Transforming Higher Education in Africa through University-Industry Collaboration

Titus O. Pacho, Kisii University, Kenya

Abstract

University-industry collaboration entails a mutually beneficial and well-defined relationship between a university and an industry to achieve results in partnership. The present study sought to investigate the potential of university-industry collaboration on university education and the preparation of students for the labour market in the context of African higher education. The study's objectives were to (1) identify the different types of university-industry partnerships, (2) examine the contribution of university-industry linkages, and (3) explore the strategies for promoting and strengthening university-industry cooperation. The study used a case study design and a qualitative research approach. Data were collected through key informant interviews and analysed using thematic analysis. Findings revealed that effective collaboration between the university and industry has the potential of reducing the problem of a mismatch of supply and demand of labour force and skills. University-industry collaborations are key for students' skills development for the labour market and effective innovation systems. The study recommends organised and formalised collaboration between the university and the industrial sector to achieve success in partnerships through research, knowledge exchange, and innovation.

Keywords: Collaboration, university, industry, labour market, research, innovation

Introduction and Background

University-industry collaboration has become an important catalyst for economic development and innovation through knowledge and technology transfer. Collaboration is defined as a mutually beneficial and well-defined relationship entered by two or more entities to achieve results they are more likely to achieve together than alone (Winer & Ray 1994). Deriving from Winer and Ray's definition, university-industry collaboration can be viewed as a mutually beneficial and well-defined relationship entered by a university and industry to achieve results they are more likely to achieve together than alone. The aim of encouraging university-industry collaboration is to enhance the relevance and contribution of universities to socio-economic development (AbebeAssefa, 2016).

There are divergent views regarding the forms, levels and intensity of university-industry collaboration. Nevertheless, the main forms of university-industry collaborations can be categorised as formal or informal, short-term or long-term (Guimón, 2013; Ssebuwufu et al., 2012; Røed, 2000). According to Guimón (2013), formal or informal university-industry collaboration could range from formal equity partnerships, contracts, research projects, and patent licensing to human capital mobility, publications, and interactions in conferences and expert groups. In addition, Røed (2000) suggests that formal or informal university-industry collaboration could include consulting, contract research, student theses, assistance with testing and experimentation,

industrial scientists lecturing at the university, university researchers as members of companies' scientific boards, joint research projects, consortiums, exchange of personnel, continuing education for industrial scientists, and gifts and grants to university departments. For Ssebuwufu and others (2012), university-industry linkages can include contract or sponsored research, joint research, professional courses, consultancy, student placements, staff exchange, and joint curriculum development. Additionally, informal collaboration could also include guest lectures or stakeholder meetings to revise the curriculum (Mpehongwa, 2013).

Guimón (2013) distinguishes between short-term and long-term collaborations. While short-term collaborations consist of on-demand problem solving with predefined results and tend to be articulated through contract research, consulting, and licensing, long-term collaborations are associated with joint projects and public-private partnerships (including private-funded university institutes or chairs, joint university-industry research centres, and research consortia). In terms of strategic focus, Guimón (2013) proposes longer-term collaborations.

Collaboration between academia and industry is not new; it dates to the early 20th century (Corzo, 2015). Since the 1990s, the strategic mission of universities has moved beyond the tradition of teaching and research toward a third mission related to better addressing the needs of the community and industry and contributing directly to socio-economic growth and development (Guimón, 2013). This shift has been triggered partly by the growth of the knowledge-based economy. Many universities and industries find it mutually beneficial to collaborate. Collaboration between university and industry is viewed as a vehicle to enhance innovation through knowledge exchange and transfer (Ankrah, & AL-Tabbaa, 2015). University-industry collaboration helps strengthen the ability of universities to conduct quality and relevant research while enhancing the capability of the industry (Tumuti et al., 2013). Additionally, collaboration has the potential to contribute additional resources to the university, promote innovation and technology transfer, and ensure that graduates have the skills and knowledge required to effectively contribute to the workforce (Ssebuwufu et al., 2012).

