Differentials in Commercialisation of Technology between the United Kingdom and Sub-Saharan Africa

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ABSTRACT

Commercialisation of technology, innovations and research outputs significantly influences the developed and the developing contexts. A comparison of the United Kingdom and Sub-Saharan Africa is analysed basing on differences in economic development, infrastructure, policy frameworks, and academic-industry linkages. This article explores these differentials through a comparative analysis, drawing insights from the Knowledge exchange visit by the authors to the United Kingdom and from existing literature. The study identifies key factors that influence successful technology commercialisation and provides recommendations for enhancing the process in Sub-Saharan Africa. These includes differences in existing infrastructure that supports innovation and technology transfer, including advanced research facilities; government policies influencing technology commercialization, either by facilitating or obstructing its progress; collaborations between universities and industries which are essential for successful commercialisation of technology and economic conditions conducive for monetization of innovation and investment growth.

Keywords: Technology commercialisation, United Kingdom, Sub-Saharan Africa, economic development, policy frameworks, academic-industry linkages.

INTRODUCTION

Commercialisation of technology, involves transforming scientific research and technological innovations into marketable products, is critical to economic growth and development. While the United Kingdom (UK) has established robust mechanisms for technology commercialisation, Sub-Saharan Africa (SSA) faces numerous challenges. Hence the need to examines differentials in technology commercialisation between these regions, highlighting the barriers and opportunities in SSA.

Technology commercialization is essential to modern economies as it promotes innovation, boosts productivity, and fuels economic growth. The commercialization stage is the most critical point in the invention value chain, requiring collaboration and connections among innovation system participants, with both public and private organizations playing key roles (Marule, 2022). Innovation is driven by trade openness, patent systems, and human capital, making policy reforms, education, and international trade initiatives crucial elements of development strategies in developing countries (Inovasi et al., 2016).

While knowledge generation is essential, transforming it into technology-driven products and processes is key to commercialization efforts in Africa (Marule, 2022). Although many African economies have improved knowledge creation, the commercialization of these innovations remains underdeveloped (Asongu & Odhiambo, 2020). Hence, the need to promote the commercialization of traditional African innovations

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and practices passed down through generations. Africa has a wealth of traditional practices that could be leveraged for commercial purposes.

