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# The Success of Research and Development (R&D) Growth in Uganda: A SWOT Analysis

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## Abstract

**Purpose**: The central mpurpose of this review was to describe the various strengths, opportunities, weaknesses and threats for and or against the Research and Development in Uganda and beyond.

**Methodology**: A literature review approach was adopted where several online and physical materials were analysed in a thematic way.

**Results**: The outcomes reveal a myriad of strengths, weaknesses, opportunities and weaknesses surrounding the Research and Development industry particulary in the less-developing world even if the more-developing world may not be fully insulated.

**Unique contribution to theory, practice and policy**: This review contributes to the undertsnading of the various issues underlying Research and Development practice. From the above review, it is encouraged that academics invest energies in enhancing the the strengths and the opportunities underlying Research and Development. Also, the academia and the researchers, continually seek practical means to thwarting the weaknesses and the threats to Research and Development.

**Keywords:** *Strenghts, Weaknesses, Opportunities, Threats, R&D*

## 1. Introduction

The origin of Research and Development (R&D) can be traced from the United States, where Thomas Edison and the Edison General Electric Company were founded in 1890 which turned out to be the changing fortunes of America's independent inventors. This crucial transformational period marked the expansion of corporate R&D, the great depression, and two world wars. Edison is credited with 1,093 patents, but it's his invention of the corporate R&D lab that made all those other inventions possible. Edison was the first to bring management discipline to R&D, which enabled a much more powerful method of invention by systematically harnessing the talent of many individuals (Hintz, 2021). According to (Ochieng et al., 2020), research in Uganda started way back in 1896 and this can be accredited to Sir Albert Ruskin Cook for his medicinal research though not properly documented and the documented regulation of research activities in Uganda was in the late 17970s with the formation of the National Research Council (NRC). This suggests that several research activities in the country between 1896 and 1970 were not formalized by the research regulatory system. The NCR was transformed into 1990 the Uganda National Council for Science and Technology (UNCST) Act in 1990 with a comprehensive mandate to guide and coordinate all research and development in Uganda.

Consistent with Lahallo and Aritonang (2020), R & D refers to a creative and systematic work undertaken to increase the stock of knowledge that includes knowledge of humankind, culture, and society and to devise new applications of available knowledge. Therefore R & D refers to two intertwined processes of research that are to identify new knowledge and ideas and development which is turning the ideas into tangible products or processes. Companies undertake R&D to develop new products, services, or procedures that will help them grow and expand their operations. So, the concept of R&D involves the actual research and utilization of the research report to cause development. The research report or the result is used or realized through the implementation of Technology and Innovation. The World Bank unveils the role of science, technology, and innovation ( STI) in the Ugandan industry which started in 2006 and was finalized in 2010. In the process, the government of Uganda was mandated to come up with a policy on STI. Since STI is the core driver of development and by the fact that Uganda cannot fund her STI ventures, the World stepped in and prioritized the six areas of; agriculture, health, energy, information, and communication technology (ICT), transport, and logistics (Brar et al., 2010).

The National Science, Technology and Innovation Policy came into force in 2009 intending to 'strengthen the national capability to generate, transfer and apply scientific knowledge, skills and technologies that ensure sustainable utilization of natural resources for the realization of Uganda's development objectives.' The policy paved way for the Uganda Vision 2040, which was launched in April 2013 with the focus to transform Ugandan society from a peasant to a modern and prosperous country within 30 years. Uganda Vision 2040 guarantees to strengthen the private sector, improve education and training, modernize infrastructure and the underdeveloped services

and agriculture sectors, foster industrialization, and promote good governance, among other goals of which can only be achieved through STI enforcement (Kearney-Volpe et al., 2019).

In addressing the centre demand, the Ugandan Government established a Ministry of Science, Technology, and Innovation (MoSTI) in June 2016 well aware that Science, Technology, and Innovation (STI) are key drivers of socio-economic growth and transformation of the world. MoSTI has the mandate to guide and coordinate scientific research, development, and National innovation system in Uganda. The new ministry represents a structural reform that should transform the national system, legal framework, and incentive structure for research and innovation, and should ultimately harmonize Uganda's long-term goals for the STI sector and foster R&D financing. Specifically, the ministry should facilitate research and innovation, promote techno-entrepreneurship, regulate STI and give sharper focus to the government's STI agenda through the support of targeted interventions like innovation support, research quality assurance, and sustainable funding (Florence et al., 2021).

