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ENTREPRENEURIAL RESOURCES AND ENGAGEMENT OF AFRICAN ACADEMICS: EVIDENCE FROM NIGERIA

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Abstract:

The objective of this study is to empirically examine African academics' entrepreneurial resources and engagement using a leading Nigerian university in order to evaluate the speculation that African academics lack entrepreneurial capabilities to engage in knowledge discovery and commercialisation, as well as to develop an understanding of the entrepreneurship gap in African universities. A cross-sectional survey and validated scales were used to collect data from 298 randomly selected academics from the university's 79 departments and 12 faculties. Descriptive and inferential analyses using mean scores and standard deviations of academics on the study variables, as well as regression analysis, were conducted to test the hypotheses. Contrary to expectations, academics have the necessary entrepreneurial resources to engage in entrepreneurial activities, but as speculated, the level of their entrepreneurial engagement is low. The study adds to the body of knowledge on academic entrepreneurship and makes recommendations to improve African academic entrepreneurial engagement. The limitations of the study and future research directions were discussed.

Keywords: *African academic entrepreneurship, entrepreneurial resources, entrepreneurial engagement, knowledge transfer, and research commercialisation.*

Introduction

Since the passage of the Bayh-Dole Act, also known as the University and Small Business Patent Procedures Act, in 1980, which allowed US universities to use public funds for research and commercialise research knowledge, there has been an increase in industry-relevant research and university-industry partnerships for knowledge and technology transfer. Similar legal frameworks implemented in many developed economies in Europe, Asia, and Australia resulted in structural and strategic policy changes, as well as other entrepreneurial capabilities and engagement with stakeholders outside the academic environment (Zhao, Broström, & Cai, 2020; Etzkowitz, 2003). This new role, known as university ambidexterity, implies the dynamic capabilities of universities, academic departments, and scientists to successfully combine the traditional roles of teaching and research with research commercialisation activities (Chang, Yang, Martin, Chi, & Tsai-Lin, 2016).

Many decades after universities in developed economies transitioned to entrepreneurial universities through the establishment of entrepreneurial infrastructures (Huyghe & Knockaert, 2015) and the development of academic

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entrepreneurial dispositions (D'Este & Perkmann, 2011; Munshaw, Lee, Phan, & Marr, 2019), concerns have been expressed about African academics and universities' entrepreneurial capabilities to engage successfully and productively with the industry (Bamiro, 2004; Bogoro, 2015; Sá, 2014). Only a few Nigerian academics produce research products that can be used for societal development (Oduwaiye, Owolabi, & Onasanya, 2009; OECD, 2013). While good research thrives in many Nigerian universities, much of it with industrial relevance and marketable breakthroughs, the rate of commercialisation is very low, according to Jones, Bailey, and Lyytikäinen (2007) and Munyoki, Kibera, and Ogutu (2011). Similarly, Fadeyi, Maresova, Stemberkova, Afolayan, and Adeoye (2019) report that between 2010 and 2017, only 3% of Nigerian businesses sourced their innovation from universities.

Several reasons have been advanced to explain African academics' and universities' lack of entrepreneurial capabilities. According to Bogoro (2015) and Atuahene (2011), most academics are engrossed in traditional scientific norms, standards, and values and conduct research for publication purposes only, rather than for knowledge transfer purposes. According to Jones et al. (2007), the cause is a lack of entrepreneurial capabilities at both the individual and institutional levels. According to Wagner, Brahmakalum, Jackson, Yoda, and Wong (2001), most African countries are scientific laggards with low innovation and university-industry partnerships as a result.

Despite these concerns and reports, few empirical efforts have been made to assess African academics' entrepreneurial capabilities in order to validate these claims. According to Clarysse, Tartari, and Salter (2011), the entrepreneurial capabilities of universities stem from entrepreneurial resourcefulness of academics, who are the primary agents that help build, promote, and breathe life into the entrepreneurial culture of departments and universities, as well as their willingness to engage in entrepreneurial practices. The objectives of this study are to assess entrepreneurial resourcefulness (innovativeness, motivation, and orientation) among Nigerian academics and examine the impact on their entrepreneurial engagement using a leading Nigerian university. This is a critical first step toward empirically investigating the concerns raised about academics' lack of entrepreneurial capacity and engagement, as well as developing a better understanding of Africa's academic entrepreneurship gap.

