ENTREPRENEURIAL CAPABILITY OF SCIENCE AND TECHNOLOGY-BASED RESEARCHERS IN SELECTED PRIVATE UNIVERSITIES IN OGUN STATE NIGERIA

Abiodun Isaac Oyebola
African Institute for Science Policy and Innovation
Obafemi Awolowo University
aoyebola@yahoo.co.uk

Abstract

The study assessed the entrepreneurial capability of Science and Technology-based researchers in the selected private universities in Ogun State, Nigeria. Primary data were mined through the aid of questionnaire administration. The questionnaire was evaluated for internal consistency by two experienced researchers and one industrialist. Three private universities were randomly selected in the state and fifteen (15) questionnaire were purposively administered on experienced Science and Technology-based researchers (academic staff members) from each of the selected universities making forty-five in total. Thirty-one (31) questionnaire were retrieved and used for analysis of this study with the aid of Statistical Package for Social Science (SPSS) version 20. The study concluded that the nature of research of Science and Technology-based researchers were basic and applied research, evaluation research, action research and ground breaking research. The study also concluded that their motivations/reasons for research were promotion and job requirements, to discover and extend knowledge, to solve problems and innovate, for academic exercise and for entrepreneurial invention. The study further concluded that majority of their publications were self-sponsored and less than 11 while only 1-3 of the publications were commercialized. The level of their entrepreneurial capabilities was very high, although, lack of interest in participating in business, lack of entrepreneurial knowledge, insufficient capital, insufficient government support, lack of market knowledge, economic conditions, inability to merge lecturing with entrepreneurship affect their entrepreneurial capability.

Keywords: Entrepreneurial capability, Universities, science and technology-based researchers

Literature Review

The aim of this study is to identify the nature and types of researches carried out, the level of entrepreneurial capability and factors influencing entrepreneurial capability of science and technology-based researchers in the selected private universities in Ogun State Nigeria.

The universities in Ogun State are embodiment of science and technology-based scholars that are recognized by their professional bodies such as American Society of Microbiology (ASM), Council for the regulation of

Engineering in Nigeria (COREN), Member of the Nigerian Society of Engineers (MNSE), Microsoft Certified Solution Associate (MCSA) Microsoft Certified Systems Engineer (MCSE), National Examination Board in Occupational Safety and Health (NEBOSH), and International General Certificate (IGC) **.** The Science and Technology-based researchers are engineers, scientist and technologist from the universities.

Universities are known to be at the 'heart of discovery and creativity (Barker, 1985; Jaffe, 1989; Hall, Stokols, Moser, Taylor, Thornquist, Nebeling, and Jeffery, 2008). Industry partnerships with research institutions are more common in developed than in developing countries (Oyebisi, Ilori, and Nassar, 2001). These partnerships have served as vehicles for meeting specific industrial research needs. In fact, in developed economies, most universities that started out collaborating with large firms are now partnering with small and medium enterprises (SMEs) (Cervantes, 1999). Such partnerships in developed countries have led to the emergence of new industries, job creation and other economic activities that have been of immense benefits to the host communities. This is however not the case in developing countries like Nigeria (Oyebisi et al., 2001).

One of the core purposes of research in universities is to solve societal problems through the commercialization of research output (Carlsson and Fridh, 2002). In commercializing research output from universities, three main strategies are commonly applied; patenting or licensing, contract research, and the creation of university spinout companies (Kroll and Liefner 2008). However, university entrepreneurship is broadly defined in order to include published research relating to entrepreneurial activities involved university (Rothaermel, Agung and Jiang, 2007). The university entrepreneurship includes but not limited to: patenting, licensing, creating new firms, facilitating technology transfer through incubators, science parks, and facilitating regional economic development (Rothaermel et al., 2007). Furthermore, the emergence of technology-based clusters, science parks and other highly successful economic zones, such as the Silicon Valley have firmly positioned universities at the centre of commercial technology development (Gibbons, 2000; Roberts and Malone, 1996; Shane, 2004). This was due to the fact that scholars in the universities that spinoff businesses applied their entrepreneurial knowledge to solving a society problem and such result money making.

