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Original Research Article

Comparative analysis of Namibia and Botswana's national innovation systems

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ABSTRACT

The main aim of this study was to compare the performance of the two National Systems of Innovation for Namibia and Botswana and how they influence national economic development & competitiveness. A mixed method research approach was applied to conduct a comparative analysis of Namibia and Botswana's National Systems of Innovation for national economic competitiveness. The study target population was 839 of respondents from policy makers, academics researchers/heads of research, industries and civil society. Two phases were adopted, namely, quantitative research through which 209 survey questionnaires administered and 123 responses received and analyzed and qualitative research where semi structured interviews to 12 key informants purposefully sampled from phase one of the quantitative study using the 10% golden rule of sampling. The study found that the existence of evidence-based science, technology and innovation policies which outline well-defined university-industry linkages and funding framework for human & institutional R&D and innovation infrastructure supported by an education system that is responsive to industry demand and technology push leads to an effective national system of innovation that is economically competitive. Furthermore, the study managed to establish the following key policy recommendation and suggested areas of further research to build an effective and efficient National System of Innovation, which is economically viable and helps build a nation's competitive advantage.

1. Introduction

Botswana and Namibia are developing countries that face socio-economic challenges such high level of poverty, unequal distribution of wealth, income disparities and unemployment which warrants the development of evidence-based innovation policies for national economic development. Therefore, the proposed study presents a heavy scholarship on national innovation system and innovation policies explaining their relationship to national economic development and competitiveness of Namibia and Botswana. The effectiveness and efficiency of National Systems of Innovation (NSI) and National Economic Competitiveness (NEC) are regarded as crucial areas of research to government, policy makers, research and innovation agencies, administrators, industries, academic researchers, and innovators as well as local communities. This is because it helps in the maintenance and development of a nation's competitive advantage (Bartels, Ritin, & Andriano, 2016). Scholars like Porter (1990) looked at the effective and efficiency of NSI from a linearity complexity of a knowledge-based economy based only on the factors of production whilst Bartela et al., (2016) dwelled on the non-linear complexity model of national innovation system which encompasses ICT as a key enabler for knowledge creation. Furthermore, Mugabe (2009) urges that realising the sustainability of innovation policies is dependent on how innovative organisations within an NSI are in achieving environmental sustainability.

To understand the above phenomena, it is required for nations to use technological and social innovations for institutional change as well as the capability to detect market failures that might hinder change in technology and innovation processes. Therefore, governments need to put in place mechanisms that support and promote innovation policy regimes to create a culture of innovation and innovativeness among its citizens by focusing on the

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governance rather than on implementation of these policies (Mugabe, 2009).

2. Literature Review

The study found that the existence of evidence-based science, technology and innovation policies which outline well-defined university-industry linkages and funding framework for human & institutional R&D and innovation infrastructure supported by an education system that is responsive to industry demand and technology push leads to an effective national system of innovation that is economically competitive.

For Namibia, a country that aspires to become an industrialised, prosperous, and economically competitive by 2030, there is a need to consider the contribution of both the public and private sectors in an efficient and effective delivery of social and economic services to its citizens. This would require the production of skilled STI manpower needed to accelerate the implementation of innovation related polices to produce economically variable knowledge that can be transformed into STI wealth creation. It is against this background that the Namibian government through the Office of the Prime Minister has benchmarked with international norms and best practices from countries like Finland and Denmark in building a government-wide Public Service Innovation Policy. This policy aims at introducing new applications to inform practices, products, services, and organisational changes that create new value through improved service delivery.

On the overall STI landscape, the study found out that Namibia does possess good innovation related polices but the challenge lies in the implementation phase. This is due to there being a huge lack of social policy cohesion and a long policy gestation period. A good example is the period taken from the development of the first National Research Science and Technology Policy (1999) to the enactment of the Research Science and Technology Act, 2004. The Regulations were only developed in 2011 and yet the operationalization of the NCRST was only realised in 2013.

