Constraints to University-Industry Linkage in Uganda: Perceptions of Dons at a Public University

Zaidi Kitagaana

Kyambogo University, Kampala, Uganda

kitagaana@yahoo.co.uk

ABSTRACT

This empirical paper presents linkage between University and Industry. The Triple Helix framework was used as a tool to assess this linkage. The research project was a qualitative descriptive case study. Standard qualitative data analysis techniques were employed to organize and analyze the data. Results indicate that there is low proportion of doctorate holders among academic staff at Higher Education Institutions ((HEI's) in Uganda. Institutions are not fully equipped with the necessary infrastructure to meet the demands of Industry. The study recommends that there should be internal capacity building by injecting more financial resources into research in Universities. Dons should be dedicated to the generation and dissemination of applied research that advances understanding of entrepreneurship in technology-based entrepreneurial culture. Strategic plans of Universities should provide policy direction in shaping and directing research priorities.

Keywords: Constraints, University- Industry linkage, public University, economic development.

INTRODUCTION

Linkage between higher education institutions and Industry has existed for a long time, particularly in the developed economies. This partnership was first introduced by Sunderland Technical College in England in 1903 (Ramakrishnan & Yasin, 2011). Universities provide major inputs for the industrial innovation process in terms of human capital. Industry can work as a laboratory where universities verify the validity of their knowledge. In Uganda, Industry is reluctant in entering into long term relationship with universities. (Ecuru & Kawooya, 2015).They complain about the perceived theoretical emphasis of University activities. On the other hand, there is an attitude in Universities that there is nothing to learn from Industry (World Bank, 2013). While governments try to encourage universities to reach out to the productive sector, some barriers exist including; mismatch between research agendas, inadequate internal structures in Universities, and lack of entrepreneurial culture in Universities (Sa, 2013).Today Universities are considered not only as centers of knowledge and learning, but as key institutions in national innovation system (Nelson, 2006). In order to carry out their role within the innovation system, Universities need to be well-linked to enterprise, other research institutes, and supported by government policies.

The Problem

The world over, formal education constitutes one of the most critical engines of development (World Bank, 2013). Indeed the importance of higher education as a driver of development has become one of the most critical development agenda items by policy makers, scholars and international development partners. The perception is that higher education plays a pivotal role in development and transformation of economies and should be given priority (National Association of State Universities and Land - Grant Colleges (NASULGC, 2008). This perception is even more valid for Universities which are poised not only on teaching and research but also on community engagement for development. Thus Universities are increasingly emphasizing the importance of the University-Industry linkage in their mission statements, development plans and evaluation reports (Makerere, 2014; Kyambogo, 2016). Ministry of Finance, Planning and Economic Development, 2010; Preece, Ntseane, Modise, & Osborne, 2012). Thus there should practically be University-Industry linkage in terms of Research Collaboration between University and Industry, Infrastructural development within Universities and entrepreneurialism.

However, practically there seems to be a minimum linkage of Universities with the productive sector (Ssebuwufu et al., 2012). University graduates seem to lack practical skills to satisfy employers' needs (Ramaskrishman et al., 2011). The development process becomes affected, due to lack of innovation which invariably prevents expansion and creation of new industries (Adepoju & Adedeji, 2015).

Uganda manifests a relatively weaker and less integrated policy and institutional framework for Science, Technology and Innovation in its National Development Plan (The Republic of Uganda, 2011). The 2012 Global Innovation Index puts Uganda at position 117 out of 195 countries (World Intellectual Property Organisation, 2012). African Union (AU) resolved that each African country should spend at least 1% of its

Gross Domestic Product on research and development (AU, 2006) yet in Uganda it was only 0.6% in 2009 (Uganda National Council for Science and Technology, 2011).