George and Bock (2012) noted that most scholars perceived that, the purpose of research on innovative technology is to either expand the reach

of human knowledge or to solve intellectually challenging problems within a specific field of expertise. George and Bock (2012) further notes that some inventing entrepreneurs are aware of potential commercial application for their inventions while many conducts scientific research without specific commercial intent in mind.

Also, substantial science and technology-based research work carried out in Nigerian universities for decades have not been commercialized (Ilori 2006 and Ilori, Adeniyi, Oyewale, and Fakoya, 2007). In the same vein, Ogbimi (1990a), observed that while Nigerian researchers have been involved in scientific research for decades, only a negligible proportion of the research results have been evaluated and commercialized. It is observable in the current trend of basic and applied research from Nigerian universities are primarily for career progression. Hence, the results of such research efforts usually end up as publications without commercialization (Oyewole, 2012). Based on that, there is need to determine the entrepreneurial capability of the science and technology-based scholars.

The concept of entrepreneurial capability provides a powerful conceptual tool through which deliberate institutional change can be theorized (Philips and Tracey, 2007). Entrepreneurial capability has been defined by scholars as the ability to identify a new opportunity and develop the resource based needed to pursue the opportunity (Arthurs and Busenitz, 2006; Philips and Tracey, 2007). Also, entrepreneurial capability implies a dynamic relationship between actors and their environments (Alvarez and Busenitz, 2001). Entrepreneurs convert ideas into products and services and ultimately create wealth and reduce unemployment (Othman, Ghazali, Ezlika and Yeoh, 2006). A society with a strong entrepreneurial culture will have a positive influence on the rate at which new firms are created, their chances of survival and growth of the existing firms (Arzeni, 1998 and Siyanbola, Aderemi, Egbetokun & Sanni, 2011). More importantly, there are five dimensions of entrepreneurial orientation as identified by Lumpkin and Dess, 2001; Lumpkin, Cogliser and Schneider, 2009; Covin and Lumpkin, 2011. They are referred to entrepreneur's disposition to autonomy, innovativeness, risk taking, proactiveness and competitive aggressiveness. However, it is highly important to observe the entrepreneurial capability of science and technology-based researchers with the theory of absorptive capacity.

Absorptive capacity as defined by Cohen and Levinthal (1990) from the firm level perspective as firm's ability to recognize the value of, assimilate and apply new external information to commercial ends. More importantly, Lane,

Koka and Pathak (2006) opined that absorptive capacity as firm's ability to utilize externally held knowledge through three sequential processes such as (i) recognizing and understanding potentially valuable new knowledge outside the firm through explorative learning transformative learning, (2) assimilate valuable new knowledge through transformative learning, and (3) using the assimilated knowledge to create new knowledge and commercial outputs through exploitative learning.

Cohen and Levinthal (1990) further argued that the firm's willingness to invest in developing absorptive capacity depends on motivation to for learning that comes from its environment. Inductive, these motivations can either be endogenously and exogenously drive. It is endogenously drive when the motivation is basically for promotion, improve in self-esteem, humanitarian service(s), business purpose(s) and contributions to knowledge while exogenously drive can be attributed to industry demand, intellectual property rights protection, scope of technological opportunities and ease of learning the external knowledge. However, motivation is a paramount factor to be consider while analyzing absorptive capacity at any level such as individuals, firms, industry and country or continents.

Therefore, absorptive capacity theory is suitable for this study because it explains the ability to recognize the value of new opportunity and internalize the needed technology for its commercial ends. However, the motivation that drives the science and technology-based researchers is stated in the results of this study.

