



BIOSCIENCE ENTREPRENEURSHIP: A PROMISING EMPOWERMENT PATHWAY FOR MEDICAL LABORATORY SCIENTISTS

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ABSTRACT

Background: Entrepreneurial abilities help to recognize business opportunities and to combine other factors of production in a way that will create value, meet needs and generate income. Bioscience entrepreneurship involves getting innovative ideas based on scientific concepts, using them to solve problems, meet needs and develop products.

Aim: This discourse aims to shed light on bio-entrepreneurship for scientists and professionals to see boundless opportunities inherent in the convergence of ideas, concepts and technologies from all disciplines of life and biomedical sciences for the creation of value and achievement of wealth through need-meeting innovations.

Methods: Professional knowledge/expertise, intuitive observation and conceptual analysis of biomedical and life sciences innovation were brought to bear, coupled with reviewing relevant literature on bioscience enterprise initiatives in various search engines.

Results: Our findings show that bioentrepreneurship in Asia, Europe and America has been used to create value and meet needs. Such enterprise initiatives have created products and services that earn foreign exchanged for these developed continents. In all climes where outstanding achievements have been recorded with bio-entrepreneurship initiatives, the roles of government, the industry, scientific community and the academia were well established. In a depressed and import-dependent economy like Nigeria, bioscience entrepreneurship can be of significant multifaceted advantage in several apparently unexplored areas which may include vivarium development/management, diagnostic reagents development/validation and biotechnology/recombinant DNA technology products as well as herbal drug discovery/development, amongst others.

Conclusion: Imperatively, in Africa, Scientists/Professionals would need to make science more “translatable”, solve problems, meet needs and add values. There is need to think of institutional research and enterprise parks, bioentrepreneurship labs and the enhancement of existing technology incubation centres. With bioscience entrepreneurship, African intellectual content would be enhanced, more home-grown products would emerge and the continent would become a developer of technology rather than just remaining a consumer of it.

Keywords: Bioscience, Entrepreneurship, Expertise, Innovation

INTRODUCTION

In basic Economics, it is known that land, labor, capital and entrepreneurial abilities are central when considering the resources for production and investment. It has been concisely defined as the creation or extraction of value (Diochon and Anderson,

2011; Gaddefors and Anderson, 2017). Entrepreneurial ability stands out among these factors in that it helps to recognize business opportunities and to combine the three other factors of production in a way that will create value, meet need and make money.

Bioscience entrepreneurship entails the process of creating value from biomedical and life sciences innovation (Meyers, 2008; Muhammad, 2018). It has to do with getting innovative ideas based on scientific concepts, using them to solve problems, meet needs and develop products. This discourse is intended to shed light on bioscience enterprise (bio-entrepreneurship) for scientists and technological experts/professionals to see boundless opportunities inherent in the convergence of ideas, concepts and technologies from all disciplines of the physical, life and biomedical sciences, for the creation of value and achievement of wealth through need-meeting innovations. Professional expertise and conceptual analysis of biomedical and life science innovation were brought to bear, coupled with reviewing relevant literature on bioscience enterprise initiatives in various search engines, to shed light on entrepreneurship in Bioscience and Biomedical Research in order to motivate scientists and researchers to think in this direction alongside their research adventures. It is worth noting that bioscience entrepreneurship in Asia, Europe and America has been deployed for the purposes of creating value and meeting needs. Such enterprise initiatives have created products and services that earn foreign exchanged for these developed countries. In all climes where outstanding achievements have been recorded with bio-entrepreneurship initiatives, the roles of government, the industry, scientific community and the academia were well established. In countries with economic depression and import dependency like Nigeria, bioscience entrepreneurship can be of significant multifaceted advantage in several apparently unexplored areas which may include vivarium development and management, diagnostic reagents development/validation and biotechnology/recombinant DNA technology products. Other areas may include biofuels, biofertilizers and biopesticides productions as well as

phytomedicines and herbal drug discovery and development, amongst others.

METHODOLOGY

In this review, Professional knowledge/expertise, intuitive observation and conceptual analysis of biomedical and life science innovation were brought to bear, coupled with reviewing relevant literature on bioscience enterprise initiatives in various search engines (Google and Bing); subject specific search engine (GoPubMed) as well as scholarly literature engines (Google Scholar and Base). The search terms used include bioscience, entrepreneurship, innovation, development, commercialization of products, bioentrepreneurship, amongst others.

