QUADRUPLE HELIX MODEL AND HUMAN CAPITAL FORMATION IN PUBLIC UNIVERSITIES IN RIVERS STATE, NIGERIA

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Abstract

This study examined the relationship between "quadruple helix model and human capital formation in universities in Rivers State, Nigeria". Two research questions and two hypotheses guided the study. The population of the study comprised three thousand one hundred and seventy-six (3,176) academic staff of the three public universities in Rivers State, Nigeria. The study used five hundred (500) academic staff as sample size representing 15.7% of the entire population using stratified random sampling technique. The study adopted a correlation survey design. Instruments titled "Quadruple Helix Model Scale (QHMS) and Human Capital Formation Scale (HCFS) developed by the researchers were validated. The reliability co-efficient of the instruments were 0.84 and 0.88 using Cronbach alpha statistics which guaranteed the use of the instruments for the study. The Pearson product moment correlation coefficient (r) was used for answering the research questions and the hypotheses were also tested using the Pearson product moment correlation coefficient (r) at 0.05 level of significance. It was found out that there is a significant high relationship between quadruple helix model and human capital formation in public universities in Rivers State, Nigeria. It was recommended among others that, the government and university's management staff should initiate an effective collaboration with the academic staff by ensuring conducive working conditions for enhanced human capital formation in universities in Rivers State, Nigeria.

Keywords: *Quadruple Helix Model, Human Capital Formation and Public Universities.*

Introduction

Higher levels of educational institutions in every given society were established to ensure the realization of innate potentialities of individuals who becomes effective catalysts for national economic growth and development. These catalysts also sieve and obliterate a nation from being a demand-led economy to a supply-led economy. Higher levels of educational institutions provide individuals with apposite knowledge, scintillating and desirable skills, attitudes and cherished positive values in the society. It is based on the aforementioned education relevance, that education industry was rated one of the expensive industries in Nigeria. The expensive nature and relevance of education, stimulates the interest of vital helices to be involved and bankrolled in educational programmes, especially "university education". These helices are the university, government, industry and society. Conversely, these four helices contribute immensely towards the realization of education, individuals' personal social competence and prosperity, which accelerates national economic progress. Schematically, their twinning together forms a model of innovation to bridge the gaps between innovation and civil society, which is known as "Quadruple Helix Model".

Quadruple helix model is a model of innovation and collaboration which builds on the triple helix model of innovation. Triple helix model of innovation is a set of interaction between academia, industry and governments to foster economic and social development (Wikipedia, the free encyclopedia, 2019). The quadruple helix model adds a fourth component to the framework of interactions between university, government, industry and civil society (Carayannis and Campbell in Carayannis, Barth and Campbell, 2009). Oscar, Monterino and Thomsbon (2010), emphasized that quadruple helix is the development of the triple helix concept by integrating the role of academia, entrepreneur, government and civil society in the activity that is based on creativity and knowledge. Hyundai and Dhewanto (2015), opined that the quadruple helix model is a conceptual framework of the collaboration between university, industry, government and community. In a nutshell, quadruple helix model is a model of innovation and collaboration between university, government, industry and civil society to foster economic, social, political and technological development of a nation through knowledge based economy. It implies that innovation and creativity performance, economic development and growth, educational planning and development are not responsibilities of any sector rather the responsibilities and cooperation of the four helices/components: university, government, industry and society.

Be it as it may, education provides the keys to national economic growth and development through the development of human capital that harnesses and manipulates other resources for sustainable national progress and individual prosperity. That was why Hsu (2009), opined that education builds important human capital and raises national productivity. These avowed objectives and relevance of education arouses the government, industry, university and society to invest heavily on education of the citizens. These four components contribute immensely towards education in several areas because at all times, they demand for quality things: resources, commodities/products, policies and laws and every other things that makes life worthwhile. Every sector of the society has been playing vital roles in human capital development, especially in developing countries like Nigeria. It is apparent that for an economy to grow to greatness, it must capture the knowledge-based institutions. These institutions bring forward all the mechanism involved for such weighty production and development of the various sectors. If the involvement is not weighty and pertinent, then it should be restructured to have a different cooperative system capable of attracting changes and innovation performance.