With the exception of a few case studies- for instance Nabudere's (2009) empirical study, most studies on University-Industry linkage focus on basic research as opposed to applied research (Bloom et al., 2006). Existing research about University-Industry linkage (e.g., Wu et al., 2015; World Bank, 2013; Sa, 2013; Marotta, 2008) focus on higher education institutions in the USA, Europe, Latin America and East Asia and the findings thereof, despite their relevance, might differ from what pertains to Uganda. Hence the need for a study in Uganda

In terms of promoting entrepreneurialism and practical skills among staff, higher education institutions employ Industry professionals as adjunct faculty; engage guest speakers to provide business and entrepreneurial advice; however no resources are specifically dedicated to supporting entrepreneurial activities by staff (Ssebuwufu et al., 2012). To ensure sustainable industrial transformation, there is need to develop and nurture an institutional capacity in science, technology, incubation and innovation (African Development Bank, 2014). Ahmad and Junaid (2008) state that unless and until the space between academia and Industry is bridged, attaining of high standards in the working of both the Industry and University in the realization of the goals of national economic development would be impossible.

Objectives of the Study

The study intended to:

1. Identify the research agenda of Universities and Industry which affect their linkage
2. Find out whether public universities in Uganda are well facilitated and equipped to support University-Industry linkage.
3. Find out whether University dons value entrepreneurial engagement.

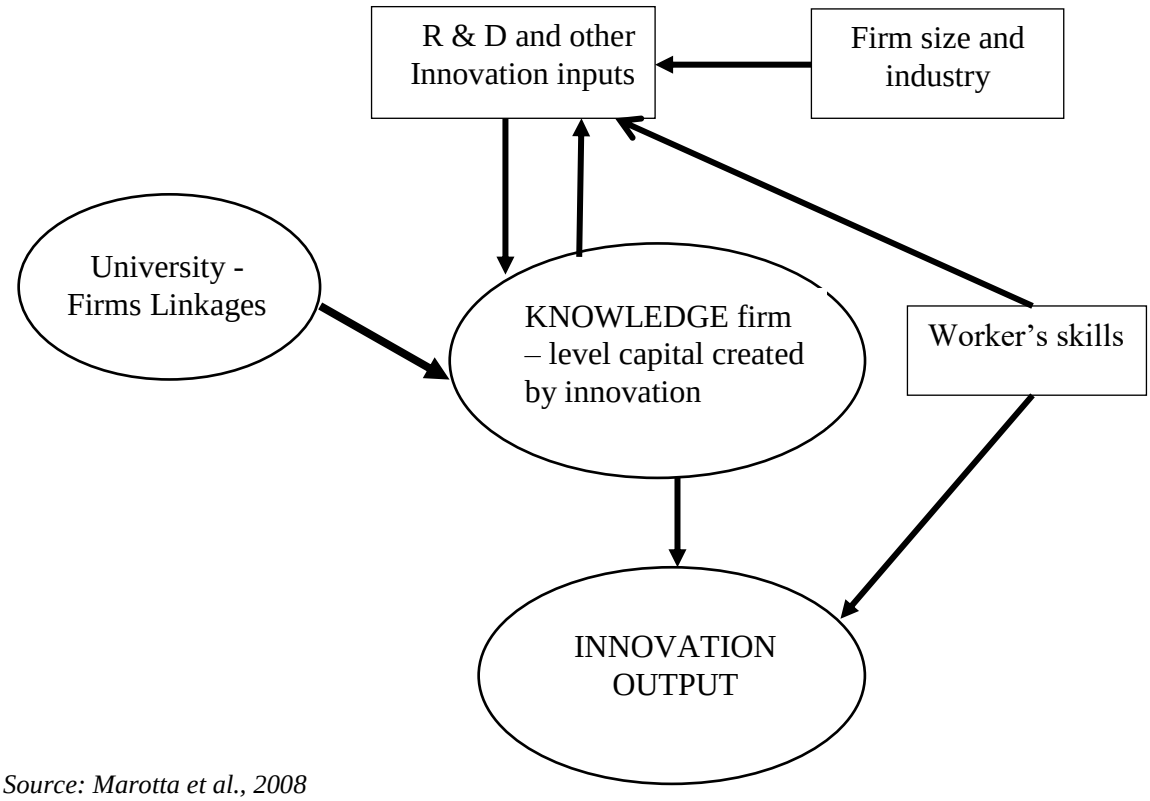
Theoretical Framework-The Triple Helix Model

