NEW KNOWLEDGE MANAGEMENT STRATEGY FOR SGCS

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KNOWLEDGE MANAGEMENT STRATEGY FOR SGCs

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List of Abbreviations

AF	Annual Forums
AU	African Union
AUC	African Union Commission
CPA	Consolidated Plan of Action
CTA	Centre for Technical Agents
DFID	Department for International Development
ECOWAS	Economic Community of West African States
ICT	Information Communication and Technology
IDRC	International Development Research Centre
IP	Intellectual Property
IT	Information Technology
KM	Knowledge Management
MEL	Monitoring, Evaluation and Learning
MOU	Memorandum of Understanding
NRF	National Research Foundation
PE	Public engagement
PPP	Public Private Partnerships
R&D	Research and Development
R&I	Research and Innovation
REC	Regional Executive Committee
SBCC	Social and Behavior Change Communication
SGCI	Science Granting Council's Initiative
SGCs	Science Granting Councils
STEM	Science, Technology, Engineering and Mathematics
STI	Science, Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa
UNESCO	United National Educational, Scientific and Cultural Organization,

Executive Summary

The central role played by science, technology and innovation in the societal and economic development of Africa has been acknowledged by African leaders as well as other policy actors. The African Union's Commission (AUC) Science and Technology and Innovation Strategy (STISA)-2024 places Science, Technology and Innovation (STI) at the epicenter of the continents socio economic development and emphasizes the urgent need for Africa to develop knowledge-based economies guided by knowledge strategies. This strategy calls for Sub-Saharan Africa (SSA) nations to prioritize the setting up of a competitive research infrastructure base, build supportive technical and professional competencies, support innovation and entrepreneurship and create conditions conducive for STI.

Setting up of competitive research infrastructure base

Knowledge management (KM) is defined in this strategy as a series of coordinated activities involved in knowledge generation / creation, analysis, compilation (documentation), storage and uptake, utilization and application. KM is crucial in enabling the Science Granting Councils (SGCs) to deliver on their specific mandate to increase efficiency of a) management of research, b) the design and monitoring of research programs, c) the formulation and implementation of policies using robust science, technology indicators, d) support knowledge transfer to the private sector, and e) systematize the sharing of knowledge expertise and skills among SGCs in SSA. The KM strategy contributes to the evolution of SGCs that are able to strengthen national science, technology and innovation systems leading to nationally led and relevant research that will contribute to the societal and development of the African nations. The KM strategy guides the coordination and linkage role that the SGCs play in ensuring that knowledge management systems are operating optimally. This includes, ensuring that financial resources are leveraged and a well-understood regulatory framework exists that creates a conducive environment for research. The SGCs also must coordinate the dissemination of the generated knowledge so that research findings are used in decision making as well as policy formulation. The coordination of these roles is crucial to the unhindered utilization of findings at this period when nations are transitioning to knowledge-based economies. Policy and decision makers need high quality, relevant, real time data and evidence in order to navigate these changes and such knowledge cannot be generated without robust strategy and it cannot reach those who need it without clear strategic generation and dissemination.

Build supportive technical and professional competencies

The science and research infrastructure is called upon to respond to the dearth of trained and highly qualified technical and professional researchers capable of conducting large scale studies to direct policy. The challenge is not only human capacity, but is exacerbated by minimal financial resources.

However, the lone-ranger approach to responding to these challenges has been identified as non-strategic and self-defeatist. More cross-nation, collaborative and corporative approaches where technical and material resources are shared could see less duplication and underutilization. The SGCs acting as gatekeepers and resources sharing brokers could ensure more sharing and learning across boundaries. Such a collaboration could extend beyond just mobilizing universities and research institutes within the countries of their jurisdictions but create sharing platforms for academic and professional exchanges within the continent. Sharing professional skills and expertise would contribute to building the capacity along the entire research. Working among the SSA nations also has the potential of ensuring that research priorities are relevant and responsive to the needs of the population. The universities and research institutes have lacked strategic approaches to created meaningful linkage with private sector and industry and SGCs can broker such interactions. The technical competencies have to strategically and deliberately expand the operational space for more women in science. Such initiatives must delve into the socio-cultural factors that hinder the equal engagement in science and technology by both men and women.

Support innovation and entrepreneurship

The world has seen a lot of progress as a result of the digital revolution while most of SSA still lags behind in the provision of basis internet connectivity, telecommunications infrastructure, stable electric power and transportation. SGCs can advocate effectively with policy makers to realize the relationship between these critical factors and evolution of scientific innovation and entrepreneurship. Once the data and evidence exist, and an environment created that allows for engagement the developmental role of science and technology and its linkage to human development is easier established. This strategy calls for a deliberate effort at prioritizing human capacity development in the areas of data collection, analysis and presentation so that decision making is data and evidence driven. This is why Monitoring Evaluation and Learning (MEL) is a centerpiece of this strategy. MEL activities will monitor not only the progress of the SGCs in delivering on their mandate, but also their efforts at institutionalization of the delivery of ethical and high-quality research and dissemination and utilization of evidence. The learning will be factored into the strategic social and behavior change and advocacy activities that are aligned to achieving these knowledge goals.

Create conditions for STI

A thriving science and technology environment is created by high level engagement of all key stakeholders. Building strong public private partnership broadens the sense of ownership and widens the pool from which human and financial resources can be leveraged. Ensuring that knowledge can be identified and accessed by all who are sensitized and made aware of its use is key to this strategy. Access to real time data by all cadres who need it to respond to day to day challenge right across the population

is at the heart of the creation of a culture in which science and technology occupies the frontline of development initiatives. Multiple knowledge and information dissemination approaches are proposed that will reach the entire spectrum of the population. Science and technology genuinely becomes the driving force of the realization of the knowledge-based economies.

Recommendations

i. Create an "objective point system" based on STI indicators for awarding research grants.

ii. Organize and conduct regular and accredited online capacity building sessions for local scientists and researchers.

iii. Develop MOU for internships, visiting scholarships, research fellowships and cross learning to build on interaction and cross learning with private sector and industries.

iv. Develop a digital database of all research that have been conducted by local scientists and within the SSA countries.

v. Orchestrate and organize regular exchange meetings where scientists interact with the public so that STI is demystified and a culture of STI is inculcated into the national psyche.

vi. Manage linkage processes between nascent science and technology hubs, universities and research institutes as well as private sector.

vii. Create a platform for broad inter-sectoral exchange bringing together players from education, science and technology, academia and economic planning policy makers to host annual reflections on policy to enhance STI.