Development of human capital is a necessary and compulsory condition in economic growth and development. Therefore, the coming together of the sectors/helices guarantees fast recovering of technological and technical misplacement in an economy. This was the reason why Etzkowitz and Dizisah (2008), stated that triple helix is based on the premise that the university plays an enhanced role in development together with the government and society, the two traditional heading institutional spheres. Academia which is referred to as the activities and entirety of deeds at the higher education institutions are almost proliferating to the extent that energy state of the federation is controlling more than two or three as the case may be. The concept of quadruple helix focuses on developing human beings who will be introducing critical innovation performance and fill in the position of trust within the government and industries for creative industry creativity.

In a quadruple helix model, Carayannis, Barth and Campbell (2009), stated the importance of the policies and practices of government, university and industry to be interacted with each other intelligently, effectively and efficiently. To corroborate with the above view is the assertion of Colapinto and Porlezza (2017), that innovation and research benefits from the evolving and overlapping relationship between academician, government and industry. Innovation is more systemic in which high skills diffused in different areas. Quadruple helix model brings about creativity that unveils the resourcefulness of existing and potential human capital at the university level. Ranga and Etzkowitz (2013), explained that creativity is born through the involvement of intellectuals (university), business, society and government that provide regulations to support the creation of creative and innovative behaviour of the business actors. To develop critical human capital in a nation, innovation performance of these four pillars are necessary, which is the element of quadruple helix model which need to encourage the creativity of the industry (business sector). The innovative process which results to

development of quality human capital is a sureness to revitalize the government agencies, industrial sectors, the society and as well as the university. Confirming the above dictum is the assertion of Etzkowitz (2008), that university has a significant role in supporting the growth of creativity because the entirety of university process contributes positively to the development of desired creativity, innovation and knowledge creation and transfer to industrial and entrepreneurial world over. Using different cognitive dimensions and new mechanism of collaboration in developing critical human capital is the crux of the concept.

Human capital formation refers to the process of acquiring and increasing the number of persons who have the skills, education and experiences, which are critical for economic and the political development of a country (Jhingan, 2016). In economic terms, it could be described as the accumulation of human and its effective investment in the development of an economy (Harrison and Myers in Alete-Omoni, 2015). It is the process of increasing knowledge, the sills and the capabilities of all the human beings in a society. Human capital formation strengthens and enhances all spheres of a nation's economic and political activities. Schematically, most of the developed economies of the world keep growing in socio-political, economic and technological capabilities due to earnest quest in human capital formation. Acquiring and increasing the number of human capital more than the physical and material resources of a community, makes a nation to be developed in a progressive pace.

Conversely, the human resource of a nation constitutes the human capital of that nation. According to Ebong in Njeke (2016), human capital simply means the required stock of skills necessary to operate the physical resources that will in turn lead to the increase in output in any form of productivity. Thus, human capital is the stock of proficiencies, values, competencies, knowledge, skills, abilities, creativity, social attributes and personality which are bestowed on productive citizens. These individuals must be efficient and resourceful to protect the image and reputation of their country in contributing meaningfully and effectively to economic development of their nation. Human capital formation in a nutshell, brings about quality education of citizens, increases individual capacities, skills, knowledge and competencies of people in a given society. It brings about citizens' prosperity, sustainable economic growth and development, improves life expectancy, enriches life experiences and improves national income.

Human capital formation is thus, associated with investment in man and his development as a creative and productive resource (Jhingan, 2016). Human capital formation raises healthy population, quality training, productive citizens and output of productivity as well as recreating manpower and ensures favourable economic growth and development. For all these attribute of human capital formation to be achieved, strong pillars of an economy need to be in collaboration with one another, such as the universities working in synergy with the government as well as the industry and the society.

University and government have always played a major role in the society by developing enormous human resources for national development. The government is the supreme body of a country with the power to make laws, implement and enforce it to control people, landscape and institutions. They control and manage every socio-economic and political system. They control the university system, finance and manages it through the appointment of qualified management staff and legitimate supreme power, economic power, political superiority and diplomatic power projection.