2. LITERATURE AND HYPOTHESES

2.1 Academic Entrepreneurial Engagement (AEE)

Miranda, Chamorro-Mera, and Rubio (2017) define academic entrepreneurship as a process where individuals or groups of individuals connected through their work to a university or research centre use knowledge generated in their research to establish businesses. Academic entrepreneurship entails commercialising scientific knowledge, which includes turning knowledge into products and processes that will invariably contribute to economic growth and innovation. According to De Silva (2012), academic entrepreneurship entails a broad spectrum of knowledge-transfer activities other than research, administration, and teaching and includes both formal and informal activities incorporating one or more knowledge-transfer activities, such as:

- engaging in external teaching and conducting seminars and training for industry (D'Este & Patel, 2007);
- consulting for the industry as a researcher in collaboration with or without the university;
- developing commercially viable products or services
- obtaining funding for research from government, non-government, or international organizations;
- collaborating with businesses and industries through joint research projects and research related assistance to small business owners (Siegel, Waldman, Atwater, & Link, 2004);
- engaging in knowledge transfer activities as joint partners with universities and industry, privately;
- establishing a joint venture(s) through industry collaboration
- facilitating the formation of spin-off companies;
- contributing to the establishment of university incubators and/or science parks;
- contributing to the establishment of university centres dedicated to commercialisation and the formation of their own businesses (Clarysse, Wright, Lockett, de Velde, & Vohora, 2005; Di Gregorio & Shane, 2003);
- engaging in contract research, and research output patenting (Mirani & Yusof, 2016; Ojo, Dorasamy, Migin, Jayabalan, Rajeswari, & Tung, 2022).

Because of their similarities and connections to teaching, research, and business creation, these activities overlap across groups. In this study, academic entrepreneurial engagement is used as a catch-all term for any of the above-mentioned formal and informal entrepreneurial activities.

2.2 Academic Entrepreneurial Resources (AERs)

An entrepreneurial resource is defined by Mosakowski (1998) as the propensity of an individual to behave creatively, act with foresight, use intuition, and be alert to new opportunities, capturing the need for entrepreneurial resources.

Entrepreneurial alertness, insight, information, education, and experience (explicit and tacit knowledge) embodied in entrepreneurs, or their social networks are examples of such resources (Barney, 2018). An entrepreneurial resource is any specific resource that an individual possesses that increases the individual's proclivity to recognise and exploit the economic value of an opportunity.

According to the resource-based theory, resources can influence entrepreneurial decision-making by shaping the identification and consideration of new business opportunities and providing entrepreneurs with the ability to perform a wide range of entrepreneurial tasks (Mickiewicz, Nyakudya, Theodorakopoulos, & Hart, 2017). Human resources, in particular, have a large impact on both commercial and social entrepreneurial activity (Hörisch, Kollat, & Brieger, 2017; Kachlami, Yazdanfar, & Öhman, 2018; Brieger & De Clercq, 2018). In their entrepreneurial endeavours, entrepreneurs face a variety of challenges and significant uncertainty, but their human resources can improve their chances of overcoming these obstacles (Meyskens, Carsrud, & Cardozo, 2010).

Academic Entrepreneurial Innovativeness (AEInn)

Innovativeness, as an innate characteristic, encapsulates what it takes to be an entrepreneur. Individuals who are highly innovative have a proclivity and willingness to take risks, do things differently, handle multiple ideas concurrently, offer new perspectives on old problems, and find solutions when challenged. They are also more likely to be interested in innovative ventures and technologies and to pursue a career in creating new technological ventures (Salhieh & Al-Abdallat, 2022). The proclivity of an academic to engage in innovative and entrepreneurial practices is referred to as entrepreneurial innovativeness. Entrepreneurial innovativeness, according to Ertürk (2012), is a way of thinking and acting that facilitates the creation and development of values and attitudes, which may in turn encourage new ideas. Thus, entrepreneurial innovativeness is the ability and propensity to identify and transform new opportunities into new knowledge and new technology for the benefit of end users.

Entrepreneurial innovativeness is a valuable resource that university academics and scientists must have in order to actively seek out research opportunities that can be turned into value for the industry. Academics who are innovative are motivated by the desire to discover new research opportunities that can be commercialised. Academics lose their ability and proclivity to identify industry-relevant and value-added research opportunities in the absence of innovation, thus limiting their entrepreneurial engagement from the start. As a result, in order to explore and exploit the market value of research, academics must be able to recognise research opportunities and develop research ideas. In a study of prospective student entrepreneurs at 55 South Korean universities, Lee, Kang, and Kim (2022) demonstrated that innovativeness influences students' knowledge exploration and exploitation. Similarly, several studies involving academics also showed that innovativeness plays an important role in the entrepreneurial engagement of academics (Prónay & Buzás, 2015; Rizzo, 2015; D'Este, 2015).