Secondly, on social cohesion and continuity, it has been a trend in Namibia that each minster appointed to head the STI portfolio always wants to start a new STI policy. For example, the review of the Research Science and Technology Policy of 1999 was started by the NCRST in 2015 but when the new Ministry of Higher Education Training and Innovation was created in 2015, the new Minister initiated a new review of Namibia's STI landscape with the assistance of UNECSO. This review recommended the development of a new STI policy framework to serve as an umbrella policy to all. This presented a parallel process to the one already initiated by the NCRST. This posed coordination challenges, resulting in much time spent on developing policies and less time for implementation as political office bearers stay in office for a five-year period.

The Botswana Government on the other hand has introduced a presidential innovation award which is annually awarded by the President of the Republic of Botswana to outstanding achievers in championing innovation in the country. Furthermore, the last review of Botswana's NSI revealed that STI is a critical sector in guiding economic competitiveness. This is evident from the way Botswana managed to make use of its established hubs (innovation, education, diamonds, health, transport and agriculture) whose output helps to improve its ranking on the World Economic Competitiveness & Global Innovation Index and other international rankings (UNESCO, 2013).

3. Materials and Methods

The methodology used in this study was a mixed research method comprising of two phases, namely, quantitative and qualitative research approaches were used to conduct a comparative analysis of Namibia and Botswana's National Systems of Innovation for national economic competitiveness.

The study target population was 839 of respondents from policy makers, academics researchers/heads of research, industries and civil society. Two phases were adopted, namely, quantitative research through which 209 survey questionnaires administered and 123 responses received and analyzed and qualitative research where semi structured interviews to 12 key informants purposefully sampled from phase one of the quantitative study using the 10% golden rule of sampling.

Furthermore, the study used the following Likert scale (1 = strongly Disagree, 2=Disagree, 3=Neutral, 4= Agree and 5 Strongly Agree).

The results from this method were analysed using SPSS to determine the statistical inferences needed by the study to make conclusion on the quantitative data collected from the 12 key informants, purposefully selected from the quantitative phase (Creswell, 2014). The second phase of the research design was looking at qualitative data gathering by means of semi structured interviews done on the 12 key informants selected from phase one of the study who were sampled and interviewed to further explain the responses from phase one of the study (Creswell, 2014; Mabhiza, 2016).

This approach was used with an understanding that quantitative and qualitative methods employed during triangulation, complemented each other in providing enriched or detailed analysis that would not be available if only one method was used in the study. Thus, triangulation has been found to be more useful in providing comprehensive data that leads to an

increased validity and reliability of results (Bekhet & Zauszniewski, 2012).

The study presented the conclusions, policy recommendations with specific reference to major lessons drawn from the study and best practices on what the NSI for Namibia and Botswana should do to improve their Economic Development & Competitiveness.

4. Research questions

The study used the following research questions listed below to generate thematic research areas to further probe and confirm the assumptions from the empirical literature with the findings of the study, based on the responses given by the sampled of 84 from a population of 839.

a) What are the key characteristics of an effective National System of Innovation?
b) What are the characteristics of Namibia and Botswana`s innovation policies?
c) To what extent have Namibia and Botswana implemented their innovation policies?
d) How is University Industry Linkages critical building national systems of innovation?

5. Results

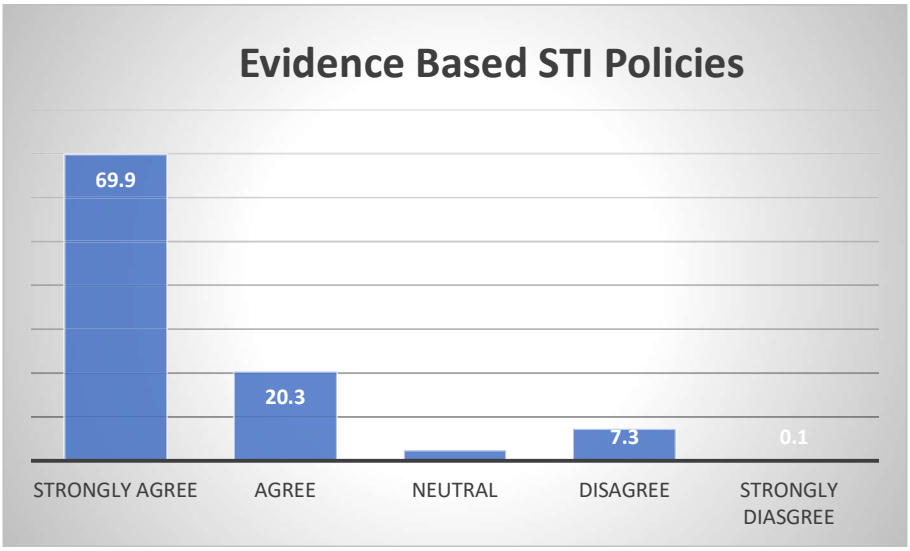
The study presents the results structured around the following research thematic areas generated from the main research questions used in study.