Entrepreneurship

Entrepreneurship is about being able to recognize opportunities that can create difference (whether for profit, social or individual benefit). Being entrepreneurial is much more than birthing a new business; and buying and selling (trading), though all these can constitute various concepts in entrepreneurship. An entrepreneurial mindset thinks about new opportunities that can be taken advantage of, to meet needs for present challenges and also for the future (Alvarez and Busenitz, 2001; Gaddefors and Anderson, 2017). It has to do with getting innovative ideas and using them to solve problems, create value, meet needs etc., (Diochon and Anderson, 2011).

Bioentrepreneurship

Bioentrepreneurship is the process of creating value from life science innovation (Meyers, 2008). It may also be referred to as bioscience entrepreneurship, life science entrepreneurship or bioscience enterprise. The way it is described notwithstanding, the fundamental concept is about translational science. That is, translating a biomedical research innovation from bench to bedside, translating a life science discovery or invention from the research phase through development to a need-meeting and marketable product or service.

The object or core issue in bioscience enterprise is to create user defined value through the discovery, design, development, testing, validation and deployment of biological, biomedical and or health innovations (Meyers, 2008; Muhammad, 2018).

Concepts and convergence of Technologies in Biosciences

Bioscience describes any science that deals with the biological aspects of living organisms (RHKWC Dictionary, 2021). The biosciences are a family of disciplines and methods grouped around the investigation of life processes and the inter-relationships of living organisms. The Biosciences provide a focus for the convergence of technologies. All disciplines of the life and biomedical sciences (applied biochemistry, microbiology, biotechnology, industrial chemistry, medical physics, amongst others) There are some fundamental concepts obvious in investment or in an enterprise activity. These include but are not limited to:

- a) The existence of an idea, which basically is a thought that comes to the mind about something that one previously has some or no knowledge about. For example, an idea can come into one's mind on how to improve an existing product or create a new product line.
- b) An invention, which could be described as a drawing, design, model or prototype one makes based on the idea.
- c) An innovation, which is a product or service that creates value in the marketplace.

The bioscience enterprise activity can take processes which may be summarized as:

- i) Firstly, it is a process, characterized by long and effective research and development times
- ii) The second element, the process is designed to create value (tangible and intangible benefits of a product or service)
- iii) Finally, bioentrepreneurs seek to exploit life science innovation for commercial purposes (Meyers, 2008; Muhammad, 2018).

What is Needed?

A consideration of bioscience enterprise initiatives in the United States, United Kingdom, Europe and Japan would give valuable clues as to certain factors that favours the development of the enterprise. Some of which are summarized below:

Role of Government – Tracing and attacking bottlenecks in material and non-material facilities, to develop common platform for interaction, initiative in technology transfer and identification of areas for entrepreneurship promotion.

Role of Industry – To understand the trends in the industry and in research and show the willingness to diversify along the lines of the trend

Role of scientific community – To develop dialogue with industry, to sell the technology in market and bring the stimulation for commercial development of technological know-how as well as help to raise awareness about regulation, patents etc.

Role of academics – Nurture entrepreneurship through various programmes, facilitate entrepreneurial training, generate information on bioscience careers, facilitate presentations by successful biotechnology entrepreneurs, conduct case studies and research.

The Role of Science Parks/Technology Incubation Centres- the roles of science parks and technology incubation centres cannot be overemphasized in the growth of bioentrepreneurship. A good example is the Surrey Research Park, which is a large research park in Guildford, Surrey, United Kingdom. It is populated mainly with ICT and Space-centred commercial enterprises and partly by University of Surrey Initiatives. The purposes include firstly, to support start-up enterprises of its own academics and students. Secondly to attract international businesses and therefore provide a small percentage of steady return on its investment. The University's interests in intellectual property rights such as joint ventures and venture capital on the site, principally from discoveries in the form of patents contributes a substantial part of its revenue.

Biosciences Entrepreneurial Lab

The Biosciences Entrepreneurial Laboratory facilitates innovation by bringing together innovators and entrepreneurs and providing services and resources by leveraging existing campus expertise and support. A good example is the Biosciences Entrepreneurial Lab, Nevada Center for Applied Research, which is a wet lab incubator space at the University of Nevada,

Reno. Its creation was inspired by the cost prohibitive nature of startups in the biosciences and to accelerate the growth and success of bioscience entrepreneurship in Northern Nevada. The Biosciences Entrepreneurial Laboratory facilitates innovation by bringing together innovators and entrepreneurs and providing services and resources by leveraging existing campus expertise and support (NCAR, 2021).



