

BUILDING A SUSTAINABLE INNOVATION ECOSYSTEM IN UNIVERSITIES FOR IDEATION AND ENTREPRENEURIAL COMPETENCE: THE UNIVERSITY OF LAGOS EXPERIENCE

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ABSTRACT

What is new?	Universities in the global south particularly in sub-Saharan African countries have not impacted greatly on their host communities as research efforts in these universities are not linked to innovation addressing societal challenges.
What was the approach?	The University of Lagos (UNILAG), recognizing that a robust innovation ecosystem is central to building capacity in the innovation space for unleashing the creative potentials of both faculty and students beyond traditional teaching and research, activated three units to drive innovation-related activities in the university. This article presents critical discussions on the University of Lagos's experience in driving innovation through novel institutional frameworks facilitated by the Research Management Office, the Innovation & Technology Management Office, and the Entrepreneurship & Skills Development Centre. The article also presents challenges encountered in the process and strategies employed to successfully navigate through the challenges, lessons learned, successes recorded in patents and intellectual property management, as well as future directions for greater impact.
What is the academic impact?	The paper makes recommendations for sustainability and for the implementation of efficient strategies in newly established units seeking to strategically drive innovation-related activities.

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What is the wider impact?	Practical implications of the UNILAG's experience for Research and management practitioners in developing countries are articulated.
Keywords	Innovation management; Technology transfer; Research management; University entrepreneurship; Research commercialisation

INTRODUCTION

Globally, universities are playing vital roles in driving economic development through cutting-edge research, and efficient management of innovation [1, 2]. In recent years, universities have increasingly leveraged industry Research & Development (R&D), and research funding, as well as local and national research facilities to boost translational development. There is an increasing focus on national growth and competitiveness (in the context of a globalized economy) through continuous technological development, driven by leading-edge research and innovation ecosystems, which integrate the research and training capacities of universities with the needs of industry and wider society [3].

In Nigeria, there is a burgeoning quest for research capacity building to harness indigenous knowledge systems for simple solutions to complex challenges in various sectors of the economy. Some universities in Nigeria are increasingly embracing processes for knowledge-driven entrepreneurial activities, including promoting faculty awareness of technology transfer and entrepreneurship potential of their research [4, 5].

In 2016, the University of Lagos (UNILAG) established a dedicated unit – the Innovation and Technology Management Office (ITMO) – to connect the useful output of faculty research with end-users. The recent upsurge in innovative inventions in the University, from both faculty and students alike, that address societal needs justified the need for such a dedicated unit charged with the responsibility to manage all aspects of the innovation value chain. The unit takes the responsibility of ensuring that novel research findings with the potential to provide solutions to societal challenges are efficiently managed through a seamless technology transfer process while ensuring sustained and mutually rewarding tripartite engagement between the University, the faculty (or inventor) and wider society or relevant industry.

BACKGROUND

Innovation is broadly recognized as a major driver for economic development since it potentially leads to productivity and competitive gains [5]. There are several definitions of innovation. One of the earliest definitions of Innovation can be traced to Hagedoorn's (1996) definition of innovation as the commercial or industrial application of a new product, or method of production [6]. According to Afua (1997), innovation is

defined as the incorporation of new knowledge into processes, services, and products [7]. In a holistic review of the definitions of Innovation, Kogabayev and Maziliauskas (2017) defined innovation as the primary function that drives the growth, development, and efficiency of any given economic activity [8]. They argued that investment activity and its outcomes are closely related to the kind of innovation employed. In simple terms, innovation refers to the exploitation of new ideas. Innovation channels present avenues for universities to create and add value to society [9, 10].