The need to foster university and industry collaborations has been made explicit in recent dialogues. The 2009 UNESCO conference on higher education observed that “higher education institutions are increasingly perceived as interactive players – their engagement with the community, government and industry is essential for innovative systems and economic growth” (UNESCO, 2010, p. 22). The Association of African Universities (AAU) through a publication titled “strengthening university-industry linkages in Africa: A study on institutional capacities and gaps”, recognises a need to create a strong interface between academia and industry that requires the skills and knowledge of graduates from universities and other higher education institutions in their enterprises to increase productivity (Ssebuwufu et al., 2012). In another article titled “academia-industry-government linkages in Tanzania: Trends, challenges and prospects”, Mpehongwa (2013) contends that the partnership between academia, industry and government in Tanzania was recognised early in the formative years of the nation when it was building African

Socialism (*Ujamaa*) since the 1960s. Such partnerships aimed to produce a workforce with the relevant socialist mind and technology innovation that would steer national development. Furthermore, the Inter-University Council for East Africa (IUCEA) (2014) through a publication titled "establishing the status of higher education qualifications systems and their contributions to human resources development in East Africa", challenges universities as institutions charged with providing job-entry level skills to ensure that their graduates are relevant to the industry and demonstrate potential for learning and growth. Since 2011, the IUCEA and the East African Business Council (EABC) entered into a partnership to enhance dialogue and collaboration between the private sector and universities.

There is a growing general perception that the knowledge and skills acquired by students at African universities do not meet the requirements of industry and the wider economy (Ssebuwufu et al., 2012). African universities have been criticized as ivory towers that produce graduates and research that are irrelevant to the needs of industry and the socio-economic challenges facing the continent (Tumuti et al., 2013; Ssebuwufu et al., 2012). For instance, across the East African region, many employers in the industry are concerned that most graduates are not well prepared for the job market.

A 2014 survey by the Inter-University Council for East Africa (IUCEA) indicates that at least half of graduates produced by East African universities lack employability skills, technical mastery and basic work-related capabilities (Nganga, 2014; Ernest, 2014). According to the study, 63 per cent of graduates from Uganda were found to lack job market skills while in Tanzania, 61 per cent of graduates were perceived to be ill-prepared; in Burundi and Rwanda, 55 per cent and 52 per cent of graduates, respectively, were perceived to be incompetent while in Kenya, 51 per cent of graduates were believed to be unfit for jobs (Ernest, 2014).

University-industry collaboration is important in offsetting the mismatch between knowledge and skills acquired by graduates from universities and those required by industry (Ssebuwufu et al., 2012). This could be achieved, for example, through offering professional courses on a fee-basis to respond to the skill and training needs of the industry, engaging industry representatives in curriculum development, and tailoring students' research projects to issues and problems of direct interest and relevance to industry (Ssebuwufu et al., 2012). Dasgupta (2017) contends that the relationship between university and industry is symbiotic – university produces graduates who are needed by industry; research output at university is utilised by the industry for innovations; industry looks to universities for solutions to their problems, and new research topics of mutual benefits arise out of a collaboration between the university and the industry.

Despite the generally weak state of university-industry collaboration in Africa, the lack of conducive conditions, and the challenges inherent in establishing linkages and partnerships across the continent, individual universities are taking initiatives to foster greater collaborations with industry (Ssebuwufu et al., 2012). It is against this background that this study sought to examine

the impact of the collaboration between St. Augustine University of Tanzania (SAUT) and its business and non-governmental partners in Mwanza City on university education. St. Augustine University of Tanzania is a private university in Mwanza, Tanzania with the motto "Building the City of God". It was founded by the Catholic Bishops of Tanzania in 1998 and accredited in 2002 as a secular, non-profit, private institution. The vision of the university is to foster the holistic development of a person and respect for human dignity. The university has a population of over 10,000 local and international students.

While there is evidence of collaboration between SAUT and the industry, the impact of such collaboration has not been investigated. The rationale for this study was based on the demand for competent graduates, dynamic nature of industries, unemployability of graduates, knowledge and skills gap – the mismatch of the knowledge and skills acquired by university graduates and those required by industry, research gap – "gap" between research done at the university and its relevance to industry, and inadequate data and literature. This study is meant to fill the knowledge gap, given the shortage of literature and knowledge about the impact of SAUT and industry collaboration on university education. Although SAUT collaborates with some industries within Mwanza City, there is a lack of formal literature regarding such collaboration. In addition, no empirical study has been carried out on the subject. The present study, thus, sought to explore different types of university-industry partnerships, the benefits of fostering university-industry linkages, and the strategies for improving university-industry cooperation for the mutual benefit of the university and industry in the context of universities in Africa.

