



# **ENTREPRENEURIAL ECOSYSTEM MATRIX (EEM): A PROPOSED FRAMEWORK FOR NIGERIAN UNIVERSITIES TO BECOME FACTORIES FOR STARTUP COMPANIES**

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## **ABSTRACT**

*Universities have been identified as knowledge creation centres, where knowledge can be created and transferred for social and economic benefits and advancement. What makes them relevant now is that we are in the knowledge era where knowledge has become the currency for facilitating sustainable development; hence, the role of universities, as knowledge creation centres, has become more relevant. This relevance is reflected in their potential to generate ideas and knowledge that can become products and companies when harnessed. The gap, however, has been that a lot of the knowledge created by universities has not gone beyond the idea or prototype stage. This study, thus, proposes a framework to harness knowledge created in and by universities to take them from the concept stage to the product stage and then to the startup stage, hence, making them factories for startup companies. This is essential for harnessing the*

*commercial value of knowledge. This study, therefore, presents a structure on how Nigerian universities can become factories for shipping startup companies that create value, opportunities and wealth, through their entrepreneurial efforts.*

**Keywords:** Entrepreneurship; Entrepreneurial Ecosystem; Startups; University

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## 1. INTRODUCTION

Universities are centres of knowledge where knowledge is created, developed and packaged in the form of graduates as products. Education enhances one's capability to learn, create value, compete for opportunities, and improve one's ability to contribute to the economic sustainability of the nation but in Nigeria, it is a little different from the norm. There are more graduates looking for jobs than there are jobs, which have culminated into the state of rising graduate unemployment (Bassey & Atan, 2012). Such outcome raises concerns and justifies the need to question the purpose of higher education and the need to get a degree.

Education is meant to create the solution to society's problems by cultivating the army of experts equipped to proffer solutions to the problems. So, if graduates leaving the university annually are leading to rise in graduate unemployment, it means that the problem of graduate unemployment is not being solved by what education has been offering. Solving the problem would mean delivering products that would be employable and be involved in job creation in Nigeria; and one major way of doing this is through entrepreneurship. So, Nigerian universities can produce student and graduate entrepreneurs that would create start-up companies which would later create jobs. Hence, universities in Nigeria need to provide the kind of education that delivers products (graduate entrepreneurs and startup companies) that create job opportunities. Given that the product is a reflection of the process, the process through which the Nigerian graduate is made needs to be revisited.

Universities also create knowledge through research (Oluwatobi, Olurinola, Alege, & Ogundipe, 2018). Hence, they are in a good position to develop the products people need and create solutions to problems faced by people and the society as a whole. Some of these products and solutions could be things people will be willing and able to pay for; thus, usable products and businesses could be made from the process. For instance, Crest toothpaste is a product from a research in Indiana University; Siri, the iPhone's digital assistant, is a product of a research in Stanford University; Coca Cola is a product from a chemist's experiment in the laboratory, to mention a few (Sakkab, 2002). These are products from educational institutions, which created knowledge products through research. These clearly indicate that universities can become centres that take knowledge from concepts to products to companies; hence, they can spin off companies from research. Such companies can then become engines for creating value, and also opportunities and wealth that translate in economic prosperity.

The experiences of revolutionary entrepreneurs and founders such as Mark Zuckerberg, Larry Page, Sergey Brin and Bill Gates also indicate that universities can become factories for startup companies, besides spinning off companies from research. Mark Zuckerberg started Facebook in Harvard University (Grossman, 2010; Westlake, 2008; Zuckerberg, 2008). Larry Page and Sergey Brin started Google in Stanford University (Page, Brin, Motwani, &

Winograd, 1999; Vise, 2007); and Bill Gates started Microsoft while in Harvard University (Boje, & Smith, 2010). These reveal the potential of universities to unleash or enable their students to create products and launch startup companies by the things they are learning or the things they are inspired by. How can Nigerian universities become plants for generating this kind of spinoffs, given that entrepreneurs and startup companies represent avenues for creating values, opportunities and wealth that the Nigerian economy is in need of?