Academic Entrepreneurial Motivation (AEM)

Academic entrepreneurial motivation is what drives academics to engage in entrepreneurial behaviour, such as forming businesses to capitalise on opportunities. Motivation, according to Edelman, Brush, Manolova, and Greene (2010), is a stimulus that converts latent entrepreneurial intention into action, establishing the link between intention and action. Thus, academic entrepreneurial motivation drives academic entrepreneurial intention and action. While intrinsic motivation refers to engaging in a task for the satisfaction it provides, extrinsic motivation refers to engaging in the task for some external benefit (Antonioli, Nicolli, Ramaciotti, and Rizzo, 2016; Rizzo, 2015). According to research, extrinsic and intrinsic motivations may have different effects on entrepreneurial engagementh. For some academics, non-monetary incentives are a higher-order intrinsic motivation to engage in entrepreneurship (Azagra-Caro, Aznar-Marqez, & Blanco, 2008), whereas, for others, financial incentives are a higher-order extrinsic motivation (D'Este & Perkmann, 2011). Financial extrinsic factors include salary increases, lunch vouchers, and monetary benefits (Sormani, Baaken, & van der Silje, 2022), financial compensation (Iorio, Labory, & Rentocchini, 2017), and funding or financial resources (Orazbayeva, Davey, Plewa, & Galán-Muros, 2020).

Non-financial, intrinsic factors that have been found to motivate entrepreneurial engagement include the desire for independence (Shane, 2004), prestige and peer recognition (Dietz & Bozemann, 2005), and individual willingness to bring research into the market (Shane, 2004; Fini, Grimaldi, & Sobrero, 2009). Factors also include a desire to apply inventions in practice (Nilsson, Rickne, & Bengtsson, 2010), necessity, the need for industrial feedback about the application of their invention, the desire to assist in the resolution of societal and community problems (Rizzo, 2015), career advancement (e.g., increased chances of promotion and personal network expansion), recognition (e.g., by the HEI and peers), and research support (e.g., in funds and data) (Sormani, Baaken, & van der Silje, 2022; Orazbayeva, Davey, Plewa, & Galán-Muros, 2020; Arzenˇsek, Koˇsmrlj & ˇSirca, 2018). The extrinsic benefit is not

a major motivator for these types of academics. Thus, academics who engage in entrepreneurial activities are motivated by intrinsic or extrinsic motives or both.

Academic Entrepreneurial Orientation (AEO)
Individual entrepreneurial orientation can be defined as a person's inclination or attitude toward engaging in entrepreneurial behaviours (Wu, 2009; Okręglicka, Filipowicz, Betáková, 2021). With the definition of individual entrepreneurial orientation as a tendency held by individual employees of the organisation toward innovative, proactive, and risk-taking behaviours in the workplace by Covin, Rigtering, Hughes, Kraus, Cheng, and Bouncken (2020), three characteristics of entrepreneurial orientation have been identified as influencers of academics' commercial research conduct. Innovativeness is required for identifying and pursuing new opportunities, making it a key determinant of entrepreneurial action. Anticipating marketable research needs or addressing specific needs requires proactivity. Risk-taking is the act of taking bold and courageous steps toward making significant financial commitments to perceived profitable research, projects, and ventures with highly unpredictable outcomes.

Though individual entrepreneurial orientation has been linked to a business startup in a variety of contexts, its importance within the university is just emerging (Todorovic, McNaughton, & Guild, 2011). Despite growing awareness of entrepreneurial universities, little is known about the application of individual entrepreneurial orientation in academic entrepreneurial engagement, with the exception of a small body of evidence highlighting its importance in university spin-offs and research commercialisation (Diánez-González & Camelo-Ordaz, 2016; Rashid & Ismail, 2014). According to Todorovic et al. (2011), this is due to its unsuitability for universities with different orientations, as well as cultural and work settings with business. However, as universities become more corporate, there is a greater need for increased use of entrepreneurial orientation to facilitate academics' entrepreneurial engagement in universities. Previous research showed that an academic's entrepreneurial and commercial orientation determines his or her proclivity to engage in entrepreneurial endeavours (Di Gregorio & Shane, 2003), knowledge creation (Vidic, 2013), exploring value-creating opportunities (Chaston & Scott, 2012), as well as commercialisation and success of starting a business among students (Ismail, Anuar, Omar, Aziz, Seohod, & Akhtar, 2015). Abidi, Nimer, Bani-Mustafa, and Toglaw (2022) enthused that faculty with entrepreneurial orientation can play a critical role in assisting their institutions in developing new academic programmes with potential market demand, interacting with industry, and developing innovative ideas and opportunities for growth and development. As a result, the ability of academics to conduct market-oriented or industry-relevant research necessitates an entrepreneurial mindset. As a result, a lack of entrepreneurial orientation can be a major impediment to entrepreneurial behaviour.