Theoretical Underpinnings of University-Industry Collaboration

Knowledge transfer between the university and the industry has become a critical resource for the survival and growth of any business in the knowledge economy. To enhance knowledge transfer, universities and industries seek to encourage different partnerships and governance strategies (Mascarenhas, Ferreira & Marques, 2018). University-industry collaboration is not underpinned by a single theoretical framework (Ssebuwufu et al., 2012; Mpehongwa, 2013). Although different perspectives on studying university and industry collaboration may exist, three theoretical frameworks are often used to guide the study of university-industry collaboration. These include the National Innovation System (NIS) model, the Triple Helix model, and the Mode 2 Knowledge Production model (Ssebuwufu et al., 2012). The advantage of implementing these models include high-speed innovation, double innovation success rate, and increased productivity

The National Innovation System (NIS) model emphasises various linkages, partnerships, networks and interactions within the sphere of an innovation system. Under the NIS framework, industries do not innovate in isolation but within a larger system involving enterprises, universities, research centres, government agencies and other actors (Goransson & Brundenius, 2011). This model stresses the importance of knowledge and technology transfers in the innovative process (OECD, 1997).

In the Triple Helix model, university-industry collaborations are viewed as a three-way interaction between university, government, and industry (Etzkowitz, 2008). Innovation is therefore seen as a product of interaction between the university, industry and government (Ssebuwufu et al., 2012). The model challenges universities to focus on establishing institutional interface structures including industry liaison and technology transfer offices, business and technology incubators and fostering entrepreneurialism through various policies and incentives (Etzkowtitz, 2008). For example, universities may look to the industry to recruit entrepreneurial researchers to work among their faculty and act as role models (Ssebuwufu et al., 2012).

The Mode 2 Knowledge Production model emphasises the application, exchange and transfer of knowledge in an interdisciplinary context. The model is "characterized by a constant flow back and forth between the fundamental and the applied, between the theoretical and the practical" (Gibbons et al., 1994, p.19). Under this model, knowledge is generated from a wider range of sources including applied science in universities and research institutions as well as from other spheres of society (Aken, 2001). Consequently, knowledge is generated not only in the academic sphere but also in the industrial sphere (Røed, 2000). This is in contrast to Mode 1 Knowledge Production model which is characterised by an academic agenda, is largely executed within the academic sphere, is mono-disciplinary, and is focused on analysis and fundamental knowledge as opposed to the application (Aken, 2001).

Methodology

To address the research objectives, the study used the qualitative research approach and a case study design. The qualitative approach and the case study design were found to be more appropriate since this study was exploratory as little or no empirical study has been conducted on the topic of university-industry collaboration in the context of St. Augustine University of Tanzania (SAUT) and industries in Mwanza. The qualitative method seeks answers to questions that stress how social experience is created and given meaning (Denzin & Lincoln, 2013). In addition, the qualitative method typically answers questions about the complex nature of phenomena, often to describe and understand the phenomena from the participant's point of view (Leedy & Ormrod, 2005). On the other hand, a case study research design entails the detailed and intensive analysis of a single case (Bryman, 2008). The case study design provided an opportunity to explore in-depth the SAUT-industry collaboration and its impact on university education.

The target population was SAUT administrators, and industry officials in Mwanza City, whose industries or businesses are in some form of collaboration with SAUT. A total of 15 participants (8 SAUT administrators and 7 industry officials) participated in this study. SAUT administrators included deans of faculties, heads of departments and project coordinators, while industry officials included managers and project directors. The sampling techniques employed were convenience and purposive sampling, respectively. Data were collected through key informant interviews and analysed using thematic analysis.

Results and Discussion

Fifteen key informants from St. Augustine University of Tanzania (SAUT) and the industry were interviewed to get their insights on the impact of the university-industry collaboration on SAUT education. Eight key informants from different faculties and departments of SAUT were interviewed as follows: 2 Faculty Deans from Education and Engineering; 5 Heads of Department from Education, Business, Sociology, Journalism, and Tourism; and 1 Project Coordinator. Conversely, 7 key informants from the industry were interviewed, including 6 managers and 1 project director from the following industries: banking, telecommunication, production, manufacturing, construction, and tourism. These exemplify the kinds of industries in Mwanza City with which SAUT has some form of collaboration. Results indicate that some faculties and departments at the University are more likely to collaborate with different industries than others, partly because of the nature of the industry, common interest, relevance and focus.

