MOTIVATION FOR ACADEMIC ENTREPRENEURSHIP IN A DEVELOPING COUNTRY

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ABSTRACT

Today's globalized economy is driven by knowledge, creativity and innovation. Knowledge generation and exploitation have become the hallmark of national competitiveness in both developed and newly industrializing economies. The emergence of Covid-19 pandemic has further proven that knowledge application is central not only to business survival but also to national sustainability. The astronomical speed that various Covid-19 vaccines were developed further shows that knowledge is indeed the currency of the 21st century. The relevance of knowledge institutions, universities especially, in creating new knowledge and transmitting them to the industry through students, exchanges and mobility, consultancy and contracts is central to knowledge diffusion. Building universities that are responsive to societal challenges has been a subject of academic and policy debate since the emergence of 'third mission' and entrepreneurial universities. Earlier studies have shown that universities with entrepreneurial mindset stand the chance to access industry resources, attract talented students and faculties and impact the society. How best to stimulate and sustain faculty's participation in entrepreneurial activities remain a challenge for university administrators and policy makers. To overcome this challenge, it is imperative to understand faculty's motivation for academic entrepreneurship and provide appropriate interventions to sustain it for improved relevance to industry and society. This article examines motivation for academic entrepreneurship among selected universities in Nigeria. Data were collected from two hundred and twenty-nine (229) lecturers in the faculties of science, technology and engineering with the aid of questionnaire. The results showed that the mean ratings of motivation for academic entrepreneurship among the faculties are to: acquire new skills and knowledge (4.02), achieve career development (4.0), provide opportunity for students (3.96), capitalize on perceived opportunity (3.86), secure fund for laboratory equipment and utilise industry resources (3.76) and lack of adequate resources within the university (3.59) among others. However, poor rewards system in the university was perceived to be discouraging to academic entrepreneurship (3.4). The results suggest that provision of robust incentive scheme and creation of entrepreneurship infrastructure where faculty and students can explore commercialisation potential of research outputs are plausible policy options to stimulate innovation in the university. The paper concludes with policy recommendations for university stakeholders.

Keywords: Academic Entrepreneurship, Innovation, Science and Technology, Commercialization, Nigeria.

INTRODUCTION

Academic entrepreneurship, entrepreneurial university and the need for universities to generate innovations that can spur development is more relevant in today's globalized world. Since the globalized world is driven by knowledge, creativity and innovation, knowledge generation and exploitation have become the hallmark of competitiveness (Siyanbola, 2019;

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Adelowo et al., 2019). The emergence of Covid-19 pandemic has further proven that knowledge application is central not only to business survival but also to national sustainability. The astronomical speed that various Covid-19 vaccines were developed further shows that knowledge is indeed the currency of the 21st century.

The relevance of knowledge institutions, universities especially, in creating new knowledge and transmitting them to the industry through students, exchanges and mobility, consultancy and contracts is central to knowledge diffusion. Building universities that are responsive to societal challenges has been a subject of academic and policy debate since the emergence of 'third mission' and entrepreneurial universities. Earlier studies have shown that universities with entrepreneurial mindset stand the chance to access industry resources, attract talented students and faculties, and impact the society (Clark, 1998; OECD, 2012; Doh, 2018; Adelowo & Surujlal, 2020). For university to become entrepreneurial, certain mindsets and operational infrastructure cum policy incentives have to be in place. For instance, the academic response to the USA Bayh-Dole ACT of 1980 resulted in huge patents disclosures, technology transfer and commercialisation. The aftermath of the ACT led to the creation of technology transfer offices (liaison office) in the university to encourage researchers to file for patents, and get help to commercialise their inventions.