University is an organized formal and social institution established by law to undertake the responsibilities of transmitting knowledge, develop desirable skills, cherished positive values, attitudes and training geared towards human development. University is one of the higher educational institutions that gives education after secondary level of education. It is a formal institution with a unified structure; Visitor, the Chancellor, the Council, Pro-Chancellor and Member of Council, the Senate, Convocation, the Congregation, the Vice-Chancellor, Deputy Vice-Chancellor, Registrar, the Bursar, University Librarian, the Director of Physical Planning and Development, the Director of Academic Planning and Control, the Provost, Dean of Faculty/School, the Head of Department and University Committee and Democratic Governance (Nwafor in Alete-Omoni, 2017). Universities are created to satisfy specific or general educational needs of a nation through teaching of students, conduct of research and dissemination of knowledge together with other community service activities (Nwafor in Alete-Omoni, 2017).

University-government collaboration can be seen as any type of cooperation between the governments and universities to strengthen all university's programmes and objectives to foster economic and social development of a nation. University-government collaboration brings about reforms, changes and innovation in the university system. Innovation and creativity, changes and reforms are the products of university-government collaboration. Praswati (2017), found out that government is the overall policy making body. These policies guide the operations of the universities to create and generate knowledge to ensure the full realization of quality human capital developed in the society. The policies of government gives both governments, cooperate bodies/organizations and individuals to establish more universities in the society. The universities act as the researcher (science) as their notable identity, while the government acts as the policy maker. That was why Carayannis and Campbell (2006), stated that the importance of policies and practices of government and university to be interacted each other intelligently, effectively and efficiently. Their collaboration also ensures the enactment of sound education laws to ensure the realization of staff affability and students' innate potentialities and personal social competence. Nkonwa (2016), asserted that university-government collaboration provides sound educational policies and laws for values-re-orientation University-government collaboration has achieve an advancement in the knowledge of information and communication technology (ICT) by introducing the knowledge of computer as a working tool in various offices and other parastatal as well as making it a compulsory course in all levels of education in this developing nation. It was due to the above aphorism that Ingram and Mclntosh in Okeke (2009), aptly remark that, if the organization does not adopt sufficiently to meet the changing demands of the environment; it runs the risk of itself becoming dysfunctional and may eventually face rejection and possibly elimination.

University-government collaboration heightens the funding of the entire university system. However, in Nigeria, the universities are still funded mainly by the government. Money is the fuel and lubricant which propels any business or social organization or activities to be financed (Ebong, 2006). It also enhances research and development as well ensures the implementation of educational plan of the university. Note worthy is the fact that other notable helices contribute towards the realization of citizens education such as industry and society. Industry-society collaboration strengthens human capital formation at the university in so many ways and forms. Industry is the aggregate of manufacturing and technically productive enterprises in a particular field often named after its principal product; the automobile and steel industry (Wikipedia, the free encyclopedia, 2019). Industries are not established in a vacuum; they are established for individual income generation, government revenue, favourable balance of payment, increased national income, national economic growth and development. The existence of the industries is to collaborate with the society to rejuvenate, rehabilitate and expand human ingenuity and push forward national development and progress. The economy grows as a result of the level of manpower trained and developed in any given society.

Conversely, every community needs something of quality both human elements that manages the industries, governments, communities and other scintillating organizations. Therefore, the effort to development them must be a congeal coalition of the industries and society as strong sectors which can not function effectively and indefatigably without quality human capital developed. Education industries as well as other industries benefit from the society in terms of land provision to build new universities, build more departments and faculties, business school, sports and petroleum institutes. Land as a free gift of nature to the society (community) is also given for firm's expansion, exploration and exploitation which attracts enormous compensation in monetary values to aid students who are studying at the universities. Provision of land also brings about the establishment of a training centre, enhancement of industrial training, field trip and signing a Memorandum of Understanding (MOU) with the host communities. This MOU signing provides students' scholarship and payment of bursary which are also leeway to students sufferings and the actualization of manpower training.