While most studies on the dispositional factors facilitating academic entrepreneurship have primarily focused on the scientists' demographic characteristics such as age, gender, seniority, prior commercialisation experience, entrepreneurship skills, entrepreneurship knowledge, and social norms (Perkmann, Tartari, McKelvey, Autio, Broström... Sobrero, 2013; Perkmann, Salandra, Tartari, McKelvey, & Hughes, 2021), our understanding of the scientists' entrepreneurial characteristics and resources and how these impact on their entrepreneurial engagement is still limited. It is argued that the assumption that African academics lack the ability to engage in research commercialisation, industry collaboration, knowledge, and technology transfer, spin-offs, and other entrepreneurial activities stems from a lack of these entrepreneurial resources. To test this assumption, the entrepreneurial resourcefulness (innovativeness, motivation, and orientation) of academics was assessed, and their predictive effects on academics' entrepreneurial engagement were explored. To accomplish this, the hypotheses are stated in the null form, which corresponds to the direction of the speculations. As a result, it is hypothesised that:

Hypothesis 1: Academics lack entrepreneurial resources (innovativeness, motivation, and orientation) necessary for entrepreneurial engagement.

Hypothesis 2: Academics engage in a low level of entrepreneurial activities.

Hypothesis 3: Academics' entrepreneurial resources (innovativeness, motivation, and orientation) do not have a significant impact on their entrepreneurial engagement.

3. RESEARCH METHODS

3.1 Participants and data collection procedure

The study used a cross-sectional design and a survey method that is best suited for gathering data from a large heterogeneous population, such as a university academic population. This enabled highly valid and high-quality population-descriptive data to be collected. Quantitative survey instruments were distributed to 495 randomly selected participants from academic staff roll-calls in each of the 79 departments across 12 faculties, representing

38.05% of the university's 1301 academic staff population. Only even-numbered academics from each department's roll-call across diversities were chosen for the exercise. After 10 weeks of data collection, 298 early and late-career academics with tenure ranging from 5 to 30 years (60.2% of the sampled academics and 22.9% of the academic staff population) returned valid responses. The focal university is deemed most appropriate for the study due to its advantageous location in the country's industrial and commercial centre. This location offers excellent opportunities for academics and the university to pursue entrepreneurial endeavours. Similar studies (Antonioli et al., 2016; Urban & Chantson, 2017; Miranda, et al., 2017; Zhao et al., 2020; Acuña-Duran, Oyanedel, & Pradenas-Wilson, 2022) employed the same methodologies to investigate academics' entrepreneurial intention and engagement and reported response rates of 11% (Huyghe & Knockaert, 2015); 20% (Urban & Chantson, 2017); and 21% (Antonioli et al., 2016) of the total academic staff population.

3.2 MEASURES

3.2.1 Academic Entrepreneurial Innovativeness (AEInn): A 16-item scale adapted from Scott and Bruce's (1994) 6-item innovative work behaviour scale comprising idea generation, coalition building, and idea realisation dimensions; Sherman's (1999) unidimensional 14-item employee innovation behaviour scale; and Odetunde's (2019) 27-item employee innovativeness scale comprising creativity, innovation, and innovation adoption was used to assess academic entrepreneurial innovativeness. Cronbach alphas for the three scales were 0.89, 0.78, and 0.92, respectively. The scales were combined and adapted for this study.

3.2.2 Academic Entrepreneurial Motivation (AEM): Academic Entrepreneurial Motivation (AEM) was assessed using a 21-item scale composed of seven subscales of three items each, drawn from a variety of intrinsic and extrinsic factors identified in the academic entrepreneurial motivation literature. These are (1) achievement, challenge, and learning, which include motivation for meaningful work and responsibility, as well as motivation to learn through the challenge of starting and running a business and self-realisation; (2) income security and financial success, which capture financial returns; (3) recognition and status, which concern social status and the desire for recognition and respect; and (4) community and social motivations, which concern the desire to contribute (Aziz, Friedman, Bopievac, & Keles, 2013; Estrin, Mickiewicz, & Stephan, 2016; Friedman, Aziz, Keles, & Sayfullin, 2012; Jayawarna, Rouse & Kitching, 2013; Uddin & Kanti, 2013). Personal motives; motivation for research resources; funding for research; learning; financial benefits; peer recognition; and altruism and community development are the seven subscales.

3.2.3 Academic Entrepreneurial Orientation (AEO): An adapted version of Bolton and Lane's (2012) academic entrepreneurial orientation scale, which includes three subscales of risk-taking, innovativeness, and proactiveness, was used to assess academic entrepreneurial orientation (Cronbach alpha ranged between 0.765 and 0.800). Wu (2009) discovered a link between opportunity recognition and entrepreneurial orientation measures. Based on this, Wu's (2009) measure of opportunity recognition is adapted in this study as a dimension of entrepreneurial orientation. Given that the entrepreneurial orientation scale's dimension of innovativeness corresponds to a lesser extent to the entrepreneurial resources of innovativeness in this study, the current study's innovativeness scale investigates broader dimensions of entrepreneurial innovativeness as an entrepreneurial trait in and of itself, rather than just as a component of entrepreneurial orientation. As a result, the innovativeness dimension of the entrepreneurial orientation scale was dropped from this study in favour of the more distinct and comprehensive innovativeness scale. This study's academic entrepreneurial orientation scale has three dimensions: risk-taking (4 items), proactiveness (4 items), and opportunity recognition (4 items).