The USA experience changed European perspective on knowledge commercialisation as well. One of the giant strides towards the development of entrepreneurial universities across Europe is the establishment of the European Technology Transfer Offices Circle which serves as an important research and technology transfer network (JRC, 2021). The Circle was established in Grenoble to bring together the major public research organisations in Europe to create channels for technology transfer and commercialisation, share experience, collectively remove barriers to innovations and create positive societal impacts (JRC, 2021). The initiative has since contributed to the strengthening of entrepreneurial culture and innovation performance of research organisations in Europe. In fact, it is one of the channels adopted to overcome the 'European Paradox' by promoting industrial linkage and technology commercialisation. The concepts of technology transfer later surfaced in Asia, Latin America and in the recent decades Africa (NOTAP, 2019; NIPMO, 2021).

The technology transfer in Africa is relatively gaining prominence in the last decade; their efforts have been concentrated on sensitizing the academic community, and organizing capacity building workshops on technology transfer, intellectual property management and research and innovation management in the institutions (Siyanbola et al., 2019). Beyond the establishment of technology transfer offices and creation of policy incentives to stimulate entrepreneurship in universities, individual characteristics and motivation of faculties also play central roles. Examining these characteristics and motivation among faculties in universities from developing countries are important for policy and practice.

The level and depth of individual characteristics and motivation provide university administrators and policymakers with the understanding of innovation triggers among the faculties, making them better able to direct policy incentives to further promote it. Other important factors for consideration in academic entrepreneurship are the economic contexts where universities and faculties operate. However, the focus of this paper is on the motivation for AE in a developing country, Nigeria with a view to providing in-depth understanding of how AE could be sustained in the system. Some initiatives to promote technology transfer and commercialisation in the country could yield improved benefits provided efforts are channeled optimally. For instance, directing incentives to faculties who already have potentials for AE

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tends to be more optimal than just trickling it on everyone in the system. Recently, one of the Vice-Chancellor of the first generation universities promised patentees during certificate-giving ceremony that each of them will be entitled to financial assistance. This singular statement propelled other researchers to file for patents and other categories of IP such that several researchers received their certificates in the subsequent ceremony. This showed ripple effects embedded in the provision of incentives to faculties who engage in patent disclosure, technology transfer and commercialisation in the system.

MOTIVATION FOR ACADEMIC ENTREPRENEURSHIP: PERSPECTIVES FROM THE LITERATURE

Motivation is regarded as the impetus for faculty members to engage in technology transfer and commercialisation efforts, either personally or in cooperation with other faculties. Understanding what motivates faculties to engage in AE is a pointer to specific structures and incentives that can help increase AE efforts (Balven et al., 2018). The authors regarded motivation as intra-individual level phenomenon with both intrinsic and extrinsic values (Gerhart & Fang, 2015). Intrinsic motivation relates to behaviours that are expressed based on inherent satisfaction derivable from that behaviour (Deci & Ryan, 2000). For instance, most faculties who have disclosed one invention or another derived pleasures in doing so without any expectation of financial benefits. Balven et al. (2018) found that most faculties are motivated by academic activities and solving societal problems with their research engagements, but not necessarily to make money.

Extrinsic motivation tends to consider benefits accruable to individual or institution from performing certain behaviours, particularly AE. Universities tend to consider financial benefits to be derived from technology transfer and commercialisation as motivation to engage in those activities. In fact, technology transfer offices assist researchers or scientists to license their invention for pecuniary benefits. In resource-scarce universities like Nigeria, faculties tend to engage AE for certain reasons including finding placement for their students to better grasp industrial experience in certain technological fields. Others tend to foster industry linkage by introducing their technologies to potential investors or established firms for commercialisation. Providing opportunity for industry-academia linkage is central to technology transfer and commercialisation and universities with strong industry linkage perception stand better chance to attract funding for research. Morales-Gualdron et al. (2009) examined entrepreneurial motivation among academia in Spanish universities using multidimensional constructs including personal, entrepreneurial opportunity, scientific knowledge, resource availability, existence of incubator organisation and social networks. The study found that scientific knowledge of faculties represents most important motivation for AE, followed by personal motivation.