5.1 Characteristics of an effective National System of Innovation

Literature reviewed by the author showed that the effectiveness of an NSI is dependent on how strong linkages are created among policy-making bodies, universities, public research institutes, financial institutions, private enterprises and technology and innovation support agencies (Mytelka, 2016). Shorter turnaround time between policy formulation of STI evidence-based policies and its implementation is another attribute identified from literature as a characteristic for an effective and efficiency NSI (UNESCO, 2016 and UNESCO, 2013).

Respondents on the survey revealed that 7.3% were undeceided whether the existence of evidence based STI policies can be a key characteristic of an effective NSI, 2.4 % disagreed whilst 20.3% of the respondents agreed and 69.9% strongly agreed that evidence based STI policies is a charactersitic of an effective NSI as shown in the Figure 1 below.

Figure 1: Evidence Based STI Policies



5.2 Education Systems, Patent Registrations and Application Triple Helix Model

On the question of whether the education systems adopted by both countries is are likely to produce the required hunan resources equipped with requisite skills and knowledge to innovate and produce goods and services to meet the demands of industry. The findings reveal that 65.9 % strong agree that having a good education system will lead to the development of a critical mass of skilled manpower needed by industry. The study reveals that 65.9% of the particiapants in the study strongly agree that have a large number of registered patents is a measure of an effectieve NSI, whilst 20.3% of the respondents only agreeing. The above responses resonants well with the literature

revealed. The rest showed that 10.6% were undecided and 2.4 or 0.8% disagreed.

Findings from the study revealed that 64.2% of the respondents strongly agreed and 25.2% agreed that application of a triple helix model of innovation where unviseristies, industry and government are interconnected, interact and suport each to pormote innovation as a measure for an effectieve NSI. These results are supported by the suggestions of Leydesdorff (2005) on how to change knowledge based innovation systems using the interconnected dynamism that exist between the three players industries work closely with universities in internalizing its R&D funstions by allowing universities to run its spin off companies and R&D (Etzkowitz, 2008) whilst governments creates enabling environments through commiting investiments in industrial policies and STI polcies as well as provision of tax incentives to industries. knowledge generated from univeristies supports government to make informed decisions backed by evidence generated through research from (Teixeira, 2013; Etzkowitz & Leydesdorff, 2000 and Aubert, 2004).

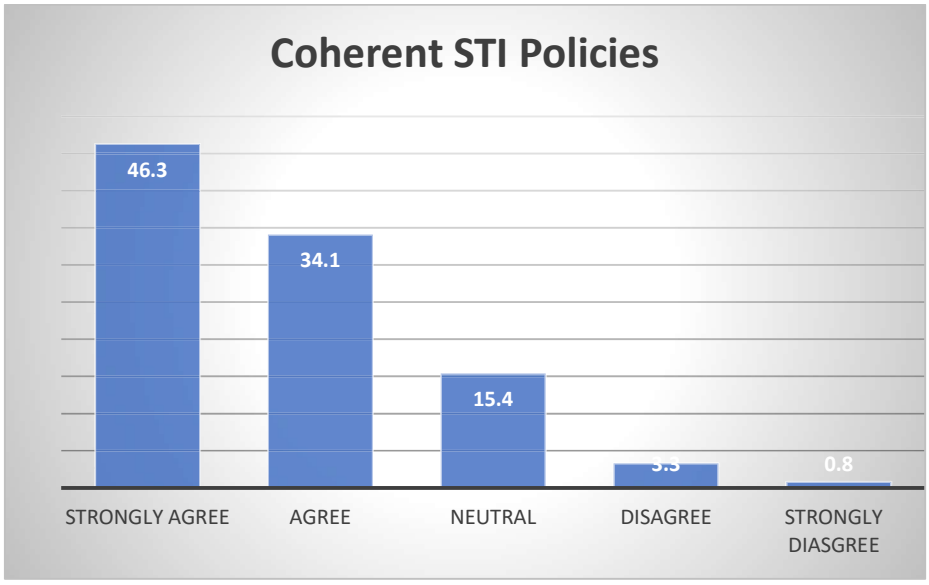
As posited by Lundvall et al. (2009) Human Resources is core to the development of an effective NSI. Results from the study shows that 68.3% of the respondents strongly agreed whilst 22.0% agreed that critical mass of skilled manpower in STI is critical for developing an effective NSI that is economically competitive.