It is necessary for Nigerian universities to consider the direction of this study in order to address ills in the economy that can be addressed via higher education. For instance, Nigeria imports a bulk of value it should create (Adegbe, Festus, & Ota, 2013), which transfers a chunk of its wealth and opportunities to other economies at its expense. Moreover, many talents developed in universities and shipped into the society exceed the amount of opportunities available to absorb them, which is an indication that these talents were trained to only function and contribute after they have found the required job opportunities; whereas, if they had been developed and engaged to launch startup companies that create opportunities and prosperity, they would have created avenues for more people to add value (Maina, 2014; Pitan, & Adedeji, 2012; Salami, 2013). The question is now how can Nigerian universities, therefore, become factories for launching startup companies?

## 2. LITERATURE REVIEW

Universities and other higher institutions of learning are mainly known for teaching, research and community development; and the perception of these universities has mainly been to prepare students for the real world of work and to be qualified for the labour market. The race and craze have been to go to school and get good grades in order to secure a good job. However, very little has been emphasized as to going to school to learn in order to create good jobs while creating value. The study of Mansor and Othman (2011) helped to provide a cure to this. Their study aimed to find out what could be responsible for influencing students' attitude and choice for entrepreneurship rather than paid employment. Using action-based research that engaged both qualitative and quantitative research approaches, they discovered that a consulting-based entrepreneurship education approach would be essential in stimulating students' interest and choice for entrepreneurship. Thus, this technique enables students to create jobs and value by stimulating their interests and inspiring them with entrepreneurial knowledge.

But beyond teaching and influencing students' attitude, universities can contribute much more to cultivating entrepreneurs and startup companies, given the availability of knowledge, research capacity, research output, infrastructure and talents. These are tools and equipment that can enable the launch of startup companies. Astebro, Bazzazian and Braguinskyb (2011) validated this in their study. They proved that universities can trigger the creation of high valued startup companies and new ventures, which are spun from research. One of the interesting facts in their study is that startup companies generated by recent graduates are more than those spun by faculty members. This is an insight into the fact that universities can generate startup companies; but more importantly, they can generate more startup companies by enabling their recent graduates through the provision of the required infrastructure, incentives and supports. The concern, however, is whether or not recent graduates are experienced enough to launch and grow new ventures. Ferreira, Loiola and Gondim (2017) clarified in their study that a recent graduate is twice as likely to launch a new venture within three years of graduation, and that the graduates' spin-offs are not of low quality, and are by no means failures; instead, they are of high quality. Approximately five percent of alumni at Harvard Business School start businesses within one year of graduation and 13 percent of those are successful. Students, therefore, represent a vital group when examining the impact of

universities on the creation of new firms (Åsterbro, Bazzaziana, & Braguinskyb, 2011; Bezerra, Borges, & Andreassi, 2017; Ferreira, Loiola, & Gondim, 2017).

Generating startups from universities and spinning off new ventures from research require institutional capacities beyond the conventional roles of teaching and research, which universities are known for. Universities, therefore, need capacities beyond their conventional roles to become factories for startup companies. Rao and Mulloth (2017) examined the various types of capabilities universities can cultivate to enable them to become breeding grounds and factories for new ventures. Using the Entrepreneurial Competence Framework, they discovered certain capabilities universities need to develop to become factories for startup companies (Rao & Mulloth, 2017). These capabilities include the ability to identify opportunities, harness them and develop them into viable businesses; technology transfer offices (TTOs) with the ability to push and keep the process of transforming ideas into new ventures in motion (Jensen & Jones, 2011); the capacity to access resources and funding; the advantage of proximity to funders, labs, venture incubators, and markets; as well as the culture and environment for enabling entrepreneurial behaviour.

To be highly competitive as a university, generating a new source of income is not debatable and this is easily achieved by becoming a university that is very interested in entrepreneurship growth, which would necessarily increase the scientific productivity of a lot of faculty (Ferreira et al., 2017; Jansen, van de Zande, Brinkkemper, Stam, & Varma, 2015; Miner, Gong, Ciuchta, Sadler, & Surdyk, 2012). Being entrepreneurial as a university increases the chances of maximizing students' skills and talent, combating unemployment firsthand and also fulfilling a social course (Campanella, Della Peruta, and Del Giudice, 2013; Ferreira et al., 2017; Iborra, Alvarez, Martinez, Suarez, and Requena, 2017; Lindh, 2017). Such helps in shaping the future of the students and increasing the economic growth of the nation (Dana & Dana, 2005; Hsu, Shen, Yuan, & James, 2015; Jansen et al., 2015; Opong-Tawiah & Chan, 2016; Paço, Ferreira, & Raposo, 2017; Wolf, 2017).