Doutriaux and Peterman (1982) found that boredom generated by routine of profession and the desire for more freedom and independence were main motivation for AE among Canadian spin-off founders. Advancement of science and its applications, personal opportunity for entrepreneurship and the need to make money were the main motivations for AE among 22US and Canadian academic entrepreneurs (Samson & Gurdon, 1990). Motivations such as market pull, technology push, personal satisfaction, resources availability and the existence of innovation infrastructure are key motivations among 104 Finnish inventors (Autio & Kauranen, 1994). In a revealing qualitative study by Shane (2004), broader categories of motivation for AE emerged including psychological and career-oriented. The psychological motivations identified were desire to put technology into use (technology push); desire for wealth; and desire for

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independence. The career-oriented motivations included the stage in the academic life cycle; status within the university; being a star scientist and prior experience in the business activities. The foregoing represents core motivation for AE in developed economies. Considering that universities in those countries are well developed, possessing innovation infrastructure, robust policy incentives, knowledge intensive firms that appreciate knowledge inputs for production, better industry linkage capability and orientation towards innovation and knowledge transfer.

Within the developing economy context, most universities operate in near isolation, with little or no interaction with industrial sector. Most of the big companies and multinationals have their R&D base in the home country while others have private laboratories in the country. Governments in developing countries have been the advocate of research commercialisation and technology transfer through their research institutions.

For instance, the National Centre for Technology Management, an Agency of the Federal Ministry of Science and Technology in Nigeria has been at the forefront of technology and innovation management in the country, continuously pushing for seamless interaction between academia and the industry. Government encourages the use of tax rebates and holiday to motivate companies' participation in local R&D activities or forced them to engage with local research institutions, but the efforts seems to be producing little or no results. Differences in motivation and inability to shift ground between industry and academia, slow perception of academia to respond to industry needs, and poor collaboration culture of the industry have been seen as hindrance to effective linkages between academia and industry. A study of university-industry linkage in the Turkish aviation industry has equally shown that differences in the research orientation, poor industry experience, and low entrepreneurial drive among academics are responsible for the weak linkages (Peksatici & Ergun, 2019).

Earlier studies have articulated several efforts and initiatives Nigerian government has put in place to encourage AE and devise robust means of commercialising research outputs from universities and research institutions (Adelowo, 2020; Adelowo & Surujlal, 2020). One of the incentive for AE is the assignment of more points to patent and technology transfer activities than mere paper publication. Indeed, paper publication is a widely recognised mean of assessing researchers for promotion. Today, patent earns more points for researchers at promotion than paper publication. Other incentives include the establishment of technology transfer offices in the research system to provide up-to-date information on the utilisation and management of intellectual property to researchers, and assisting them to file for patents and invention commercialisation (NOTAP, 2019).

The establishment of technology business incubators within or near research-intensive universities is another effort in the right direction to promote AE among the faculties in Nigeria. Despite all these initiatives and established structure, the rate of patenting is low and the degree of involvement in technology commercialisation is little (Adelowo, 2018). Diverse reasons could be adduced to low generation of patent, technology transfer and commercialisation among Nigerian faculties including poor research infrastructure, low investment in R&D, poor orientation towards AE, limited research resources and the publish or perish syndrome. Despite these challenges, some universities have recorded successes in AE, including patent generation and research commercialisation. This paper therefore seeks to provide detail motivating factors for faculties' participation in AE in selected universities in South West Nigeria.

RESEARCH AND METHOD

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This paper adopts descriptive analysis of a cross-sectional survey conducted among faculty members in science, technology and engineering fields from thirteen selected universities in Southwest Nigeria. Details of sampling selection procedure have been thoroughly discussed in the earlier studies (Adelowo, 2018; Adelowo & Surujlal 2020). The selected faculties include those whose research engagements have potential for tangible outputs; some of them have actually created intellectual property at the time of data collection. Related academic entrepreneurial activities of the faculties in the schools have also been succinctly reported in Adelowo and Surujlal (2020) to include start-up formation and industry collaboration (SUFIC), training related entrepreneurial engagements (TREE), faculty externship (FE) and university-related entrepreneurial engagements (UREE).