To overcome this challenge, the governments of Namibia and Botswana that committed themselves to invest over 23% of the national budgets allocation to the education, science technology and innovation sectors (Government of the Republic od Namibia, 2012; Ministry of Finance & Develoment Planning, 2007). Secondly, the governments have vowed to adhere to the provisions of the SADC Protocol on Science, Technology and Innovation compiling all Member States to spend at least 1% of their GDP on R&D (SADC, 2008) and the African Union declaration to set aside 1% of GDP to be spend on R&D by Members States by 2020 (African Union, 2014).

5.3 Namibia-Botswana Science Technology and Innovation Policy (STI) Framework and Strategies

As indicated in the UNESCO report on Namibia review of its TVET, Higher Education and innovation policy (UNESCO, 2016) and the Botswana STI policy review (CSIR, 2005) done by the CSIR the STI policy frameworks and strategies are characterized with gaps and barriers hindering advancement of innovation and entrepreneurship. Developing polices that are Coherent is identified as one of the mechanisms of addressing challenges encountered by Namibia and Botswana in implementing its STI polices and strategies. Results from Figure 2 below shows that the majority of respondents constituting 46.3% strongly agree followed by 34.1 % who agrees that existence of coherent STI policies is critical for Namibia and Botswana to address challenges hindering advancement of research and innovation & economic growth for competitiveness.

Figure 2: Coherent STI Policies



The second machinery is for both countries to put in place mechanisms that are aimed at removing barriers preventing the smooth introduction and application of innovation and entrepreneurship, engagement of

enterprises in skill formation and innovation development, having enhanced institutional linkages/ partnerships with companies as well as having dedicated funding systems to support R&D and Innovation within their STI ecosystem. Respondents were asked whether removing barriers on innovation and entrepreneurship development, engagement of enterprises in skill formation and innovation development, having enhanced institutional linkages/ partnerships with companies, having strong university industry linkages as well as having dedicated funding systems to support R&D and Innovation would create opportunities for innovators and entrepreneurs to innovate and contribute to economic growth and wealth creation.

Results from the study indicate that the majority, 39.8% of the respondents strongly agree that removing barriers on innovation and entrepreneurship contributes to economic growth and wealth creation. The study shows that 30.1% of the respondents strongly agree that engaging enterprises in skills formation and innovation whilst 35% of the respondents strongly agree that having enhanced institutional linkages with companies or communities reduce the risk of excluding the needs of companies or communities during STI development and implementation.

Strong university industry linkages as well as having a dedicated funding system to support R&D and Innovation are also some of the attributes Namibia and Botswana needs to integrate into their STI policies. Results the study indicates that 69.9% representing majority of the respondents strongly agreed and agreed that having a strong university industry linkage leads to an effective NSI as industry will finance R&D to improve its productivity and universities produces knowledge needed by industry to innovate. Furthermore, the study showed that 37.4% of the respondents strongly agrees & 33.3% agrees that a dedicated funding system to support R&D and Innovation is critical in achieving the commitments of realizing the 1% of GDP expenditure spend on R&D made by Namibia and Botswana at continental (AU level), regional (SADC protocol on STI) and nationally in the NDP 10 (Botswana) and NDP5 (Namibia: achieve 1% expenditure of GDP by 2020).

The study concludes that having coherent policies, removing barriers on innovation and entrepreneurship development, engagement of enterprises in skill formation and innovation development, having enhanced institutional linkages/ partnerships with companies, having strong university industry linkages as well as having dedicated funding systems to support R&D and Innovation as key indicators for developing and implementing effective STI policies and strategies.