CHAPTER 1

Background and Context

African leaders and other policy actors within the continent recognize the central role played by science, technology and innovation (STI) and related factors in economic growth and in addressing developmental and social challenges. This recognition is manifested, for instance, in continental policy initiatives such as The African Union Commission's (AUC) Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024) which was developed in 2014 as part of the AU Agenda 2063 that places STI at the epicenter of the continent's socio-economic development. STISA's mission is to "Accelerate Africa's transition to innovation-led knowledge-based economies". The STITA-2024 is clear on the urgent need for Africa to have knowledge-based economies by putting in place a competitive research infrastructure base, supportive technical and professional competencies, flourishing innovation and entrepreneurship and a conducive policy environment for STI. Strategically, STISA-2024 envisages that the roll out of the strategy will be coordinated from the continental to the regional and to the national level which is where Science Granting Councils manage the vision and implement STISA strategy.

Science Granting Councils (SGCs) are key players in the development of strong national STI systems which are the precursors for transformation to knowledge-based African economies proposed by STISA 2024. SGCs are key actors promoting Public Private Partnerships (PPPs) around Research and Innovation (R&I) within a country's national system of innovation. The role of SGCs and their proxies in different settings is largely to provide support that funds science through a diversity of platforms. The councils act as agents of the government while representing the interests of the country's scientific community. They are important 'intermediaries' in the flow of international funding and technical support to R&D performing institutions in a country".

The SGCs perform six crucial functions that contribute to the evolution and effective functioning of national STI systems including:

i) Disbursement of research grants (different categories)
ii) Valorisation of results/ dissemination /uptake of research reports and findings
iii) Collect data / statistics – Research and Development (R&D) surveys
iv) Capacity Building/ Training (individual/ researchers)
v) Disbursement of scholarships / loans (different categories from Honours to PhD)
vi) Advocacy for STI

African Union Commission (2013). African Union Science, Technology and Innovation Strategy for Africa 2024.
Mouton, J., Gaillard, J., & van Lill, M. (2014). Science Granting councils in Sub-Sahara Africa. Stellenbosch University, CREST, IRD. South Africa. CREST Scoping Report - Science Granting Councils in Sub-Saharan Africa (2014).

The Science Granting Council's Initiative (SGCI) is a multi-donor Initiative organized into Phase 1 (SGCI-1: 2015 - 2020) and Phase 2 (SGCI-2: 2018-2023) and supported by Swedish International Development Cooperation Agency (Sida), United Kingdom's Department for International Development (DFID), Canada's International Development Research Centre (IDRC) and South Africa's National Research Foundation (NRF). Since its inception in 2015, the Initiative has been strengthening the capacities of Science Granting Councils in 15 Sub-Saharan Africa countries in order to support research and evidence-based policies that will contribute to economic and social development. SGCI participating countries include Burkina Faso, Côte d'Ivoire, Ghana and Senegal, Ethiopia, Kenya, Rwanda, Tanzania and Uganda, Botswana, Namibia, Malawi, Mozambique, Zambia and Zimbabwe.

The SGCI aims to strengthen the ability of the Councils to: i) manage research; ii) design and monitor research programmes, and to formulate and implement policies based on the use of robust science, technology and innovation indicators; iii) support knowledge transfer to the private sector, and iv) establish partnerships among Councils and with other science system actors. In SGCI-2, two cross-cutting dimensions, research excellence and gender equality were added to the SGCIs activities.

The SGCI's principal outputs include: i) more effective research management practices among Councils, ii) strengthened ability of Councils to design and monitor research programmes, and to formulate and implement policies based on the use of robust STI indicators, iii) increased knowledge exchange with the private sector, and iv) increasingly coordinated and networked Councils. The anticipated outcome arising from these outputs is more effective Councils that will strengthen national science, technology and innovation systems, leading to nationally-led research that contributes to development in participating countries. The initiative seeks to improve the quality and relevance of science research, increase the uptake of research findings, increase coordination between the key science system actors, increase linkage and collaboration among these same actors to improve efficiency in the field of research and innovation. Greater level of engagement and involvement of private sector and industry so that research findings are progressed to usable innovations.

1.2 Gap Analysis and Emerging Opportunities

In developing this Knowledge Management (KM) strategy, we define KM broadly from knowledge creation / generation, analysis, compilation (documentation), storage and uptake, utilization and application. While this process is ideal, it is cyclical and self-perpetuating. The mandate of the SGCs involves igniting the process of scientific research from its inception, facilitation of scientific research through creating an enabling environment, developing protocols and ensuring ethical and quality compliance. SGCs support in seeking funding for research and creating infrastructures that ensure that all stakeholders are engaged including private sector commodifiers and commercialization entities.

Finally, SGCs support dissemination by increasing access to research findings. They communicate research findings that are available and promote its uptake and utilization especially in the development of policies and plans. In addition, SGCs evaluate the impact of the research on social and economic development of a given society. Therefore, the KM strategy will address issues of knowledge generation, codification and compilation and managing access to research findings.

Strategically, the SGCs should be progressing to a position to:

a) Play a bigger role in research grant management by utilizing data to make award decisions.
b) Promote and coordinate the dissemination of research findings.
c) Steer the conducting of regular R&D surveys to increase awareness of knowledge gaps and use data to drive research priorities as well as drive the institutionalization of data for decision making.
d) Build the human resource capacity along the research chain so that ethical and quality research is the norm.
e) Develop research kitty for offering high level scholarships that will further strengthen the human capacity for research especially in policy making.
f) Strategically engage and involve the private sector and civil society in the entire research continuum so that they appreciate the value for investment in research and innovation as well as driving public engagement and participation towards a science culture.
g) Support the establishment and collaborative use of incubation and science and technology parks to increase access to high quality learning sites.
h) Actively spearhead gender mainstreaming to increase involvement of women in research and innovation.
i) Engage with the education sector to drive reforms that will result in greater emphasis on science and math education from the lower levels to build a pool of science researchers.

Many countries are transitioning to knowledge-based economies and this has called the attention of policymakers and practitioners to generate, disseminate, uptake and utilize knowledge. In Africa, as elsewhere, the role of science, technology and innovation is gaining a new momentum and countries are experimenting with various policy options, institutional and organizational reforms, new partnerships, practices and processes. Unfortunately, the changes are occurring in the context of limited knowledge and guidance for policy- and decision-makers. Many countries have not prioritized and at times are not able to fund large scale, comparative studies that could yield valuable lessons for policy action. The Consolidated Plan of Action (CPA), that was the precursor to STISA, identified the 'low ranger' approach by African nations in their efforts to develop research infrastructures which resulted in duplication and underutilization whereas a more coordinated approach would have led to complementariness in developing infrastructure and hence increase access.