The 2020 Global Innovation Index report shows poor performance across all indices of innovation creation and management in Nigeria, as the country ranked 117 out of 131 countries with a score of about 20 percent in contrast to best-ranked Switzerland at 66 percent [11]. Countries that were better ranked included those with arguably excellent infrastructure, capacity, systems and frameworks that are built around their university education to meaningfully drive innovation for social and economic impact. Across continents, the African continent has widely disparate innovation performances. A cursory look at the Global Innovation Index shows that while some African countries rank in the top 75 (e.g. South Africa, Morocco, and Tunisia), others rank much lower [11]. The existing systems for Innovation management in Africa are largely plagued by low levels of science and technology activities, over-reliance on government or foreign donors for R&D activities, inadequate engagement with the industry sector, limited adoption of Intellectual Property (IP), and a daunting environment for technology transfer [12, 13]. These are, nevertheless, broad generalizations across the North-Africa and Sub-Saharan Africa regions. Some economies within these regions have been quite exceptional because they have, in recent years, given attention to the need for efficient innovation management strategies and research commercialization [11]. As an example, Botswana and Tunisia have witnessed remarkable progress in the innovation landscape which, arguably, can be associated with both countries' higher expenditure on education and research development. In addition, some other African countries such as South Africa, Kenya, and Egypt, have demonstrated strong financial market indicators including venture capital deals (South Africa), strong support for technology adoption and indigenous knowledge flows, active information and communication technologies (ICTs) promotion, as well as the creation of novel and locally-relevant organizational models (Kenya), and a stronger use of IP systems (Tunisia). Nigeria has not fared competitively in the Global Innovation Indices over recent years as modern R&D and innovation activities have hitherto suffered neglect. However, many Nigerian universities are waking up to the National Universities Commission's (NUC) call for the entrenchment of systems and strategies supporting a sustainable efficient innovation ecosystem as such is increasingly becoming a *sine qua non* for national development. Since independence in 1960, Nigeria's administrations have demonstrated an increased interest in and appreciation of the role that science and technology (S&T) plays in the country's socio-economic and overall national development. The Federal Government recognized this fact and in 1985 re-established the Federal Ministry of Science and Technology (FMST) as a separate entity. Since then, Nigeria has made significant efforts

to develop S&T policies through a combination of government support, international cooperation, and the tireless efforts of its scientists, engineers, and technologists. In 1986, the nation's first National Science and Technology Policy was created [14, 15]. The goal of the policy was to foster collaboration in the field of environmental research and development (ER&D) in order to advance environmental knowledge. Utilizing S&T expertise to guarantee a higher standard of living for the populace was the overall mission. In 1997, the strategy was revised to place greater emphasis on sectoral developments, cooperation, funding, and S&T system coordination and management [15]. The National Office for Technology Acquisition and Promotion (NOTAP), an agency under the aegis of the Nigeria Federal Ministry of Science and Technology, was established by Decree 70 of 1979. Its objective was to implement a more efficient process to ensure the acquisition of best contractual terms and conditions in technology transfer and for the adaptation of imported technology. NOTAP was also mandated to conduct the registration of all foreign technology transfer agreements having effect in Nigeria, as well as to promote locally generated technologies, promote intellectual property, and encourage the development of inventive and creative skills among Nigerian scientists, inventors, researchers in universities, and innovators in all fields.

At the University of Lagos (UNILAG), the Research Management Office (RMO) was established in 2012 and subsequently birthed the Innovation and Technology Management Office (ITMO) in 2017. Both Offices were mandated to work synergistically towards building and implementing models for modern university-based research and innovation management processes as well as empowering faculty members and their research teams to engage better with industry. They also focused on building networks for interdisciplinary innovation and entrepreneurial ecosystems, and harnessing opportunities for technology transfer and commercialization. The University had (and still has) the potential to leverage its prime location being at Lagos - Nigeria's industrial and economic capital within a metropolitan system. While the ITMO has, over the past seven years of its establishment worked with the immense support of the University's management to build, maintain, and advance a sustainable innovation ecosystem for the University, there have been remarkable successes and challenges. This paper focuses on some of the major experiences of the Innovation and Technology Management Unit of the RMO while articulating strategies employed to build locally relevant innovation management systems, as well as tackle some of the unsettling challenges at the inception of the Office.

THE UNILAG MODEL FOR THE DEVELOPMENT OF A REASONABLE INNOVATION MANAGEMENT SYSTEM

There are myriad models adopted by universities to contribute efficiently to innovation processes. Some of these processes are specifically and purposefully developed by the universities themselves or by policy design for that reason. Some of such strategies include, but are not limited to, academic patenting, education programs for innovation

and technology commercialization, academic training for the creation of start-ups, student-based entrepreneurship, and University-Industry collaboration for technology transfers. In addition, policy measures addressing opportunities for collaboration between universities and the private and public sectors, are examples of channels/activities with potential for positive impacts on innovation processes [10, 14, 15].