Fig.1. An illustrative image of a segment of Biosciences Entrepreneurial Laboratory (NCAR, 2021)

Exploiting Developments in Science for New Bioscience Enterprises

In a depressed and export-dependent economy, bioentrepreneurship can be of significant multifaceted advantage in the following ways (not exhaustive):

1. Vivarium development and management
2. Diagnostic reagents (development, validation, manufacturers' representation)
3. Public health and epidemiology services and consultancy
4. Tissue Culture as a Bioscience Enterprise-deploying tissue culture technologies for research and innovation
5. Biotechnology, recombinant DNA technology, genetics-developing skills and technologies in these areas for

creation of value, meeting needs and service rendering.

6. Biofuels, biofertilizers and biopesticides production from locally available bioresources like sawdust, waste papers and plastics as well as from plant materials
7. Safe Rodenticides production using knowledge from toxicological sciences.

Adding Science to Local Contents for Development and Commercialization

Bringing concepts in science into local contents and understudying some traditional materials (Ethnobotanical beliefs and phytomedicines) can be useful ways to improve on these items and hence expanding entrepreneurial chances.

A typical example is the Proff's Kilishi Story which serves as a clear-cut case of Bioscience Entrepreneurship emanating from a university based research and innovation.

The Kilishi process technology developed by Professor. John Igene and Associates: adopted for commercialization by the National Programme for Food Security (NUC, 2005b). In sum, it was the research that brought the transformation of Kilishi production process from pilot plant stage to

commercialization. Simply, the traditional/historic Kilishi and its production process were observed and Prof. John Igene and Associates came up with approaches to produce an enhanced and exportable product, Proff's Kilishi, with well-established mechanized reproducible approach, reportable scientific/ dietary information, better flavouring, enhanced shelf-life as well as improved taste, improved process technology, export value and foreign exchange factor (Igene, 2020).



Fig.2 A Sample of Proff's Kilishi (Adopted from ZBM, 2021)

Biomedical Scientists and Bioscience Entrepreneurship: Functional Science

The proof that science goes beyond the laboratories into real life utility is the foundation of translational research. This gives strength to the development of products, formulation of policies, implementation of projects, etc. Science is seen to be functional when it can be translated into value and need-meeting services, some of which are seen in but not limited to the areas listed below:

- i. Development of health and bioscience products (reagents and chemicals)
- ii. Expansion of the spectrum of employment/employability for the

- biomedical scientist and consultancy
- iii. Specialist / Mega Lab Concept (Services and trainings)
- iv. Biological Model development/Science photography and micrograph development/Atlases
- v. Expert/specialist services/consultancy: Formation of a consortium/consultancy platform by Scientists
- vi. Legal expert witness : Biomedical consultancy
- vii. Evaluation of food and drinks: toxicology and nutrition services

- viii. Methods development, validation and modification: Analytical methods/equipment validation and literature composition (for made in Nigeria/Africa medical equipment/reagents).

Medical Entrepreneurship in Nigeria as an Untapped Gold Mine: Taking Advantage

Medical Entrepreneurship in Nigeria is actually an area of business with several investment opportunities as can be seen in the following:

1. Medical device and Medical consumables distributorship
2. Non emergency medical transportation
3. Drugs/Smoking cessation Services
4. Medical waste disposal business
5. Medical Courier
6. Medical practice management company
7. Remote site emergency support
8. Weight loss clinics /Health and fitness centers
9. Medical financial Solutions
10. Ambulance/Medical Escort
11. Mortuary Services
12. Geriatric centres/Creche / Play group
13. Aesthetic medicine services/Cosmetics clinic

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14. Medical apparels, gift items and jewelries
15. Medical writing/Publishing: states/chapters associations

An Important Challenge

The African Biomedical Scientists, Health and other Science Professionals need to accept the fact more than ever before that, science is applied, science is “translatable”, science solves problems, meets needs and adds value.

Science in the African setting should not be on paper and end on paper. There is need to think of university research, enterprise parks and bioscience entrepreneurship labs and enhance existing technology incubation centres. There is more need for developing nations to become developers of technology, not just largely remaining consumer nations.

CONCLUSION

With bioscience entrepreneurship, African intellectual content would be enhanced, home-grown products would emerge and the continent would become a developer of technology rather than just remaining a consumer of it.

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