Among the challenges facing knowledge generation in SSA identified in several sources and which hinders the inculcation of a knowledge culture is the fact that it is driven mainly by external funding. More than ½ of R&D is externally funded. This compromises African ownership, accountability and sustainability. When bilateral or multi-lateral partnerships are funded mainly by 'outsiders' the African partners lose leverage on the design of the research and what results is not Africa-centric. The small project funding is seen as resulting in non-sustainable activities linked to low impact and narrow reach events such as workshops and consultancies. The inability of the African nations to commit adequate resources to seize the agenda of research means that those who provide the resources control the agenda. The preponderance of research leaning towards health and agriculture is mainly because these are the research areas that the funders prefer. Focus thus mainly rests on applied research as opposed to basic research. The manipulation of research direction begins with what the World Bank report attributes to the lack of focus on STEM subjects, low quality of basic education in science and math, and higher education systems skewed towards social sciences and humanities.

The role of politics and political ideology in determining progress of research is illustrated in the scientific progress of Tanzania and Senegal. Tanzania was among the quickest off the block after independence in setting up research and technology systems. This was driven by the Ujamaa philosophy that emphasized self-reliance (The Arusha Declaration) leading to a proliferation of research and technology institutes. In Senegal after the 2014 change of leadership, research, science and technology received a boost with more resources allocated. Even if it was not to the level proposed by the African union it was a significant rise. There was also a focus on women engagement in research leading to the ring-fencing of funds for female researchers (PAPES). When politics is driven by an ideology that seeks to operationalize the vision of a science and research-led development a lot can be achieved while the opposite is also true.

The SGCs suffer from lack of coordination and linkage internally and externally. There is little in terms of working in tandem between bodies charged with development of STI policy, weak links characterize the relationship between regulatory entities, private sector, universities and research institutions. This low interrelation extends to African and international policy research think tanks from whom coordinating capacity could be built. The policy making is hampered by low access to evidence and data in STI policy making because data for decision making is not institutionalized. The CPA offers an indictment to the lack of coordination and linkage when it states:

> *"The continent, as a whole, has spread its limited resources too thinly across science and technology fields. In many cases existing science infrastructure of the relatively well-to-do countries of the region is not accessible to others that desperately require it."*

The research capacity is fragmented both at the continental and national level where collaboration is seen to be weak. As a result of this fragmentation the role of private sector in knowledge generation is

underplayed. Most SGC lack a strategic approach that would generate funds and create opportunities for human capacity development.

In a study done Oyelaran-Oyeyinka, B. et al, (2018) , they found that although most African universities have an outreach office, majority focus on facilitating the administrative tasks needed to support partnerships with international donors. Very few universities have experience in incubation and science and technological parks. There is broad agreement among all key actors on the need for SGCs to strengthen relationships with the private sector through formal contractual partnerships. It is noted that many of the universities lack a strategic plan for engaging with the private sector. The limited interactions with public sector are confined to workshops, seminar and conferences where meaningful engagement is limited. Analysis on the PPPs in R&I in the African context show that there is an urgent need to improve the enabling environment to strengthen PPP cooperation. Poor institutional settings and the inability of local institutions to provide a healthy environment to enable PPPs in R&I are commonly identified in the literature as factors that constrain private participation in the African context. There are significant and persistent constraints on performance, such as the inability of local institutions to provide the legal, financial and administrative framework that are needed. There is lack of clarity or lack of formal guidelines regarding the formation of PPPs in R&I.

SGC operations are modelled on government operations thus developing MOUs with private sector and universities and research institutes is not an easy task. The political economy reviews conducted in 2017 show that government cycles, party politics and policies determine the focus of the scientific and innovation agenda. The private sector, in particular, is generally uncomfortable with the vicissitudes that political shifts bring. Insulating the SGCs for politics would be a major step in enabling them to define the research agenda.

A report by Vallejo B. et al (2018) indicates that on average universities in SSA initiate and lead the discussions regarding the implementation of PPPs in R&I. However, universities do not have a structured strategy for approaching the private sector. The platforms used to approach the private sector are mostly through conferences where their research findings are presented, industrial internships and grant writing. Further findings revealed that, the role SGCs or related agencies with universities was not often explicitly recognized. SGCs are largely perceived as rule-setting and regulation-making entities.

Oyelaran-Oyeyinka, Banji, Vallejo, Bertha and Vasudev, Shruti. (2018). Towards Effective Public-Private Partnerships in Research and Innovation: A Perspective for African Research Granting Councils.

Bertha Vallejo & Banji Oyelaran-Oyeyinka & Nicholas Ozor & Maurice Bolo (2018). Public-Private Partnerships in Research and Innovation: Opportunities and Barriers for African Science Granting Councils, In Press.

The Councils recognize the persisting gender inequality which severely limits women from achieving their potential and effectively contributing to development challenges. Women scientists have a critical role to play in Africa's development, including pushing the envelope on gender equality, one of the 17 Sustainable Development Goals (SDGs). Although significant progress has been made globally in closing the gender gap in primary school enrolment, gender inequality prevails elsewhere. This includes in science, where women remain heavily underrepresented. According to data from UNESCO only 30% of the world's researchers are women. According to the SCGI Annual Report of 2016 , STI can only lead to better lives for all when the concerns, abilities and needs of both males and females are taken into account, when research priorities are determined, the parameters of research questions drawn, research teams are diverse, research funding decisions are gendered, research methodologies apply the gender lens, the findings and conclusions reported are disaggregated by gender, and finally, the gender dimension is considered when future research areas are suggested.

The emergence of digital technologies in the recent decades have led to new ideas about the opportunities that they offer for science and how science systems and norms might need to be re-configured in order to seize the opportunities they offer. The open science is based on open data and open access to the results of scientific inquiry, to enhance efficiency, the rate of discovery, understanding of complex systems and, in collaboration with other societal actors. In hindsight, due to data deluge there is need for greater discipline in data use if science is to retain statistical rigour and uphold the principle of reproducibility .

The underdevelopment of the infrastructure to support innovation, equally results in poor knowledge creation, storage and dissemination. There are shortfalls identified in access to broadband internet services, basic telecommunications services, reliable electricity supply, water, good transportation networks, laboratory facilities and financial support systems. The production chain of quality post-graduate education programs stimulated by a coordinated systematic human capital development with clear career pathways for researchers outside of teaching in the universities is lacking.