3.2.4 Academic Entrepreneurial Engagement (AEE): The scale of academic entrepreneurial engagement developed by De Silva (2012) was used to assess academic entrepreneurial activities. The scale assesses five types of entrepreneurial activities by academics within universities: (1) training and consultancy; (2) company formation by universities; (3) company formation by academics who do not have a university role in these companies; (4) collaboration with industry; and (5) academic teaching and research, such as developing new degree programmes, acquiring research funds, and part-time teaching with other higher education institutions. Several studies have used this scale to assess academics' entrepreneurial activities within universities (Mirani & Yusof, 2016).
A 7-point Likert response format ranging from 1 (to no extent/strongly disagree) to 7 (to a very great extent/strongly agree) was adopted for the scales.

4. FINDINGS

4.1. Analysis of characteristics of academics

The academics were made up of 71.2% men and 28.8% women. Early-career academics (associate lecturers, lecturer

2, and lecturer 1) made up 60% of the sample, while late-career academics (senior lecturers, associate professors/ readers, and full professors) made up 40%. Lecturers in Science, Technology, Engineering, and Mathematics (STEM) made up 50.2% of the sample, while those in Humanities and Social Sciences (HSS) related disciplines made up 49.8%.

4.2 Descriptive and correlations analyses

Table 1 shows the results of descriptive and correlation analyses. The mean scores ($\bar{x}$) for the academic entrepreneurial resources range between *5.36* (AEO) and *5.56* (AEInn) and the standard deviation (Sd) between *0.90* (AEO) and *0.98* (AEM). The mean score ($\bar{x}$) and Sd for AEE are 3.78 and 1.46, respectively. Correlation analyses show significant moderate positive intercorrelations among the three AERs with correlation coefficients ranging from 0.376 (AEInn vs. AEO) to 0.469 (AEM vs. AEO) and between AERs and AEE range from 0.212 (AEM) to 0.311 (AEInn).

Table 1: Descriptive statistics and correlations among the AERs and AEE variables

SN	Variable	Meas	SD	1	2	3	4	5
1	Demo	1.29	0.46	1.00	.089	.078	-.009	.149**
2	AEInn	5.56	0.95		1.00	.412**	.376**	.311**
3	AEM	5.53	0.98			1.00	.469**	.212**
4	AEO	5.36	0.90				1.00	.234**
5	AEE	3.78	1.46					1.00

**p<.001, N= 298

Notes: Demo (Demographic Variables), AERs (Academic Entrepreneurial Resources), AEInn (Academic Entrepreneurial Innovativeness), AEM (Academic Entrepreneurial Motivation), AEO (Academic Entrepreneurial Orientation), and AEE (Academic Entrepreneurial Engagement).

4.3 Hypotheses testing

Hypotheses 1 and 2 were assessed by examining the mean scores and standard deviations of academics on the three entrepreneurial resources and entrepreneurial engagement. These statistics are appropriate to analyse sample characteristics in aggregated rating and ordinal scales like the Likert scale, especially with large sample sizes (≥ 30 to 40) (Pallant, 2007). A check on the normality of distribution using Kolmogorov-Smirnov and Shapiro-Wilk tests (Table 2) (Harpe, 2015) showed that the data on all the variables are approximately normally distributed and are free of extreme scores that may make the use of mean and standard deviation unjustifiable.

Table 2: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df.	Sig.	Statistic	df.	Sig.
AEInn	0.108	298	.000	0.954	298	.000
AEM	0.096	298	.000	0.904	298	.000
AEO	0.106	298	.000	0.905	298	.000
AEE	0.071	298	.001	0.969	298	.000

a. Lilliefors Significance Correction

As shown in Table 1, mean scores on the variables ranged from 5.36 for AEO to 5.56 for AEInn and 3.78 for AEE on a scale of 1 (To no extent/Strongly disagree) to 7 (To a very great extent/Strongly agree). The standard deviations are observed to be low, ranging from *0.89* for AEO to *0.98* for AEM, and *1.46* for AEE. The clustering of data around the means with less variability indicates that the mean scores are a true reflection of the extent of entrepreneurial resourcefulness and engagement of academics, indicating that academics are entrepreneurially resourceful in innovativeness, motivation, and orientation. However, the relatively low mean score ($\bar{x}$ =3.78) and high standard deviation (Sd=1.46) for AEE indicate that most of the AEE scores fall below the mean score. This implies that some academics engage entrepreneurially, but many academics do not. Thus, while hypothesis 1, that academics lack

entrepreneurial resources of innovativeness, motivation, and orientation necessary for entrepreneurial engagement was disproved, hypothesis 2, that academics engage in a low level of entrepreneurial activities was upheld.