The Triple Helix Model stresses the role of, and the interplay between, different types of innovation actors for understanding the dynamics behind innovative performance, growth and competitiveness of nations (Freeman, 1991; Lundvall, 2007; Nelson, 2006. The model centres on the interaction between three parties of Universities-Industry -Government as the key to improving the conditions required for the innovations at the heart of knowledge based societies (Leydesdorff & Meyer, 2006). Industry takes the role of production, government is attributed the responsibility of overseeing the contractual relationships capable of guaranteeing interactions and stable relationships of exchange and Universities are allocated the role of producing new knowledge and technology (Etzkowitz, 2003).

The Triple Helix Model rose to prominence in the 1990s (Leydesdorff & Etzkowitz, 1998). Universities are considered as relevant and distinctive actors, contributing to the innovative potential of societies. This holds particularly for basic research, which is characterized by high levels of technological and market uncertainities and long lead times (Vaugelers, 2014). Private investors tend to refrain from basic research, leaving universities and public research institutes uniquely positioned to produce science-based knowledge upon which the development of new products, processes and services can build (Vaugelers, 2014). At the same time, an effective contribution to the capacity of an innovation system requires that universities do not only create ideas that can be commercialized, but also that they are willing to become involved in the process of transferring research ideas towards commercial success.

Universities should become more active in the transfer of research results. There are various pathways for Industry and science to interact. These include formal relationships, such as collaborative agreements between University and Industry, Research & Development contracting, own licensing policies, intellectual property management and spin-off activities of science institutions (World Bank, 2013). There are some industries where the link between science and innovation is explicit and direct - Industries such as manufacturing are “science based”in the classic sense and rely heavily on advances in basic research to feed directly into their innovations (World Bank, 2013). In non-science based industries, much innovation also derives from other-than-basic-research related activities. Nevertheless, even here innovation may be facilitated by better use of basic research resources, such as the training of skilled researchers helping to increase the absorptive capacity of Industry.

Figure 1 Main Factors Determining Firms' Innovation Output



Source: Marotta et al., 2008

Interaction between firms and higher education institutions play a role in bringing new products and new processes into economic use. One way of enhancing innovation is by examining how research and development (R&D) investments translate into commercial patents. A firm is regarded as innovative when it innovates in products or processes. The knowledge from universities affect the innovative outcome of firms. Availability of skilled labour positively affects the possibility of introducing a new product.

Research Agenda

Strategic plans of universities can provide an important vision for shaping and directing research priorities (Parker, 1992). They can help build institutional research capacity by ensuring that research projects are selected according to those that align best with University objectives, including niche areas of specialization. Strategic plans can help institutions shift away from the current system of fragmented, individualistic researcher collaborations aimed primarily at career advancement towards building overall institutional research capacity (Kruss et al., 2009). Strategic plans however need to be more than just a paper exercise (Ssebuwufu et al., 2012). Importation and imitation of strategic plans and policies from other countries, without a serious reflection on the institutions capacity and a realistic vision of its future direction risk putting in place irrelevant policies. Research capacity, defined by Volmink (2005), as "comprising the institutional and regulatory frameworks, infrastructure, investment, and sufficiently skilled people to conduct and publish is not articulated in the mission statements of most universities research".

Ugandan higher education lacks capacity not only at the system and institutional levels, but also at the level of individual academics (Jones, Bailey, Lyytikäinen, 2007). Research output is limited by the low percentage of academic staff that holds doctoral degrees, (Uganda Vice-Chancellors' Forum, 2012).At the institutional level, universities in Uganda have long been facing funding difficulties due to limited state resources. Universities face constraints in building research programs in relevant fields of science and technology that would be of interest to Industry. Generally, weak research capacity and insufficient research and development funding inhibit a more sustained research role (Atuahene, 2011). These structural issues prevent universities from training a larger number of scientists and retain productive researchers. With limited funding and support to their research mission, universities are usually hard-pressed to initiate and sustain programs of research (Bailey et al, 2011).