## **2.1. Limitations to Universities' Potential to be Start-up Factories**

Though it is quite essential for universities to become more entrepreneurial, some factors limit their chances to be start-up factories. For instance, there seems to be no approved theory that can singlehandedly increase the growth level of entrepreneurial enthusiasm in students which have led universities to find succour in several research outcomes responsible for limiting the quest to be more entrepreneurial and create an entrepreneurial environment (Croce, Grilli, & Murtinu, 2013; Jansen et al., 2015; Miner et al., 2012; Munari, Pasquini, & Toschi, 2015; Munari, Sobrero, & Toschi, 2018; Payumo, Arasu, Fauzi, Siregar, & Noviana, 2014). Some universities that are successful in encouraging and helping students build their startups still face a major challenge of early stage funding for some business which would eventually lead to the death of some of these businesses that could not access the funds which limits the number of students' start-up companies. The university also faces some challenges ranging from adequate human resource to help train and mentor start-up founders and market credibility for the businesses founded and these factors could impede the success of the businesses founded (Bezerra et al., 2017; Campanella et al., 2013; Miner et al., 2012).

## **2.2. Benefits to Universities that are potential Start-up Factories**

Being entrepreneurially inclined as an educational institution and a factory for Startup Companies is also very beneficial in several ways. An entrepreneurial university is simply not an institution that just disperses knowledge but potentially helps students develop the capacity needed to run and build successful businesses (Ferreira et al., 2017; Miner et al., 2012). MIT

is an example of an entrepreneurially-focused university that has enabled students, faculty and alumni to establish companies, which employ over 3.3 million people and generate nearly two trillion dollars in revenue as at 2006 (Jansen et al., 2015; Siegel & Wright, 2015; Wright, Siegel, & Mustar, 2017). An Entrepreneurial university thereby fosters the commercialization of discovery, thus, making faculty, staff and students eager to conduct research, aid job creation, and invest in university research endeavours (Åsterbro et al., 2011; Roach, 2017).

Universities such as MIT, which has about 24 percent of its alumni as entrepreneurs, have shown the world and the educational system that it is possible for universities to become enabling environments for churning entrepreneurs and ventures (Åsterbro et al., 2011; Ferreira et al., 2017). Stanford University, Tsinghua University in China, Halmstad University in Sweden, International Institute of Information Technology Hyderabad (IIIT), Stony Brook University, Chalmers University in Sweden, among others, have produced significant spin-offs and startups by students and faculty; hence, proving that educational institutions can be factories for startup companies (Åsterbro et al., 2011; Ferreira et al., 2017; Jansen et al., 2015; Miner et al., 2012; Wolf, 2017).

### 2.3. Entrepreneurial Ecosystems

Though Universities can be considered as factories for startup ventures, it is pertinent to not neglect vital factors that would be necessary in ensuring the overall creation, launch, growth and development of startup companies. In fact, one of the reasons for considering Universities as venture factories is that they seem to possess some of the of the vital factors that would enable the successful take off and growth of startup companies. The environment as well as inter-workings of these factors is what makes the entrepreneurial ecosystem. The strength of this ecosystem determines the successful launch and development of startups. For instance, new ventures need access to market for their products, finance and human capital to thrive. The lack of any of these can lead to a wreck or make venture creation not feasible. This suggests the relevance of considering the entrepreneurial ecosystem, which the University environment can be for startup ventures.

Various studies have identified certain elements that define an entrepreneurial ecosystem. Entezari (2015) clearly identified six actors and eleven factors that makes up an entrepreneurial ecosystem. The six actors include entrepreneurial Universities, academic entrepreneurs, financial institutions, knowledge-based industrial parks, science parks and the government. Corroborating the actors are the eleven factors, which include opportunities, enterprise culture, learning, entrepreneurial capacity, human capital, innovation capital, social capital, University-Industry linkage, infrastructure and info-structure. The study of Jha (2018) confirms the validity of these elements; however, the elements were presented in the form of six domains, which signifies clarity and simplicity. These domains are market access, institutional support, finance, human capital, conducive culture and progressive policy framework. Recognizing these factors as the elements that make up an entrepreneurial ecosystem that determines the success or failure of a starup venture, is confirmed by proven studies (Cohen, 2006; Isenberg, 2010; Isenberg, 2011; Holienka, 2015; Auerswald, 2015; Hochberg, 2016; Acs, Stam, Audretsch, & O'Connor, 2017).