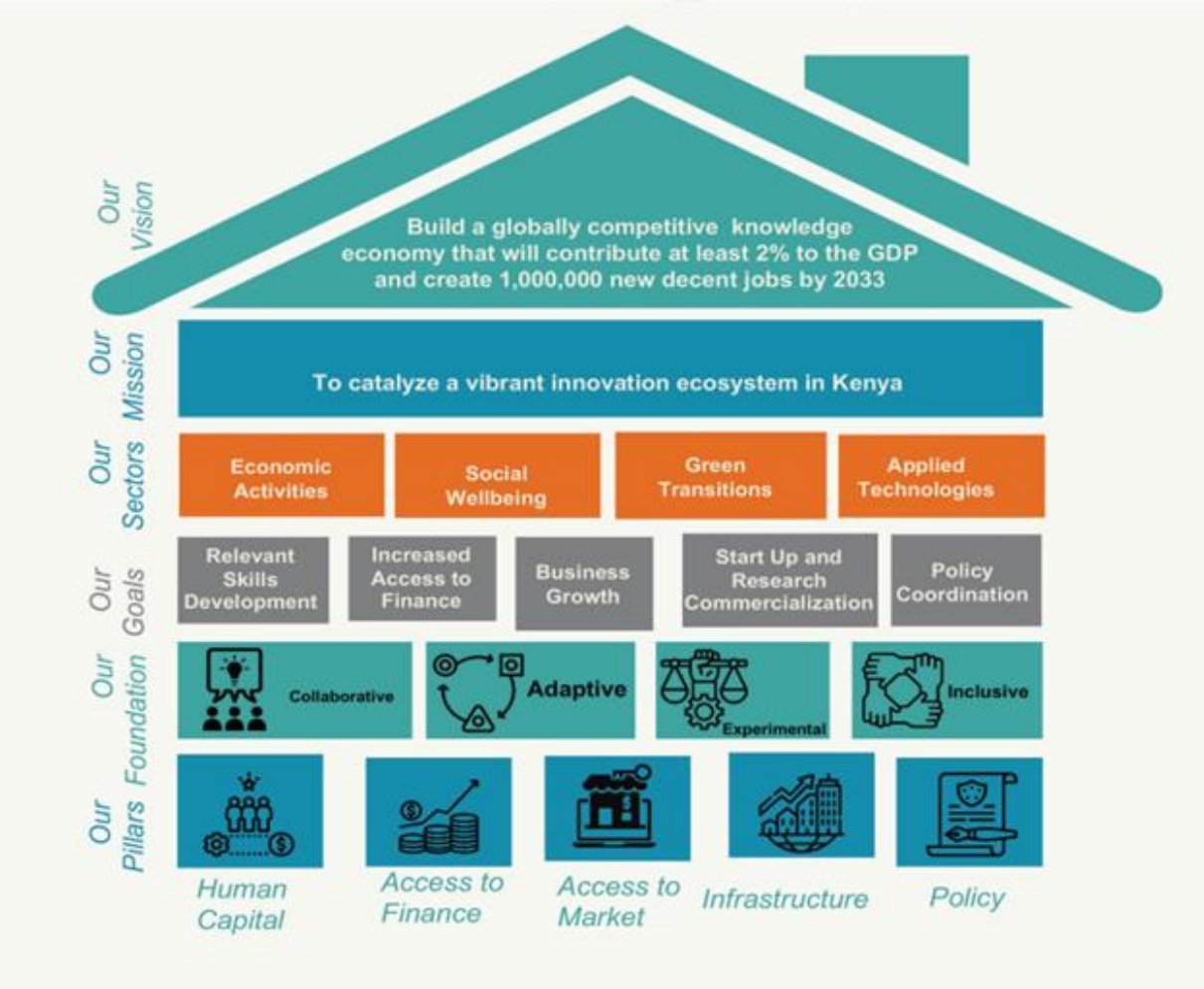
LITERATURE REVIEW

Concept of commercialization of technology

The process of turning new technologies, ideas, or innovations into marketable goods or services that can be sold effectively in cutthroat marketplaces is known as "commercialization of technology." This procedure is essential for converting scientific and technology breakthroughs into useful applications that add to economic value and advance society.

Theoretical framework

This study examined the innovation ecosystem presented below which was derived from the Kenya National Innovation Agency (KeNIA) 10-year Master Plan. It shows the areas of focus and the basis of analysis which have been used in analysing the finds in this paper.



Adopted From Kenia National Innovation Agency 10 Year Master Plan.

The framework emphasizes on the following four pillars:

Human Capital Pillar which refers to the efforts to enhance relevant skills and experience among the population for quality output production in the knowledge economy. Qualified human resources are a vital component of a successful knowledge economy. Development of accessible and diverse programmes is essential to produce graduates better equipped to competitively participate in a global knowledge economy.

