

An Analysis of the Mediating Role of Universities in the Achievement of Industrialization in Selected Universities in Kenya

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ABSTRACT: Globally, university partnerships and collaborations have been identified as key pillars in technology transfer which translates to development outcomes for society. Kenyan universities have been facing many challenges especially low financing and high enrolment which have affected their roles in as far as development of technology is concerned. Through the Kenya Vision 2030 strategy and the Big Four Agenda, there has been intensified efforts to strengthen university linkages with firms/industries with the aim of achieving industrialization. In this study descriptive survey design with a multiple case analysis approach was used to analyze the mediating role of universities in achievement of industrialization in Kenya. The specific objectives of the study were: to determine the extent of technology transfer from universities to industries in Kenya, to establish the causal relationship between universities and Industries in Kenya and to find out the hindrances to the linkage between universities and Industries in Kenya. Both qualitative and quantitative data was collected. The respondents of the study were purposively selected due to the unique nature of the study. This study established that both public and private universities in Kenya are the main source of technology transfer to firms, even though the products/services are not visible in the market. The study further revealed that there was no causal relationship between universities and firms/industries in Kenya implying that technology transfer was one way. Finally this study identified several hindrances to linkages between universities and firms/industries which include: over-reliance on imported products/services, poor education systems and competing interests between universities and firms/industries. Policy recommendations include institutionalized linkages between universities and firms/industries, promotion of multidisciplinary approach to learning and research and a complementary relationship between universities and firms/industries rather than competition.

1. INTRODUCTION

1.1 Background Information

Higher education systems are established in many parts of the world to contribute toward achievement of human resource development goals of supplying human capital for industrial development. One key aspect of these goals is to ensure that institutions of higher education act as innovation agents that drive the country's competitiveness by developing suitable human capital with scientific skills that make the country's products and services competitive (Kilika, Ogutu, Obonyo, and Munyoki, 2016).

In addition these institutions provide researchers who are capable of generating and applying new knowledge and technologies that are considered to be critical in driving industrial development if shared with the productive sectors of the economy. Disseminating this knowledge generated by institutions of higher learning

calls for close linkages between these institutions and industries (Xiao and Tsang, 2004). According to Harley and Green, (2003), institutions of higher learning can be viewed as economic engines that contributes positively to economic growth and development in addition to being primary centers of knowledge. The linkage between institutions of higher learning and industries has become an important agenda especially in the context of knowledge intensive economies which eventually contribute to economic development. This is through upgraded skills and knowledge of the workforce which lead to invention and innovation through technology transfer notes (Esham, 2008).

1.1.1 University Education in Kenya

The origins of university education in Kenya can be traced back to 1947, when the then colonial government came up with a plan seeking to establish a technical and commercial institute in Nairobi (Bailey, Cloete & Pillay 2013). In 1951 that this concept received a Royal Charter, under the name of the Royal Technical College of East Africa. The College was initially designed to provide education in courses leading to the Higher National Certificate similar to ones offered in Britain and to prepare students for university degrees in engineering, and commercial courses not available in Makerere in Uganda. This college later became University of Nairobi the first university in Kenya (Mwiria & Nyukuri 1994).

After Kenya's independence in 1963, the demand for university education continued to increase and more universities came up. Universities in Kenya are categorized into public and private universities. Public universities are fully funded by government though they supplement funding through tuition fees from students especially self-sponsored students. Private universities on the other hand rely on private investors and fees from students' for funding. The main purpose of establishing universities in Kenya was, for them to play a pioneering role in addressing the problems of underdevelopment (Mosha, 1986).

In 2018 Kenya had a total of 60 universities which were accredited, 31 of these being public universities while 30 are private universities. In Kenya, university education while highly valued and acclaimed by all, faces great challenges with a potential impact on the sector's contribution to the country's development. Universities' in Kenya have not been able to achieve their major purpose of addressing the problems of underdevelopment partly because of the academic nature of education and the problems of low funding and high enrolment. Low funding led to lack of resources for teaching and for research and development. As a result university education in Kenya continued to deteriorate while unemployment increased. Manufacturing and industrialization has stagnated in Kenya, painting a glimpse picture to eliminating underdevelopment (Odhiambo, 2018).