The Innovation and Technology Management Office (ITMO) of the University of Lagos implemented major strategic interventions to efficiently manage innovative output of research with a vision to make a significant contribution to social and economic development. The operational framework of the ITMO is anchored on linking protected innovations of faculty members resulting from sponsored research (University or external funding), or non-sponsored research inventions to business enterprises for commercial uptake either to improve current business models or start a new enterprise. The framework is illustrated in Figure 1 and shows how ITMO receives a disclosure of invention from members of the community, processes the invention for intellectual property, prototypes the invention, incubates and then commercializes the invention in conjunction with the University's Entrepreneurship and Skills Development Centre (ESDC). The University's Innovation Management Policy stipulates that Innovations from funded research can only proceed to the ITMO through the research grant coordinating unit of the University – which is the Research Management Office (RMO). This is to ensure proper tracking of research milestones. The policy, nevertheless, allows for non-funded inventions of faculty members/students to be disclosed directly to the ITMO for access to support with prototyping (e.g. proof of concept), patents and technology transfer.

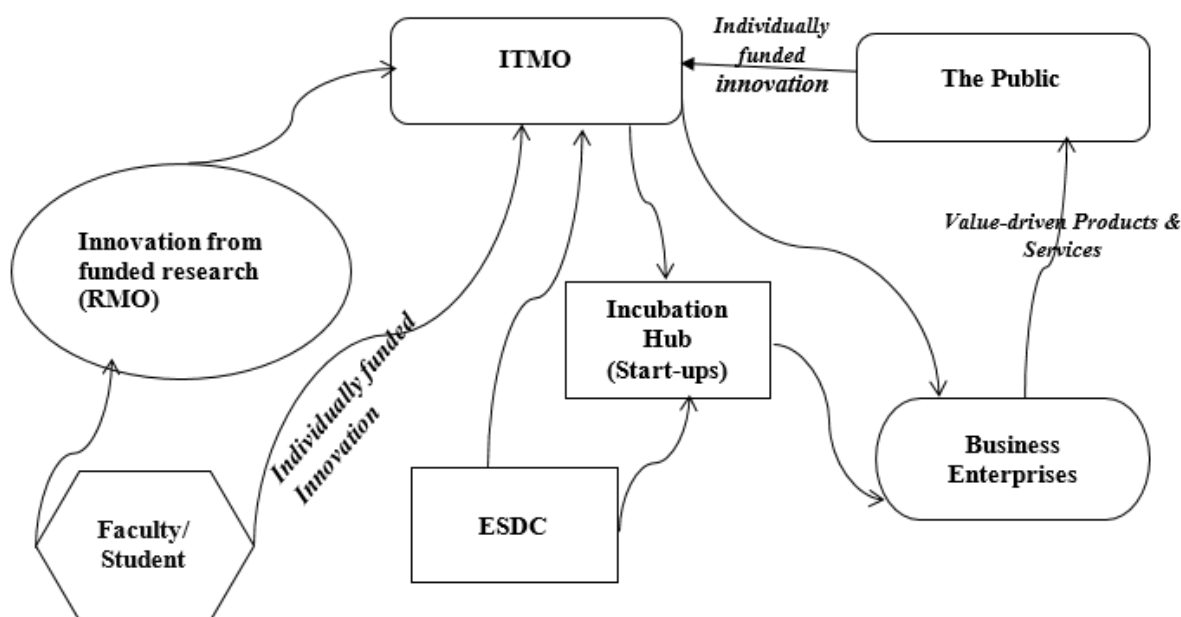


Figure 1. Activity flow paths for Innovation and Technology Management at the University of Lagos, Nigeria

Building a Sustainable Innovation Ecosystem

The subsequent sections provide narratives of the steps and strategies employed by the University to set up a sustainable innovation management ecosystem with a view to making significant contribution to community and national development.