It is important to note and consider that the government of Uganda has adopted policies, political declarations plans, and strategies for sustainable development while taking into consideration that STI is crucial in the achievement of Uganda's National Vision 2030 and successive development plans. STI development remains strategic in uplifting different sectors of the economy such as agriculture, industry, energy, health, education, environment, etc as vividly highlighted in the National Development Plans (NDP I, II, and III). All the goals within the Sustainable Development Goals can only be achieved through STI (GoU, 2015). UN CSTD also argues that rapid technological change can contribute to the faster achievement of the 2030 Agenda for Sustainable Development through e.g. improving income gained, increased productivity, and reduced cost of goods and services; enabling the faster and wider deployment of innovative solutions to economic, social and environmental obstacles that constrain development; supporting more inclusive forms of participation in social and economic life; replacing environmentally costly modes of production with more sustainable ones; as well as giving policymakers powerful tools to design and plan development interventions. To achieve the above Vision and NDPs, the government of Uganda came up with many interventions strategies among which includes the Mainstreaming ST&I in the national development process, resources planning, and appropriation processes in all sectors at the central and local government levels. The success of the above strategy can be analyzed using its SWOT (strengths, weaknesses, opportunities, and threats).

## 2. The outcomes

*1.2 Strengths of R&D*

This entails the resources that the government can use to achieve its objectives of mainstreaming the STI in the national development process, resources planning, and appropriation processes in all sectors at the central and local government levels. Uganda has several funding avenues support mainstreaming the ST&I into the national development processes. Financial support is key for any

institution to realize its objectives. For instance, the R&D and STI ventures in the Ugandan universities are majorly funded through three main avenues; Internally Generated Funds, Government Subvention, and Donor funding. At least 80 percent of the research funds at Mbarara University come from donors who invest in research with a particular motive (Kyaligonza et al., 2015). (Clesensio et al., 2020) also attested on the government of Uganda has invested a lot of money in the innovation of technology in accordance to the UNCST 2011 ST&I Status Report indicated government expenditures on science and technology of UGX 359.8 billion in 2007, UGX 367 billion in 2008, and UGX 479 billion in 2009 or a GERD of 1.1% in 2007, 1.9% in 2008 and 2.3% in 2009. More broadly, Government R&D expenditure increased from UGX 61.1 billion in 2008 (0.31%) to UGX 79.7 billion (0.39%) in 2009.

Another strength for the mainstreaming of the ST&I into the development processes is the collaboration between the Universities and industries. This is done through the curricula of the universities that provide internship programmes for all undergraduate programmes at both public universities and private universities. This is to support learners in obtaining practical experience from the industrial settings while on internship. They interface with the real-life experience in the industry that supplements the theoretical and some practicals learned from the institute. Makerere university collaboration in R & D with the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) to improve the agricultural sector (Makerere University College of Agricultural and Environmental Sciences 2017).

One of the strengths of R&D being felt in the ST&I is the developed and strengthened technical training centres both public and private to train individuals with capacity in technology-based industries in practical technical tasks, including developing software, managing networks, ensuring product quality, performing chemical testing, drilling, tracking products (Bienen & Ciuriak, 2015). For instance, the Youth Apprenticeship Program was developed by the Uganda Investment Authority (UIA) and Vantage Communications Ltd. This programme was specifically developed for the unemployed and school dropout youth in Uganda. This is in line with the Ugandan education, training, and skills policies that need to encounter the specific human capital needs of labour markets to support the economy in need of complex skills.

The ST&I policy in place is one of the Ugandan strengths in mainstreaming the ST&I into the development process. The policy aims at enhancing the contribution and role of ST&I in the national development process, as highlighted in Vision 2040 and the National Development Plans. It emphasizes the contribution of innovation and research in transforming Uganda into a knowledge-based economy and articulates the government's intent to nurture research and development that builds the human capital required (Brar et al., 2010). The policy also aims to strengthen the national capability to generate, transfer and apply technologies, and to ensure sustainable utilization of natural resources for the realization of Uganda's development objectives (MoFED, 2009).