In 2007, the government of Kenya launched a new long term national planning strategy, known as Kenya Vision 2030 covering the period 2008 to 2030. The aims of this strategy was to transform Kenya into a newly industrialized middle-income economy providing a high-quality life to all its citizens by the year 2030. The vision was based on the economic, social and political pillars. The economic pillar aim was to improve the country's economic prosperity through an economic development program. The social pillar aim was social equity while the political pillar aim was creating a democratic society. Kenya Vision 2030 strategy emphasizes that Kenya should provide globally competitive quality education training and research to her citizens for development and enhance individual wellbeing. Further it emphasizes the important role that universities needs to play to achieve these development goals by the year 2030 (Republic of Kenya, 2007).

In 2018 the government of Kenya embarked on an economic blue print to foster development and provide solutions to various socio-economic problems facing the economy. This strategy was commonly referred to as the Big Four Agenda which identified four priority initiatives to be implemented in the period 2018-2022. These initiatives included, food security and nutrition, universal healthcare, affordable housing and manufacturing. At the global level, the Big Four Agenda is aligned to the Sustainable Development Goals (SDGs) while at the national context it is hinged on the Kenya Vision 2030. To achieve these initiatives and especially on manufacturing, universities play a key role particularly through technology transfer (Republic of Kenya, 2018).

1.2 Statement of the Problem

The government of Kenya has unveiled a number of comprehensive development plans and strategic plans aimed at transforming the country into an industrialized economy. Among these document is the Vision 2030 and the Big 4 Agenda which have clearly outlined clear roadmaps for achieving this goal. Kenya has therefore embraced industrialization as a means of achieving structural change of the economy. To achieve industrialization the country should embrace innovative technology in its production of goods and services. Further there will be need for quality human capital with the ability to develop new ways of doing business. Institutions of higher learning are the primary source of such human capital through education and training. These institutions also provide new inventions and innovations through research and development (R&D) (Mutinda, 2020).

New Partnership for Africa's Development (NEPAD) (2017), Notes that none of the African universities feature among the ranked universities in the world despite the fact that the continent is huge in terms of mass and population. In 2020 Kenya had a total of 31 public universities and 32 private universities. For these institutions to compete on the global stage and the country to meet the SDGs, there is need to improve strategies for ensuring quality of university education especially through partnerships and collaborations (Republic of Kenya, 2020).

Technology transfer through university-industry linkages and collaborations, are important aspects especially in Kenya because it sets the phase for development. Without new ideas and better skills being developed by research institutions and universities and being applied in the industry, then meaningful development would not take place (Munyoki, Kibera and Ongutu, 2011). Institutions of higher learning have innovation centres and business incubation hubs, where research on various technological aspects is carried out continually. Results of these researches finally are applied in industries through manpower training, collaborative research, advisory services or consultancy services. Increasingly more universities in Kenya are seeking to establish collaborative links with manufacturing firms for purposes of developing new products and technologies (Mwangi and Kombo, 2018). Despite the number of universities increasing in Kenya, the impact of these institutions in terms of technology transfer and innovation has not been felt much. There seems to be a gap between what universities are producing from the research processes and training of human capital and what is actually needed in industries. This study sought to analyze university-Industry linkages and their role to attainment of industrialization in Kenya.

1.3 General Objective

The general objective this study sought to address was to analyze the mediating role of higher academic institutions as agents of industrialization in Kenya.

1.4 Specific Objectives

- i. Determine the extent of technology transfer from universities to industries in Kenya.
- ii. Establish the causal relationship between universities and Industries in Kenya.
- iii. Find out the hindrances to the linkage between universities and Industries in Kenya.