Following the studies on the motivation for AE by Morales-Gualdron et al. (2009), thirteen motivation-related items were identified and presented to the faculties for them to rate the extent to which they perceived them as motivation to be involved in entrepreneurial activities. The thirteen items include the need to acquire new knowledge and skills, capitalize on perceived opportunities, utilise industry resources, desire for wealth, personal satisfaction, to provide opportunity for students, secure fund for laboratory equipment and good/poor university reward system, insufficient income and job related dissatisfaction. In the thirteen universities, a total of three hundred and fifty copies of the questionnaire were distributed across the selected disciplines while two hundred and twenty-nine copies were retrieved. The retrieved copies of the questionnaire were all useful for analysis. The data were analysed using descriptive and factor analysis with the aid of SPSS version 20. The results of the analysis were presented using tables.

RESULTS AND DISCUSSION

This section discusses the results of the data analysis, presenting individual motivation item ratings and mean scores before proceeding to showing the outcome of the exploratory factors analysis. It is observed in Table 1 that virtually all motivation items were rated far and/or fairly above the mean of 3.0 that is medium. However, the real overall mean rating of 3.67 was computed as a benchmark against which individual mean ratings were compared. The implication of the general outlook of the results indicate that all the items represent important motivating factor for AE but some are stronger motivation than others. The acquisition of new knowledge and skill related to entrepreneurship was rated as one of the most important reasons for engaging in AE. This indicates that about 77.7% of the faculty members reported the need to acquire new knowledge and skill as their source of motivation, showing mean rating of 4.02 far above the stipulated benchmark. This is important as different skill sets are required to engage in entrepreneurial activities that can culminate into patent generation, technology transfer and commercialisation. Another important source of motivation rated high (76.2%) by the faculty members was the desire to achieve career development, probably because entrepreneurial engagements provide platform for additional fund to be sourced from interested parties, particularly investors or industrialists to further their research. The results are consistence with the findings in Hayter (2011) where it was reported that AE were motivated by the urge to move their technology out of the university to attract funding for additional research. Personal satisfaction is another important motivation for the faculties in Nigerian universities to engage in AE. About 75.9% of the faculties rated personal satisfaction as the motivation for AE. The personal satisfaction here is one of the intrinsic reasons why such behaviour is exhibited (Deci and Ryan, 2000). Given that majority of the faculties have personal satisfaction in doing AE is an indication that with little incentive, there could possibly be an explosion of knowledge transfer in

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the system. Furthermore, about 73.4% of the faculties are motivated to engage in AE so as to provide opportunity for their students to gain practical industrial experience. Students are fundamental source of knowledge dissemination to the industry and some faculties introduce their students to relevant firms, particularly to put into practice whatever they were taught in the laboratories and classes. There is already a special programme in the country for students in the fields of science and technology to visit industry twice before the completion of their programme. The first one which happen in the second year is called SIWESS while the latter one undertaken in the year 4 is industrial attachment (IT). Faculties refer students to relevant firms for both the SIWESS and IT. Other important motivating factors for AE rated high by the faculties included the need to capitalise on perceived opportunity, to securing fund for laboratory equipment and to utilise industry resources. Majority of them are also motivated by lack of industry partners. The absence of industry partner to collaborate with on technology commercialisation could be a push factor for faculties who believe so much in the feasibility of their project. For instance, some faculties have established private ventures to demonstrate commercial viability of their technologies, although with little returns. This corroborates Hayter's argument that academics' definition of success differs, as it could mean technology development to some, others may consider monetary gains as a measure of success (Hayter, 2011). Some faculties perceived themselves as successful not only by publication impacts achieved, but also by placing the products of their research endeavour in the market.

Moreover, faculty members' rating of job dissatisfaction and university reward system as motivation for AE were the least.