The strength in the mainstreaming of the ST&I in Uganda development process also lies in the fact that she is rich in natural resources that offer a wide range of manufacturing opportunities, including food and mineral processing; production of beverages; textile, clothing, and leather production; packaging material; metal fabrication; chemical and pharmaceutical production. Security is paramount in achieving the development planning process and it's for this reason that the president of the Republic of Uganda has directed that all vehicles and motorcycles be fitted with tracking devices to help in tracking the vehicles and motorcycles that had been terrorizing the citizen. This is arrived at as a result of research on how vehicles can be tracked. According to (Kamurungi, 2021)**,** the global positioning system (GPS) trackers shall be installed by the Russian company, Joint Stock Global Security in all the vehicles and motorcycles in the country.

Technology adaptability and acceptability as one of the strengths in the mainstreaming of ST&I in the Ugandan planning processes. For any impact of a given technology to be felt, there must be high acceptance and its impact by the societal since the advent of technology comes with an irresistible force that leaves no choice but to adopt. Fortunately for Uganda, the majority of adults are youthful, that possess a very high drive for technology exploration. The use of technology has greatly impacted most spheres of life. In affirming this, Uganda has finally made a move from traditional teaching methodologies to more innovative student-centered, self-directed learning by learners known as e-learning, the use of modern technologies in teaching and learning cannot be avoided. Practices and research indicated that e-learning can meet the needs of students who are unable to attend a face-to-face lecture (Zhu & Justice Mugenyi, 2015).

*2.2 The Weaknesses of R&D*

These are the limitations within an organization that curtails its success.

The success of ST&I mainstreaming in Uganda to a large extent depends on education. As an emerging developing state in the technological world, education must be at the forefront in creating the personnel that would foster such innovations. But Unfortunately, the education sector itself is constrained by many challenges, among which, a lack of qualified education professionals in the line of ST&I, and majorly curricula that do not match the objective of ST&I, nor sectors and industries. In an ideal situation, university and tertiary institutions would develop closer coordination with sectors and industries to produce adequate numbers of graduates to stirrup the ST&I adventure, as well as the competency and confidence to step easily into professional life upon graduation which many a time marred by inadequacy in the training attained process.

Mobile broadband which is the internet connecting device is an important market not only to the country's telecom sector but also to the wider Ugandan economy and society. This service represents the primary means of internet access. According to Uganda Communication Commission (2014), as of June 2014, there were 4.1M mobile broadband subscriptions in Uganda, representing a penetration of 11.7% over the population representing the growth from 3.6M in 2013 and 2.6M in 2012. All these connectivities represent a Compound Annual Growth Rate

(CAGR 2010- 2014) of approximately 70%. Device prices have been the major barrier to mobile Internet adoption leaving quite a good number of consumers in the use of feature phones with limited data functionality. There are a small fraction of approximately 3.5 million total fixed broadband connections in Uganda. According to the Ministry of Information, Communication Technology and National Guidance (2018), Uganda, ranks 153rd in the world for fixed internet penetration with only 3per 1000 inhabitants having access to fixed internet. Yet, for most, if not all business outfits, industries, research/ academic institutions, IT/Innovation hubs (BPO), ICT, and industrial parks require dedicated fixed internet hence a weakness impeding the STI mainstreaming in the development process of Uganda.

To realize the value of R & D, there must be a positive attitude in its utilization. But unfortunately in Uganda, the receptiveness to innovative products and services by the population is still very low. While many innovations have penetrated the economy of Uganda, many people take long to adopt them with a fear of their impact on the economy, i.e. in terms of cost, and also lack of skills to apply them. The slow adoption process affects their receptivity coupled with heavy taxes on some of the innovations that are perceived to be a political threat.

Communication and ICT infrastructure is one of the drivers in the attainment of the R & D moves towards ST&I but unfortunately, Uganda's internet usage is low when compared to other developing countries in South East Asia and Sub-Saharan Africa, yet Internet usage has a very high correlation with the country's economic development. In a study by Pewresearch (2016), Comparatively, the study reveals that 28% of individuals sampled in the age of 18-34 years in Tanzania use the Internet and own a smartphone unlike only 16% for Uganda. 11% of respondents in Tanzania age 35+ use the Internet and have a smartphone in comparison to 3% for Uganda. 27% of high-income earners in Tanzania use the Internet and own smartphone compared to 17% for Uganda. In yet another observation by (UBOS (2015), an estimated 13 per 100 inhabitants subscribe to the internet in 2015.