Types of SAUT-Industry Collaborations

Results show that St. Augustine University of Tanzania (SAUT) collaborates with different kinds of industries at various levels and intensities. SAUT interviewees specifically identified the following examples of industries which SAUT collaborates with in Mwanza: (1) banking – CRDB and Mkombozi Bank; (2) telecommunication – Vodacom, Airtel, Tigo, Halotel; (3) production – Jumeme, TANESCO; (4) manufacturing – Coca Cola, Pepsi (5) construction – Tanroads; and (6) Tourism – different hotels. The interviewees identified the following areas of collaboration: service provision, finance, sharing resources, shareholding, internships, knowledge sharing, research, human resources, employment, and sponsorship of events and students. However, results show that there is minimal collaboration in the areas related to curriculum development and review, research, and teaching.

Results also reveal that SAUT-industry collaboration ranges from formal to informal and from short-term to long-term. This coincides with the categorisation of university-industry collaboration provided by Guimón (2013), Ssebuwufu and others (2012), and Røed (2000). The interviewees reported that formal collaborations are long-term and involve some agreements in the form of a memorandum of understanding or agreement. They mentioned two organisations hosted at the SAUT campus as examples, wherein one of the organisations, SAUT is a shareholder. This concurs with Guimón (2013) assertion that university-industry collaboration could involve formal equity partnerships. In contrast, interviewees noted that informal collaborations are short-term and sometimes happen haphazardly without any formal agreements. They identified industry sponsorship of university events such as writing competitions and conferences as examples. While all four forms of collaboration are recognised in the literature (Guimón, 2013; Ssebuwufu et al., 2012; Røed, 2000), participants suggested that collaborations should be formalised. Interviewees from both SAUT and the industry acknowledged that in most cases, the collaborations are informal and short-term, and thus might not have a greater impact on the university education.

Additionally, interviewees from SAUT lamented the lack of an office to develop, promote and coordinate SAUT-industry collaboration. While they recognise the Public Relations Office (PRO) and individual personal contacts as the main contact with the industry, they argued that this is ineffective as the PRO is already overwhelmed with many responsibilities. Furthermore, participants noted that uncoordinated individual contacts with industry are more self-centred and may not promote the interest of the university. The need for a university-industry liaison office has been emphasised by the Triple Helix model, which challenges universities to focus on establishing institutional interface structures including industry liaison/technology transfer offices (Etzkowtitz, 2008). The technology Transfer Offices (TTOs) and Industrial Liaison Offices have been identified as key to establishing and improving university-industry collaborations (Mascarenhas, Ferreira & Marques, 2018).

Contribution of University-Industry Collaboration to University Education

All the participants agreed that SAUT-industry collaboration can play a critical role in university education. It can have a direct impact on the university's core functions of teaching, research, and community service. This is exemplified by its potential to enhance the quality and relevance of university education, experienced-based education, scholarship of engagement, exchange and application of knowledge and skills, deep-level learning, development of soft skills, social capital, and funding. Similarly, Ssebuwufu and others (2012) maintain that university-industry collaboration is important in offsetting the mismatch between knowledge and skills acquired by graduates from African universities and those required by industry. This is possible by offering professional courses to respond to the skill and training needs of the industry, engaging industry representatives in curriculum development, and tailoring students' research projects to issues and problems of direct interest and relevance to the industry (Ssebuwufu et al., 2012)

Quality of education

Results reveal that SAUT-industry collaboration has the benefit of promoting the quality of education at SAUT in various ways. Participants noted that collaboration enables the university to easily access internship, industrial attachment and placement opportunities for practical training for its students, especially those from the fields of engineering, journalism, and education. Participants added that through collaboration with industry, the university can have the advantage of using industry infrastructure such as laboratories, workshops and equipment for experimentations. Additionally, the university can also receive feedback from the industry about its students and academic programmes. This is important in evaluating the university programmes for improvement. Finally, the collaboration can make the graduates more successful on the job by having the opportunity to learn best practices in the industry, a direct link from theory to practice, and a better understanding of day-to-day demands on the job. These have the potential of boosting SAUT graduates' employability and creativity and contributes to the role of university education

in preparing students for their future career. This concurs with Harvey and Knight (1996) definition of quality as fitness for purpose.