Although, digital revolution has is shown to have short-term disruptions, from rapidly redefining relationships between customers, workers and employers, and permeating almost everything we do, progressively overhauling all industries whilst creating new ones, it has already shown enormous capacity to create long-term benefits. African governments cannot avoid these forces that technology

Oyelaran-Oyeyinka, Banji, Vallejo, Bertha and Vasudev, Shruti. (2018). Towards Effective Public-Private Partnerships in Research and Innovation: A Perspective for African Research Granting Councils.
Bertha Vallejo & Banji Oyelaran-Oyeyinka & Nicholas Ozor & Maurice Bolo (2018). Public-Private Partnerships in Research and Innovation: Opportunities and Barriers for African Science Granting Councils, In Press.

has unleashed. In order to capitalize on the digital revolution there will be need to take a cue from other counterparts elsewhere by developing systematic adoptive and adaptive responses that are aligned with the aspirations of STISA-2024. Each state must equip itself to the best of its abilities with the skills, the support mechanisms, and the opportunities for translation of cutting-edge digital technologies.

Africa like the rest of the world lacks data science and software engineering skills, largely because it has not been able to train and produce enough data analysts and scientists and other support staff to acquire and process large data sets, to identify patterns, establish relationship and solve problems. Boulton G. et al, 2020 in their report said that, there is a need for:

- Data stewards who handle and manages data and whose responsibilities include planning, implementing and managing research data input, storage, search, and presentation for the whole data management lifecycle.
- Data scientists who have expertise in the overlapping regimes of business needs, domain knowledge, analytical skills, programming and systems engineering, and managing end-to-end scientific processes through each stage of the data lifecycle, up to the delivery of scientific and business value to science or industry.

The SGCs should monitor progress made in capacity building among the SGCs and other stakeholders in creating competent data stewards and scientists. STISA-2024 clearly states the need for a robust monitoring, evaluation and learning (MEL) strategy for every SGC with clear indicators. Among the most significant ones are:

- % of increase in number of scientists trained in STI.
- % of increase in number of scientists trained in MEL.
- % of increase in research out at the local and international level.
- % of age increase in the qualified staff to support expansion of research activities at all levels.
- % of increase in resources dedicated to human resource capacity building.
- % of increase in program and policies that create an enabling environment of science.
- % of increase in the publishable research outputs.

According to the report for the African SGCI, Open Science in Research and Innovation for Development in sub-Saharan Africa, barriers that hinder collaborative open science in Africa include:

- Researchers are anxious about their career prospects and how open science would affect this. They are concerned about the ownership of results, technologies generated, and the importance of prime authorship.

https://en.unesco.org/news
SGCI 1-2016 Annual Report 2016.
Boulton G. et al., (2020). Open Science in Research and Innovation for Development of Africa. The African Technology Policy Studies Network Research Paper No. 32.

- Lack of adequate capacities both human and ICT infrastructure.
- Fear of loss of Intellectual Property.
- Funders, universities and research institutions pressure researchers to publish in high impact factor journals, which are often not open-access journals.
- Few research databases and journals based in Africa.
- Lack of awareness among policy makers of open science.
- Lack of open science culture among researchers that needs to be inculcated.

The SGCs identified priority areas that need improvement in creating an open science culture among researchers in SSA (See Box 1). SGCs should leverage on the available opportunities for open science to promote knowledge sharing among public and private stakeholders. At Source: Boulton G. et al., (2020). Open Science in Research and Innovation for Development of Africa. The African Technology Policy Studies Network Research Paper No. 32.

This KM Strategy is operationalized in the Social and Behavior Change Communication Strategy. The recommendations that call for social and behavior change are reflected in the SBCC strategy.

Example:

Recommendation	Activity	Indicator
· Endorse the Science International accord on open data and work with stakeholders to simulate a culture of data sharing.	· Hold dissemination meetings of the Science International accord among stakeholders · Produce popular versions of the Science International accord for distribution.	• # of dissemination meetings held • # of scientists attending sessions • materials produced for dis-semination
· Develop a concordat with interna-tional funders for balanced interna-tional collaboration involving African scientists	· Hold meeting with international funders to develop collaboration strategy and MOUs	• # of meetings held
· Stimulate a conversation on how open science might best be contextualized in the African setting	· Hold public and popular session that discuss the role of science and research in development	• # of international funders attending meeting • # number of MOUs devel-oped · # of open sessions held · # of popular communication materials developed · # of person reached with material.

Source: Boulton G. et al., (2020). Open Science in Research and Innovation for Development of Africa. The African Technology Policy Studies Network Research Paper No. 32.

The SCGI organized a multi-stakeholder forum on public-private partnerships in Burkina Faso in November 2018 . The purpose for the forum was convene multi-stakeholders from both the private and public sector to dialogue on strategies to bridge the gap between the Science Granting Council in Burkina Faso, the private sector, academia and the government. From the discussion, some of the knowledge management gaps identified included:

When countries emulate context specific approaches from elsewhere and try to replicate them in their contexts, the political economy, histories and path dependence will most likely undermine the good intentions

- Low visibility of the research findings.
- Low trust between the private sector and research firms and institutions.
- Insufficient collaboration between universities and research centres and between universities, research centres and the private sector.
- Challenges of utilizing, disseminating and commercializing research results.
- Inability of the local private sector to have access to research findings.
- Lack of incentives mechanisms to promote research in all forms of collaboration between the public and private sector (public procurement, PPP).

Without clear evidence to support decisions, countries will continue to develop new policies, approaches, practices and processes, but the outcomes are likely to be sub-optimal. There is a flip side that there will be policy gaps that will slow down the social and economic development. If policymakers and implementers lack the "how-to-guides" that are informed by experiences and lessons from other partners and regions, they are prone to make similar mistakes or duplicate efforts. The challenges highlighted above have informed the SGCI's approach to strengthen the SGCs in the management of knowledge generated and the translation of knowledge among participating countries.

Some recommendations from the multi-stakeholder forum on public-private partnerships in Burkina Faso were to i) establish an effective process or system that will enable people to have access to research findings based on their specific development needs, ii) establish an awareness and support framework for researchers to ensure they own the results and are able to share their innovations with industry, and iii) establish a relevant information system for wider dissemination of research and innovation results and find better channels for engaging the private sector at all stages of the research process.

Over the years, African universities have come up with innovations but due to poor industrial base and weak link between academia and the industry, such innovations have not been commercialized. In Africa, poor Intellectual Property (IP) culture within academia and industry, is a key impediment to the

Multi-stakeholder dialogue on public-private partnerships in Bukina Faso, May 2018.

continent's industrialization agenda. There is need to strengthen existing Intellectual Property Agencies in order to build their capacity to assist innovators translate their novelties into commercial ventures. Notably, innovations have to be IP protected in order to exploit them economically.

Universities need support to identify and profile innovations for upscaling, incubation and commercialization. Innovation profiling should consider technical, economic, and socio-cultural characteristics of a product. In addition, research on market potential, possible collaborators, and Intellectual Property audit should be considered. The SGCs should support universities to ensure that there is continuous process of research, innovation and commercialization of outputs, by forming multidisciplinary collaborations of scientists and entrepreneurs who can make business sense out of a research idea. There is need for building strong linkages and collaboration between universities internally and externally among the 15 SGCs covered by the SGCI. Formal agreements defined by MOUs to ensure that access to facilities and existing infrastructure is realized.