*2.3 The Opportunities for R&D*

Opportunities are favorable situations that when tapped can improve the chance of achieving the organizational objectives.

One of the opportunities that will aid the mainstreaming of the ST&I in the development process is the Government of Uganda's recognition of the importance of ICT in national development through the National Science, Technology, and Innovation Plan 2012/2013–2017/2018. As such, Uganda's ICT sector is one of the most vibrant and fastest-growing sectors since its liberalization in 2010, supported by a good ICT legal and regulatory framework. A wide range of Internet points of presence, Internet cafes, training centres, telecentres, ICT labs in schools and higher education institutions has been implemented by the Rural Communications Development Fund (RCDF). As of today, Uganda is currently implementing ICT-related initiatives in the areas of e-infrastructure (Research and Education Network Uganda, Broadband Services ERT Programme, National

Backbone, Migration from Analogue to Digital Broadcasting Project, and eNetwork project) and eGovernment (Electronic Government Infrastructure and ICT4 Democracy in East Africa project) (Barakabitze et al., 2019). These in addition to the National ICT Policy 2014 are aimed at coordinating and harmonizing the disparate ICT efforts and policies across different ministries. Its objectives include building skills in the ICT field; promoting innovation in ICT products, services, and applications; expanding ICT infrastructure; deepening the diffusion and utilization of e-services by the public and the private sectors; and promoting e-government initiatives, promoting universal access to technologies, with a special emphasis on rural areas and disadvantaged categories of the population (Ministry of Information and Communications Technology, 2014).

The availability of several policies, Acts, programmes, etc for Uganda fix her at a better opportunity in the world of R&D and the actualization of the STI mainstreaming in the development processes; Universities and Other Tertiary Institutions Act of 2001, Education Sector Investment Program 1998, Government White Paper (1992) requires universities to generate and diffuse knowledge and ST&I research for development, National Development Plans 1, 11 and 111 stipulates the role of research in development, Comprehensive National Development Planning Framework (CNDPF), Uganda Vision 2040 launched to transform Uganda economy, National STI Policy Paper launched 2009, Taking part in the Africa ST&I Indicators (ASTII) Program run by NEPAD. All these opportunities when properly tapped will fix Uganda in a better position via R & D and ST&I.

Another opportunity is the Human resource development to carry out the R&D to facilitate the mainstreaming of ST&I in the development process of Uganda; Millennium Science Initiative funded by World Bank to support research, ST&I education and training Government Support to Scientists(GSS) program, Funding to strengthen Uganda Industrial Research Institute; Joint Clinical Research Centre (JCRC) and Economic Policy Research Centre (EPRC), African Innovation Outlook (2010) reported that Uganda had 1768 research staff of which 785 were researchers. Hence 26 researchers per million inhabitants As observed by Mahmood et al. 2020), Human Capital which is considered as a blend of knowledge, skills, and abilities of the individual to perform a specific task represents one of the key resources for the development of organizations and or nations.

Availability of the private entity and the Ugandan capacity to work in partnership is also one of the opportunities that can be tapped in the mainstreaming of the ST&I in the different aspects of the development process This is beneficial in that the private sector contributes in their expertise to add on to the national technical experts. According to the law governing the PPP, the private sector contributes 30% of such resources while the public backs it up with the remaining percentage. This is forwarded by (Tshombe et al., 2020) that the existence of strong institutions, both public and private, is a requirement for every visionary country. Working under partnership also pave way for funding from the private sector to supplement the public budget. According to

(Engelsman et al., 2020), there is a growing realization that large-scale infrastructure development in Africa can only be attained through a co-funding arrangement with the private sector. Dykes and Jones (2016) likewise agreed to the fact that private provide capital for public entities, which are often resource-poor and thus have limited ability to finance developmental activities.

Availability and mandate given to the CSOs is an opportunity for this state. During ST&I-related policy formulation, CSOs are often consulted to make their input especially in the area of their implementation which would make them operate adequately. It is significant to note that policy issues are the responsibilities of the government. (Williamson & Rodd, 2016) observe the use of relationship building with government officials as a mechanism for influencing policies is vital for CSOs due to their outstanding services aided by recruitment of very competent personnel, CSOs possess very technical personnel who play a crucial role in providing technical assistance through their specialized persons in support for the R&D, ST&I projects. According to (Ayhan & Önder, 2021), human resource variables of professional competence for work achievement, and organizational training influence the performance of CSOs.