1.5 Research Questions

- i. What is the extent of technology transfer (products/services) from universities to industries in Kenya?
- ii. What is the causal relationship between universities and industries in Kenya?
- iii. What are the hindrances to the linkages between universities and industries in Kenya?

1.6 Justification of the Study:

The study sought to provide key highlights of consideration by policy makers in strengthening the role of universities in industrialization especially through university-industry linkages and technology transfer. Further it aimed to provide a solid platform for enabling the government to achieve the Big Four Agenda especially Agenda number four on manufacturing. The aim of manufacturing in the Big 4 Agenda was to increase the contribution of manufacturing to GDP specifically from 9.2% in 2016 to 15% by the year 2022. This initiative would be achieved through establishment of industrial perks, Special Economic Zones and Implementation of

policies that promote processing and value addition. This agenda was in line with the ninth Sustainable Development Goal (SDG), which aimed at building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation for development (Mutinda, 2020). In line with this agenda this study sought contribute to value addition in two front; developing the relevant workforce for industries and other sectors and secondly contributing to development of new ideas and innovations to industries.

1.7 Scope of Study

The study aimed to analyze the role of universities in achievement of industrialization in Kenya covering universities and local industries in Kenya. The study focused on employees data working in local industries located near universities and universities in Kenya. The study used primary data collected in local industries (firms) and universities in Kenya in June 2022.

2. LITERATURE REVIEW

2.1 Introduction

This section discusses literature review with the aim of exploring available and existing information by previous researcher on the area of this study.

2.2 Theoretical Literature

2.2.1 Human Capital Theory

The term human capital can be traced back to the early 1960's when Schultz (1961) proposed that human capital comprised the knowledge, skills, and abilities of people working in an organization. This definition was somehow limited in that it did not take into account the concept of value and importance of investing in human capital. Becker (1993) expounded further on the human capital theory adding an extra dimension of the health and well-being of people. The human element in organizations which consists of the combined intelligence, skills and expertise is the one that gives the organization its distinctive character. According to this theory it is the human factor of the organization that is capable of learning, changing, innovating and providing the creative thrust for the long-run existence of the organization. Acemoglu and Autor (2009) included the aspect of productivity in terms of organizational and unit-level outcomes or outputs in the theory of human capital. The human capital theory, applied in the context of the organization suggests that individuals who invest in education and training increase their skill levels and are more productive than those less skilled, hence more earnings.

2.2.2 Labour Theory of Value

The labour theory of value traces its root way back to the 18th century to Adam Smith (1776). The theory postulates that the economic value of a good or service is determined by the total amount of the socially necessary labour required to produce it. Classical economist David Ricardo was of the view that the value of a good was proportional to how much labour was required to produce it, including the labour required to produce the raw materials and the machinery used in the process.

2.2.3 Structural Change Theory

Todaro and Smith (2012) Argue that structural change theory focuses on the means by which developing countries transform their domestic economic structures from subsistence agriculture to modern industrial manufacturing and service economies. This theory makes use of neoclassical price and resource allocation tools and econometric models to describe how the transformation takes place. This theory postulates that in addition to the accumulation of capital both physical and human, changes in the economic structure are necessary for the transition from a traditional economy to a modern economy.

2.2.4 Endogenous Growth Theory

Endogenous growth theory is a theory of economic growth and development whose major proponent was Romer (1990). According to this theory long-run economic growth is determined by forces that are internal to the economic system particularly those that encourage technological knowledge. The long-run rate of economic growth which is measured by the growth rate of output per worker depends on the growth rate of total factor productivity (TFP), which in turn is dependent on the rate of technological progress. According to this theory technological progress takes place through innovations, in the form of new products, processes and

markets, all of which are results of economic activities. Since innovations result from R&D, economic policies with respect to trade, competition, education, taxes and intellectual property should be considered as channels through which technological progress takes place.