Hypothesis 3 was tested by conducting a hierarchical regression analysis. Two regression analyses were conducted. In the first analysis, the overall model was estimated by entering the demographic variables with all entrepreneurial resources en bloc in the regression equation. This resulted in an overall model that explained 21.7% ($R^2 = .217$, $p < .001$) of the variance in Academic Entrepreneurial Engagement (AEE). In the second equation, four models were estimated. Following the suggestion of Meyers, Gamst, and Guarino (2013), the entrepreneurial resources were entered into the regression equation according to the weight of their correlations with AEE in Table 1. As suggested by Garson (2006) and Mertler and Vannatta (2005), demographic variables (Model 1) were entered first into the regression equation to effectively hold constant any influence they may have on AEE. Then, sAEInn (Model 2), AEO (Model 3), and AEM (Model 4) were consecutively added to the equation. Change in R^2 (ΔR^2), a measure of effect size, was estimated at each step to determine whether any one particular entrepreneurial resource contributes to the impact on entrepreneurial engagement over and above the resource already in the regression equation. Standardised beta weights (β) were estimated to determine the unique contribution of each of the entrepreneurial resources to AEE.

Results in Table 3 show that demographic variables and each of the three AERs produced an overall model that accounted for 23.2% of the variance in AEE. The demographic variables, AEInn, AEO, and AEM, respectively, produced 22.8%, 23.0%, and 23.2% variances in AEE, resulting in a significant change (ΔR^2) of 1.7% by AEInn, but insignificant changes of 0.1%, and 0.2% by AEO and AEM, respectively. Thus, out of the three AERs, only AEInn made a significant contribution to the variance in AEE. Assessment of their unique contributions using their beta weights (β) also revealed that only AEInn made a significant unique impact of 14.6% (β=.146, p<.01) on AEE. AEO and AEM did not have any significant impact on AEE. Thus, hypothesis 3, that AERs (innovativeness, motivation, and orientation) do not have a significant impact on their entrepreneurial engagement was confirmed, as only one out of the three AERs significantly impacts AEE.

Table 3: Hierarchical regression analyses for the impact of academic entrepreneurial resources (AERs) on academic entrepreneurial engagement (AEE).

Dependent Variable	Independent Variables	F	R^2	Adj-R^2	ΔR^2	β
AEE	Demo and all AERs	16.191**	.217**	.204	.217**	.136*
	Model 1: Demo	7.016*	.023*	.020	.023*	.145*
	Model 2: AEInn	6.423*	.228*	.220	.017*	.146*
	Model 3: AEO	.526	.230	.219	.001	.050
	Model 4: AEM	.749	.232	.218	.002	-.056

**p <.001, *p<.01, N = 298

5. DISCUSSIONS

In contrast to hypothesis 1, evidence from this study indicates that academics are entrepreneurially resourceful in terms of innovativeness, motivation, and orientation. This finding suggests that academics have the resources needed to identify new opportunities as well as evaluate and conduct innovative research that will benefit the market. Several studies have found these resources to be significant predictors of knowledge transfer, research commercialisation, and other academic entrepreneurial activities (Prónay & Buzás, 2015; Rizzo, 2015; D'Este & Perkmann, 2011; Di Gregorio & Shane, 2003; Vidic, 2013; Chaston & Scott, 2012; Ismail *et al.*, 2015). Becoming academic entrepreneurs or champions of new ventures is primarily attributed to their individual attributes (Clarysse et al., 2011). As a result, it is incorrect to assume that African academics lack entrepreneurial skills. Aligning with the resource-based theory, possessing these resources predisposes academics to recognise and exploit the market value of research opportunities and perform a wide range of entrepreneurial activities, and overcome challenges (Mickiewicz, Nyakudya, Theodorakopoulos, & Hart, 2017; Hörisch, Kollat, & Brieger, 2017; Kachlami, Yazdanfar, & Öhman, 2018; Meyskens, Carsrud, & Cardozo, 2010).

Low-level entrepreneurial engagement found among academics was anticipated and consistent with the speculation that African academics are not entrepreneurially engaged (Jones et al., 2007; Munyoki et al., 2011). While this

may be due to the pressure to conduct research solely for publication and career advancement, rather than for knowledge transfer and commercialisation as reasoned by Bogoro (2015) and Atuahene (2011), it may also be due to other individual and institutional constraints like the difficulty of integrating academic duties with industrial engagement (Ambos, Mäkelä, Birkinshaw, & D'Este, 2008), lack of entrepreneurship knowledge, lack of institutional support system, inadequate sensitisation of academics by management on the benefits of knowledge transfer, and lack of institutional incentives (Siegel, et al., 2004). According to Ajzen (2012) and Carsrud and Brännback (2011), perceived barriers prevent individuals from acting on their entrepreneurial intentions.