5.4 Challenges in Implementing STI Policies and Strategies.

Namibia and Botswana were over the years not having dedicated ministries of science technology and innovation forcing their STI budgets to be channelled through ministries of education and planning where the portfolio had been attached. This has always caused a challenge in implementing STI polices and strategies.

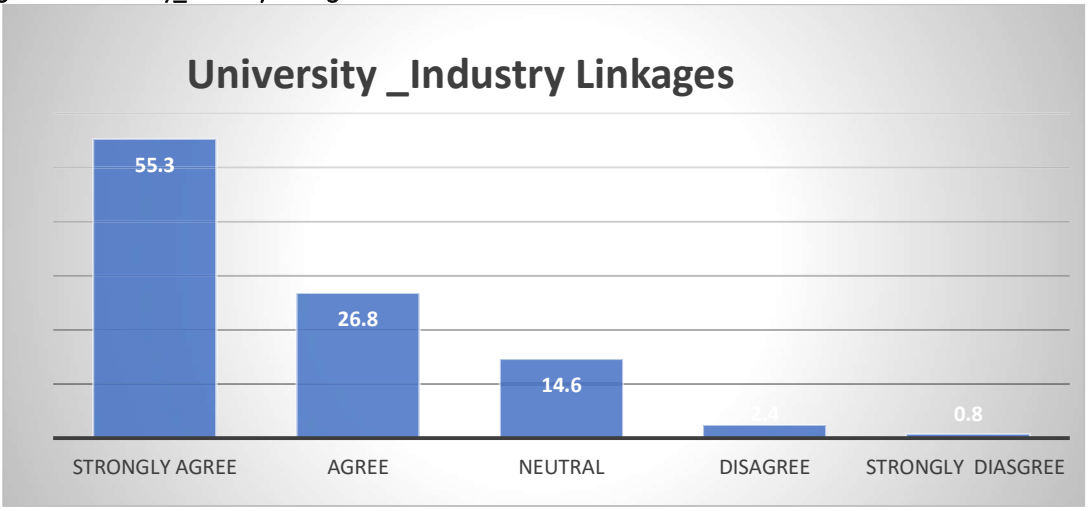
Results from the study shows of the respondents 46.3% strongly agreeing and 32.5% agreeing that channelling of STI budgets through ministries of education and planning by Namibia and Botswana over the past years have resulted in overfunding of STI making the sector to effectively implement their STI policies. Furthermore, financing of STI activities in both countries as been fragmented due to the fact that allocation to STI activities is scattered over various ministries calling for a need of a centralised STI budget.

The study shows that 51.2% and 30.9% of the respondents strongly agree and agree that having a centralised budget for STI will ensure a well-coordinated and governance mechanism spearheads the realization of set targets in national research agendas. The study concludes that Namibia and Botswana need to strengthen their STI coordinating agencies (NCRST and BITRI) to overcome challenges in implementing STI policies and strategies and ensure coordination and structural governance.

5.5 University-Industry Linkages

Creating an enabling environment through policy interventions that supports national research and innovation funding bodies to provide matching funds for co-financing of collaborative joint R&D projects with global partners abroad, industries nationally and universities is a responsibility of government (Geuna.A, Salter, & Steinmueller, 2003). The study recognised the good model South Africa is currently practising through its R&D funding agency the National Research Foundation (NRF) where joint collaborative R&D projects with the European Union under the Horizon 2020 are co-financed through match funding or co-location (Glrobbelaar, Tijssen, & Dijlsterhuis, 2017).
The Table below shows the results that 55.3% of the respondents strongly agreeing, 26.8% agreeing, 14.6% undecided, 2.4% disagreeing and 0.8 % strongly disagreeing of the respondents on the provision of matching funds to co-finance joint R&D to strengthen universities and industry are encouraged to set up research and innovation centres within campuses that will be capable of transforming the research and innovation outputs into products, processes and services required by industry to growth the market share and remain competitive.

Figure 3: University_Industry Linkages



6. Discussions of results from qualitative study

This section provides a summary of the key discussions based on the research themes from the qualitative study analysis,

6.1 Characteristics of an effective National System of Innovation

The respondents for the qualitative study, unanimously agreed that the existence of evidence-based science, technology, and innovation policies and well-defined industry-university linkages with strong R&D infrastructure manned by skilled STI personnel are key tools for countries to remain economically competitive.