Research Method

The study assessed the entrepreneurial capability of Science and Technology-based researchers in the selected private universities in Ogun State, Nigeria. Primary data were mined through the aid of questionnaire administration. Multistage sampling techniques were deployed for this study. Ogun state was purposively selected because of its proximity to Lagos state and its description as part of greater Lagos metropolitan area. Furthermore, Ogun state serves as the base for manufacturing hubs in Nigeria with concentration of industries. Hence, it is expected that academic-industry relationship takes place in the study area, resulting to business spinoff. Three private universities namely: Covenant University, Babcock University and Bells University of Technology were purposively selected on the bases on the age of establishment and the top three Private Universities in the state (Nigerian University Commission, 2019). Fifteen (15) copies of questionnaire

were purposively administered on experienced Science and Technology-based researchers from each of the selected universities, making forty-five in total. The questionnaire administered identified the nature and types of researches carried out, the level of entrepreneurial capability and factors influencing the entrepreneurial capability of science and technology-based researchers in the study area. The variables were measured on a five-point Likert scale such as 1 was allotted for strongly disagree and 5 for strongly agree. Likewise, 1 was allotted to 1-20 and 5 was allotted to 81-100 to rank entrepreneurial capability Science and Technology-based researchers. Thirty-one (31) copies of questionnaire were retrieved and used for analysis of this study with the aid of Statistical Package for Social Science (SPSS) version 20.

Results and Discussion

Table 1 showed the qualifications of the Science and Technology-based researchers addressed in this study. The Table implied that majority (61.3%) of the respondents were Lecturer II, this means that most of the respondents in this study had Ph.D. or reputable years of work experience based on national universities commission (NUC) promotion requirements for academic staff. More importantly, the academic ranks of the remaining respondents were Lecturer I (29%), Senior Lecturer (6.5%) and Associate Professor/Reader (3.2%). This showed that Science and Technology-based researchers addressed in this study are experts in their related area of interest.

Table 1 further showed the professional qualifications of these Science and Technology-based researchers. About 13% of these researchers were Council for the regulation of Engineering in Nigeria (COREN) registered, while close to 10% of the researchers were Member of the Nigerian Society of Engineers (MNSE) registered. The table also showed that 3.2%, 3.2%, 3.2%, 3.2% and 3.2% of the remaining Science and Technology-based researchers were Microsoft Certified Solution Associate (MCSA) registered, Microsoft Certified Systems Engineer (MCSE) registered, National Examination Board in Occupational Safety and Health (NEBOSH) registered, and International General Certificate (IGC) registered and American Society of Microbiologist respectively.

Also, Table 1 showed the category expertise of the Science and Technology-based researchers considered in this study. Majority (51.6%) of the researchers are expertise of Engineering while about 22.6% and 19.4% of the researchers are expertise of Natural Science and Biological Science

respectively. The remaining researchers are expertise of Computer/Technology (3.2%) and Medical Science (3.2%).

Table 1: Qualifications of the Respondents

Academic Ranks	**Frequency**	**Percentage**
Associate Professor/Reader	1	3.2
Senior Lecturer	2	6.5
Lecturer I	9	29.0
Lecturer II	19	61.3
Total	**31**	**100.0**
Professional Qualifications		
American Society of Microbiology	1	3.2
COREN	4	12.9
MNSE	3	9.7
MCSA	1	3.2
MCSE	1	3.2
NEBOSH	1	3.2
IGC	1	3.2
No response	19	61.3
Total	**31**	**100**
Expertise		
Natural Science	7	22.6
Engineering	16	51.6
Computer/Technology	1	3.2
Biological Science	6	19.4
Medical Science	1	3.2
Total	**31**	**100**

Table 2 showed the nature of research and reasons for engaging in research by the Science and Technology-based researchers considered in this study. Majority (38.5%) of the respondents agreed that they engaged in research for promotion and job requirements, while only 15.4% of the respondents disagreed that they engaged in research for promotion and job requirements.

Furthermore, Table 2 showed that majority (71.4%) of the respondents strongly agreed that they engaged in research for discovery and extension of knowledge while just 3.6% of the remaining researchers strongly disagreed that they engaged in research for discovery and extension of knowledge.