2.2.5 AK Theory

The AK theory is viewed as the first version of endogenous growth theory which argued that the aggregate production function can exhibit a constant or even increasing marginal product of capital. This is because when firms accumulate more capital, some of that increased capital will be the intellectual capital that creates technological progress which offsets the tendency of marginal product of capital to diminish. In the situation where the marginal product of capital is assumed to be exactly constant, then aggregate output Y , is proportional to the aggregate stock of capital K . That is given as:

$$Y = AK$$

Where A is a positive constant and hence the 'AK Theory'. According to this theory the long-run growth of an economy will depend on its rate of saving. An increase in the rate of savings will lead to a higher growth rate of the economy.

2.3 Empirical Literature

Omar and Salleh (2013), did a study on University-Industry Collaborations Models in Malaysia focusing on the interaction between university, government and industry. This study focused these three main components that assume different functions towards successful collaboration between university and industry. According to this study factors such as researcher motivation, engagement mode, student training and facilities in universities were identified as internal factors for university to collaborate with industry. The study found out that these collaborations bring huge opportunities between the two parties. This study recommended that large multinational and national companies set up their research laboratories in universities and provide funding for research and development. These approaches will hence have tremendous effects on successful university-industry collaborations.

University-Industry Collaboration on OECD countries by Guimon, Paunov and Borowiecki (2019), focused on assessing the impact of knowledge transfer on these countries. The study analyzed the policy programs implemented in a variety of OECD countries and how they impacted on knowledge transfer from universities. According to this study new policy practice to support spin-offs and include focus on quality and student entrepreneurship. The study further recommended universities to pay more attention to in-house business incubation and entrepreneurship training. The recommendations from this study were an overview and review of the main policy instruments for knowledge transfer and their interactions.

Munyoki, *et al* (2011), carried out a study on the extent to which university-industry link exists by studying selected medium and large manufacturing in Kenya. According to this study the idea of technology transfer and university-industry link are related in that it deals with the transfer of technology, ideas and skills from those who have them to those who need them. This study adopted the descriptive approach of the cross-sectional nature and targeted three consumer manufacturing firms. The results of this study established that local government institutions were the main source of technology transfer followed by universities and other institutions of higher learning. Further manufacturing firms local universities as the highest potential source of technology. This rating meant there was need for universities to harness the opportunity by strengthening the linkage between themselves and industries. The second major finding of this study was that multinational firms relied more on imported technology than indigenous firms. The study concluded that there was need for local universities to engage in practical research to enhance relevant industry requirements in the collaboration.

Nyangau, J. (2014) Carried out a study on higher education as an instrument of economic growth in Kenya using the documentary review method to collect data. This study established the challenges that faced university education which included low funding levels of research and development and crumbling infrastructure. These challenges inhibited the contribution of universities to economic growth. The study recommended modernization of institutions of higher education and adoption of policies that support aggressive collaborative investments in research and development.

Munyoki et al. (2011), did a study on the mediating role of university industry collaboration on the relationship between human resource development, infrastructure and performance of universities in Kenya. This study used the descriptive survey approach which relied on structured questionnaires to collect data. The population of the study was made up of all the public and private universities in Kenya. The results of this study showed a relatively strong relationship between the universities human resource development infrastructure and performance. Further this relationship is improved when the construct of university industry collaboration is introduced. Therefore this university concluded that university human resource development infrastructure is relevant in organizational strategies for university industry collaborations.

Kombo and Mwangi (2018), carried a study on strengthening university partnerships and collaborations in Kenya using a descriptive survey design with a multiple case analysis approach that enabled in-depth information from the sample in the target universities. According to the results of this study four major typologies of partnerships were found to exist in most universities in Kenya. These include the higher education support services, the university-industry partnership, financing initiatives and service delivery partnerships. Further according to this study heterogeneous cultures that exist among these institutions were found to be some of the hindrances to successful partnerships. It was noted that some institutional cultures are pervasive and often affect the success of the partnerships. This study concluded that universities in Kenya take partnerships as a key ingredient of development especially in their function of teaching and research.