ESTABLISHMENT OF AN ENTREPRENEURSHIP AND SKILL DEVELOPMENT CENTRE (ESDC)

The Entrepreneurship and Skills Development Centre (ESDC) was established by the University in 2016 and serves as a dedicated centre focusing on promoting entrepreneurship among its students, staff, alumni, and society. The ITMO works collaboratively with the ESDC towards developing commercialization models for protected inventions and to promote a culture of entrepreneurship among staff and students. There was a commitment to sensitize overall entrepreneurial thinking and entrepreneurial capital while building a dynamic economy through entrepreneurship, and indeed a responsibility for the commercialization of innovations with the capacity to proffer simple solutions to complex problems of society through engagement with industry [16]. The Innovation Unit of the University sought to facilitate innovation and entrepreneurial-driven economic growth by encouraging entrepreneurial culture and fostering collaboration among groups of entrepreneurs, business incubators, industry actors, venture capitalists, etc.

CALLING FOR INNOVATIVE SOLUTIONS TO ADDRESS SPECIFIC SOCIETAL PROBLEMS THROUGH HACKATHONS

Traditionally, the ITMO encourages innovation among faculty and students of the University, alumni, business enterprises, organizations and interested members of the public towards facilitating societal economic development through the transfer of scalable intellectual property. The ITMO developed and piloted several institutional platforms for the galvanization of the innovative ideas of members of the University community into tangible outcomes, as well as for the commercial uptake of such innovative outputs for the benefit of society. In this way, the ITMO served as the contact space for coordinating “town and gown” engagement and maintained a culture of symbiotic relationship. Today, to strengthen the innovation trickle-down mechanism, the ITMO scouts for and receives novel inventions with the potential to proffer solutions to societal problems, from members of the University community. One of the practical steps frequently taken is the conduct and facilitation of periodic sectoral surveys to identify industry and society problems as well as articulate possible solutions. To achieve this, ITMO conducts industry-specific innovation challenge competitions (e.g. Hackathons), which have, to a large extent, proven to be a useful approach for facilitating the translation of research/development to innovation and linking R&D of members of the University community to entrepreneurship and commercialization.

The Unit coordinated the development of the UNILAG novel Ambubag ventilator for patients with respiratory distress during the COVID-19 pandemic. This invention has been patented and has opened up opportunities for University-industry collaboration for scale-up and commercialization of the invention. Indeed, the Lagos State

Government funded the development of the prototype, which has been completed and there are ongoing negotiations for industrial production. The ITMO also inaugurated the first-ever UNILAG Innovation Challenge among students in February 2020. The event had seven teams across faculties including the College of Medicine, which was selected for the final round. In essence, the hackfests organized by ITMO have proven to be a reliable strategy for galvanizing innovation aptitude and capabilities of the University community.

INTELLECTUAL PROPERTY FILING AND DOCUMENTATION

The Innovation and Technology Management Office (ITMO) of the University offers patent drafting and filing services to members of the public as part of an internal revenue generation drive. The Office also engages with inventors/innovators in the preparation of invention disclosure documents and provision of administrative and technical support in the packaging of patent/copyright documents. Other support functions for Innovation management include managing, coordinating and keeping records of intellectual property flow in the University. The Office, however, also provides patent specification drafting and filing services to the general public for a fee. At some point, the Office realized that faculty members needed support with funds for Intellectual Property Applications and Licensing, so it negotiated for the approval of a dedicated fund for patent-related and innovation activities in the University by ensuring that the Central Research Committee (CRC) approved a line budget for innovation in all proposals for seed grant sponsored by the Internally Generated Revenue (IGR) within the University. In the last two years, 19 historic patents of various inventions from across the faculties in the University were successfully filed. In the four years May 2017 - July 2021, the ITMO developed and published a Senate-approved Patent Management Protocol for the University. This became the University's first comprehensive patent governance document. In addition, the Office successfully submitted a proposal for the transformation to an Innovation and Technology Management Office with a wider mandate for greater service delivery to members of the public. This was approved by the Governing Council at its meeting on May 5, 2021.