Also, majorities (40% and 53.3%) of the respondents agreed and strongly agreed that they engaged in research so as to solve problems and innovate. This affirmed the report of George and Bock (2012) that, most scholars perceived the purpose of research on innovative technology is to either expand the reach of human knowledge, or to solve intellectually challenging problems within a specific field of expertise.

Table 2 further showed that majorities (44.8% and 27.6%) of the respondents agreed and strongly agreed that they engaged in research for academic exercise respectively. Only 10.3% and 17.2% of the remaining respondents strongly disagreed and disagreed that they engaged in research for academic exercise respectively.

Table 2: The nature and reasons for engaging in research

Characteristics	**1**	**2**	**3**	**4**	**5**	**Total**
Reasons for Engagement in Research						
Promotion and Job Requirements	23.1	15.4	-	38.5	23.1	**100**
Discover and extend knowledge	3.6	3.6	-	21.4	71.4	**100**
Solve problems and innovation	3.3	3.3	-	40.0	53.3	**100**
Academic Exercise	10.3	17.2	-	44.8	27.6	**100**
Entrepreneurial Inventions	3.6	17.9	-	46.4	32.1	**100**
Nature of Research engage in						
Basic Research	11.1	7.4		59.3	22.2	**100**
Applied Research	-	3.5		55.2	41.4	**100**
Evaluation Research	7.1	17.9		60.7	14.3	**100**
Action Research	7.7	26.9		50	15.0	**100**
Ground breaking research	-	33.3		50	16.7	**100**

Keys:
1 = Strongly disagree, 2 = Disagree, 3 = Indifference, = 4 = Agree and 5 = Strongly agree

Table 2 showed that majorities (46.4% and 32.1%) of the respondents agreed and strongly agreed that they engaged in research for entrepreneurial inventions respectively while 3.6% and 17.9% of the remaining respondents strongly disagreed and disagreed respectively that they engaged in research for entrepreneurial intention.

Concerning the nature of research engaged in by the respondents, Table 2 showed that majority of the respondents agreed that they engaged basic research (59.3%), applied research (55.2%), evaluation research (60.7%), action research (50%) and ground breaking research (50%).

Table 3 showed that majority (67.7%) of the respondents indicated that their estimated number of publications was less than 11, while 22.6% of the respondents indicated that their estimated number of publications was between 11-15. Hence, 3.2%, 3.2% and 3.2% of the remaining respondents reported that their estimated number of publications were 16-20, 21-25 and, 26 and above respectively. This is related with the academic ranks of the respondents.

Table 3 Publications, Commercialization and Grants of Respondents

Characteristics	**Frequency**	**percentage**
Estimated number of Publication(s)		
Less than 11	21	67.7
11- 15	7	22.6
16 – 20	1	3.2
21 – 25	1	3.2
26 and above	1	3.2
Total	**31**	**100**
Number of commercialized research		
1 – 3	18	58.1
4 – 6	1	3.2
No response	12	38.7
Total	**31**	**100**
Receive Grant		
Yes	7	22.6
No	24	77.4
Total	**31**	**100**
Sponsored research		
Self	28	90.3
International Investors or Sponsors	2	6.5
No response	1	3.2
Total	**31**	**100**

Concerning the number of commercialized researches by the respondents, majority (58.1%) of the commercialized research as reported by the

respondents were between 1-3 while only 3.2% (4-6) of the research were commercialized.

However, majority (77.4%) of the research carried out by the respondents were not funded with grants rather self-sponsored (90.3%).

Table 4 showed the level of entrepreneurial capability of the respondents in the study area. The Table indicated that the entrepreneurial capability as stated were innovation, risk taking, proactiveness, competitiveness, autonomy and opportunity recognition. Hence, the level of innovation of the respondents were high (40%) and very high (36.7%). Also, the level of risk taking were average (40%), high (30%) and very high (20%). Furthermore, the level of proactiveness of the respondents were high (41.9%) and very high (35.5%). The level of competitiveness of the respondents were high (48.4%) and very high (29%). The level of autonomy of the respondents were high (51.6%) and very high (32.3%) while the level of opportunity recognition of the respondents was high (41.9%). The identified entrepreneurial capability are also related to five dimensions of entrepreneurial orientation as identified by Lumpkin and Dess, 2001; Lumpkin, Cogliser and Schneider, 2009; Covin and Lumpkin, 2011 such as autonomy, innovativeness, risk taking, proactiveness and competitive aggressiveness.