Industry-society collaboration encourages manpower training and absorption. For education and training to be meaningful in the society, those citizens that have undergone training and education must be perfect as well be absorbed by the industries to stimulate the interest of those ones in the university to study harder in order to strengthen the society for development. Manpower refers to the totality of the

energies, skills, knowledge and experiences available in a country (Diehomah in Anyanwu, Oaikenan, Oyafusi & Dimowo in Alete-Omoni, 2015). It is also the managerial, scientific, engineering, technical craftsmen and other skills which are employed in creating, designing, developing, organization, managing and operating productive and science enterprises and economic institutions (Yusufu in Anyanwu Oaikenan, Oyafusi & Dimowo in Alete-Omoni in Alete-Omoni, 2015).

Industry-society collaboration encourages the achievement of skill acquisition. Asodike (2016), posited that skill acquisition involves storing of information concerning a particular skill over a prolonged period of time. Green (2011), posited that skill acquisition is the process of obtaining skills through formal education or learning. So, it appears that this congeal collaboration encourages the development of human resources for nation building. It also brings about demand for manpower as well as their supplies by the society. This ideation brings about the building of health, productive and creative industries such as research development centre, hospitals, schools, firms and pleasure parks. Eke-Anyanwu (2017), asserted that industry-society collaboration has provided enormous opportunities for technological advancement and social rehabilitation of citizens in the society. The industries collaborate with the society in terms of economic contributions and opportunities for credit facilities. Financial industries collaborate with the society in terms of credit facilities which enables them to meet up with the financial challenges of their children in school.

Statement of the Problem

It appears that over the years, Nigerian economy has remained a demand-led economy in spite of the fact Nigerian universities have been producing enormous manpower of different levels and kinds. Due to the underdevelopment saga of this nation, graduates and youths are into banditry operations and other heinous crimes. Experiences have also shown that vital areas such as agriculture, manufacturing, mining and production sectors of the economy are lacking quality manpower as catalysts for individual prosperity and national economic development. The public always blame the universities for these aforementioned quadrancies of the society, while the university blames the government, industry and society for the lack of collaboration among them which is an effective mechanism for quality human capital formation which is the best process of achieving skills and education for economic and political development. It is in the light of the above overview that the researchers investigated the relationship between quadruple helix model and human capital formation in universities in Rivers State, Nigeria.

Aim and Objectives of the Study

The aim of this study was to examine the relationship between quadruple helix model and human capital formation in universities in Rivers State, Nigeria. Specifically, the study sought to:

examine the relationship between university-government collaboration and human capital formation in universities in Rivers State, Nigeria.

determine the relationship between industry-society collaboration and human capital formation in universities in Rivers State, Nigeria.

Research Questions

The following research questions guided the study:

What is the relationship between university-government collaboration and human capital formation in universities in Rivers State?

What is the relationship between industry-society collaboration and human capital formation in universities in Rivers State

Hypotheses

The following hypotheses were tested at 0.05 level of significance

There is no significant relationship between university-government collaboration and human capital formation in universities in Rivers State.

There is no significant relationship between industry-society collaboration and human capital formation in universities in Rivers State

Methodology

This study adopted correlational survey design. The population of the study comprised three thousand one hundred and seventy-six (3,176) academic staff in the three public universities in Rivers State, Nigeria: University of Port Harcourt (UPH), Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUOE). The study used a sample size of five hundred (500) academic staff representing 15.7% of the entire population using stratified random sampling technique. Researchers developed instruments titled "Quadruple Helix Model Scale (QHMS) and Human Capital Formation Scale (HCFS). The instruments were validated by three experts in the Department of Educational Psychology (Measurement and Evaluation) for data collection. The reliability coefficients of Quadruple Helix Model Scale and Human Capital Formation Scale were 0.87 and 0.88 using Cronbach Alpha statistical method. Five hundred (500) copies of the instruments were administered and 493 copies were retrieved for data analysis. The data generated with the instruments were used for analysis. Research questions were answered using Pearson product moment correlation coefficient (r), while the hypotheses were tested at 0.05 level of significance using Pearson product moment correlation coefficient (r).

Results

Research question 1: What is the relationship between university-government collaboration and human capital formation in universities in Rivers State?

Hypothesis 1: There is no significant relationship between university-government collaboration and human capital formation in universities in Rivers State.

Since the study is correlation study, the research questions and hypotheses are most appropriate to be in the same table.