BUILDING CAPACITY IN INNOVATION AND SECURING PARTNERSHIP

The UK Department for International Development (DFID) defines research capacity as "the ability of individuals, organizations and systems to undertake and disseminate high-quality research effectively and efficiently" [17]. Capacity building is a complex notion which involves the development of knowledge, skills, attitudes, and social capital to set objectives, achieve desired outcomes, and create adaptive procedures to solve problems [18]. At the University of Lagos, our objectives on building capacity for responsible innovation focus on strengthening the skills and abilities of researchers to identify social and infrastructural developmental challenges in society, to translate all identified needs into researchable problems, to proffer innovative solutions using scientific approaches, and to disseminate innovative outcomes to respective end-users (such as firms, government institutes, extension organizations, etc.). UNILAG's ITMO

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aims to build a critical mass of researchers, who would employ innovative approaches in tackling problems of national priority, and promote capacities for innovation in ways that best address the local needs of society. In this way, we believe that our researchers will be better placed to advocate for solutions with local relevance.

UNILAG ITMO has, since its inception, been supportive of informing institutional policies for technology transfer and engagement with industry. In the first few years after the establishment of the Office, biannual “train the trainer” workshops on intellectual property management protocols and patent drafting were conducted for 45 selected staff members in cohorts. There were also capacity building programs for knowledge translation and technology transfer within the innovation space for members of the University community. The Office inaugurated 12 Faculty Innovation Officers as faculty adjuncts to coordinate innovation activities in the 12 faculties of the University. In addition, there were training programs in conjunction with the Entrepreneurship and Skills Development Centre (ESDC) to expose individuals to a wide range of technology transfer activities for enhanced skills and experience in the process of commercial development of inventions.

ENGAGEMENT WITH INDUSTRY

Universities are increasingly playing significant roles in today’s knowledge-driven economy, especially with the creation of new knowledge [2, 19]. The role of the industry sector in synthesizing new knowledge through strong collaboration with universities, for value-addition to products and services, and gaining a competitive edge is also widely acknowledged [19, 20, 21, 22]. This synergy has been recognized to foster possibilities for development at local, national, and global levels. In the last few years, the University of Lagos has received requests from Micro, Small and Medium Enterprises (MSME) for knowledge-driven innovative solutions, for business solutions, quality assurance in business products and services, as well as research-driven better business performance. Some of these requests include opportunities for consultations and formal engagements with the University researchers on exploring local technology solutions such as: indigenous fabrication of machinery, process automation, technology transfer/adaptation solutions and feedstock substitution. Hitherto, such engagements were at the level of individual-business enterprise interface devoid of an institutional platform – which distorts proper articulation and documentation of what the University contributed to improving business competitiveness and societal well-being.

Furthermore, the ITMO played active roles in the ongoing university-private sector discourse for mutually beneficial relationships. The flow paths for innovation and technology management at the University of Lagos as well as the methodical processes for the transfer of innovation from funded research through the Innovation and Technology Management Office with synergistic input and support from the Entrepreneurship and Skills Development Centre, are as shown in Figure 1. Ultimately, this management pathway drives activities at the Incubation hub, supports development for spin-offs, and represents our model at the University of Lagos.

SUSTAINING THE INNOVATION ECOSYSTEM

A revolving fund model is deployed for sustainability at the Innovation and Technology Management Office. This model is built on the premise that after a few years, the Office should be able to sustain its activities from income generated from the services it renders the University researchers as well as the community at large. The model comprises the following components: budgetary allocation from the University in the first few years, and Innovation and patenting charge line on every research proposal approved for a Central Research Committee (CRC) grant. A fixed percentage on the Facilities and Administrative Charges on externally funded research as well as income generated from patent drafting/filing services offered to members of the public. The generated income from Technology Transfer services offered to business enterprises is also a component of the pool of sourced funds. Others include income generated from syndicated training and education programs on innovation and technology management as well as sponsorship support from external partners.

CHALLENGES

Initially, one major challenge that was facing the ITMO was the non-availability of stable funds and little or no access to financing mechanisms. Adequate financing is unarguably a vital necessity at all stages of an innovation cycle, from conceptualization and ideation to commercialization, prototyping, piloting, and, eventually, business sustainability on a long-term basis. The University has not been able to leverage exhaustively the potential for funding through angel investors, industry investment, and other seed investors. There is also not much support for Small Medium Enterprise (SME) financing through affordable loans with low-interest rates without complicated demands for collateral at most commercial banks in the country. However, a range of new actors seem to be springing up on the horizon with hopes and promises to support local innovation. The University, therefore, sees the need for more formal engagements with industries and angel investors. There are also emerging expectations for innovative funding such as corporate venturing and crowdfunding, albeit not fully explored by the University yet. These mechanisms will perhaps allow access to public support schemes for innovation financing.