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Improving the capacity of training institutions in the country to better support generation and commercialisation of innovation is central to this pillar. The second pillar is access to Finance focuses on funding required to support the successful operation of the national innovation ecosystem. This includes the production and commercialisation of the outputs of the knowledge economy. Financial resources are essential to the sustainability of a knowledge economy. Capital is necessary for the funding of the development of infrastructure, commercialisation operations, policy development and human capital development. Increasing the pool of funds available to stakeholders within the national innovation ecosystem is essential to the long-term success of the knowledge economy. Access to markets is the third pillar focusing on finding opportunities for generation of commercial value from the outputs of the knowledge economy. This includes finding, growing and maintaining commercial relationships. The success of the knowledge economy will depend on the ability to create new markets for the outputs of the national innovation ecosystem. Intentional efforts should be made to develop local market opportunities and to open regional and international markets for these outputs. This will include creating awareness of these commercial opportunities and ensuring the output meets the quality standards required to access these markets. Infrastructure is the fourth pillar that pays attention to physical and virtual solutions that support the ability of actors within the knowledge economy to produce quality outputs. This includes physical infrastructure such as information, communication and technology (ICT) equipment and services that can interconnect the innovation ecosystem to promote collaboration. Physical spaces that can increase interaction of stakeholders within the ecosystem and offer facilities for the production and commercialization of knowledge are also an essential part of this pillar. Policy is the fifth and the last pillar that refers to laws and regulations that provide guidelines within the innovation ecosystem. These are essential elements to encourage the participation of stakeholders who would make investments of human and financial capital in the national innovation ecosystem to promote the generation, protection and dissemination of knowledge outputs.

From the global context, Japan and the UK as one of the two powerful economies, have developed comprehensive national strategies to bolster innovation and intellectual property management, each tailored to their unique economic landscapes and objectives. Japan has instituted a national IP Management policy that emphasizes the creation and protection of intellectual property, its commercial exploitation, and the promotion of creative content, especially in audiovisual works. Integral to Japan's strategy is the adoption of the Triple Helix Model of innovation. This model promotes a collaborative interaction between stakeholders fostering a synergy that drives economic and social development. Universities are encouraged to pursue research that informs industrial production, while the government regulates and nurtures market environments conducive to innovation.

The UK, on the other hand, has articulated its vision through the UK Innovation Strategy, aiming to position itself as a global hub for innovation by 2035. The strategy is structured around four key pillars as indicated below:

1. Unleashing Business pillar is cantered on invigorating businesses with a keen interest in innovation. The focus here is to provide the essential support and nurturing environment that businesses need to thrive and grow. By removing barriers and facilitating resources, this pillar aims to catalyse business-led innovation, driving forward economic prosperity.
2. People through talent play an indispensable role in innovation, this pillar seeks to transform the UK into a premier destination for innovative minds. It focuses on attracting and retaining top-tier talent, fostering a skilled workforce that can propel forward the nation's innovative capabilities.
3. The UK's research, development, and innovation institutions are in line with the demands of companies around the nation thanks to the Institutions and Places pillar. In order to ensure that innovation is not only centralized but also distributed throughout different regions, it focuses on strengthening these institutions' ability to promote both local and national economic growth.
4. Missions and Technologies pillar fosters innovation in vital areas of need and opportunity while tackling major challenges both domestically and internationally. It seeks to enhance the UK's proficiency in important technologies, putting the nation at the front of innovations and solutions.

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In order to effectively tackle developmental difficulties, innovation necessitates a customized strategy that considers the distinct circumstances, requirements, and capacities of developing nations (Omidi et al., 2020). Sustainable growth in these areas can be aided by adaptable innovation tactics, better policy coordination, and the development of regional innovation ecosystems (Omidi et al., 2020). Furthermore, Sub-Saharan African companies can stimulate innovation through internal human capital strategies like training and slack time, with variable outcomes depending on the business and setting (Omidi et al., 2020). This variation emphasizes how crucial it is to have strong training initiatives in order to promote innovation and entrepreneurship in Africa.

Successful technology commercialisation justifies efforts, funds and time committed to research and development and it propels enterprise development, spurs industrialisation, enhances enterprise technological capability, efficiency, and competitiveness, create investment opportunities, and make research more demand driven. Developed nations, particularly the United Kingdom, have effectively leveraged technology commercialisation to maintain their competitive edge in the global market. Conversely, Sub-Saharan Africa, despite its vast potential and abundant resources, lags significantly in this area. Understanding the factors contributing to these disparities is essential for developing strategies to enhance technology commercialisation in SSA.