The force of globalization is considered an outstanding opportunity as it compels the nation into interdependence, interconnectedness, partnerships, and mobility across global communities. According to (Huisman et al., 2020), these new developments enable global challenges and achievements to transcend national boundaries and this requires sustainable solutions which need to be addressed collectively. Partnerships across national and disciplinary boundaries are thus rapidly emerging which stresses the role of higher education and research in the future growth of Africa for international partnerships as a priority area for the mobilization of resources to revitalize African universities and other sectors to effect R&D.

*2.4 The Threats to R&D*

The challenging Bank finance conditions for innovation and entrepreneurship in Uganda is a threat to ST&I mainstreaming. As observed by (Ayyagari et al., 2012), that limited access to financing affects any business activity and decision, guides firms to minimize uncertain and risky activities, and, by consequence, curtails innovation. And as per the World Bank (2018), only 10 percent of firms have a bank loan or line of credit, a proportion less than for low-income countries which is at 22 percent, and still lower than in 2006 when it was at 17 percent. Given the fact that the youthful groups form the biggest portion of the Ugandan population, the unfortunate part of it is that they are the poorest, jobless, and lacks sureties to acquire finances besides the expectation of driving the state by them puts the ST&I situation at stake.

Much as Ugandan investment into ST&I is yielding positively to some extent, critics such as (Kasimbazi & Alexander, 2018) argued that, due to foreign aid acquired in a bid to fund the ST&I activities, Uganda is more indebted calculated as over 3,100 million USD is due to the multilateral creditors with World Bank, IMF, and African Development Bank being the core creditors. The trend seems to continue to its worst point since the revenue base is small making it a big threat as

the technology afore seen to improve the economy of the state will instead drain the citizen through over-taxation in a bid to service debts.

The high population growth rate of Uganda is one of the major threats in the realization of ST&Is. The high population growth harms savings rates which limit obtainable resources per capita for human capital development, as well as physical capital accumulation. According to the World Bank, (2018), Uganda has experienced a significant growth stoppage since 2010, an indicator of acute demographic pressures that the country is exposed to. The population increased from 24 to 35 million during 2002-2014 and is expected to be above 80 million in 2040. Another threat that tends to undermine the mainstreaming of ST&I in the development processes of Uganda is the quality of scientific research institutions as compared to other African countries, the quality of scientific research institutions in Uganda is still underdeveloped. The research institution as observed by is characterized by lower numbers of personnel in science-based disciplines and poor infrastructure development, lack of financial resources to support research, and low numbers of staff with a Ph.D. degree to enhance research activities.

Brain drain has been considered as one of the most critical threats to the mainstreaming of ST&Is in the development processes. It is majorly caused by poor remuneration, poor working conditions, and international opportunities. It seems nothing serious is being done by the institutions to mitigate the brain drain that is leaving the motherland that trained them helpless in terms of lack of drivers in the mainstreaming of the ST&I. According to (Wakida, 2011), the brain drain causes were quite well linked with performance management in the institutions where no formal human resource systems were placed, and if they were there, they were not followed consistently putting the ST&I mainstreaming at stake

Lack of trust by the citizen in certain undertakings is still a big threat in the realization of ST&I mainstreaming. The mandatory vehicles and motorcycle tracking idea, introduced by President Museveni to culminate gun crime hampering the ST&I mainstreaming, received resistance even before the exercise commences as some individuals think will encroach into their privacy and compromise personal security, infringement on human rights, and others also feared it will be used by the government to harm opposition politician and curtail their activities (Independent, 2021). Basing on the level of mistrust the citizen have of the ruling government, the purpose of this Intelligent Transport Monitoring System (ITMS) shall not be realized.

## 3. Conclusion

The mainstreaming of ST&I in the development plan is taking shape but at a very low pace as seen above in terms of its strength, weakness, opportunity, and threat. Uganda needs to tap the available opportunities to strengthen its capacity and overcome the weakness and the threats as highlighted above other than have more booming ST&Is in papers only.

## 4. Recommendations

From the above review, it is encouraged that:

a) Academics invest energies in enhancing the the strengths and the opportunities underlying Research and Development.
b) The academia and the researchers, continually seek practical means to thwarting the weaknesses and the threats to Research and Development.

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