These studies have clearly helped to identify the elements that make up the entrepreneurial ecosystem and the roles the play in the system. However, few studies have explored the interactions that exist within entrepreneurial ecosystems and how the interrelationship among the elements affects the kind and quality of startup venture that will be generated in such ecosystem (Roundy, Brockman, & Bradshaw, 2017; Roundy, Bradshaw, & Brockman, 2018). It is believed that the variances in these, among entrepreneurial ecosystems are what

differentiates one ecosystem from another. Moreover, little attention has been given to viewing the University as a potential entrepreneurial ecosystem that can be seized to address societal economic issues such as graduate unemployment and the lack of optimal use of resources. This study, thus, capitalizes on these gaps to contribute to the existing body of knowledge on the subject.

### 3. OVERVIEW OF THE NIGERIAN CASE

#### 3.1. Factors that Increase graduate unemployment in Nigeria

Economies that end up thriving are the ones where the people have the freedom of enterprise and are encouraged to establish ventures that create value, opportunities and wealth (Corcoran & Gillanders, 2015). It has also been said in the literature that entrepreneurship is a pivot for economic development (Carayannis & Von Zedtwitz, 2005). Increasing graduate unemployment is a reflection that there are limited employment opportunities, which suggests that there are few enterprises with employment opportunities to offer. Also, an institutional environment that makes doing business a burden can discourage free enterprise even in a mixed economy (Corcoran & Gillanders, 2015). When the ease of doing business is low, the creation of new ventures are discouraged (Corcoran & Gillanders, 2015). Besides, if the process for business registration is characterized by long and bureaucratic procedures, economic agents may be discouraged from indulging in entrepreneurship. The availability of infrastructure also represents an important factor. The availability of electricity, good roads, and hitch-free communication systems makes enterprise convenient. This section therefore expresses an overview of the Nigerian case on this subject.

#### 3.2. Level of competitiveness in Nigeria

It is pertinent to then consider the level of competitiveness in Nigeria. This will help to reveal the level and quality of institutions, the macroeconomic environment, infrastructure, healthcare, education, financial market, market size, technological readiness, and business innovation. As a result, level of an economy's productivity is defined by the level of productivity in such economy (World Economic Forum, 2017). This study, therefore, employs the Global Competitiveness report by the World Economic Forum to assess the level of competitiveness overtime in Nigeria. With this, the Nigerian economy can be assessed from a broad perspective whether it is a conducive environment for enterprise, particularly enterprises generated from knowledge creation centres like the University.



Figure 1: Nigeria's Global Competitiveness Index (2006-2017)

## Entrepreneurial Ecosystem Matrix (Eem): a Proposed Framework For Nigerian Universities to Become Factories For Startup Companies

**Source:** World Economic Forum, 2006-2017

The Global Competitiveness report measures competitiveness, using the Global Competitiveness Index (GCI), which has seven (7) points as the maximum; that is, seven indicating full competitiveness. Figure 1 shows a trend overtime of Nigeria's level of competitiveness from 2006 to 2017. In 2006, Nigeria's level of competitiveness was 3.45 points, which was less than the average. However, Nigeria's level of competitiveness increased to 3.81 in 2008 out of 7 points, representing her highest point till date. As at 2017, the level of competitiveness has dropped to 3.3 points. These dwindling levels indicate poor utilization and employment of available resources in a way that consistently improves the level of productivity that translate into prosperity. Creating an enabling environment that supports prosperity is therefore essential. Such will enable enterprises to create prosperity (Oluwatobi, 2015).

This study, therefore explored the level to which new businesses are registered in Nigeria every year. This was done by employing data on new businesses registered annually from the World Development Indicators (WDI). As shown in Figure 2, the level of new businesses registered has been on the rise since 2004. Over 20,000 new businesses were registered in 2004 while over 60,000 new businesses were registered in 2008. In 2012, more companies, over 80,000 new businesses, were registered in Nigeria (World Development Indicators, 2017). These reflect a rise in the level of new businesses created annually in Nigeria.