Underdeveloped infrastructure, weak policy frameworks, limited academic-industry links, economic instability, skill gaps and brain drain, cultural and social barriers, insufficient funding for research and development, regulatory and bureaucratic obstacles, market access, distribution issues, and a lack of collaboration and networking are just a few of the many obstacles that SSA faces when it comes to commercializing technology initiatives. A multifaceted strategy is needed to address these issues, including infrastructure investment, policy reforms, bolstering academic-industry ties, establishing a stable economic climate, filling skill gaps, encouraging an innovative culture, boosting R&D funding, simplifying regulatory procedures, enhancing market access and distribution networks, and encouraging networking and collaboration. By addressing these issues, SSA can foster an atmosphere that encourages technology innovation and commercialization, which will ultimately propel economic expansion and advancement.

METHODOLOGY

This study employed a qualitative research design, utilising case studies, document analysis, and expert interviews. The study sample based on the sponsors visitation program. The UK and SSA are compared based on key indicators such as infrastructure, policy frameworks, academic-industry collaborations, and economic conditions. Data sources include academic journals, government reports, and industry publications.

The study ensured a comprehensive analysis, by adopting a multi-faceted methodological approach. Firstly, interviews were conducted with heads of the institutions visited in the UK, presentations made and a thorough review of existing literature on technology commercialisation in both the UK and SSA was conducted. This includes academic papers, government reports, and industry analyses. Secondly, case studies of successful technology commercialisation initiatives in the UK and SSA were examined to identify best practices and common challenges. Finally, interviews with experts in the field, including policymakers, academics, and industry leaders, provided nuanced insights into the factors influencing technology commercialisation in both regions.

FINDINGS

The differentials between UK and SSA is presented in the table below. The findings are based on the Strategic Focus, Legislative and Policy Framework, Implementation and Institutional Support and, Intellectual Property. The UK and the SSA differentials point to approaches towards fostering innovation. Another key highlight is the different stages of policy development where SSA might be at the stage of

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building foundational economic strengths, while the UK is executing a well-defined strategic vision to harness and elevate its innovation landscape.

Table 1: The differentials between UK and SSA

Criteria	UK	Kenya	South Africa
Strategic Focus	Direct innovation strategy with pillars targeting business innovation, talent development, institutional alignment, and technology.	Broad economic supports: human capital, finance, market access, infrastructure, policy.	Intellectual property management from publicly financed research, with emphasis on legislation and specific policies like IPR-PFRD Act.
Legislative and Policy Framework	Strategy led by government initiatives without explicit mention of new legislation.	Lacks specific legislation directly targeting innovation.	Strong legislative framework (IPR-PFRD Act), Decadal Plan, and White Paper on Science and Innovation focusing on structured policy approaches to innovation.
Implementation and Institutional Support	Detailed roles for institutions aligning with innovation goals, integrated government, and institutional support.	General mention of essential economic supports, lacks detail on specific institutions.	Specific agencies like TIA and university collaborations highlighted, showcasing strong linkage between policy, funding, and institutional support.
Focus on Intellectual Property	Not the main focus, though innovation strategy could implicitly cover IP considerations through technological advancements.	Focus on managing IP with specific agencies dedicated to overseeing and promoting IP exploitation.	Explicit focus on managing IP from publicly financed research, with specific policies and agencies dedicated to overseeing and promoting IP exploitation.
Global Positioning Goals	Aims to make the UK a global hub for innovation by 2035.	Explicit mention in the Kenya National Innovation Agency 10 year Master plan.	Not explicitly aiming for global positioning in innovation but focuses on maximizing local innovation outputs and managing public research outcomes effectively.