Table 1
MOTIVATION FOR ACADEMIC ENTREPRENEURSHIP

Motivating factors	Very low	Low	Medium	High	Very high	Mean
	%	%	%	%	%	3.67*
New knowledge and skill acquisition	3.3	4.7	14.4	41.9	35.8	4.02
Achieve career development	1.9	5.6	16.4	43	33.2	4
Personal satisfaction	2.3	4.2	17.6	44.9	31	3.98
Provide opportunity for students	1.4	4.7	20.6	43	30.4	3.96
Capitalise on perceived opportunity	3.3	4.2	22	43.9	26.6	3.86
Insufficient income	5.5	8.2	21.5	29.7	35.2	3.81
Secure fund for Lab equipment	2.8	9.3	23.7	37.2	27	3.76
Utilise industrial resources	3.7	7.9	25.2	40.7	22.4	3.7
Lack of industrial partners	8.2	8.2	22.3	30	31.4	3.68
Take advantage of institutional opportunity	6.6	7.5	22.5	41.8	21.6	3.64
Lack of resources within the university	7.7	9	23.5	36.2	23.5	3.59
Desire for wealth	5.6	10.6	26.4	35.2	22.2	3.58
University reward system	12.5	14.4	19.4	31.9	21.8	3.36
Job related dissatisfaction	12.2	19.9	25.3	30.8	11.8	3.1
1=very low, 2=low, 3=medium, 4=high, 5=very high, * Benchmarked mean						

Further to the above discussions, the entire motivating factors for academic entrepreneurship in Nigeria were subjected to data reduction strategy to summarize the entire

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items more succinctly, using Principal Component Analysis (PCA) and Promax with Kaiser Normalization Method. The items were examined for internal consistency and reliability. The analysis showed good internal consistency and high reliability after they were subjected to analysis of variance and reliability tests. The entire reliability test showed Cronbach's Alpha of 0.89 with significant analysis of variance ($F=21.9$, $P<0.01$).

The result of the analysis showed that the Barlett's Test of Sphericity was statistically significant (1487.7, df =105, $p<0.000$), and the Keiser-Meyer-Olkin index of 0.877 was 'meritorious' (using the thresholds proposed by Kaiser, 1974). Three factors were identified with Eigen values greater than one and accounting for 62.71% of the variance that explained motivating factors for AE in the universities. The three factors were retained based on the 'elbow' in the scree plot and 'principle of parsimony' (Handfield & Melnyk, 1998). The first factor dimension is dominant, accounting for 40.4% of the variance, while others account for 15.67%, and 6.71%. These factors followed theoretical richness as they represented key motivators of AE among faculty members (Doutriaux & Peterman, 1982; Morales-Gualdron et al., 2009; Balven et al., 2018).

The structure matrix of factors loading, as reported in Table 2, shows the correlations between the items and the factors. The coefficients reflect all paths from a variable to a factor, since the factors are themselves correlated.

The first factor has seven items loaded strongly on it and most of these items related to the desire or anticipation of faculty members to push for knowledge application for the betterment of their careers, students and institutions. These anticipatory items explained 40.4% of factors motivating AE among the faculty members.

This factor is then renamed as 'push factor' for AE. The second factor relates to key challenges encountered by the faculty members that forced them to look elsewhere for resources and incentives to become better academics. This factor has five items loading and explained 15.67% of factors motivating AE. Majority of these items relate to resource-constraints, poor income and job dissatisfaction. The third and the last factor had three items loading and are related to extrinsic motivations and positive incentive scheme in the universities. This factor accounts for 6.71% of the motivating factor for AE and is renamed extrinsic factor. In summary, the three factors extracted from the entire motivation factors AE among faculties in Nigeria are push factor, resource constraints factor and extrinsic factor.

Table 2
FACTOR LOADING AND BASIC PARAMETERS OF MOTIVATION FOR AE IN NIGERIA'S UNIVERSITIES

	Component		
Structure Matrix	1	2	3
To achieve career development	0.859		
To provide opportunity for the students	0.819		
To acquire new knowledge and skills	0.813		
To capitalize on perceived opportunity	0.783		
For personal satisfaction	0.742		
To secure fund for lab equipment	0.736		
To utilize industrial resources	0.703		
Lack of resources within the university		0.828	
Lack of industrial partners capable of commercializing the		0.825	

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new product/technology			
Insufficient income		0.804	
Job related dissatisfaction		0.797	
Poor university reward system		0.632	
Good university reward system			0.768
Desire for wealth			0.704
To take advantage of institution's opportunity			0.662
Variance explained	40.40%	15.67%	6.71%
KMO	0.877		
Bartlett's Test of Sphericity	F=1487.7, P<0.000, df=105		
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.			