Experience-based education

According to the interviewees, SAUT-industry collaboration promotes experiential learning, which is key for skills acquisition and development. According to one industry interviewee, "Our collaboration with SAUT is important in contributing to the university education in a practical sense. We are open to receiving students from the university for internships, industrial attachment and practical training". These opportunities are important as they ensure "a constant flow back and forth between the fundamental and the applied, between the theoretical and the practical" (Gibbons et al., 1994, p.19). Experiential learning posits that 'experience is the best teacher'. Proponents of experiential learning advocate a 'learning by doing in which teaching and learning are connected to everyday life so that learning becomes immediately relevant to students. Dewey (1916/2011) insists that students must always be involved in "an actual empirical situation as the initiating phase of thought" (p. 85). Experience-based education has become widely accepted as a method of instruction and a central lifelong task essential for personal development and career success in colleges and universities (Kolb, 1984).

Scholarship of engagement

University-industry collaboration has the potential to enhance the scholarship of engagement, which connects teaching and research to the understanding and solving of social, economic, civic, and moral problems (Boyer, 1996). Isolation renders knowledge inapplicable to life and thus infertile leading to what Dewey (1916/2011) terms 'academic exclusion'. In which case, "social concern and understanding would be developed, but they would not be available beyond the school walls; they would not carry over" (Dewey, 1916/2011, p. 195). Participants pointed out that through greater collaboration with industry, teaching and research at SAUT can be tailored to address the needs of industry and society in general. Collaboration with industry can enhance the relevance of knowledge produced at SAUT. Many African universities have been criticized as ivory towers that produce graduates and research that are irrelevant to the needs of industry and socio-economic challenges (Tumuti et al., 2013; Ssebuwufu et al., 2012).

Exchange of knowledge

Participants indicated that SAUT-industry collaboration and partnerships promote deep-level learning through knowledge transfers and exchange between the university and industry. This is important for innovation and for reducing the mismatch between knowledge produced at the university and that required by industry. University-industry collaboration can ensure that graduates have the skills and knowledge required to effectively contribute to the workforce (Ssebuwufu et al., 2012). Collaboration and partnerships can enrich the learning process by generating rich sharing and discussion in the classroom based on concrete experiences. This can

facilitate integration between lived experiences of students and their academic training due to the constant interaction of new knowledge with existing knowledge, and the integration of knowledge and learning processes with the personal and communal life of the student (West, 2004). Collaboration and partnership between university and industry also provide practical solutions for industry problems. The result on knowledge exchange and transfer is supported by the Mode 2 Knowledge Production model which emphasises the application, exchange, and transfer of knowledge in an interdisciplinary context.

Application of knowledge and skills

Results reveal that SAUT-industry collaboration provides an opportunity for the application of knowledge and skills in concrete situations. Collaboration offers avenues through which students can think thoughtfully about their course content and creatively apply what they learn to real situations in the context of the industry. This is possible because collaboration provides students with experiential opportunities and occasions to test their ideas by application, to make their meaning clear, and to discover for themselves their validity (Dewey, 1916/2011).

Service mission

Results indicated that university-industry collaboration can promote the university's community service mission or outreach services through community service-learning. Service-learning broadly means educating and encouraging students to actively participate in society by engaging in activities which meet the needs of the community while reflecting upon the services and learning from the experience. SAUT-industry collaboration can make the university more connected to the community. Dewey emphasises the importance of connecting learning institutions with communities when he states that "the school must itself be a community life in all which that implies. Social perceptions and interests can be developed only in a genuinely social medium – one where there is give and take in the building up of a common experience". He adds that learning in school should be continuous with that out of school so that there should be a free interplay between the two. To achieve this, Dewey (1916/2011) suggests that there should be numerous points of contact between the social interests of the school and the community.

Soft skills

Results show that SAUT-industry collaboration contributes to the development of students' soft skills through exposure to out-of-class and work-related concrete experiences. The following statements by one university interviewee illustrate the importance of university-industry collaboration in promoting the development of students' soft skills. Exposing students to engaging with industry is key to developing their soft skills such as constructive teamwork, well-reasoned decision making, networking, responsibility, appreciation of diversity and effective communication, which they might not have an opportunity to learn in the classroom. Soft skills are not only important for personal development but are also an important aspect of graduates'

employability. A 2014 survey by the Inter-University Council for East Africa (IUCEA) found most East African graduates 'half-baked' (Nganga, 2014). This suggested that they lacked employability skills, technical mastery and basic work-related capabilities (Nganga, 2014; Ernest, 2014).