3. METHODOLOGY

3.1 Introduction

This chapter focuses on the methodology and approaches that were used in the study highlighting aspects such as the research design, target population, sampling technique, sampling frame, data collection procedures as well as data analysis and presentation.

3.2 Research Design

This study adopted the descriptive survey design with a multiple case analysis approach which was used to collect in-depth information from the sample in the target universities and medium enterprises. This design attempted to describe the transfer of technology from universities to industries and came up with specific predictions. The survey design enabled compilation of information on typologies and issues relevant to policy directions for higher education in Kenya.

Specifically the study used the innovation-based theory model by Romer (1990) which recognizes intellectual capital as the source of technological progress. In this model, innovation causes productivity growth by creating new varieties of products. It makes uses of Dixit-Stiglitz-Ethier production function, in which final output is produced by labour and a continuum of intermediate products.

$$Y = L^{1-\alpha} \int_0^A x^\alpha di, \quad 0 < \alpha < 1 \dots i$$

Where Y is aggregate output, L is aggregate supply of labour which is assumed to be constant, $x(i)$ is the flow input of intermediate product i , and A is a measure of different intermediate products that are available for use and it measures increase in productivity through changes in product variety.

3.3 Population

Kothari (2006), postulates that target population is the total collection of elements about which one wishes to make some inferences. It is divided into two categories; target population and study population. Target population describes the large population where the small population is coming from while study population is the smaller population to be used in the research. The relevant target population for this study comprises all the universities in Kenya. In 2020 Kenya had a total of 31 public universities and 32 private universities, making a total of 63 universities (Economic Survey, 2020).

3.4 Sampling Frame

Sampling frame refers to the list of items or respondents which sample has to be drawn, it constitutes all the components of the study population (Dempsey, 2006). The study will focus on the research centres or

incubation centres in the universities selected in-depth information on ideas and researches done in these centres and its absorption by industries. In the selected universities multiple case study analysis approaches will be used to study and provide information to answer the research questions.

3.5 Instruments

Orodho (2009), argues that data collection method as a tool for data collection should be both objective and systematic. The study employed questionnaire as the primary data collection method. The questionnaires contain both open ended and closed ended questions. Questionnaires are effective instruments since they allow the respondents to give much of their opinion regarding the research problem concerned (Cartlidge, 2002). According to Kothari (2006), one advantage of information obtained from questionnaires is that it is free from any bias and influence from the researchers. Owing to these reasons, questionnaires were a viable method for this study.

3.6 Data Collection procedures

The study involved collection of both primary and secondary data. Data collection procedure is the process of gathering pieces of information that are needed for research process (Morris, 2007). The primary data provided a presentation of the actual information that was obtained to achieve the aim of the study. Primary data was collected using both open ended and closed ended questionnaires. The instruments were self-administered to the 68 respondents who will be selected for the purposes of analysis. Empirical and theoretical literature from journals, books and publications was also reviewed to provide secondary data.

3.7 Pilot study

A pilot study was used to reveal the weaknesses, if any, in the research design and the instruments in order to provide proxy large scale studies for selection of probability sample (Cooper & Scindler, 2006). A pilot study is a small experiment designed to test logistics and gather information prior to a large study in order to improve the latter's quality and efficiency.

3.8 Data Analysis and presentation

The study generated both qualitative and quantitative data owing to the nature of the instrument to be adopted which includes both open and closed ended questions. Qualitative analysis involved coding and organizing collected data into themes and concepts that addressed the research questions. Descriptive statistics in the form of frequencies and percentages was used for analysis in this study. Further data analysis was done using the statistical programs of SPSS to achieve the objectives of the study.