CONCLUSION AND POLICY RECOMMENDATIONS

The paper sets out to examine motivation for AE among faculties in selected universities. It delves into significant benefits of AE, as it fosters innovation, creativity and national competitiveness. AE relates to the entire process of transforming research engagement into products or services in the industry either by faculties themselves or in partnership with others (Adelowo & Surujlal, 2020). The developed countries and their universities are already above board in AE, several policies and incentives have been put in place to motivate research efforts towards commercialisation. The prominent ones are the Bayh Dole Act and the establishment of technology transfer offices and innovation infrastructures.

The latter has now become a common practice in all economies of the world, including Africa, to promote academic entrepreneurship. It has also been established that apart from incentive system and establishment of innovation infrastructure, there are other extrinsic and intrinsic motivation for AE. Motivation for AE among faculties differs across nationalities and institutions. Considering resource constraints system where most faculties operate in Nigeria and weak academia-industry linkage, one would expect zero AE potential. Interestingly, there are some faculties who have engaged in patent disclosure and technology commercialisation through spin-off and industry linkages. Understanding key motivation among these faculties is important for policy and practice. The major motivation for AE was extracted using descriptive and exploratory factor analysis. The descriptive analysis showed that some motivations are more important to stimulate their AE potential. The motivating factors that describe the push factor from the exploratory analysis are perceived to be a major driver of AE.

The push factor here is clear indication of readiness for the faculties to engage in AE regardless of challenges that might be facing them. Majority of the items that made the push factors could be regarded as intrinsic drivers with greater self-motivation and urge to create opportunity for their students. The school administrators and policymakers might take advantage of faculty's self-motivation by creating conducive atmosphere for technology commercialisation such as technology business incubators, innovation labs, and development of science parks to spark innovation in the system. The advantage science parks create over other innovation infrastructure is that it brings together innovation actors, particularly industry players, policymakers and multinationals to tap into the talents and knowledge pool in the park. Science parks also create a spill-over to the community such that tech jobs and wealth are created in the community, translating to national wealth and competitiveness.

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The second factor, resource-constraints, is rather propelled by key challenges. The urge by the faculties to overcome inadequate funding for research in the university and job related satisfaction form important motivation for them to engage in AE. In the last few decades, government has established special intervention fund to bridge research funding in the country. In addition, the national research and innovation fund, as clearly articulated in the national science, technology and innovation policy, is meant to improve innovation climate and bridge the 'valley of death' in research commercialisation. Although, the National Council to functionalize the fund was inaugurated, but the bill to provide legal backing was denied assents by Mr. President.

The Fund is expected to perform similar functions the National Research Fund is performing in South Africa but because it failed to secure presidential assents, funding innovations remains a challenge. It is therefore imperative for the government, university administrators, development partners and even the Diasporas to rise to the creation of innovation fund in the system. Also, recent effort by the TETFund office to create National Research and Development Foundation (NRDF) for the commercialisation of knowledge outputs is gathering momentum among universities and research institutions in the country (TETFund-NRDF, 2021). As parts of the efforts to establish the foundation, a sensitisation visit to 227 public and private institutions was recently carried out by TETFund, advocating a paradigm shift in research system.

The third factor, extrinsic is also very important to incentivize innovation and academic entrepreneurship in the university system. Reward system and the potential to balance between teaching, research and AE could be prioritised for the university to maximize its potentials. For this to happen, a well-articulated IP or innovation policy could be formulated to incentivize faculties with inventions and patents to commercialise them while also retaining their positions in the university. The policy would equally guide against undue conflict of interest in the system.

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