From the analysis the following KM opportunities have been identified that need capacity building (Box 2).

Box 2: Opportunities for Knowledge Management Among SGCs

Knowledge Generation	Knowledge Uptake and Application
· Role of STI is gaining new momentum in many SSA countries.	· Need to create formal guidelines and strategies for formation of PPPs in R&I.
· Need to create incubation and science and technological parks.	· Need to develop gender transformative policies.
· Capacity building for data stewards to manage data analysis, presentation & dissemination for use.	· Leverage on the emergence of digital technology for open science including creating networks among SGCs.
· Support African universities to come up with research innovations that address social and/or economic needs of its society.	· Capacity building among data scientists in communicating research findings for socio-economic development.
	· Build capacity of Intellectual Property Agencies to assist innovators translate their novelties into commercial ventures.

1.3 What have the SGCs done so far

Since the inception of the SGCI there has been a deliberate focus to address the gap on knowledge transfer to the private sector. Of the four SGCI thematic areas, two themes address the issue establishing and strengthening PPPs.

- Theme 3: The overall goal is to strengthen the capacity of participating SGCs in Sub-Saharan African countries to establish partnerships with each other, and to foster public-private linkages. There will be onsite coaching support to strengthen the capacity of participating SGCs to design and manage collaborative agreements.

- Theme 4: The overall goal is to strengthen partnerships and networks among SGCs and other science system actors in order to achieve increasingly coordinated and networked Councils in Sub-Saharan African countries.

Theme three of the SGCI aims to strengthen knowledge transfer to the private sector & cooperation agreements and grants. According to the report from the Annual Forum in Abidjan , a number of Councils have formed collaborative partnerships e.g. Mozambique and Namibia, the East African Community, Côte d'Ivoire and Sénégal, and Sénégal and Burkina Faso. Public-private partnerships are also being concluded with Malawi, Uganda, Mozambique and Cote d'Ivoire. Some of the strategies that have been found to be useful include face-to-face meetings in knowledge sharing, developed a strategy for private sector engagement and monitoring and support for cooperation agreements. For example, it was found that active interaction between the SGC staff in both Councils was crucial in the formation of the collaborative projects between Mozambique and Namibia. In addition, the team has effectively used interviews conducted during the meetings, the evaluation forms and performance indicators.

As reported from the experience during the 2018 Annual Regional Meeting in Ghana, the SGCI created a platform for exploring possibilities of SGCI engagements through the Councils and Commissions mainly in West Africa with the ECOWAS Division of STI which is in charge of valorization of research products and strengthening the governance of research institutions among others. The Annual Forums (AFs) are intended to be the substantive meetings of the SGCI. They provide a platform and space for sharing of evidence, lessons learned and best practices linked to the SGCI's thematic areas amongst Councils, RECs and other STI system actors.

The SGCI has an interim web presence (www.sgciafrica.org) where relevant documents are uploaded. The virtual hub aims to provide the following services: web portal, virtual learning platform, resource repository, MEL data collection and sharing platform, scheduling and social media interface, SGC profiling tool, online grant management system platform for collaborative projects, webinars, survey administration functionality, and project management dashboard.

The 2019 Consultative Meeting with SGCI Councils in Entebbe reported that Actions plan: i) Target different private sector players, identify their needs, invite them to partner with relevant R&D; ii) Supporting actions of creating and/or strengthening linkages between academia and industry; Engage private sector provisional bodies.

SGCI 2018 Annual Forum Masterclass 2018 Annual Forum & Monitoring, Evaluation and Learning (MEL) workshop Abidjan, Côte d'Ivoire

The SGCI has facilitated (and continues to facilitate) collaboration/ interactive learning between/ among Councils. For example, Malawi is engaged in a partnership with Zimbabwe and hopes to extend this to Zambia. PASRES (Côte d'Ivoire) would never have collaborated with Zimbabwe and Mozambique without SGCI's support. PASRES has learnt a great deal from Mozambique .

Gender has been introduced as a cross-cutting theme in this phase. In the previous phase, the CTAs were required to incorporate gender dimensions in their work. A more deliberate approach with a budget allocation in this phase will enable a wider scope of interventions. Gender Mainstreaming Framework and Action Plan to ensure gender dimensions are integrated in capacity strengthening activities. The purpose of the Framework and Action Plan was to contribute to gender equity and to encourage greater participation by women in STI and research.

By the end of Phase 1, the SGCI recognized that there were challenges that hindered effective uptake of these knowledge products by the SGCs and other science system actors.

Some challenges included:

- Limited capacity for data collection (Capacity to design and monitor research using robust STI Indicators)
- Improving uptake of research findings and appreciation of the benefits of STI (low uptake of research findings)
- Weak capacity to promote research and development mainstreaming by organisations
- Limited capacity to promote knowledge exchange with the private sector.
- Limited number of women involved and participating in STI and SGCs leadership.

1.4 Methodology

The knowledge management strategy development process will use the following strategies:

- Carry out a comprehensive desk review.
- Carry out key informant interviews to gather views from the SGC members on KM challenges and strengths.

1.5 Role of SGCs in Knowledge Management

Through its thematic activities, the SGC Initiative contributes to the long-term goal of enhanced use of science, technology and innovation for Africa's socio-economic transformation. In addition, the Initiative is keen on a situation where the knowledge products lead to:

- Better research management practices and processes
- Better use of evidence and STI indicators for policy planning and implementation;

- Enhanced knowledge transfer to the private sector and increased scientific cooperation between countries and
- Enhanced networking amongst Africa's Councils with opportunities for joint learning and collaborations.

The innovation development and commercialization centers would perform the following activities.

- *Identification of Innovation products for commercialization.*
- *Facilitate innovations product profiling.*
- *Support feasibility studies for up scaling the innovations.*
- *Facilitate business plan development for new innovations.*
- *Promote incubation of innovations into new enterprises.*
- *Facilitate development of Commercialization Policy.*
- *Facilitate measurement of the socio-economic impact of innovation outputs in the country.*

The primary targets for the SGCI are the SGCs and other science system actors e.g. universities, research institutes, etc. The SGCs are creations of the law/statutes and have specific mandates including in most cases: Research Funding (resource mobilization and disbursement; priority setting and grant management amongst others); Quality Assurance (research excellence, merit, ethics and standards); Policy Advice (balancing facilitation with regulation; risks and benefits); Knowledge Exchange/Uptake (transfer, commercialization and other impact pathways); and Training/Capacity Building (Supporting innovation system actors in achieving their mandates). Therefore, the knowledge products generated from the SGCI become very crucial in enabling the SGCs and other science system actors gain relevant new knowledge, experiences and lessons to improve their efficiency, effectiveness and value for money in service delivery.