4. DATA ANALYSIS AND PRESENTATION

This chapter presents the key findings of the study and the results of data analysis. The data was collected in June 2022 for the purpose of the study. The data generated was both qualitative and quantitative owing to the nature of the instruments used in data collection which had both open and closed ended questions.

Data analysis used four phases normally used in many researches namely data clean up, data reduction, data differentiation and data description. Data clean up involved editing, tabulation and coding with the aim of assigning numeric values to responses and finding out any anomalies in responses.

The study targeted 30 local industries and 30 universities in Kenya which were identified in different locations in Kenya. A total of 24 local firms responded and 28 universities responded, giving a response rate of 86 percent. The sampled firms were requested to indicate the extent to which they relied on various forms of innovation transfers (products, services and new ideas). Table 4.1 gives a summary of the mean scores of various sources of innovation transfer to local firms in Kenya.

Table 4.1 Sources of technology transfer ranked

Source	Mean Score	Std. error	% of total population
Public Universities	2.65	0.25	21.2
Private Universities	2.54	0.24	20.32
Research Institutions	2.84	0.26	22.34
Consultants	2.34	0.24	19.04
Foreign Institutions	2.11	0.19	16.92
Total			100

Computed by the mean score for a particular source by the total of the means and converting into percentages. Table 4.1 illustrates that firms get technology through technology transfer through various sources in different degrees. It was clear that research institutes are the major sources of technology transfer with a mean score of 2.84, followed by public universities with a mean score of 2.65. Private universities rank third with a mean score of 2.54 followed by consultants with a mean of 2.34 and foreign institutions rank position five with a mean of 2.22.

Objective one sought to determine the extent of technology transfer from universities to industries in Kenya. The following indicators were used to measure this objective: whether universities are key in development of products/services, whether firms produce better products/services when university graduates are employed, whether firms' products/services are better when they link with universities and, development and distribution of products/services to firms by universities. This was on a like chart scale of strongly agree, agree, neither agree nor disagree, disagree and strongly disagree.

Majority of the respondents neither agree nor disagree (35.3%) that universities are key in development of products/services for firms in Kenya while (34.5%) agree that universities are key in development of products/services. Among the respondents (10.6%) strongly agreed with (10.3%) disagreeing while (9.3%) strongly disagreed that universities are key in development of products/services for firms in Kenya. Majority of the respondents (30.3%) strongly agreed while (25.6%) disagreed that university graduates employed in firms led to better products/service. Of the respondents (18.4%) agreed, (12.7%) agreed while (13%) strongly disagreed that employing graduates led to better products/services among firms. With regard to whether firms have better products/services (27.3%) agreed, (22.2%) neither agreed nor disagreed, (21.8%) did strongly agreed, (18.7%) disagreed while (10%) strongly disagreed. Finally regarding whether universities develop and distribute their products/services to firms (30.2%) strongly disagreed, (25.8%) disagreed, with (11.4%) strongly agreeing while (8.5%) agreed. Table 4.2 summarizes this information.

Table 4.2 University technology transfer to firms

	SA%	A%	NA/D%	D%	SD%
Universities are key in development of product/services	10.6	34.5	35.3	10.3	9.3
Better services/products when firms employ university graduates	30.3	18.4	12.7	25.6	13
Firms have better product/services when they link with universities	21.8	27.3	22.2	18.7	10
Universities develop and distributes their products/services to industries in Kenya	11.4	8.5	24.1	25.8	30.2

Key: SD (Strongly Agree), A (Agree), NA/D (Neither Agree or Disagree), D (Disagree), SD (Strongly Disagree)

From the results obtained it was established that both public universities and private universities had significant technology transfer. However the number of existing products/services and business processes in the market from local are very scarce. Most of the products in the market are imported from foreign countries while a considerable number of services and processes are developed locally.

The second objective sought to establish the causality between universities and Industries in regard to technology transfer in Kenya. The first objective results indicate that there is significant technology transfer from universities to firms in Kenya. Respondent from the firms were asked whether they transferred any technology to universities and all the responses pointed to nil transfer. This therefore reveals that there is no causal relationship between universities and firms in transfer of technology.