Internal Structure

Higher education institutions are not equipped with the necessary infrastructure to meet the demand of Industry (Sierra, Vargas & Torres, 2017. Institutions are not equipped to fulfill the missions the society has assigned to

them. A persisting lack of internal structures and human resources to engage with the productive sector inhibits the expansion of University Industry ties. Ugandan universities have undertaken efforts to foster and institutionalize linkage with Industry via the incorporation of Industry linkages into their strategic plans and the creation of designated posts and offices. However such offices operate on minimum budgets in many institutions and are not always staffed with sufficient expertise in entrepreneurialism, intellectual property right management and marketing strategies (Ssebuwufu, et al., 2012). Kyambogo University for example has highlighted linkages in its strategic plan, but lack complementary and supportive policy and mechanism for regulating interactions with the productive sector (Kyambogo University, 2013).

Universities' research productivity appears to be crucial in determining the level of linkages with Industry. In terms of factors that facilitate University-Industry partnerships, the organizational structure of universities has been identified as an important dimension in their technology transfer performance (Filippetti & Savona, 2017). The quality of higher education institutions is the most important determinant factor for industries to engage with universities in their region (Vedovello, 1997).

Many industries in Uganda are small to medium scale firms producing for local markets while the relatively larger ones are subsidiaries of transnational companies which draw upon the in house research & development capabilities of the parent company. There is no awareness of the existing research results and new technologies by Industry, the absence of research agenda, and the irrelevance of some University research (Dhesi & Chadha, 1995; Filippetti et al, 2017). There is also lack of sufficiently qualified researchers priorities, weak research infrastructure, inadequate funding for research and donor influenced research priorities (Dhesi & Chadha, 1995). Under such conditions, the link between the supply of skills and the new knowledge from higher education institution and the demand for the products from industries and other parts of the productive sectors are not clearly established.

There is lack of trust and confidence on the part of Industry in higher education institutions as potential partners (World Bank, 2013). This lack of trust appears to have multiple causes. First, there is a cultural reliance on foreign technologies and some suspicion of local innovations. Universities are therefore not viewed as sources of useful information and expertise. Second, the lack of experience of firms in dealing with universities prevents a more informed understanding of potential avenues for cooperation. Reliance on foreign innovation and technologies is an impediment to the development of University-Industry partnerships in Uganda. The general population in Uganda tends to prefer "imported goods and ideas" at the expense of local products and innovations (Sa, 2013).

Higher education institutions in Uganda have seen little or no infrastructure improvements for the last few decades (African Network of Scientific and Technological Institutions (ANSTI) (2005). Learning infrastructure is widely deficient due to insufficient budget and overdependence on public financing. Infrastructure, such as internet access, library, textbooks, equipment, laboratories and classroom space are critical bottlenecks resulting in deterioration of quality of education and learning (World Bank, 2007). The poor state of facilities also affects the quality of research and its ability to contribute to societal development and progress.

Entrepreneurial Culture

In Uganda, public universities were created as an extension of the state, with strong public financial support and the appointment of academic administrators serving as civil servants (Sawyerr, 2004). Therefore University dons do not see their roles to take on more entrepreneurial initiatives on behalf of their institutions. Universities are promoted as an integrated part of the national innovation system including national organization research systems, their contributions are not measured narrowly in terms of their contributions to Industry and the formal sector, but equally for their role in promoting productivity gains throughout the larger productive sectors.

There is no appropriate leadership at many institutions to initiate, guide and support University-Industry linkages. University senior administrators do not seem to see their role to facilitate the establishment of partnerships with the Industry. Without such leadership, Industry engagements are often viewed as peripheral activities conducted at the sole initiative of a few individuals. The role of University administrators is also to find ways to increase the human and financial resources of their institution, rather than to simply manage limited resources (Sa, 2013).