Table 1: Pearson product moment correlation on the relationship between University-Government Collaboration and Human Capital Formation in Universities in Rivers State

Variables	n	df	r	Level of Sig.	Sig. (2tailed)	Decision
University-Government Collaboration Human Capital Formation	493	491	0.77	0.05	0.03	Ho_1 Rejected

Table 1 revealed that the Pearson product moment correlation coefficient of the relationship between university-government collaboration and human capital formation in universities in Rivers State was calculated to be 0.77. The result showed that there is a high relationship between university-government collaboration and human capital formation in universities in Rivers State, Nigeria. This implies that an increase in the independent variables (university-government collaboration) leads to a corresponding increase in the dependent variable (human capital formation).

In testing the hypothesis, the correlation coefficient ($r = 0.77$) between university-government collaboration and human capital formation is high. The significant value of 0.03 ($p<0.05$) reveals a significant relationship. Based on that, the null hypothesis was rejected. Therefore, there is a significant relationship between university-government collaboration and human capital formation in universities in Rivers State.

Research Question 2: What is the relationship between industry-society collaboration and human capital formation in universities in Rivers State?

Hypothesis 2: There is no significant relationship between industry-society collaboration and human capital formation in Universities in Rivers State.

Table 2: Pearson product moment correlation coefficient on the relationship between Industry-Society Collaboration and Human Capital Formation in Universities in Rivers State

Variables	n	df	r	Level of Sig.	Sig. (2tailed)	Decision
University-Society Collaboration						Ho_2 Rejected
	493	491	0.69	0.05	0.01	
Human Capital Formation						

Table 2 revealed that, the Pearson product moment correlation coefficient of the relationship between industry-society collaboration and human capital formation in universities in Rivers State was calculated to be 0.69. The result showed that there is a high relationship between industry-society collaboration and human capital formation in universities in Rivers State as determined by the coefficient of 0.69. This implies that an increase in independent variable (industry-society collaboration) leads to a corresponding increase in dependent variable (human capital formation).

In testing the hypothesis, the correlation coefficient (r=0.69) between industry-society collaboration and human capital formation in universities in Rivers State is high. The significant value of 0.01 ($p<0.05$) reveals a significant relationship between industry-society collaboration and human capital formation in universities in Rivers State, Nigeria.

Discussion of Findings

University-Government Collaboration and Human Capital Formation

The findings of this study showed that there is a significant high relationship between university-government collaboration and human capital formation in universities in Rivers State. The value of 0.77 showed that there is a significant high relationship between university-government collaboration and human capital formation in universities in Rivers State. This finding agrees with the assertion of Nkonwa (2016), that university-government collaboration provides sound educational policies and laws for values-re-orientation.

Industry-Society Collaboration and Human Capital Formation

The finding of this study showed that there is a high significant relationship between industry-society collaboration and human capital formation in universities in Rivers State. The Pearson product moment correlation coefficient of the relationship between industry-society collaboration and human capital formation in universities in Rivers State was calculated to be 0.69. This implies that an increase in the independent variable (industry-society collaboration) leads to a corresponding increase in the dependent variable (human capital formation). This finding agrees with the assertion of Eke-Anyanwu (2017), that industry-society collaboration has provided enormous opportunities for technological advancement and social rehabilitation of citizens in the society.

Conclusion

Based on the findings of this study, it was concluded that there is a significant high relationship between quadruple helix model and human capital formation in universities in Rivers State, Nigeria. Therefore, the university government, industry and society should strengthen their collaboration with code of trust, cooperation and knowledge sharing to ensure the realization of effective human capital formation in public universities Rivers State, Nigeria.

Recommendations

From the result of the findings and conclusion, the study offers the following recommendations: The government and university's management staff should initiate an effective collaboration with the academic staff by ensuring conducive working conditions for enhanced human capital formation in universities in Rivers State, Nigeria. The industries and society should establish an effective collaboration with the universities to enhance human capital formation at the universities in Rivers

State, Nigeria. Society should ensure that they are involved in the modification of educational policies, laws, curriculum and decision making at the universities. The industry should assist the universities in engineering, technical and technological training and retraining of students and graduates as well as modifying the university's curriculum to international standard.

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