Objective three sought Find out the hindrances to the linkage between universities and Industries in Kenya. Majority of respondents identified importation of products and processes as the biggest hindrance to linkages between universities and firms in Kenya at (41.9%). Among the respondents (33.4%) indicated that education system in Kenya was not product/service oriented and therefore a hindrance to linkage between universities and firms. Finally (24.7%) of the respondents indicated that the high price at which universities sold developed products/services as well as new ideas was hindrance to the linkage between universities and firms in Kenya.

5. RESULTS DISCUSSION AND RECOMMENDATIONS

This study established that both public and private universities in Kenya are the main source of technology transfer to firms, even though research institutions also considerable transfer too. These institutions act as training ground for organizations and mainly provide human capital to such organizations. As Kenya seeks to create a dynamic society of knowledge-based economic development the linkage between universities and firms needs to be strengthened. This implies that there is need for both universities and firms to come with ways of strengthening their linkage in order to enhance research relevant to industry requirements. According to Munyoki (2007), so long as universities continue doing research and coming up with results that are not applicable to industries, the gap between universities and industries will continue to widen and become weaker. Therefore universities should be positioned as problem-solvers for the socio-economic issues affecting Kenya through innovation.

This study has also established that the linkage between universities and firms in Kenya is one way, from universities to firms. Firms and industries can partner with universities through public private partnership for development. They can provide business mentorship and fund ideas and research and development in universities to strengthen the technology transfer. Further industries and firms can channel industry needs to universities and together in partnership try to develop technology that is relevant.

The study also identified hindrances to university firm linkages one of them being overdependence on importation of products/services and business processes. Locally developed products/services and business processes are limited in Kenya. This points to dim situation as far as innovation is concerned in Kenya. Universities in Kenya need to come up with applicable solutions to the socio-economic problems facing Kenya. Firms and industries should be able to identify needs that face the society and together with universities they develop solutions in terms of products/services and business processes.

It was also established that the education system in Kenya is not market oriented and more theoretical in nature. This is a hindrance to innovation that would lead to development of products that suit the market. Universities lack understanding of market and industry needs and mechanisms of effective interaction with industries to develop and transfer technology. There is need to shift university education from theory to practical aspects that develop solutions to society needs. Universities in Kenya should be centers of true innovation in science and business. The government and policy makers should develop incentives for universities and the needed resources to manage the shift from theory to practical based education that benefit society.

High cost of products/services and business processes developed in Kenya has been identified as a hindrance to the university-firm/industry linkage. Most universities in Kenya are into profit making business rather than being innovators who develop solutions. The core mandate of Kenyan universities seems to have shifted to profit maximization which has greatly hampered the ability of technology transfer. Universities are therefore in competition with firms/industries rather than complementing each other. Development and distribution of products/services by universities is affected by the high prices and therefore firms/industries prefer importation. The high price of locally developed products/services and processes makes them less competitive compared to foreign ones.

5.1 Recommendations

Firstly the linkage between universities and firms/industries need to be institutionalized for long-term success. Partnerships thrive where vibrant institutional cultures are developed from individual, departmental and institutional levels. These linkages should be two way, that is from universities to firms/industries and from firms/industries to universities for technology transfer to be effective. Secondly Kenyan universities should encourage and promote multidisciplinary approach to learning, research and innovation. Such approach should include engagement with industries and communities to promote research uptake and enrich university curriculum. Lastly universities in Kenya need to complement firms/industries rather than be in completion with them.

Areas for Further Research

The study focused on determining the extent of technology transfer from universities to industries, establishing the causality between universities and Industries in regard to technology and identifying hindrances to university-firms/industries linkages in Kenya. Similar studies may be conducted focusing on the specific source of technology transfer in regard to solving practical industry problems. A study can be conducted on university partnership with other world universities renowned for technology development.

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