A further analysis on the findings is structured along infrastructure, Policy Frameworks, Academic-Industry Linkages, and Economic Conditions as explained below:

INFRASTRUCTURE

The significant disparity in infrastructure between the UK and Sub-Saharan Africa (SSA) is a key factor influencing technology commercialization. The UK benefits from a well-established infrastructure that supports innovation and technology transfer, including advanced research facilities such as the Science and Technology Facilities Council (STFC), along with incubators and accelerators that provide critical resources for startups and researchers. This strong infrastructure consistently fosters innovation, presenting a strong value proposition for entrepreneurs. Conversely, SSA's infrastructure is generally underdeveloped, with limited access to modern research facilities and technological hubs, which stifles innovation and restricts researchers and entrepreneurs from commercializing their inventions. Weak infrastructure in public research institutions and universities, lack of trust in the private sector, and insufficient collaboration between universities and industries further impede innovation. Outdated technology and equipment also compromise

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research quality and limit industrial development and commercialization (Berthet et al., 2014). Additionally, volatility in foreign direct investment (FDI) favours low-tech sectors, obstructing high-tech innovation (Aubert, 2005). African nations face several challenges, including limited access to technology, low internet penetration, inadequate infrastructure—particularly in energy and transportation—and insufficient development of human capital in education and health, all of which hinder technological growth in the region (Osabuohien, 2010).

POLICY FRAMEWORKS

Government policies significantly influence technology commercialization, either by facilitating or obstructing its progress. In the UK, the government has introduced comprehensive policies aimed at promoting technology commercialization, such as funding programs, tax incentives, and supportive legal frameworks. These measures create a favourable environment for innovation and offer financial support to researchers and startups. The innovation ecosystem is guided by the UK Innovation Strategy 2035, which focuses on four key pillars: (i) Unleashing Business; (ii) People – positioning the UK as an attractive destination for innovation talent; (iii) Institutions & Places – developing innovation institutions to meet the needs of businesses and regions across the UK; and (iv) Missions & Technologies – using innovation to address major challenges faced by the UK and the world, while advancing key technological capabilities (https://www.gov.uk/government/publications/uk-innovation-strategy).

In SSA, many countries lack coherent policies to promote technology transfer. There is often a disconnect between policy formulation and implementation, with insufficient funding and inadequate legal protection for intellectual property. This policy gap significantly impedes the commercialisation of technology in the region. Some of the key challenges include weak coordination between Innovation and Industrial Policies, limited stakeholder integration, inadequate funding and support structures, and a lack of focus on commercialization in policies in the design phase. However, joint planning and delivery mechanisms between the policies prevent seamless commercialization of technology, limiting its impact on economic development.

The need for the development of dedicated technology commercialization strategies, involving public and private sector cooperation to unlock the economic and industrial potential of innovation in Africa is paramount (Marule, 2022). The Industrial Policy framework, while acknowledging the importance of innovation, struggles to operationalize these technologies into market-ready products and services due to the lack of clear guidelines for transitioning research from development to commercialization (Marule, 2022). Human capital at the secondary and tertiary levels should be an integral aspect of policy development in Africa (Oluwatobi et al., 2016). Policymakers should focus on improving ICT infrastructure, access, usage, and skills to address growth challenges in SSA (Osabuohien, 2010). This provides evidence that an innovative ICT infrastructure can drive sustainable transformation and shared prosperity. Promotion of innovation entails improvement of digital infrastructure should be pursued simultaneously with policies that enhance human capital (Osei, 2024).

ACADEMIC-INDUSTRY LINKAGES

Strong collaborations between universities and industries are essential for the successful commercialisation of technology. In the UK, there are well-established linkages between academia and industry, facilitating the transfer of knowledge and innovation. Universities actively engage with industry partners through research collaborations, technology licensing, and spin-off companies. These collaborations ensure that research outcomes are translated into marketable products and services and its impact is measured by the transformative solutions delivered to the world (in health, aerospace, finance, environment, sports, energy among others). In contrast, academic-industry linkages are weak in SSA, with limited interaction between universities and the private sector. The lack of collaboration inhibits the flow of knowledge and technology from academia to industry, resulting in missed opportunities for commercialisation. The lack of interaction

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between key stakeholders, duplication of efforts, and aging equipment further hinders the commercialization of innovations(Berthet et al., 2014). The Science Technology and Innovation (STI) policies are not coherent, there is limited domestic expenditure on R&D, weak university-industry collaboration; low implementation of existing STI policies; low promotion of innovation at the enterprise level; and low awareness of intellectual property rights (Osakwe & Moussa, 2017).

