible for developing and implementing standards in various industries. The board has established various programs and initiatives aimed at improving the quality of products and services.</p>

<p>Private Sector</p> <p>African Institute for Mathematical Sciences (AIMS) Rwanda</p>	<p>AIMS Rwanda is a pan-African institution that provides advanced education and research in mathematical sciences. The institute has established various programs and initiatives aimed at promoting the development of STEM skills and knowledge among young people in Rwanda.</p>	<p>Provides students with advanced knowledge and skills in areas such as data science, machine learning, and artificial intelligence. The program has trained over 200 students since its establishment in 2016, with over 60% of graduates finding employment in the private sector, academia, and research institutions.</p>
<p>Civil Society Organizations (CSO's)/ Non-Governmental Organisation (NGOs)</p> <p>Rwanda Organization for Development Initiatives (RODI) Kepler</p>	<p>Contributes to the formation of a new generation of development agents and competitive small farmers in Rwanda. Is a non-profit higher education program that operates a university campus in Kigali, Rwanda. It is one of the first programs worldwide to integrate massive open online courses (MOOCs), flip teaching, and other education technology practices into a blended learning curriculum, with the goal of lowering the cost of higher education without a reduction in academic quality or outcomes.</p>	<p>RODI has supported more than 20,000 Farmers and Young Entrepreneurs in the framework of Value chain Development, job creation, access to finance through Saving and Lending Internal Communities (SLICs) and job placement since 2012. -Over 90% of graduates from the bachelor's degree program have found employment within six months of graduation. Graduates have gone on to work in a range of industries, including finance, healthcare, hospitality, and non-profit organizations. -Kepler has partnered with organizations such as the Mastercard Foundation and Acumen to provide funding and support to young entrepreneurs.</p>

5. Conclusion

Rwanda is one of the countries in the SSA region that is fully embracing STI as a means for propelling its economic growth to achieve its national goal. It has created some level of the enabling policy environment as well as set up institutions to implement them. Rwanda has adopted and implemented several initiatives to promote innovation, such as the Rwanda Innovation Fund, which provides funding and support to innovative projects and start-ups, and the Smart Rwanda Master Plan among others. There are many examples of good practices that are being implemented although more needs to be done to develop skills, create jobs for the youth and enhance entrepreneurship. These have come with a fair share of challenges that offer opportunities to the various actors in the ecosystem to take them up.

6. Policy Recommendations

In view of the study findings, the following recommendations are proffered:

Recommendation 1: Consider establishing initiatives aimed at funding start-ups, mentorship and scaling up of new ventures:

Given the high number of business failures especially in the ICT sector, the government should entice large investors and capital ventures to offer start-ups a chance to merge or collaborate to assure their profitability and sustainability. The government could also support these efforts by allocating government procurement opportunities to ICT startups and established enterprises and offering or enabling them to launch products or scale up operations to levels that are competitive worldwide. It is also vital to widen the application of ICT principles beyond mobile phone services. This is likely to increase chances for young innovators and entrepreneurs, broadening Rwanda's mostly informal economy. The private sector in these spaces is also encouraged to support start-ups by funding, mentorship or even partnering to ensure the success of the ventures.

Recommendation 2: Commit towards increasing institutional capacities and building awareness among firms on STI to trigger youth skilling and employment in both the formal and informal sectors:

Considering the low level of education among Rwandan youth, particularly in rural areas, the government and other key stakeholders must commit to raising these standards through increased investment in education as well as increased capacity building activities and training within the existing structures of institutions and business firms. This is expected to increase knowledge, which is essential for unleashing the potential of STI in the creation of job opportunities and entrepreneurship among youth. The necessity for systems to protect youth and women in the informal sector, which plays a major part in the rural economy, is also regarded as critical. This is supported by the fact that the

informal sector has demonstrated resilience in the face of economic problems, acting as a buffer and absorbing labour that may not be absorbed by the formal sector.

Recommendation 3: Enable cooperation and coordination between various sectoral and thematic policies and their institutions to increase and expand economic opportunities for the youth: As the largest proportion of the Rwandan economy is informal, the cooperation and coordination amongst actors must be enhanced through the development of engagement platforms which will be used to air out concerns affecting each stakeholder category. It is also expected that sectoral issues ailing the economy can be tackled within these platforms thereby harmonizing efforts and unlocking synergies geared towards creating employment opportunities for the youth and marginalised groups.