Another challenge is the understaffing of the Innovation and Technology Management Office (ITMO) as the paucity of human resources has, to a large extent, slowed down optimal performance. Nevertheless, efforts are in place to not only reinforce staff strength through employing additional staff but also to build the capacity of staff through training for global best practices in innovation management, as well as institutionalize a career structure in innovation management. The lack of feedback from faculties to the Office is also another challenge requiring critical intervention, as such information from faculty could help refine existing processes, articulate reforms for better performance, and improve upon deliverables.

Judging by our experience, the time needed for the drafting of patents, obtaining certified patent rights, and commercialization of innovation can be very long, as the

ITPO has to work with the National Office for Technology Acquisition and Promotion (NOTAP). Business growth and development can also be discontinuous and erratic in the face of our fragile economy with heightened susceptibility to micro-economic distortions. In our opinion, the society and stereotypes bring additional dimensions to this litany of challenges as there is, generally, a lack of trust and confidence in local innovation, including research outputs from our local universities. This mistrust invariably has multiple causes. First, there is a traditional over-reliance on foreign technologies and local innovations are taken with a pinch of salt and multiple suspicions. The public confidence on universities for reliable technology is at its lowest ebb as the expertise of researchers to produce competitive products is very frequently questioned. Second, the lack of deeper levels of engagement with industry in collaborating with universities forestalls critical understanding of possible avenues for mutually beneficial collaboration. There is also a remarkable distrust by industry about the potential of universities to deliver globally competitive innovation. This double-edged scepticism from industry and the community remains an impediment to the growth of university impact in this space.

DISCUSSION

Building a sustainable Innovation ecosystem in the University, nurturing platforms for university spin-offs and supporting entrepreneurship are critical dimensions of innovation management [1, 19]. The University of Lagos recognizes the importance of these factors as drivers for the contribution of the University towards national development, and has set-up mechanisms to establish and sustain an innovation management ecosystem. The University continues to build capacity for academic entrepreneurship and commercialization of innovation through harnessing innovative output of research from staff and students, while creating novel pathways for its management in our limited resource setting in ways that maximize potential for sustainability and impact.

The impetus for the establishment of the Innovation and Technology Management Office (ITMO) to coordinate innovation and technology management is driven by the increasing need for the University to harness the creative and innovative outputs of completed research with the potential to add value to public utility products and services, link the town to the gown, as well as contribute ultimately to national development. The ITMO, furthermore, offers the potential to assist the Entrepreneurship and Skills Development Centre (ESDC) in accomplishing its mandates and facilitates the activities of the Centre by acting as the primary interface for solutions to real-time enterprise challenges emerging from the Centre. In these settings, Research Administrators have played significant roles in the recorded successes of the Office since its inception, and continue to explore avenues to improve upon delegated tasks.

However, the ITMO is at this time experimenting with new initiatives and novel models for the successful connection of the various innovation activities of faculty members

into a more coherent university ecosystem logic. This novel ecosystem involves recognizing available resources within the academy and finding ways for deeper engagements with industry and the public sector. We acknowledge that University-Industry (UI) engagement for knowledge transfer occurs through a wide variety of channels [20], such as consulting, contract research, membership of advisory boards, joint creation of physical activities and infrastructure, training of personnel, and joint placements or supervision of students [21, 22]. Nevertheless, our focus in the current paper draws an exclusive view on the scope of UI partnership for research commercialization activities due to the University's recent drive to explore revenue generation through executing licensing deals and establishing spin-out companies.