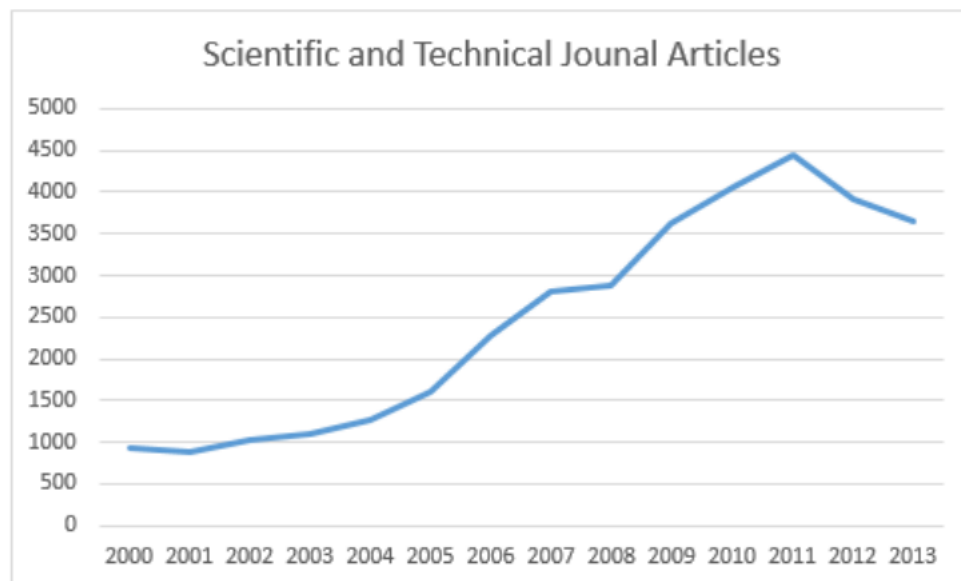


**Figure 2:** New Businesses Registered Annually in Nigeria (2004-2012)

**Source:** World Development Indicators (2017)

This rise is a reflection of the freedom of enterprise and the quest of people to be self-employed, start and run their own enterprises. However, this may not be adequate given that the survival rate may be low as proven by facts that one in five startup companies survive their first 3 years (Giardino et al., 2014). This further justifies the need for universities in Nigeria to become factories for startup companies, knowing that universities can provide the enabling resources that can give startup companies the solid foundation that will minimize their failure rate at the startup phase. Launching from the university gives startup companies access to research ideas and output, advice from specialists and experts, access to research labs for the purpose of experimentation, and access to shared resources such as electricity, internet, office space, administration to mention a few.

Besides, these, universities have increasing pool of knowledge generated from research, which could be spun into enterprises. Based on the understanding that businesses start as ideas, it is expected that such ideas should not be lacking in universities, given the volume of ideas generated from research and development annually from universities in Nigeria. Figure 2 shows that the volume of research output in Nigeria since 2000 has been on the increase, thus indicating access to ideas and insights possessing commercial values (World Development Indicators, 2017).



**Figure 3:** Number of Scientific and Technical Journal Articles in Nigeria (2000-2013)

**Source:** World Development Indicators (2017)

Universities in Nigeria can, therefore, become enablers and engines for economic growth and development. This suggests the need to rethink the role of universities in the society. However, no matter the volume of research output generated overtime, if its potentials and commercial values are not employed through enterprise, its prosperity potentials will not be unleashed. Hence, it is vital for universities to go beyond teaching, research and community development to becoming factories for churning out high growth startup companies that will generate value, opportunities and prosperity.

This study postulates that an economy can advance its level of competitiveness by harnessing universities as veritable platforms for launching startup ventures and spinning off companies from research. This is made possible as a result of the capacities that universities have to create knowledge through research, develop talents through training, and create markets (through the student and faculty population). These are beside, infrastructure available in universities that can be shared and employed for the purpose of enterprise. Ideas for business purposes should not be lacking in universities, as a result of research activities going on. Talents for building enterprises should not be lacking because of the process of talent development that takes place within them.

#### **4. THE UNIVERSITIES' ENTREPRENEURIAL ECOSYSTEM: A PROPOSED FRAMEWORK**

Universities can frequently churn out startup companies by setting up platforms to: create value from knowledge (ideas, concepts, prototypes and products) developed by the university



**Entrepreneurial Ecosystem Matrix (Eem): a Proposed Framework For Nigerian Universities to Become Factories For Startup Companies**

community; validate that the value created is an efficient, effective and applicable solution; develop the entrepreneurial mindedness of the university community; and establish the enabling environment, which is defined by the incentives, institutional quality, infrastructure, capital, access to markets, workspace, laboratories for experimentation, Technology Transfer Offices (TTOs) as well as industry support and linkages.