Some governments have reformed the reward systems for University professors and researchers by introducing new incentives to collaborate with Industry. A report by the Australian Advisory Council on Intellectual Property (Australian Advisory Council on Intellectual Property, 2012) advocates a rebalancing reconsideration of the key performance measures of public universities and research centers, developing mechanisms to increase the motivation of universities and their researchers to collaborate with Industry. Emerging countries like Turkey have redesigned the academic promotion rules to introduce new incentives in addition to traditional criteria like publications (Zuniga, 2011).

Employers of University graduates do not provide them with adequate training which would enable them to be creative, imaginative and innovative in identifying business opportunities, training in risk management, training and support that would enable them to establish career in small and medium enterprises (SME) and to inculcate in young graduates the spirit of perseverance that would enable them to persist in any business venture they embark on. The employers do not involve themselves in course planning design, and delivery (Idaka, 2013). They do not have any idea about what the graduates have learnt until they have reached the Industry.

Science parks are an infrastructural mechanism for transferring technologies from universities to firms. Hall, Link & Scott (2001) conducted an exploratory examination of the evolution and growth of U.S. science parks and their influence on academic missions of universities. Their empirical analysis came to the conclusion that science parks stimulate technological spillovers from universities to firms. However, there is virtually no empirical evidence on the impact of these facilities on the research performance of firms. Siegel, Westhead, & Wright (2003), attempt to fill this gap by examining whether firms located on University science parks in the United Kingdom have higher research productivity than observationally equivalent firms that are not located on science parks. It was found that Science park firms are more efficient than non-science park firms, in terms of generating new products, services and patents. Evidence suggests that University science parks constitute an important spillover mechanism, since they enhance the research productivity of firms.

Universities are encouraged to transfer their laboratory discoveries by patenting and licensing their intellectual property to local firms. Academic entrepreneurship or spin-offs are a source of new firms and jobs and can be a significant revenue source for universities. Spin-offs from University can be important for regional technology transfer (Kumar & Gupta, 2017). But universities do not only have an impact on new firm creation through their own spin-offs,they also correlate with other start-ups. Research has shown that geographical proximity to universities is positively correlated with regional startup rates in high-tech industries (Rothaermel & Ku, 2008). Locating science parks on University campus provides firms closer access to University research in more informal ways. It may facilitate the recruiting of University (post-) graduates. Agglomerating firms in a park/building may furthermore lead to positive spillovers between participating firms. For University spin-offs, a science park or business incubator near the University provides easyaccess to business resources while allowing the researcher to still be in close contact with his/her labaratory/University position. The empirical literature that evaluates the role of science parks and incubators is still in its infancy (Veugelers et al., 2014). As firms self-select to join science parks and incubators, models assessing the effect from locating in science parks must account for the quality of firms that select into science parks.

METHODOLOGY

Descriptive research was a preferred strategy for this work as the study did not focus on a large number of participants but on the quality of the information obtained from them. Furthermore, the focus of attention in the research project was to explore the perceptions and experience of the participants say the beliefs, the feelings they expressed, and the explanations they gave which was treated as significant realities. Individuals contribute to the construction of reality through interaction. This means that social reality may have multiple perspectives. This is why the researcher favored to interact with the participants and dialogue with them. Factors that inhibit University-Industry linkage depend on individual perception. Epistemologically the researcher believes that knowledge is subjective and tentative. Factors that people hold for the failure to create a strong link between University and Industry are creations of individual minds depending on situations in which such people are positioned. Ethnomethodology is embraced as a philosophical school of thought. This is aligned with epistemological position of qualitative research, described as interpritivism (Bryman, 2012).