6.2 Namibia-Botswana Science Technology and Innovation Policy (STI) Framework and Strategies.

The study found the need to address the problem hindering the development of coherent STI policies for Namibia and Botswana by avoiding the borrowing syndrome policy, but rather embarking on proper in-house environmental scanning to remove barriers to innovation and entrepreneurship. This could be done through the engagement of enterprises in skills formation and innovation development; ensuring the existence of enhanced institutional linkages/partnerships with companies & communities. Also, through forging strong university-industry linkages and having a dedicated funding system to support R&D and innovation.

6.3 Challenges in Implementing STI Policies and Strategies.

The study identified a long policy gestation period (policy adoption to implementation); lack of adequate supportive infrastructure; science, technology and innovation not embedded into national visions of the country; Science, technology and innovation not seen as a tool for economic growth and development. Furthermore, science, technology and innovation budgets channeled through ministries of education and planning and lack of centralized STI budgets as challenges faced by Namibia and Botswana in implementing its STI policies and Strategies.

The study further found out that understanding by different ministries and state agencies of the role of NCRST as a coordinating authority for the implementation of the research, science and technology policy of 1999 was limited due to diverging views on STI policy and competition for budgetary resources. The institutional status also led to rivalry between different R&D projects. The absence of science and technology incorporation in political parties' manifestos led to parliament not actively engaging in discourse that could accelerate the implementation of STI legal frameworks. For example, Namibia's RST Act provides for the President of the Republic of Namibia to be Patron of STI in the country, but this provision has not been implemented. Finally, the absence of the STI coordinating authorities (NCRST & BITRI) in either the Ministries of Education and of Higher & Tertiary Education and Innovation seemed to reduce their influence on sectoral ministries such as those of agriculture & water, energy & mining, fisheries, trade and industry, environment, finance and the National Planning Commission (NPC) was also

identified as a challenge hindering the implementation of STI policies and Strategies for Namibia and Botswana.

6.4 University - Industry Linkages

The National System of Innovation for developed countries like Switzerland, USA and UK is driven by a high intensity and quality of institutional linkages and collaboration among universities and research institutes. This is realised through a coordinated interactive approach involving public and private sector-based R&D institutions, universities, industry, public policy agencies and sectoral ministries for making a country's NSI functional and productive.

The quantitative research findings on university-industry linkages, indicates that most respondents agreed that the collaboration between industry and institutions is weak because most industries operating either in Namibia and Botswana are proxies of the R&D industries operating across the borders likes of South Africa and Britain.

In the case of Namibia, there is a need for the country to come up with an evidence based STI; a policy framework which aims at promoting such linkages and collaborations. Since the inception of Namibia's NSI, its R&D institutions have established different kinds of collaborations, through joint research projects and participation in regional and international programmes like the EU Horizon 2020 and STISA 2024.

In this regard, the University of Namibia and the Namibian University of Science and Technology in their quest to build a strong university-industry collaboration have been participating in several research programmes of the European Union (EU) such as the SAIS II & Demola with Finland, Phoenix project with Cardiff University, GIZ with Germany, TIKA with Turkey and DFID with the UK. They have bilateral cooperation arrangements with universities in South Africa through joint research chairs and collaborative projects of mutual benefit to both countries.

Whilst, Botswana on the other hand have reviewed its Science and Technology Policy for 1998 which include mapping its research and innovation with the assistance of UNESCO under the Global Observatory of Science, Technology and Innovation Policy Instruments (GO-SPIN) in order to strengthen its NSI. The review provided an opportunity for Botswana to strengthen its capability to develop the Policy on Research, Science, Technology and Innovation in 2011 (UNESCO, 2013). The Botswana National Policy on Research, Science, Technology and Innovation was developed by the Ministry of Infrastructure, Science aand Technology through a consultative process which involved the participation of governement entities, private sector, research sector, academia, development partners and civil society to as well as fullfilling the commitements made in the SADC Protocol on Sciecne, Technology and Innovation signed in 2008 and its Regional Indicative Strategic Development Plan (RISDP) that present science and technology as key driver for enconomic competititveness (Republic of Botswana, 2011).