Recommendation 4: All stakeholders should consider working closely to develop assessments and evaluations of policy outcomes that can be used in policy learning and for improving performance in subsequent policy cycles: Given that the development and implementation of various policies and programs in Rwanda yielded mixed results in the face of different challenges, the government must now collaborate with all stakeholders to develop assessment criteria and evaluations that will periodically indicate performance to allow timely tweaking of activities and strategies to ensure the path to success is not obstructed. Furthermore, these evaluations can be highly useful papers for ensuring that future policies and programs avoid mistakes and learn from prior programs. For each policy/program/strategy, elaborate monitoring and evaluation procedures must be built, with quality indicators in place to determine success or failure in the creation of jobs for the youth and improved livelihoods for the marginalised.

References

- Akamanzi, C. (2019). National skills development and employment promotion strategy 2019-2024. Rwanda Development Board.
- Gihana, D. and Kooijman, A. (2020). Gender and Energy Country Briefs - Rwanda, ENERGIA.
- Government of Rwanda [GoR], (2021a). Country strategy paper 2022–2026. October. African Development Bank.
- GoR (2021b). Analysis Report: Rwanda National Research and Experimental Development (R&D) Survey For 2018/2019. <https://ncst.prod.risa.rw/index.php?eID=dumpFile&t=f&f=31919&token=f-087400316857cf32ab4d8040b2d05c491cf3c0a>
- GoR (2020). Science, Technology and Innovation Policy. Available at: <http://www.ncst.gov.rw/content/official-documents>
- GoR (2017). National Strategy for Transformation (NST1) 2017–2024. Available at: https://www.minecofin.gov.rw/fileadmin/user_upload/Minecofin/Publications/STRATEGIES/NST1/NST_A5_booklet_final_2.04.19_WEB.pdf
- International Finance Corporation (IFC) (2021). Demand for Digital Skills in Sub-Saharan Africa. Key Findings from a Five-Country Study: Côte d’Ivoire, Kenya, Mozambique, Nigeria, and Rwanda. Pennsylvania Avenue, N.W. Washington, D.C. 20433. Demand+for+Digital+Skills+in+SubSaharan+Africa_web.pdf (ifc.org)
- Ministry of Education [MINEDUC], (2017). Science & Technology in Rwanda. http://mineduc.gov.rw/fileadmin/user_upload/pdf_files/STI_in_Rwanda_Booklet_prepared_for_TWAS27th_Annual_Meeting_Final-1.pdf
- National Institute of Statistics of Rwanda [NISR], (2017). Integrated Business Enterprise Survey (IBES) 2015. Kigali: NISR, July.
- NISR (2019). Rwanda Labour Force Survey 2019. Kigali, Rwanda: NISR.
- Rwanda Development Board [RDB], (2022). Annual State of Skills Supply and Demand, 2022. <https://rdb.rw/files/state-of-Skills-report-2022.pdf>

RDB (2018). Rwanda Youth in Science, Technology, Engineering and Mathematics (STEM) Survey. Kigali, Rwanda: RDB.

Twinoburyo, E. N, Munu M. L. and Z. Vlamincck (2022). Digital divides or dividends? Assessing the inclusiveness of basic services in Rwanda's digitalisation agenda. INCLUDE. <https://includeplatform.net/wp-content/uploads/2022/10/Digital-divides-or-dividends-Assessing-the-inclusiveness-of-basic-services-in-Rwandas-digitalisation-agenda.pdf>

United Nations Educational, Scientific and Cultural Organization [UNESCO], (2021). UNESCO Science Report: The Race Against Time for Smarter Development. S. Schneegans, T. Straza and J. Lewis (eds.). UNESCO Publishing: Paris. <https://unesdoc.unesco.org/ark:/48223/pf0000377433>

World Bank and Government of Rwanda (2020). Future Drivers of Growth in Rwanda: Innovation, Integration, Agglomeration, and Competition. Washington, DC: World Bank. doi:10.1596/978-1-4648-1280-4.