The study took place at the Faculty of Engineering -Kyambogo University. This faculty offers eleven bachelor's degree programs and these are: Engineering in Mechanical and Manufacturing, Engineering in Telecommunication, Engineering in Civil and Building, Engineering in Industrial and Management, Vocational Studies in Technological studies with education, Science in Building Economics, Engineering in Environmental Engineering and Management, Automotive and Power Engineering, Surveying and Land Information Systems, Science in Land Economics and Bachelor of Architecture (Kyambogo university, 2016).The Faculty has four departments. These are: Lands and Architectural Studies, Electrical and Electronics, Mechanical and Production and then Civil and Building Engineering. Kyambogo was chosen as the research University for the reason that it was one of the first Universities in Uganda to embrace University-Industry linkages (Nabudere, 2009).

The University adopted University-1ndustry linkage as an integral part of its agenda and in its master plan 2014-2024 (Kyambogo university, 2014), according to which, the University committed itself to a number of things such as the following: Academic and Research development, Physical Infrastructure development, Collaborative Linkages, Consultancy (Kyambogo university, 2006).The faculty of engineering was chosen for the study because what is taught at the faculties of engineering finally find application in Industry through manpower training, collaborative research and high desire to produce new products together. Engineering gives room for technology transfer which is important for economic development. The Four Heads of Department from the faculty of engineering were selected purposively and were interviewed because of their direct knowledge of

University Industry linkage in Uganda. An appropriate sample size for a qualitative study is one that adequately matches the research objectives and there is no formula for defining the number of participants (Yin, 2011; Creswell, 2014). The semi-structured interview protocol was pilot-tested with two volunteers before interviews took place. Piloting allowed for refining the phrasing of the questions and their order, to maximize understanding and facilitate the logical flow of themes in the interviews. The researcher made appointments with participants and met them at the agreed time and venues. Data was collected from academic Heads of Department of Engineering Sciences. The data for this study was generated through documentary reviews, face-to-face semi-structured interviews and observation. Written data sources included published and unpublished documents, administrative documents, and strategic plans of the selected University. Observation was done in order to obtain data that could not be gained through interviews. After data collection, data was analyzed. This involved breaking up data into manageable themes, patterns, trends and relationships (Mouton, 2005). Standard qualitative data analysis techniques were employed to organize, code, and analyze the data (Miles & Huberman, 1994).

Qualitative research seeks to produce credible knowledge of interpretations processes and understanding, with an emphasis on uniqueness and context. There are four criteria of research trustworthiness developed by Lincoln and Guba (1985) and Guba and Lincoln (1989) which have been widely cited in the social science research methods literature (eg. Kalof, Dan & Dietz 2008; Bryman, 2012) to evaluate the quality of qualitative research: Credibility, transferability, dependability and confirmability.

Credibility deals with the accuracy of data to reflect the observed social phenomena. Transferability refers to the level of applicability of the study findings into other settings or situations. While it is certain that the data from a qualitative study is not reproducible, it is not impossible to apply a qualitative study in a different setting. Dependability corresponds to the notion of reliability which promotes replicability or repeatability. Dependability concerns taking into account all charges that occur in a setting and how these affect the way research is being conducted. Confirmability refers to the extent to which others can confirm the findings in order to ensure that the results reflect the understandings and experiences from observed participants, rather than the researcher's own preferences. Lincoln and Guba (1985) suggest using an inquiry to enhance confirmability.

FINDINGS

The findings of this study shows that University-Industry linkage in Uganda suffer from a number of factors, among which is a cultural difference between academia and Industry. Academic staff seems to prioritize long-term partnerships with Industry, while Industry is concerned with solving specific problems with commercial profitability implications. Another major barrier to the development of University-1ndustry linkage relates to universities' institutional capacity. University dons indicate that universities do not have the structures and personnel to engage productively with Industry. Specifically, this lack of capacity includes limited human resources and poor infrastructures. Participant coded 001 reasons that there is a missing link between the University (which has the knowledge) and Industry (which has the money) and that is the technology park which would undertake innovation. "We are not moving a step" - he complains.