The possibility that this result may also be attributed to early-career academics was explored. The mean scores and t-tests for independent samples were used to compare the entrepreneurial engagement of early and late-career academic samples. Early-career academics were found to differ significantly from late-career academics *($t = -1.96$, $df. = 296$, $p<.05$)*, with early-career academics having significantly lower mean scores *($\bar{x} = 2.54$ and $\bar{x} = 5.01$)* due to their relative lack of experience in commercial research. This suggests that the low level of entrepreneurial activities by academics in the study may actually be due to early-career rather than late-career academics. Previous studies have confirmed that academics' entrepreneurial engagement is influenced by their career life cycle (D'Este & Perkmann, 2011; Novotny, 2017). They are more likely to engage in entrepreneurial activities later in their careers when they have attained higher academic positions, amassed ample intellectual capital, and gained more industrial work experience.

In terms of the impact of entrepreneurial resources on academics' entrepreneurial engagement, entrepreneurial innovativeness was found to have a significant impact on academics' entrepreneurial engagement. This contradicts the study's expectations. However, the failure of entrepreneurial motivation and orientation to impact academics' entrepreneurial engagement confirms the expectations. Though the impact of entrepreneurial innovativeness on entrepreneurial engagement is unexpected, it is consistent with literature linking entrepreneurial innovativeness to academic business engagement, research spin-offs, and knowledge and technology transfer among scientists (Moog, Werner, Houweling, & Backes-Gellner, 2015; Kautonen, van Gelderen, & Fink, 2015; Ismail et al., 2015). The ability of academics to identify and conduct novel research while capitalising on market value is determined by their innovativeness as a primary entrepreneurial resource. The failure of entrepreneurial motivation and orientation to influence academic entrepreneurial engagement in this study contradicts the literature, which has established these resources as critical to the academic entrepreneurial process and critical in determining an academic's proclivity to engage in entrepreneurial endeavours (Rizzo, 2015; Ismail et al., 2015). It does, however, confirm the hypothesis that African academics are not entrepreneurial.

6. CONCLUSION

This study is premised on the notion that African academics and scientists lack the capacity to engage with industry successfully. It is an important first step toward empirically evaluating and validating this speculation by assessing African academics' entrepreneurial resourcefulness and engagement with a focus on Nigerian academics. Contrary to popular belief, academics are entrepreneurially resourceful in terms of innovativeness, motivation, and orientation, all of which are required for sensing, conducting, and bringing research to market. But their level of entrepreneurial engagement is low. While entrepreneurial innovativeness influences their entrepreneurial engagement, entrepreneurial motivation and orientation are insufficient to generate it. Thus, while the study discovered evidence to contradict the speculations about academics' entrepreneurial resourcefulness, it also found evidence to support the low level of entrepreneurial engagement among academics.

6.1 Implications of the study

This study has important implications for both the literature and practice. The findings refute the notion that African academics lack entrepreneurial skills while validating speculation about their low entrepreneurial engagement. These contradictory findings explain why, despite the fact that good research with market value abounds in Africa, particularly in Nigerian universities, their commercial rate is low. Beyond the notion, this study was able to provide empirically verifiable evidence and insights into African academics' entrepreneurial resources and engagement. As a result, the study was able to expand the literature by providing information and discoveries that will spark further discussions and research on African academic entrepreneurship.

The study has a wide range of practical applications for academics, departments, and the university as a whole. The discovery of entrepreneurial resourcefulness (innovativeness, motivation, and orientation) among academics demonstrates that academics, first and foremost, have the basic prerequisites for entrepreneurial engagement. This leaves the university with the responsibility of fostering entrepreneurial spirits and interests within the

university, as well as raising academics' awareness of the benefits of commercialising their research in order to generate research grants and additional revenue for themselves, their department, and the university. According to literature, the decision of universities to become entrepreneurial is aided by the internal supportive environment of the universities (Toledano & Urbano, 2008). By providing an enabling university environment and putting in place a support system and associated infrastructural facilities, university administration plays a critical role in facilitating the entrepreneurial engagement of academics and departments.

Universities should establish a technology transfer office (TTO), an industrial liaison office (ILO), business incubation centres, and science parks to coordinate and identify commercially valuable research and activities to commercialise it; identify and license new technology and relevant intellectual property; stimulate and manage the flow of knowledge and technology between the university and the industries and markets and facilitate and grow business incubation centres. Furthermore, the university can assist academics in establishing and cultivating networks by assisting them in creating forums that connect them with industry players.