The following strategies have been proposed to facilitate uptake of knowledge products from the SGCI:

a) Ensure relevance by prioritizing key issues/topics of immediate interest and relevance to the SGCs. Extensive consultations have resulted in topics such as political economy, research excellence, public-private partnerships, and currently the new approaches for funding research and innovation among others.
b) Enhance quality by generating policy-relevant knowledge and evidence through commissioning state-of-the-art studies and reviews on the prioritized themes/topics.
c) Ensure timeliness by facilitating access to the knowledge products through effective communication and dissemination of the knowledge products using both online and print media channels.
d) Improve capacity strengthening through training, coaching and mentorship as well as by facilitating sharing of lessons and experiences through forums and meetings.

The Initiative recognizes that the true value of knowledge outputs from its activities lies in their uptake and utilization. That is the extent to which they inform and influence behavior and practices amongst

the Councils and their affiliates. It is in this context that this knowledge management strategy provides a framework for tracking the research / knowledge outputs, their uptake, use and influence.

In view of the Councils mandate in relation to knowledge management, it is suggested that their role focuses on connection and coordination rather than knowledge generation. Some functions could be:

- To serve as a knowledge hub, providing connections to existing resources and initiatives for STI for researchers and users (internal and external users) and serving as information clearinghouse.
- Disseminate knowledge for making evidence-based policy decisions. This component would help countries to strengthen the link between technical know-how and political will.
- To create a cycle of learning what works. Collect feedback about knowledge use and implementation experiences, and
- Capacity building (peer-to-peer learning, training, technical assistance).

1.6 Knowledge Management Strategy

Knowledge Management is about creating, identifying, capturing, and sharing knowledge. It is about getting "the right knowledge, in the right place, at the right time" to influence an action or a decision . A KM strategy answer the following: type and quality of knowledge we want to share, who is our audience with whom do we want to share the knowledge, define channels of how the knowledge will be shared, and explain why (motivations and objectives) this knowledge should be shared. Explicit knowledge can be recorded and easily organized and it includes research findings, lessons learned, toolkits, etc. Tacit knowledge is subconscious. It is context-specific and includes, among other things, insights, intuitions, and experiences .

Research and innovation play an essential role in triggering smart and sustainable growth and job creation. By producing new knowledge, research is central to developing new and innovative products, processes and services, which enable higher productivity, industrial competitiveness, and ultimately prosperity. Knowledge uptake and use and commercialization remains a challenge in most African countries. This can be attributed to bottlenecks affecting investment in innovation, weak knowledge flows and science-business linkages among other reasons.

The SGCs should support higher education institutions and other public organizations performing research and innovation to establish innovation development and commercialization centers that facilitate up-scaling of innovation technologies and to translate them into products for economic and social impact. Such centers would serve as avenues to identify business potential for the products and support the engagement with private and public entities in the commercialization process with an ultimate goal to ensure innovations contribute to the economic growth for the country.

This section examines tacit and explicit knowledge, and ways to understand, capture, and maximize the impact of both. It looks at formulating a KM strategy and offers a suite of tools that can be used in knowledge management, including after-action reviews, knowledge audits, identifying and sharing best practice, knowledge harvesting, storytelling, communities of practice, and the peer assist.

1.7 Components of Knowledge Management

There are four components in KM namely people, process, content/IT, and strategy.

People: Regardless of the industry, size, or knowledge needs of an organization, there is always need for people to lead, sponsor, and support knowledge sharing. Knowledge is created, generated, captured, and shared through human interaction - making it essentially a social act. People must, therefore, be at the core of any KM approach, particularly since substantial knowledge resides within individuals and difficult to transfer to others. Human Resource is a fundamental need in the KM operation. Staff with capacity to a) identify the Knowledge gaps b) design intervention strategies, c) monitor and evaluate the efforts d) document the KM interventions for institutional memory.

The SGCs need to strengthen their human resources in order to improve the way they create, capture, share, and use knowledge. Some skill sets that are required include: knowledge audit, knowledge harvesting, best practice documentation, organization of community of practices, use of peer assist, learning facilitation etc. There does not need to be dedicated KM staff as this function can be embedded in the current officers and capacity build gradually. To get the right people collaborations and partnerships should be established. There is need to establish mentorship and coaching programmes to link senior experienced researchers with junior researchers in order to build capacity. KM strategy will require change in the SGCs culture and behaviour. At the heart of this change would be recognizing the centrality of knowledge, and how the institutions must improve the way they create, capture, share, and use it.

Processes: We require defined processes to manage and measure knowledge flows. Processes, both formal and informal, help us capture and share knowledge while technological platforms that are appropriate to the context can expedite knowledge storage, retrieval, and exchange. The SGCs should create KM processes which ensure that knowledge is accessible when it is needed and in the right format. The KM team should be able to identify bottlenecks, reroute the flow of information and measure inputs and outputs. The following steps show how knowledge flows in an organization.

i. Create new knowledge / knowledge products
ii. Identify knowledge use and collect the knowledge to be shared.
iii. Review the knowledge (relevancy, accuracy and applicability)
iv. Share through documentation, collaborative activities and informal posts.

v. Access knowledge through pull e.g. search and push (e.g. alert) mechanisms
vi. Use knowledge to make informed decisions or to solve problems.

SGCs need to identify ways to build these steps into their organization's every day processes. They should leverage on available technology tools e.g. to deliver alerts in the flow of work.

Content: Knowledge content and information technology (IT) tools are important to connect the right people to the right content at the right time. Content is any kind of documented, structured knowledge, from best practices to quick tips or unstructured information shared among colleagues. IT infrastructure is important because it enables people to create, store, retrieve and use or reuse content. SGCs should use content management to facilitate collaboration, uncover innovations, and enable access to ready and relevant content to its audiences. Therefore, it is crucial to invest not only on general relevant and quality content but also in efficient IT tools.

Strategy: There is need to have a clear and documented strategy for using KM to meet the most important and urgent needs of the organization. The technology tools and KM team must be guided by a well-defined strategy. Leadership is important to drive the KM effort in the organization, including ensuring sufficient resources are allocated for KM activities. The KM strategy must be aligned to the organization's strategy and knowledge needs. The strategy should outline i) the value proposition for KM, ii) approaches including tools and teams, iii) financial resources, and iv) expected impact of the KM.