Social capital

Participants maintained that university-industry collaboration can lead to the development of social capital because of the interactions and activities for the mutual benefit of the parties. Social capital involves the networks, exchanges, trust, and reciprocity that exist between and among people that enable them to act together to pursue shared objectives (Heffner, 2002). Building social capital has the potential of dismantling the curtain between the university and the industry. The networks developed during the university-industry collaboration activities are important for graduate employment opportunities.

Funding

The interviewees acknowledged that one of the major motivations for university-industry collaboration is for the university to get increased funding and support for strengthening its educational activities such as research projects and sponsorship of its academic activities. However, most interviewees maintained that many collaborations are driven by financial and material agendas. This has been emphasised by one university administrator who stated that:

Collaborations between SAUT and industries tend to focus on material and financial resources while forgetting the interest of students and academic matters. Funding is commonly cited as one of the main motivations for academics to collaborate with industry, while the academic aspects seem to be ignored as an important factor for collaboration. Academic issues should form the basis for collaboration since the main mission of a university include teaching, research, and community service.

Strategies to Enhance SAUT-Industry Collaboration

According to (Awasthy, Flint, Sankarnarayana & Jones, 2020) it is important to consider a comprehensive list of factors operating in a broad context within the collaboration system for improving the effectiveness of collaboration. Several strategies to improve collaboration between St. Augustine University of Tanzania and industries were suggested by the participants. First, there was a call from SAUT participants to improve the database of industries with which SAUT can collaborate. There was a concern about the lack of or inadequate organisation and availability of documented information about industries. The database was regarded as important for various faculty members, departments and faculties to make informed decisions on relevant industries to collaborate with. Second, participants proposed that the SAUT alumni in the industrial sector can be used as important links between the industries and the university. Third, participants, especially from SAUT emphasised a need to establish an office to coordinate and promote collaboration with industries. They argued that while there could be many individual isolated collaborations taking

place, these are not known or documented. The importance of establishing a Technology Transfer Office (TTOs) and Industrial Liaison Office to improve university-industry collaborations has been emphasized by Mascarenhas, Ferreira & Marques (2018). Fourth, participants challenged the university to establish a university consultancy bureau. Fifth, participants called for a need for staff capacity building around university-industry collaboration. This could be conducted through regular seminars and workshops as part of the university staff professional development programme. Fifth, both participants from the university and industry challenged the university, especially, the faculty members and postgraduate students to focus on research which is more relevant to the needs of industry and the general economy. This point has been underlined by Guimón (2013), who suggested a paradigm shift from traditional teaching and research toward a third mission related to better addressing the needs of the community and industry and contributing directly to socio-economic growth and development.

Other measures suggested to improve the effectiveness of university-industry collaboration from the study included encouraging personal contacts, guest lectureship from industry personnel, employing qualified industry staff on a part-time basis, organising joint exhibitions, inviting industry representatives to SAUT activities such as students' orientation, graduations, exhibitions, community day and conferences, building more trust between the parties and formalising collaborations. Finally, participants challenged the staff to be more on their collaboration activities with the industry. They expressed concern about the self-centred mentality of some staff who are more interested in promoting their interest rather than the university. They suggested a need for a system focus on collaboration initiatives so that individual staff, departments and faculties should work in harmony towards the achievement of the goals of the university. They should holistically view the university to create synergies between different individuals, departments and faculties to deliver the goals of the whole university.

Conclusions and Recommendations

This study concludes that St. Augustine University of Tanzania's collaboration with industry is key to linking the university with corporate partners to unlock and accelerate innovative ideas from both parties and enhance the relevance of research and the quality of graduates from the university. SAUT collaboration with industry has the potential of bringing university education out of the clouds and ivory towers and of restoring in students' minds the connection between what they are learning and what knowledge, skills and attributes are relevant to the industry and the broader economy and society. The university can work with the industry in the areas of curriculum development and review, design of relevant courses needed by industries, training of students, and setting up of labs. These can help solve the problem of a mismatch of supply and demand of the labour force and the requisite knowledge, skills and attributes needed by industries.