The participant coded 002 reasons that most of the industries do not have research & development units to collaborate with the universities. Joint research & development programs in 'research and licensing agreements' where research results (whether patented or not) are licensed to interested parties in Industry is non-existent. The Industry would finance continuing research in this field at the University, commit itself to develop products that will be the outcome of the project. In this case, the Industry purchases some research services, mainly analysis, testing, etc and receives the results for its use. Research & development projects depend on the personal contacts of researchers with local Industry. The Ugandan companies do not have their own research & development centres. However, projects based on individual contacts often lead to long-lasting collaboration. Some few universities and their related research centres do have research facilities that can be used to develop solutions to meet Industry's needs but are not being utilized. People and institutions are not always interested in getting involved in research & development partnerships hence Industry-institute interaction can only be achieved by finding out strategies to draw relevant stakeholders into systematic and reciprocal interaction to address work place trends and technology emancipation. The third participant coded 003 complains about the lack of trust between Universities and Industry and the high staff attrition which does not favour collaboration. This absence of expertise affects not only academic professionals, but also the staff who are unable to deal with all aspects related to relationships between the University and the outside world. Participants revealed that their faculty has acquired a research officer to deal with commercialization of research, but with limited facilitation. Participant 004 opines that the University is not equipped with the necessary infrastructure to meet the demand of Industry. He complained about the chronic underfunding of research and physical infrastructures necessary to appropriately train their students.

Overall, the Dons think that their institution is not fully equipped to fulfill the missions the society has assigned to them. A persisting lack of internal structures and human resources to engage with Industry inhibits the expansion of University-Industry ties. In almost all countries in sub Saharan Africa, universities were created as

an extension of the state, with strong public financial support and the appointment of academic administrators serving as civil servants. Therefore University administration may not have seen as part of their roles to take on more entrepreneurial initiatives on behalf of their institutions (Cloete et al, 2011).

University-Industry collaboration is a source of advancement of knowledge.While this relation is weak in Uganda, Industry offers opportunities to check the authenticity of new knowledge and highlights the deficiencies in this new knowledge. The participants were of the opinion that University-Industry collaboration is beneficial for University as well as for Industry. Industry works as a laboratory and polishes the potential of the youngsters and prepares them for working in the market. University-Industry collaboration give confidence andperfection to the graduates and enables them to survive in the global market.

DISCUSSION

Academia and Industry have different goals and priorities. While the Industry is concerned with the bottom-line and relatively short-term goals, the impact of higher education institutions activities can only be measured in the long-term. University academic staff seem to prioritize long-term partnerships. Most University-Industry partnerships are contractually bound and short-term, with very little room for applied research. These views show the divide that exists between University and Industry. Some academics believe that Industry does not have an intellectual understanding of University structures and activities. Universities are structured along lines of academic discipline. This has determined the research agenda and the content of the curriculum. There is an inherent mismatch between the research orientations of Industry and universities, with an excessive focus on fast commercial results in firms and on basic research in universities. Linkage is a costly activity and the returns only accrue in the medium and long-run, but industries seek short term results and clear contributions to current business lines (World Bank, 2013).

In terms of outputs, firms are usually interested in how quickly new products can be obtained and want to delay publications to avoid disclosing information. University researchers in contrast, are motivated to publish research results as fast as possible. This is a path to salary improvements. Promoting research opportunities may help play a positive role in reducing staff attrition and brain drain.

Doctorate degree holders, by virtue of their training and educational attainments, are responsible for initiating and undertaking research, graduate student supervision and holding senior management positions. However, 80 percent of academic staff has no doctorates. This is an obstacle by firms contracting universities (Kruss et al., 2009). There is a wide disparity in income generated by higher education institutions from collaboration with Industry. Many Universities generate less than US$ 10,000 in five years from consultancy services, commercialization of research, joint research and other activities undertaken with Industry (Ssebuwuufu et al., 2012), commercialization entails a certain level of risk and may not generate profit. As a result University linkage with Industry should be assessed not only through financial lens but also in terms of their broader contributions to national economic development.