Our ecosystem model is consistent with the Triple Helix Model [23] – a metaphor alluding to the helical structure of DNA. The authors contend that the helical structure of the DNA determines the structure and genotypes of its living entity. This comparison is applicable to the strength and quality of interactions between academia, government and industry as a *sine qua non* for successful management and utilization of innovation activities in a given innovation system at the country level. It is, however, important to highlight some of the challenges frequently encountered. For instance, UNILAG has identified an area where significant efforts should be invested, which focuses on the need to change public (including industry and government) perception and narrative of the quality of innovation in academia through periodic engagement with the community, science communication of outputs and the relevance of outputs, as well as public re-orientation for confidence in the innovative output of local research. In this way, support can be garnered from within and beyond our immediate community for rapid uptake, investment support, funding, and successful commercialization of innovation. With the existing ecosystem and an articulated approach for community and industry engagement, UNILAG seeks to strengthen linkages and prioritize innovation management to make an impact in society.

The sustainable ecosystem for innovation management in low and middle-income countries must find innovation managers and administrators who will work closely with faculty researchers to not only promote the successful management of innovation but to also promote the visibility of innovation and recognition of competitiveness. The activities and frameworks for promoting innovation developed and deployed by the University are not necessarily suitable for other universities, and should not be adopted without a critical look at available support from the existing managerial structures of the University and other possible practices that might yield intended outcomes. Having said that, the University of Lagos ITMO has certainly learned quite a lot from its own internal experiences working with faculty as well as a critical evaluation of what could be considered most suitable given the prevailing social, economic, financial and resource situations.

While this manuscript shares our unique model, the important message is that each university must look inwards and develop its own realistic strategy based on a thorough analysis of the strengths, opportunities, weaknesses, and threats in their innovation

channels. Careful consideration could also evaluate existing networks at regional, national and international levels for strong collaboration with industry and public sectors. There is a need to learn how to best communicate university innovation to society. This is increasingly becoming a prerequisite for securing research funding, for Research and Innovation programs within, and for the development of policy instruments defining terms of engagement for technology transfer. The establishment of a sustainable innovation ecosystem in Nigerian universities for novel ideation and entrepreneurial competence remains a key constituent of the national innovation processes and requires inputs from users, industry and government. Researchers and Research Administrators have a key role to play in driving this ecosystem.

CONCLUSION

The Innovation and Technology Management Office, University of Lagos is resolved to play a pivotal role towards making significant contributions to national development through the establishment of a sustainable innovation ecosystem in the University for idea development, management of intellectual property, capacity building for technology transfer, and entrepreneurial competence. The Technology Transfer arm of the Office has made giant strides in patenting some novel inventions with commercial viability and working closely with the Entrepreneurship and Skills Development Centre to explore spin-off potentials. Nigerian universities must begin the process of harnessing efficient systems and frameworks for innovation management, including engagement with industry, government and society, for overall national development.

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BIOGRAPHY

Dr. Patrick E. Okonji has vast experience working as Senior Research Fellow and as University Research and Innovation Manager. He possesses strong academic and professional background in Public Health and has worked with Research Centres focusing on Public Health and Safety, Epidemiology, Low Vision Rehabilitation, and Environmental Health. He currently works at the Research Management Office of the University of Lagos. His roles include leading and participating in cutting-edge research in the fields of Public Health, Environmental Health, Low Vision Rehabilitation, and Digital Health. He also works with and supports research universities on efficient strategies for exploring funding opportunities and for ensuring adherence to funders' guidelines in the conduct of innovation-driven research. Patrick coordinates competitive research studies along tested value propositions to promote sustainable and inclusive development through strategic engagement with stakeholders with interests in the research to market Innovation and ensure seamless technology transfer.

Prof. M.O.H. Amuda is the current Director, Centre for Information Technology and Systems at the University of Lagos. He was the immediate Past Head, Department of Metallurgical and Materials Engineering, and the Pioneer Deputy Director (Innovation), Research and Innovation Office University of Lagos, 2017-2021; now referred to as the Innovation and Technology Management Office (ITMO). He is also the Pioneer Head, UNILAG Intellectual Property and Technology Transfer Office and Chair in Welding Process Analysis and Fusion-based Surface Modification at the Faculty of Engineering. Prof. Amuda is also the Team Lead, Materials Development and Processing Research Group (MADEPREG) at the Department of Metallurgical and Materials Engineering, Faculty of Engineering, University of Lagos, Akoka Main Campus.

CONTRIBUTION INFORMATION

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Prof. M.O.H. Amuda: Writing – review & editing.

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