1.8 Type of Knowledge and Proposed Tools

Knowledge management is not only about learning and organizing data. It's a way to maximize potential, increase efficiency, and keep organizations running like a well-oiled machine. The SGCs must ensure that people have access to the knowledge they need, that knowledge is stored, and that the knowledge is reviewed, updated or discarded. The SGCs are keen on gaining new knowledge, experiences and lessons that i) improve their efficiency, ii) are cost-effective, and iii) enhance service delivery. Table 1 shows the type of tools that are currently being used by the SGCs in each objective under Theme 3 and 4.

Table 1: Efficiency of Current KM Tools that are Used by SGCI and SCGs

Objective	Types of Tools	Remarks on Efficiency
Objective 1: Provide an intra and inter- regional platforms for interaction, information sharing, experiential learning, and collaboration among Councils and other science system actors to contribute to the implementation of the African Union Commission's STISA 2024;	Annual Forums	· Efficient in creating Communities of practice where tacit knowledge can be shared.
Objective 2: Support and consolidate the voices and views of Science Granting Councils to effectively contribute to key STI policy debates at the regional and continental levels;	Annual Regional Meetings	· Encourage discussion · Increase engagement and collaboration · Improve communication · Bring people to align to a particular course / idea · Expensive to bring huge number of people together.
Objective 3: Commission state-of-the-art and publication quality research papers/ reviews on key STI themes in order to share innovative lessons and good practices, and disseminate knowledge as a global public good; and	· Policy Briefs	· Easy to share and disseminate
Objective 4: Promote and disseminate the scientific work, innovations and technologies produced by Councils to key stakeholders such as policymakers, private sector actors, academia, practitioners, and other key stakeholders in the ARM and AFs.	· Research Papers · Journal articles · Book Chapter · Training/Capacity building · Manual repository Databases knowledge centres	· Timeliness, good local coverage, broad acceptance, high believability by audience. · Easy to access by stakeholders. · Policy position papers are good in convincing the audience that the opinion is valid and based on evidence. · Journal articles / book chapters easy to share among science researchers and can create communities of practice. · Difficult to tell readability and use. · Could be too many and sometimes too technical / too academic · For private sector e.g. business partners not easy to understand the language. · Learn from each other. · Gain consensus and develop standards · Learn from each other · Organized system to storage research information.
When countries emulate context specific approaches from elsewhere and try to replicate them in their contexts, the political economy, histories and path dependence will most likely undermine the good intentions.	· Organize researchers - private sector symposia	· Need a lot of resources (time and human) to organize and retrieve information. · Not easy to access by stakeholders outside the SGCs. · Not easy to share information. · Encourage discussion · Increase engagement and collaboration · Improve communication · It's expensive to hold symposia · If not well organized could end up with talk without action.

The SGCs should facilitate access to the knowledge products through packaging and dissemination using both online and print media channels. Possible channels could include SGCI virtual hub, partner websites (including the funders, CTAs, Councils and other collaborators such as universities), annual forums, regional meetings as well as face to face meetings with key government officials and private sector stakeholders.

1.10 Knowledge Sharing Channels and Tools

- **Communities of Practice:** these are learning groups made up of individuals who share an interest in a particular discipline. The Community of practice are able to share knowledge, information and experiences on the same issues in different contexts. A Community of Practice can over time document their learnings and codify their findings in such a manner that they influence the practice.

- **Best Practice:** The term "best practice" indicates a strong or useful case study or approach that might helpfully inform future activities. Identifying, capturing, and sharing best practice generally involves explicit knowledge captured in such "sharing" tools as data- bases, and tacit knowledge disseminated via, for instance, communities of practice. Ways of identifying and sharing best practice include: identification of user requirements, discovering best practices among well performing individuals, creating a dossier of good practices, validating best practices, and disseminating and applying the knowledge.

- **Knowledge Audits:** A systematic process to identify an organization's knowledge needs, resources and flows, as a basis for understanding where and how better knowledge management can add value, also called "Knowledge Inventories." Knowledge audits involves identification of knowledge needs, conducting a knowledge inventory, analyzing knowledge flows, and creating a knowledge map.

- **Knowledge Harvesting:** A tool used to capture the knowledge of "experts," making it widely available to others. It involves focusing on specific knowledge and expertise needed, finding experts whose knowledge is wanted, eliciting the knowledge, organizing the knowledge in a coherent and systematic form, packaging the knowledge according to audience needs, sharing the knowledge, application of knowledge and evaluation and adaptation of the knowledge based on feedback of users.

- **Meetings and Conferences:** Meetings and conferences that are agenda driven and deliberate and which offer well-structured opportunities for learning. They are coordinated by a learning facilitator who ensures that specific smart learning objectives for every meeting are adhered to. Experience sharing should be factored into the agenda of such meetings.

- **Publications / Peer-Reviewed Research Articles:** Various levels of publications will be developed premised on segmented targets. It is understood that publications act as records of knowledge developed as well as reference material. Every category of the targeted audience needs an audience specific publication that reinforces learning. The audience specificity will take into account the level of language used, technical jargon and terminologies.

- **Peer Assist:** Is a meeting, before and/or sometimes during a project, in which a group of peers discuss a particular problem. The meeting is usually convened by project leaders, selecting the

participants whose advice and knowledge is particularly sought. The project leaders must manage the entire meeting (or set of meetings) which typically last from half-a-day to two days.

- **Social Media:** A powerful learning tool because if its interactivity. Social media also allows broadening of reach of the messages. Social media principles of brevity and clarity will ensure that the knowledge generated will be shared to a wider audience.

- **Webinars / Online Events / Videos / Multimedia Presentations:** These are formal learning opportunities to provide information, especially expert sessions. This platform will allow for regular inter-council discussions that will build on knowledge exchange and standardization of quality as well as inculcate a culture of open sharing and peer review.

- **Tools, Guidelines or Frameworks:** to be generated to assist learning. The production of tools, guidelines etc. will be a continuous process. The development of tools and guidelines helps to codify knowledge and crate a repository of knowledge in the organizations.

- Reviews and syntheses of country experience in applying tools, guidelines, or frameworks / Evaluation reports: Regular meetings to take stock of the progress and processes used is a best practice to ensure fidelity to the strategies and larger organizational goals.

- Courses/Learning Modules: – In-house capacity building for SGC staff conducted through 'brown-bag' sessions where informal knowledge exchange happens or where formally structured curriculum sessions are delivered by senior colleagues. Online learning modules to build awareness, knowledge and experience sharing sessions.

- Databases / Data Portals: Development of Databases, Libraries etc. as well as mechanisms for easing access. The data bases need to be interlinked across the Councils and an access protocol developed.