ECONOMIC CONDITIONS

Economic stability is a critical factor influencing technology commercialisation. The UK benefits from a stable economic environment that provides a conducive atmosphere for innovation and investment. A robust financial sector, access to venture capital, and a supportive business environment encourage entrepreneurs to take risks and invest in new technologies. In SSA, economic instability in many countries hinders investment in research and development. High levels of poverty, unemployment, and political instability create an uncertain environment that discourages both local and foreign investment in technology commercialisation. The lack of demand for knowledge in developing countries demands the generation of frugal innovation systems in Africa(Adebowale et al., 2014). Economic difficulties, such as a widespread informal economy, poverty, restricted access to financial services, and susceptibility to climate change, greatly impede advancement toward achieving the SDGs (Osei, 2024). Sub-Saharan Africa's economies are highly susceptible to global disruptions, such as the COVID-19 pandemic and geopolitical conflicts like the Russia-Ukraine war(Osei, 2024). Entrepreneurship does not directly affect innovation in African owing to the low institutional quality (Omidi et al., 2020).

CONCLUSIONS

This paper draws conclusions based on a number of factors. The UK's advanced infrastructure significantly supports innovation, while SSA's underdeveloped infrastructure hampers technological commercialization due to outdated resources and lack of collaboration. The UK has robust government policies aiding technology commercialization. While SSA struggles with incoherent policies and lacks the necessary funding and legal protection. Strong partnerships between academia and industry in the UK boost innovation, whereas SSA shows weak linkages, limiting the commercial potential of technologies. The UK's stable economic environment promotes innovation and investment. In contrast, SSA's economic instability discourages investment and stifles innovation. The UK has a clear strategic vision targeting global innovation leadership by 2035. SSA lacks a cohesive innovation strategy, focusing mainly on basic economic development.

The UK's success factors include well-established infrastructure, supportive policies, strong academic-industry collaborations, and a stable economy. SSA's challenges encompass underdeveloped infrastructure, ineffective policy frameworks, inadequate academic-industry partnerships, and economic instability.

RECOMMENDATIONS

SSA countries should invest in building modern research facilities and technological hubs to support innovation. Developing infrastructure that facilitates research, and development is crucial for fostering innovation and commercialisation. Governments and private sector stakeholders must collaborate to finance and develop these facilities. International partnerships and funding from development agencies can also play a vital role in bridging the infrastructure gap. Establishment of National and regional shared Science and Technology Facility Centre may be critical in unlocking research to Commercialization.

Governments in SSA need to formulate and implement policies that encourage technology transfer and provide incentives for innovation. This includes establishing clear legal frameworks for intellectual property protection, offering tax incentives for research and development activities, and creating funding programs to support startups and researchers. Effective policy implementation is essential to ensure that these measures translate into tangible benefits for innovators and entrepreneurs.

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Strengthening collaborations between universities and the private sector is crucial for effective technology commercialisation. Universities should actively seek partnerships with industry players through joint research projects, technology licensing agreements, and the establishment of innovation hubs. Governments can facilitate these collaborations by providing funding and creating platforms for interaction between academia and industry.

Efforts should be made to create a stable economic environment that attracts investment in research and development. This includes implementing sound macroeconomic policies, improving governance and political stability, and reducing barriers to investment. Building a stable and predictable business environment will encourage both local and foreign investors to support technology commercialisation initiatives in SSA.

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