Uganda's public universities operate with uniform salaries to all professors regardless of performance and have no mechanisms to ensure that the professors perform. Universities should introduce incentive based rewards. This is supported by Wu (2015) who reasons that this would give the professors direct economic benefits from research collaboration. Another reason for lack of University-Industry collaboration is limited capacity and financial resources constraints from the University. The universities are increasing the number of students and resources are used on teaching instead of research and University-Industry collaboration. At Kyambogo University, the department of Civil and Building Engineering has a total of 981 students against 19 lecturers-making a lecturer-student ratio of 1:52 which is unacceptable for sciences. The recommended ratio is 1:10 (National Council for Higher Education, 2011). By limiting the number of students, universities would be able to conduct more applied research. The professors would therefore get better knowledge of the Industry.

Institutional constraints such as employment rules for civil servants that bars creating private organizations at public universities limits academic entrepreneurship and the potential of exploration of patents. Academics feel that research commercialization is not part of their job as academic researchers. They are more interested in transferring textbook knowledge instead of teaching the wider potential of knowledge. Geuna & Muscio (2011) reason that the most critical factors for entrepreneurial development in the University are attitudes towards entrepreneurship from academics. A way to change this attitude is to establish incentive structures that ensure a pull towards more entrepreneurial activities. Patents and copyrights are considered the measure of innovation. Few patents are held by universities because the patents accruing from commissioned research are owned by the Industry and not the University (Kruss, 2009). Science parks and technology incubators serve as formal structures to develop technology. From this research, the University has not established such structures. The University needs financial support to start science parks, and spin off firms and finances to train staff in project management skills. With no incubation centres' where innovations, knowledge and skills are transformed into viable enterprises, locally established companies are vulnerable for collapse.

CONCLUSION

University-Industry linkage is essential for the advancement of new knowledge. This linkage can help the youth to apply their knowledge and understand the underlying concepts, which ultimately helps University as well as Industry. University-Industry relationship highlight the weak areas and also provide path for further development. Uganda has tried to establish science, technology and business infrastructure for research and development. This effort should go hand in hand with efforts at strengthening University research governance and management, science and entrepreneurship. Strengthening University capacity, the government needs to take responsibility for designing a national innovation system with appropriate frameworks.

RECOMMENDATIONS

- In Uganda, there is a gap between University-Industry, which creates difficulties for researchers. This gap needs to be bridged.The amount of funding available for empirical research is inadequate. Larger total funding allocations are recommended.
- The challenges posed by the constraints to University-firm interactions may also be addressed by education and advocacy programmes. The University curricula review should progress in consonance with the development dynamics in society and Industry. Universities that have upgraded their research and teaching would be approached by industries that are dynamic due to competition in the economic environment. The government can be the catalyst of University-firm interactions by adequate support for research and use Ugandan university experts rather than foreign consultants.
- Government's poor support for research has also been a hindrance to University-Industry linkage. Multi-disciplinary research may provide opportunity for spin-offs if government policy is supportive.
- The University system and researchers need a changed attitude to scientific research. Research should connect with society and Industry, and should not purely be for the sake of academic promotion. A review of the scientific appraisal system in the universities would be necessary to ensure that innovative research is encouraged and rewarded above traditional contribution to knowledge.
- There is need for the establishment of a unit for mediating between University and Industry, and an agency that oversees University-Industry linkage at the national level. There should be a synergistic national policy on University-Industry collaboration. This will specify roles for stakeholders and provide incentive for such linkages. The policy should aim at improving government support for research, harmonize results of publicly funded research, and ensure that funds for research are domiciled in a reputable agency mediating between Universities and Industry.
- The statutory instruments and acts that established universities should be revised to incorporate entrepreneurship tenets into the university teaching and research. Platforms for sharing of Information and research findings between the two entities should be arranged by responsible institutions and establishments. The interaction should be consistently evaluated, since constant interaction between University teachers, laboratory scientists and industrial entrepreneurs would solve many problems and considerably reduce the reliance on foreign expertise and technology. A small part of the earnings of business enterprises may be donated to the research funds set up by higher institutions.

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