- Radio Announcements / Newsletters/Regular Bulletins: These are non-technical public engagement approaches to increase awareness and support for STI support. Public engagement (PE) is a fundamental part of a) raising community awareness and increasing knowledge of tenets of ethical and quality STI research b) promoting understanding of research and building relationships with research subjects c) building community support for ground-up advocacy.

- Science Congress / Schools & Colleges Exhibitions: College and school outreach or interface, which could take the form of support of Science Congress competitions or just in school science days where researchers interact with students to build relationship and also to promote science. This is a significant gender mainstreaming approach. This will also assist to inform the public what the SGCs do. Exhibitions are opportunities for show-casing science at work and also promoting innovation.

It is a great place for private sector engagement. Industry could use these sessions to introduce innovative solutions.

- **SGCI Virtual HuB will provide the following services:** web portal, virtual learning platform, resource repository. MEL data collection and sharing platform, scheduling and social media interface, SGC profiling tool, online grant management system platform for collaborative projects, webinars, survey administration functionality, and project management dashboard. The hub will comprise a public and closed (private) space for access to the core SGCI.

1.11 Information Technology and Knowledge Management

Over the years the use of technology to communicate has become the norm. With the 2020 COVID-19 pandemic, use of virtual online tools to communicate and collaborate in projects has become the new normal. Box 3 shows online team collaboration tools that can be used from instant messaging to video conferencing.

Box 3: Collaboration online tools for productive teams

Communication tools (instant messaging / video conferencing)

1. GoTo Meeting: An online video conferencing software that allows users to schedule meetings and share screens. It's one of the most popular video tools with millions of users.

2. Flowdock: is a group and private chat platform. Its most interesting feature is its team inbox which aggregates notifications from other channels, e.g. Twitter, Asana and customer support tools.

3. WebEx: Cisco's WebEx provides personalized video meeting rooms where users can host and join meetings. People can use WebEx for team collaboration, webinars, training and customer support.

4. Slack: An online platform offering instant messaging, file transfers and powerful message search. It has many features and dozens of integrations with other tools like Trello and Intercom.

Manage projects / tasks (Coordinate tasks & keep track of objectives)

5. Asana: A well-known project management tool which allows users to assign tasks to other members, add followers to projects and monitor deadlines. It's useful as a to-do list or calendar for strategic planning.

6. Wimi: Wimi offers users their own 'unified workspaces' where teams can manage projects and share files and calendars. One can control access in each workspace with a rights-based system. Wimi Drive, their file syncing software, helps make the most out of cloud technology.

7. Milanote: Is one of the qualified tools that can be used for serving numerous purposes including blogging. Using this tool, one can organize creative projects and place them into excellent visual boards. It will provide a feel like the user is working on the wall in a creative studio. Milanote would be a great fit too for designers who work remotely.

8. Dapulse: This is a collaboration tool that helps to communicate, set objectives and assign tasks. Its big advantage is that it has a great visual design so it's easy to understand and work with.

9. ProofHub: Is a work management tool that offers a comprehensive suite of collaboration and project management functions. On this platform, one can organize files, plan and monitor projects and discuss with colleagues and stakeholders. ProofHub also lets users review and approve files through an online proofing tool.

10. Redbooth: Is an easy-to-use project management tool. Its platform allows users to plan and collaborate through many functions from video conferencing to creating Gantt charts.

Creating together (team work)

11. Google Docs: Google's collaboration tools include its Docs and Sheets services, which are designed to allow teams to edit files at the same time and save all their changes automatically.

12. Quip: Quip allows teams to import and work live on different file types. Edits are saved automatically and its chat, comment and checklist features make collaboration easy.

13. Codingteam: Coders can easily collaborate when writing their code through platforms like Codingteam. It offers a free 'software forge' that encourages visibility and collective code building.

1.12 Recommendations

1. Create an "objective point system" based on STI indicators for awarding research grants.
   Predictability and a perception of objectivity are crucial in the development of a culture of research. Those entering the research continuum need to be guided by some objective criteria and knowledge of the STI indicators need to be made ubiquitous among the science fraternity as the building block for quality research. Next, the hitherto unclear career path for an individual interested in research, needs to be clear to remove the uncertainty that leads to seeking refuge in teaching. The focus on teaching at the expense of research is attributed to unclear career options. This will go a long way in developing human capacity all along the research process chain.

2. Organize and conduct regular and accredited online capacity building sessions for local scientists and researchers.
   Systematic capacity building of scientists is very crucial in developing a pool of competent scientists and also strengthening the research institutions. Capacity building conceptualizing research that informs societal needs and communicating those results to the society should be the focus. Establish formal as well as informal capacity building approaches targeting young professional. Formalize mentorship programs within every nation and develop exchange programs among the SGCI beneficiary countries.

3. Develop MOU for internships, visiting scholarships, research fellowships and cross learning to build on interaction and cross learning with private sector and industries.
   Exposure to research application within industries is necessary to create awareness of the processes of commodification and commercialization of research findings. Scientists engaging with industry will also create a stronger recognition of the societal and economic problems that will make research more relevant. Closer collaboration with private sector will open up avenues for leveraging resources for financial support and also allow for researchers access to private sector research infrastructure that is at times more advanced.

4. Develop a digital database of all research that have been conducted by local scientists and within the SSA countries. Literature review conducted to support the development of this strategy noted that there is scanty knowledge of what research is available as well as credible directory of the researchers by their findings. Without this information there can be no coordinated incremental research that would build on the knowledge gaps. A clear research agenda forms the basis on collaboration with other stakeholders. It also demonstrates the progress that has been achieved overtime and provides good linkages to knowledge application that can be used to leverage more funding. The usage of this data base if promoted at the universities and research institutions will greatly inform the research agenda.

5. Orchestrate and organize regular exchange meetings where scientists interact with the public so that STI is demystified and a culture of STI is inculcated into the national psyche. It has been established that poor quality introduction to science and math education as well as focus of social sciences and humanities in high school lays a poor foundation for STEM leading to weak science cultures. More engagement with STI will change attitudes towards research. The dissemination of research findings within such a context will have more significance as well as creating the up-swell bottom up advocacy support for research.

6. Manage linkage processes between nascent science and technology hubs, universities and research institutes as well as private sector. Globally, science and technology hubs are driving innovation. In Kenya the USHAHIDI and M-Pesa platforms have demonstrated that there is a lot that can come out of such hubs. Little coordination or linkages are currently happening and the governments are unable to offer the collegiate innovative atmosphere necessary.

7. Create a platform for broad inter-sectoral exchange bringing together players from education, science and technology, academia and economic planning policy makers to host annual reflections on policy to enhance STI. Policy making happens in silos reflective of the manner in which research is funded and conducted and as a result does not benefit from synergy. Building interpectoral links opens up possibilities for strengthening networking and exploiting collaborative synergies.

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