The importance of policies in sustaining university-industry collaboration has been recognized (Awasthy, Flint, Sankarnarayana & Jones, 2020). This study has implications for policy and

practice. The study has implications for research and innovation policies with a strong emphasis on the interaction between universities and industry. This implies the formation of research and development collaborations and integration of university-industry collaboration into the mission statements and strategic plans. In terms of practice, this study recommends regular curriculum development and review involving key stakeholders like industry personnel. It also recommends encouraging collaborations based on the principle of reciprocity, embracing innovative pedagogical approaches linked to the industry and community such as service-learning, involving industry in training programmes, and establishing a university-collaboration office to coordinate activities.

Marshall and Rossman (2011) acknowledge that "no research project is without limitations; there is no such thing as a perfectly designed study" (p. 42). In this context, a limited sample size may compromise the generalisability of the data beyond the sample selected for this study (Boyce and Neale, 2006). Although the findings in this study suggest that universities and industries benefit from collaboration, it is important to note that the university, industries and companies investigated only represent a small percentage of the university and industry sectors. Therefore, it might be difficult to generalise the findings about university-industry collaboration in general. However, this study considered different perspectives from various industries, companies, and university departments to allow for possible generalisations to be drawn. The study might serve as an enlightening example of how universities and industries collaborate and the outcome of such collaboration. In addition, this study might serve as a preliminary step to further investigation.

The study recommends that further studies around university-industry linkages and partnerships be carried out. The first suggestion under this heading might be to carry out a study from a broader perspective. This might involve a larger sample, more cases, and a different methodology. A broader-perspective approach would allow for comparisons to be made and generalisations to be found. This would enrich the data and enable a more in-depth analysis of the impact of university-industry linkages and partnerships. The second suggestion would be to investigate the challenges that hinder effective university-industry collaboration. The study finally recommends further studies on the impact of university-industry linkages and partnerships with a focus on the industry.

References

Abebe Assefa, A. (2016). University-industry linkage practices, determinants and challenges theoretical and empirical article review: Lessons for effective and successful collaboration. *International Journal of Research in Management, Economics and Commerce*, *6*(3), 1-16.

Aken, van, J. E. (2001). Mode 2 knowledge production in the field of management. (ECIS working paper series; Vol. 200113). Eindhoven: Eindhoven Centre for Innovation Studies. Retrieved from https://pure.tue.nl/ws/files/2415195/553017.pdf

Ankrah, S. & AL-Tabbaa, O. (2015). Universities–industry collaboration: A systematic review. *Scandinavian Journal of Management*, *31*(3), 387-408. https://doi.org/10.1016/j.scaman.2015.02.003

Awasthy, R., Flint, S., Sankarnarayana, R., & Jones, R. L. (2020). A framework to improve university–industry collaboration. *Journal of Industry-University Collaboration*, *2*(1), 49–62. https://doi.org/10.1108/JIUC-09-2019-0016

Boyce, C., & Neale, P. (2006). *Conducting in-depth interviews: A guide for designing and conducting in-depth interviews for evaluation input*. Watertown, MA. Pathfinder International.

Boyer, E. (1996). The scholarship of engagement. *Journal of Public Outreach*, *1*(1), 11-20.

Bryman, A. (2008). *Social research methods* (3rd ed.). New York: Oxford University Press.

Corzo, J. (2015). How academic institutions partner with private industry. Retrieved from https://www.rdmag.com/article/2015/04/how-academic-institutions-partner-private-industry

Dasgupta, A. (2017). Finding the right fit in academia and industry collaboration. Retrieved from https://www.geospatialworld.net/article/expectations-in-academia-and-industry-collaboration/

Denzin, N.K. & Lincoln, Y.S. (2013). Introduction: The discipline and practice of qualitative research. In N.K. Denzin & Y.S. Lincoln (Eds.), *The landscape of qualitative research* (4th ed., pp.1-42). California: Sage.

Dewey, J. (1916/ 2011). *Democracy and education.* Simon & Brown.

Ernest, S. (2014, June 12). Over 50 per cent of EA graduates half-baked. The *EastAfrican*. Retrieved from http://www.theeastafrican.co.ke/news/Over-50-per-cent-of-EA-graduates-half-baked/-/2558/2345578/-/qx8ga3/-/index.html

Etzkowtitz, H. (2008). *The Triple Helix: University-industry-government innovation in strengthening university-industry linkages in Africa: a study of institutional capacities and gaps action.* New York: Routledge.