What actually defines a university as a factory for churning out startup companies is its entrepreneurial ecosystem—that is, the quality of its entrepreneurial ecosystem. This simply refers to the enterprise capacity of an environment and how enabling it is in fostering entrepreneurial activities and endeavours in the University. It can therefore be defined as the capacity and environment that support entrepreneurial thinking, activities, efforts and action.

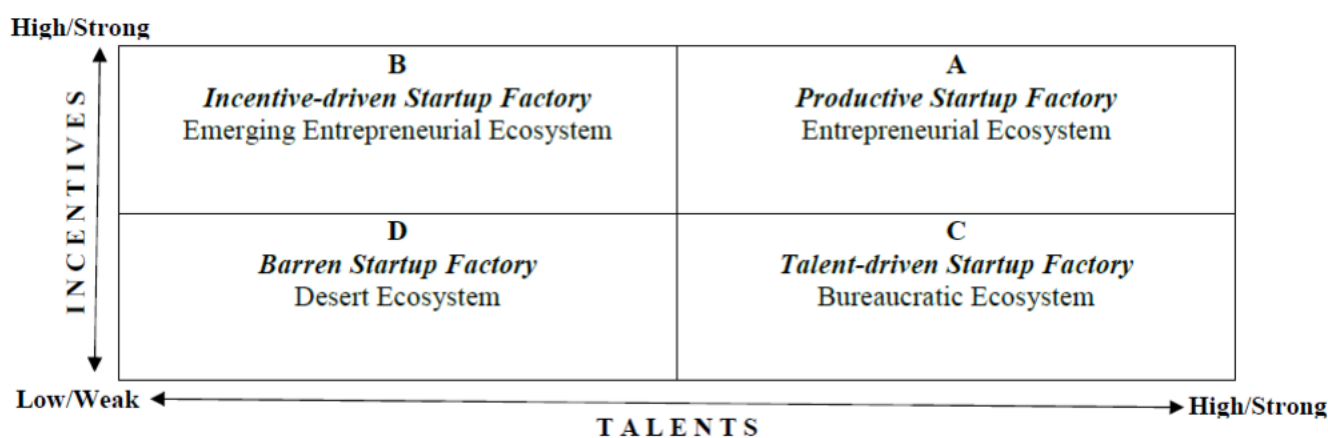
An entrepreneurial ecosystem, as defined by this study, is based on two pillars. They are talents and incentives. Talents refer to the capacity of the people to be enterprising, seize opportunities, generate opportunities, create value, develop tradable products, generate wealth and create prosperity (Gagné, 2005). In simple terms, therefore, talents refer to the quantity and quality of the people in the environment. They represent the people that create employment, business and market opportunities. They define the category of persons, who possess the relevant skills for producing market-ready products and services that inject wealth into the economy when traded. Talent development, therefore, is about developing the entrepreneurial mind. Hence, all activities to be carried out in the university community should be aimed at installing entrepreneurial-mindedness in the players, which include students, faculty, graduates, and members of the community. On the other hand, incentives refer to the environment that enables the talents to create value, wealth, opportunities and prosperity. This can be in the form of the availability of infrastructure (electricity and ICT), protection of intellectual property, access to venture funding, access to markets, and laboratories for experimentation, incubation support, hitch-free technology transfer mechanisms, and incentives for creation, innovation as well as enterprise (Fogel, 2001). Table 1 clearly presents these two pillars.

**Table 1: Two Pillars of an Entrepreneurial Ecosystem**

Pillar	Pillar Constituents
Talent	Entrepreneurial Education
	Entrepreneurial Mentoring
	Entrepreneurial Action/Exercises
	Industry exposure
	Research/innovation capacity
Incentives	Economic motivation
	Institutional quality (IPR protection, Ease of doing business, Access to markets etc.)
	Infrastructure (Incubator, ICT, electricity, etc.)
	Funding (Access to Capital; venture funding etc.)
	Access to Markets
	Laboratories for tests and experimentation
	Incubation support (shared resources—administrative services etc.)
	Active Technology Transfer Office (TTO)
	Reward share

**Source:** Authors

The quality and level of each of these two pillars as well as their interrelatedness are what define the health, impact and success of an entrepreneurial ecosystem. For instance, an entrepreneurial ecosystem with a high level of talents and a high level of incentives to match would be a healthy entrepreneurial ecosystem with high impact. This study, therefore, developed a matrix that defines four kinds of entrepreneurial ecosystems. This matrix is called the Entrepreneurial Ecosystem Matrix (EEM). It is presented in Figure 4. This matrix will help to reveal what is responsible for the status of any of the ecosystems, hence, providing a guide to addressing the issues faced in each one. This will, therefore, enable Universities to assess and diagnose their ecosystems as well as guide them on where and what to invest in to become healthy entrepreneurial ecosystems that cultivate high-growth entrepreneurs and startup companies.