Table 4: Level of Entrepreneurial Capability

Entrepreneurial Capability	**Level**					
	Very Low	**Low**	**Average**	**High**	**Very high**	**Total**
Innovation	-	-	7 (23.3)	12 (40)	11(36.7)	**30 (100)**
Risk Taking	-	3 (10)	12 (40)	9 (30)	6 (20)	**30 (100**
Proactiveness	1 (3.2)	-	6 (19.4)	13 (41.9)	11(35.5)	**31 (100)**
Competitiveness	-	-	7 (22.6)	15 (48.4)	9 (29)	**31 (100)**
Autonomy	-	-	5 (16.1)	16 (51.6)	10(32.3)	**31 (100)**
Opportunity Recognition	2 (6.5)	2 (6.5)	9 (29)	13 (41.9)	5 (16.1)	**31 (100)**

Key

Very Low = 1-20, Low = 21-40, Average = 41-60, High = 61-80, and Very high = 81-100

Table 5 showed the factors influencing entrepreneurial capability of the respondents. The Table showed that respondents agreed (33.3%) and strongly agreed (33.3%) that they lack interest in participating in business, agreed (43.3%) and strongly agreed (40%) that they lack entrepreneurial knowledge and skills. Also, the respondents agreed (41.9%) and strongly agreed (51.6%) that they do not have sufficient capital, the respondents agreed (45.2%) and strongly agreed (38.7%) that insufficient government support influence their entrepreneurial capability. Furthermore, the respondents agreed (56.7%) and strongly agreed (30%) that lack of market knowledge affect their entrepreneurial knowledge, the respondents agreed (64.5%) and strongly agreed (30%) that economic conditions affect their entrepreneurial capability while the remaining respondents agreed (48.4%) and strongly agreed (19.4%) that inability to merge lecturing with entrepreneurship affect their entrepreneurial capability.

Table 5 Factors Influencing Entrepreneurial Capability

Characteristics	**1**	**2**	**3**	**4**	**5**	**Total**
Lack of Interest in participating in business	20	13.3		33.3	33.3	
Lack of entrepreneurial knowledge and skills	6.7	10	-	43.3	40	**100**
Insufficient Capital	3.2	3.2	-	41.9	51.6	**100**
Insufficient government support		16.1	-	45.2	38.7	**100**
Lack of market knowledge	3.3	10	-	56.7	30	**100**
Economic conditions	6.5	9.7	-	64.5	19.4	**100**
Inability to merge lecturing with entrepreneurship	12.9	19.4		48.4	19.4	**100**

Keys:

1 = Strongly disagree, 2 = Disagree, 3 = Indifference, = 4 = Agree and 5 = Strongly agree

Conclusion and Recommendations

The study concluded that the nature of research of Science and Technology-based researchers were basic and applied research, evaluation research, action research and ground breaking research. The study also concluded that their motivations/reasons for research were promotion and job requirements, to discover and extend knowledge, solve problems and innovate, basically for academic exercise and for entrepreneurial invention. The study further concluded that majority of their publications were self-sponsored and less than 11 while only 1-3 of the publications were commercialized. The level of their entrepreneurial capabilities were very high, although, lack of interest in participating in business, lack of entrepreneurial knowledge, insufficient capital, insufficient government support, lack of market knowledge, economic conditions, inability to merge lecturing with entrepreneurship affect their entrepreneurial capability.

The study recommends that Science and Technology-based researchers need to garnish their knowledge/expertise with entrepreneurial knowledge, develop interest in participating in businesses, apply for business grants from venture angels, Bank of Industry (BOI) or government grants and develop capability to merge lecturing with entrepreneurship.

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