The university can also collaborate with industries through a direct partnership programme that allows for staff exchange for specific periods of time. Academics may be granted a two-year professional practice leave in the industry during their first eight years of university work, in order to gain industrial experience and business knowledge. Academics will be exposed to industrial needs on which research can be focused. The exchange programme has the potential to bridge the cultural gap between academia and industry, allowing for greater collaborative efforts. All of this raises the prospect of academics conducting more industry-relevant and commercially relevant research. The university can also assist academics to overcome institutional constraints such as insufficient rewards and poor incentives for university researchers (Siegel et al., 2004; Debackere & Veugelers, 2005); time constraints due to work overload (De Silva, 2012); and funding difficulties due to limited resources and insufficient R&D funding (Atuahene, 2011; Mohamedbhai, 2008). The effects of the "publish or perish" academic culture can be mitigated by giving equal weight to inventions, innovations, and patent developments for promotion and career advancement as publications.

6.2 Limitations of the Study

The study is limited to a single university and an academic sample with a skewed distribution across disciplines. While data from some disciplines is sufficient, data from others is insufficient. This calls the findings' generalisability into question. Given the inherent diversity of the academic population and universities, the findings may differ across disciplines and universities with a larger sample size. As a result, the findings of this study should be regarded as preliminary and should not be generalised beyond the focal university in the absence of additional research that addresses these limitations. The findings should also be interpreted with caution as an index of African academic entrepreneurship.

6.3 Suggestions for Future Studies

First, research has shown that academic engagement is a multi-level phenomenon that necessitates taking into account individual academic characteristics, departmental entrepreneurial culture, and the university's entrepreneurial support system (Perkmann et al. 2013). The department and university shape individual faculty members' entrepreneurial attitudes and behaviours. Departmental entrepreneurial culture and the entrepreneurial activities of experienced faculty in spinoff creation, knowledge transfer, and industry collaboration provide the entrepreneurial orientation that encourages early-career academics to pursue research and commercialisation (Chang et al., 2016; Rasmussen, Mosey, & Wright, 2014; Sieger & Monsen, 2015). Similarly, entrepreneurial universities with internal supportive environments, culture, and infrastructure influence departmental entrepreneurial cultures and encourage academics to have positive attitudes toward engaging in entrepreneurial activities (Chang et al., 2016). However, research on the impact of department and university contexts on academic entrepreneurial engagement in Africa is limited. As a result, future research should consider investigating the role of departmental and university contexts in facilitating or impeding African academics' entrepreneurial engagement.

Second, the academics' lack of entrepreneurial intent could be another plausible explanation for their low engagement. Intention has been identified as the most important predictor of action and the most immediate precursor to establishing a business (Douglas, 2013; Kautonen, et al., 2015; Krueger, Reilly, & Carsrud, 2000; Schlaegel & Koenig 2014). As a result, if their motivation is insufficient, academics will not engage in entrepreneurship; therefore, research into the role of entrepreneurial intention in academic entrepreneurial engagement will be critical.

Third, while this study found that entrepreneurial motivation and orientation have no effect on academics' entrepreneurial engagement, the two entrepreneurial resources may be able to moderate the relationship between innovativeness and entrepreneurial engagement. As moderators, it is likely that the combination of innovativeness and the two entrepreneurial resources will result in a higher level of entrepreneurial engagement than innovativeness alone can provide. Similarly, the assumption that entrepreneurial intention has a direct causal effect on engagement assumes that the relationship between entrepreneurial intention and engagement can be moderated by the three entrepreneurial resources. If this assumption is correct, the presence of entrepreneurial resources increases the likelihood that entrepreneurial intention will be realised, implying the pathways by which entrepreneurial intention can be translated into action. As a result, it is worthwhile to investigate the potential of (1) motivation and orientation as moderators of the relationship between innovativeness and engagement, as well as (2) innovativeness, motivation, and orientation as moderators of the relationships between intention and engagement as links facilitating the transition from intention to action.

Finally, research indicates that academic entrepreneurs are motivated by both intrinsic and extrinsic factors (Ozgul & Kunday, 2015). In developed economies, university scientists are primarily motivated by intrinsic factors such as gaining recognition in the scientific community, expanding research work, personal satisfaction, serving the nation, and sharing knowledge, as well as, to a lesser extent, by extrinsic factors such as financial gains, technology transfer, collaboration with industry, spin-offs, and so on as secondary factors (Siegel et al., 2004; Antonioli et al., 2016). Motivations for participating in knowledge transfer activities may differ in the African context. Because academics in Nigeria, for example, are poorly compensated, financial consideration (extrinsic motive) rather than intrinsic motives may be the primary motivator in the decision to engage in entrepreneurial activity. It is critical to investigate the motivations for entrepreneurial engagement in order to develop policies to encourage entrepreneurial engagement among academics in the African context.

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