ATPS TechnoPolicy Briefs Series

- Leveraging Science, Technology, and Innovation for Enhanced Youth Employment in Nigeria (ATPS TechnoPolicy Brief No. 66)
- Unlocking the Potential of Education and Skills for Supporting Youth Employment in Kenya (ATPS TechnoPolicy Brief No. 65)
- Harnessing Science and Technological Innovation for Youth Employment and Skill Acquisition in Ghana (ATPS TechnoPolicy Brief No. 64)
- Is Ethiopia's Science, Technology, and Innovation Policy Landscape Effectively Creating Jobs and Fostering Skills for the Youth? (ATPS TechnoPolicy Brief No. 63)
- University-Led Ecosystems for Sustained Innovation and Entrepreneurship Development in Kenya (ATPS TechnoPolicy Brief No. 62)
- Eco-innovation Policies for Sustainable Development in Africa (ATPS TechnoPolicy Brief No. 61)
- Institutional Landscape for Eco-innovation Development in Africa (ATPS TechnoPolicy Brief No. 60)
- Policy and Institutional Framework for Ecological Organic Agriculture in Benin (ATPS TechnoPolicy Brief No. 59)
- Institutional Framework for Ecological Organic Agriculture in Kenya (ATPS TechnoPolicy Brief No. 58)
- Policy and Institutional Framework for Ecological Organic Agriculture in Senegal (ATPS TechnoPolicy Brief No. 57)
- Advancing Ecological Organic Agriculture in Nigeria (ATPS TechnoPolicy Brief No. 56)
- Policy and Institutional Framework for Ecological Organic Agriculture in Rwanda (ATPS TechnoPolicy Brief No. 55)
- Bridging Climate Information Gaps to Strengthen Capacities for Climate Informed Decision (ATPS TechnoPolicy Brief No. 54)
- Embracing Open Contracting in Africa (ATPS TechnoPolicy Brief No. 53)
- The Digital Revolution, Open Science, and Innovation for Open Science Development in Sub-Saharan Africa (ATPS TechnoPolicy Brief No. 52)

- Nouvelles approches de financement de la recherche et de l'innovation en Afrique (ATPS TechnoPolicy Brief No. 51)
- New Approaches for Funding Research and Innovation in Africa (ATPS TechnoPolicy Brief No. 50)
- Towards Effective Public-Private Partnerships in Research and Innovation: A Perspective for African Science Granting Councils (ATPS TechnoPolicy Brief No. 49)
- Innovative Practices and Policies for Promoting Biodiversity Informatics in Sub-Saharan Africa (ATPS TechnoPolicy Brief No. 48)
- Improving the Relevance of University Training to Labour Market Demands in Africa (ATPS TechnoPolicy Brief No. 47)
- Developing Policies for Biodiversity Informatics in sub-Saharan Africa (ATPS TechnoPolicy Brief No. 46)
- ICTs role in Agricultural Development: Prospects of Land Potential Knowledge System (LandPKS) (ATPS TechnoPolicy Brief No. 45)
- Mainstreaming Gender in the National Science, Technology and Innovation (STI) Policy of Kenya (ATPS TechnoPolicy Brief No. 44)
- Social Innovation: An Untapped Resource for Inclusive Green Growth (ATPS TechnoPolicy Brief No. 43)
- Policy Axes that Can Uphold Agricultural Innovations for Climate Change Adaptation and Food Security in Central Africa: Case of Cameroon, Equatorial Guinea and Central African Republic (ATPS TechnoPolicy Brief No. 42)
- Frameworks for Intellectual Property Protection of Traditional Knowledge in Tanzania (ATPS TechnoPolicy Brief No. 41)
- Assessment of Possible Intellectual Property Protection Options of Traditional Knowledge System in Ethiopia (ATPS TechnoPolicy Brief No. 40)
- Towards influencing National Legislation, Policies, Strategies and Programmes for appropriate Protection and Benefit-Sharing of Traditional Knowledge (TK) with and by Traditional Herbalists in Uganda. (ATPS TechnoPolicy Brief No. 39)
- Traditional Healers and their Provision of Mental Health Services in Cosmopolitan Informal Settlements in Nairobi, Kenya. (ATPS TechnoPolicy Brief No. 38)
- Policy Implications for Intellectual Property Systems for Traditional Healers in Lesotho. (ATPS TechnoPolicy Brief No. 37)

- Incidence of Indigenous and Innovative Climate Change Adaptation Practices for Smallholder Farmers' Livelihood Security in Chikhwawa District, Southern Malawi. (ATPS TechnoPolicy Brief No. 36)
- Machobane Farming System and its Relevance to Climate Change Policy in Lesotho. (ATPS TechnoPolicy Brief No. 35)



The African Technology Policy Studies Network (ATPS) is a transdisciplinary network of researchers, policymakers, private sector actors and the civil society promoting the generation, dissemination, use and mastery of Science, Technology and Innovations (STI) for African development, environmental sustainability and global inclusion. In collaboration with like-minded institutions, ATPS provides platforms for regional and international research and knowledge sharing in order to build Africa's capabilities in STI policy research, policymaking and implementation for sustainable development.

African Technology Policy Studies Network (ATPS)
Contact Executive Director:
executivedirector@atpsnet.org
8th Floor Chancery Building,
Valley Road
P.O. Box 10081-00100 Nairobi
Tel: +254 (020) 2714092
www.atpsnet.org

Science, Technology and Innovation for African Development

ISBN: 978-9966-124-69-2