The University of Botswana (UB) on their research collaboration with NEPAD on the SANBio, SAIS II, the Square Kilometer Array (SKA) Radio Telescope reserch with South Africa, Botswana International Universityof Sciecne and Technology (BIUST) with UK university on big data funded by the NEWTON FUND and the Botswana Open University (BOU) were collaborating with industry and government in developing human resources needed to spearhead the development and promotion of reseach, science, technology and innovation.

Furthermore, the responses from the key informants purposefully sampled from the quantitative research for this study reviewed that the national R&D institutions and universities are not adequately collaborating together, and university-industry collaboration being weak and further identified the following as main barriers hindering the strengthening of university-industry collaboration or linkages as:

6.4.1 Mismatch between R&D priorities of industry and those of universities. While industrial firms or enterprises need R&D that explicitly focuses on adding commercial value to their activities, most of the R&D activities at the universities are not organized in such ways as to target industrial needs.

6.4.2 Finding from government to universities as well as funding from international sources, tends to restrict the universities to R&D that is not focused on commercial interests or agendas. In some cases, funding is tied by grant stipulations or provisions that restrict university participation in industrial R&D;

6.4.3 Universities are just starting to develop an entrepreneurial culture and are only now formulating institutional policies that direct their R&D efforts to industrial or commercial ventures. Universities have limited internal capacities for collaboration with industry; and

6.4.4 Venture capital financing or funding for R&D is not easily available in Namibia; and government funding of enterprises is not adequately used to stimulate university-industry collaborations.

7. Conclusions

Innovation was for a long time a neglected topic in mainstream social science even though economits like schumpeter had developed the theory of innovation a centrury ago that drives long term economic and societal change its intergration into research and science policies has been a challenge (Fagerberg, 2018). A case in point here is Namibia, which had developed a good STI policy (National Research Science

and Technology Policy, 1999) way back in 1999 but still the implementation of this policy was a challenge as compared to Botswana.

The long gestation period between policy formulation and implementation, i.e. Namibia took six years from 1999 to enact the Research Science and Technology Act, 2004 (Act 23 of 2004) and a further 13 years for the Research Science and Technology, Regulations 2011 to be gazetted. The proposed institutions mentioned in the policy like the National Commission on Research Science and Technology and the Research Science and Technology Fund were only established in 2013.

Whilst Botswana had its first S&T policy developed under the Ministry of Finance and Development Planning in 1996 which has undergone several reviews and new policy was development under the new Ministry of Infrastructure, Science and Technology.

Furthermore, a comparative analysis on government expenditure on R&D as a percentage of GDP and the global innovation performance (GII) of top ten performing countries in the world, including Namibia and South Africa revealed that there is a strong correlation between the increase in GERD and the country's performance on the Global Innovation Index. Namibia scored low on Knowledge & technology output compared to Botswana, South Africa and Mauritius in the SADC region and Finland, Switzerland, and Singapore.

For Namibia to improve its ranking on the GII, there is a need to strengthen institutions tasked with knowledge creation and increase the government expenditure on R&D as a percentage of GDP. The figure below indicates that Singapore, had the highest value of GERD at 2.185 percent and a GII score at 58.7 followed Finland, whose GERD as a percentage of GDP stood at 2.89 percent and GII scored for 2017 was 58.5 percent. South Africa's GERD expenditure stands at 0.765 percent of the GDP and GII score for 2017 was 35.8 percent in 2017 GII. Lastly, Namibia scored the least score of 27.9 percent in the 2017 GII report and had GRED expenditure of 0.35 percent according to the Namibia R&D survey report of 2014 (NCRST, 2016) .

8. Policy recommendations

This section proposes policy recommendations that Namibia needs to follow in order to improve its competitiveness and for Botswana, what the country must maintain in terms of the policy framework for her to remain highly ranked in Africa and the world at large. Therefore, the study extracts recommendations from the research findings on the selected research themes and proposes institutions responsible for implementation as well as providing what inputs are needed to ensure smooth implementation. Lastly the study suggests the appropriate strategies to realize the proposed recommendations from the findings.

Therefore, infrastructure development (equipment provision) should be regarded as an opportunity for retaining the qualified scientists who in return would play a pivotal role in growing the economy and creation of jobs.