Goransson, B., Brundenious, C. (2011). *Universities in transition: The changing role and challenges for academic institutions.* Springer: New York.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994) *The new production of knowledge: The dynamics of science and research in contemporary societies.* London: Sage.

Guimón, J. (2013). Promoting university-industry collaboration in developing countries. World Bank. Retrieved from

http://innovationpolicyplatform.org/sites/default/files/rdf_imported_documents/PromotingUniversityIndustryCollaborationInDevelopingCountries.pdf

Heffner, G.G. (2002). Creating social capital through service-learning and community development at faith-based liberal arts colleges. In G.G. Heffner & D.C. Beversluis (Eds.), *Commitment and connection: service-learning and Christian higher education* (pp. 3-19). Lanham: University Press of America, Inc.

Harvey, L. & Knight, P.T. (1996). *Transforming higher education.* Buckingham: The Society for Research into Higher Education and Open University Press.

Inter-University Council for East Africa (IUCEA) (2014). *Establishing the status of higher education qualifications systems and their contributions to human resources development in East Africa*.

Kolb, D. A. (1984). *Experiential learning: Experience as a source of learning anddevelopment*. Englewood Cliffs, N.J.: Prentice-Hall.

Leedy, P. D., & Ormrod, J. E. (2005). *Practical research: Planning and design.* Upper Saddle River, N.J.: Prentice Hall.

Lulat, Y. G. M. (2005). *A history of African higher education from antiquity to the present.* Santa Barbara CA: Greenwood Publishing Group.

Marshall, C. & Rossman, G. B. (2011). *Designing qualitative research*. Thousand Oaks, California: Sage.

Mpehongwa, G. (2013). Academia-industry-government linkages in Tanzania: Trends, challenges and prospects. *Global Journal of Education Research*, *1*(1), 084-091.

Nganga, G. (2014, May 21). Survey finds most East African graduates 'half-baked'. *University World News.* Issue No: 321. Retrieved from http://www.universityworldnews.com/article.php?story=20140523130246934

Organisation for Economic Co-operation and Development (OECD) (1997). *National Innovation Systems.* Paris: OECD. Retrieved from https://www.oecd.org/science/inno/2101733.pdf

Pauw, K., Oosthuizen, M. & Van Der Westhuizen, C. (2008). Graduate Unemployment in the Face of Skills Shortages: A Labour Market Paradox. *South African Journal of Economics*, *76*, 45–57.

Røed, H. (2000). *University-industry collaboration: Systemic interaction or one-way knowledge transfer*? Oslo: Centre for technology, innovation and culture. Retrieved from https://www.duo.uio.no/bitstream/handle/10852/17829/roedhilde.pdf?sequence=1

Schibany, A., Leonhared, J. & Polt, W. (1999). *Towards realistic expectations: The science system as a contributor to industrial innovation*. Seibersdorf: Österreichisches Institut für Wirtschaftsforschung.

Ssebuwufu, J., Ludwick, T. & Béland, M. (2012). Strengthening university-industry linkages in Africa: A study of institutional capacities and gaps. Accra: Association of African Universities (AAU). Retrieved from http://www.heart-resources.org/wp-content/uploads/2015/09/strengthening-university-industry-linkages-in-africa-report-2012.pdf?x30250

Tumuti, D., Wanderi, P. & Thoruwa, C. (2013). Benefits of university-industry partnerships: The case of Kenyatta University and Equity Bank. *International Journal of Business and Social Science, 4*(7), 26-33.

United Nations Educational, Scientific and Cultural Organization (UNESCO) (2010). *World conference on higher education 2009 final report.* Paris: UNESCO.

West, O. G. (2004). Beyond the critical curtain: Community-based service learning in an African context". *Teaching Theology and Religion, 7*(2), 71-82.

Winer, M. & Ray, K. (1994). *Collaboration handbook: Creating, sustaining and enjoying the journey*. Saint Paul, Minnesota: Amherst H. Wilder Foundation.

Mascarenhas, C., Ferreira, J. J., & Marques, C. (2018). University–industry cooperation: A systematic literature review and research agenda. *Science and Public Policy, 45*(5), 708–718. https://doi.org/10.1093/scipol/scy003.