Table 1: Policy Recommendations on characteristic of an effective NSI

Research Theme	Recommendations	Institutions responsible for implementation	Inputs needed	Strategies
Characteristic of effective NSI	Develop evidence-based science, technology and innovation policy	NCRST & BITRI Agricultural council, diamond hub, NCHE, NQA. BIPA, BBS, BIH. Ministries responsible STI from both countries. Ministries responsible for Trade and Industry from both countries. Universities. Chambers of Commerce	Financial resources. Human resources. STI Legal & policy frameworks.	Have an education system that responds to industry demands. Governments maintaining a strong political will in championing STI. Encourage high participation of SMEs in innovation and entrepreneurship development. Having a funding framework for R&D and Innovation. Invest in the developing of knowledge workers. Forge a strong university/government and industry partnership.

Table 2: (STI policy frameworks, challenges in implementing STI policies)

Research Theme	Recommendations	Institutions responsible for implementation	Inputs needed	Strategies
Namibia Botswana STI policy Frameworks and Strategies	Develop coherent STI policies	Ministries responsible STI from both countries. NCRST & BITRI	Financial resources. Human resources.	Remove barriers to innovation and entrepreneurship. Maintain a strong political will & leadership to drive STI. Forge a strong university/industry linkage.

			STI Legal & policy frameworks	Ensure a dedicated funding system to support R&D & Innovation
Challenges in implementing STI policies and strategies	Ensure strong policy coordination, coherence and political leadership	Parliament, Cabinet Ministries responsible for STI from both countries on the policy formulation and approval phase NCRST & BITRI on the execution phase	Implementation plans with clear monitoring and evaluation Human & Financial resources	Reconfigure the institutional mandates of STI coordination authorities to give them adequate authority to coordinate STI policies and promote policy coherence across the institutional terrain in order to avoid weak policy coherence. Ensure STI is embedded in the national visions of the country. Invest in R&D infrastructure to support research. Ensure national R&D Funds are established to provide funding to R& D and Innovation. Ensure STI budgets is centralized and channeled through these established R&D Funds. Ensure STI coordinating bodies are strengthened.

Table 3: Policy Recommendations on solutions to improve STI Policies and Strategies

Research Theme	Recommendations	Institutions responsible for implementation	Inputs needed	Strategies
Solutions to improve STI Policies and Strategies	Reduce long policy gestation period (i.e. time taken from policy development to implementation). Namibia had its first RST policy in 1999 it took 5 years to have the RST ACT in 2004, and another 9 years for NCRST to be established	NCRST & BITRI Namibia Research & Innovation Fund Botswana research science and innovation fund	Implementation plans with clear monitoring and evaluation Human & financial resources	Ensure STI policy harmonisation to avoid duplication. Ensure STI policy implementation plans are synchronized with NDP cycles. Provide incentives to researcher and scientists. Encourage the participation of SMEs in the Innovation value chain. Develop a critical mass of skilled manpower . Maintain a strong political will and leadership that supports STI development. Encourage universities to establish R&I centers

Table 4: Policy Recommendations on University _Industry Linkages

Research Theme	Recommendations	Institutions responsible for implementation	Inputs needed	Strategies
University Industry linkages	Forge strong university/industry linkages	UNAM/NUST/UB/BUIST/industry	University research policies Financial and Human resources	Establish platforms that connects users with knowledge creators. Providing matching funds channeled through research centers within universities

8. Areas for further research

The key findings and recommendations presented in this study provides lessons to all stakeholders interested in learning about the role of national systems of innovation in driving national economic competitiveness. The study was comparing Namibia and Botswana's national systems of innovation and how they influence their economic competitiveness by leveraging on their ability to sustainably utilise its natural endowments for the promotion of investments in technology prospecting, acquisition, and technology commercialization of research output. Furthermore, the study identified a weak empirical information on the use of natural resources through technological innovation which could trigger further research to understand what is causing this anomaly.

The limited timeframe in which the study was conducted could not allow the researchers to cover a broader comparative analysis of NSIs of the entire SADC countries thereby having a holistic picture of the regional perspective. Another area seeking further research is to look at the influence of having dedicated funding structures for STI in the SADC region compared to their European counterparts in relation to economic competitiveness.

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