**Figure 4:** Entrepreneurial Ecosystem Matrix (EEM)

**Source:** Authors

Not every university is a healthy environment for launching, developing and churning out startup companies (Any source in literature to back this up.) As noted, the university is known for teaching and research mainly; but restricting the role of the university to these two limits the potentials of the university. The potentials of the university include its liberty to create and its access to a pool of talents, knowledge from research, ideas, infrastructure and creative young minds. Limiting the role of the university to mainly teaching and research, therefore, under-utilizes the university’s potentials. This is why it is essential for universities in Nigeria to generally look beyond teaching and research and incorporate entrepreneurship as a compulsory engagement for students so as to become startup factories. A startup factory, in this context, refers to a “plant” for “producing” startup companies, where the university represents the “plant.”

As shown in Figure 4, the EEM captures the various categories of ecosystems that could exist in a university. They include the desert ecosystem (Grid D), the bureaucratic ecosystem (Grid C), the incentive-driven ecosystem (Grid B), and the entrepreneurial ecosystem (Grid A).

The desert ecosystem is the kind of ecosystem that generates little or no startup company. It is characterized by low level of talents and low level of incentives. The capacity of the people to create value and economic prosperity is low; and incentives that encourage entrepreneurial thought and action are lacking. Its features include poor infrastructure, lack of incubation support, lack of access to venture funding, lack of incentives for experimentation, lack of protection of intellectual property rights, limited market access, lack of entrepreneur success

and mentorship to inspire enterprise to mention a few. Any University in this category can be referred to as a *Barren Startup Factories*. What makes it a desert ecosystem is that it does not allow entrepreneurship and enterprise activities to flourish.

Another kind of ecosystem is the bureaucratic ecosystem, which is on Grid C. This kind is characterized by the availability of substantial volume of talents possessing skills relevant for creation, innovation and enterprise. This high volume of talents is as a result of in-house training, industry exposure, in-house mentorship and talent development. Despite this, the environment does not enable and incentivize talents to operate productively. Their abilities are limited by low incentives; hence, there is limited access to resources (even when available), limited access to markets, lack of infrastructure, rules that discourage adventuring, poorly-equipped laboratories, limiting bureaucratic processes required to make progress, lack of recognition or reward for creativity and enterprise, lack of infrastructure and lack of protection of intellectual property rights. Basically, the environment does not enable entrepreneurship and enterprise. The danger here is that talented people can be lost to other enabling environments, which turns the ecosystem into a desert ecosystem, if there is no turnaround. The volume of talents, however, is expected to engender a turnaround by the demands they make and the pressures they put on key decision makers. With time, some of the talents may end up as key decision makers, who will commit efforts to increase the level of incentives, thus, leading to a productive startup factory (Grid A). Basically, the early phase of this ecosystem attracts and encourages talents because the environment is characterized by talent development and exposure. However, the system eventually gets to a saturation point, where individuals have been developed and equipped and they require resources and incentives to express the capacity they have developed. Moreover, existing resources and infrastructure have been over-pressured. Such talents will then begin to put pressure on the system to provide incentives. Such pressure represents a drive towards a productive ecosystem in the long run. This is why it is referred to as a *Talent-driven Startup Factory*.

Grid B of the EEM refers to an Incentive-driven Startup factory. Even though it is characterized by low level of talents, it is featured by a high level of incentives strong enough to stimulate the increase in the quantity and quality of talents. The high level of incentives in this ecosystem is responsible for stimulating the emergence of this ecosystem to become an entrepreneurial ecosystem. Thus, as people have access to infrastructure, funding, markets and they become aware that they can profit from their intellectual property rights (which can be protected), they begin striving to improve themselves and develop their talents, thereby improving the level of human capital. The volume of incentives in this ecosystem, thus, encourages increase in the level of talents, hence, stimulating the ecosystem to transit into an entrepreneurial ecosystem (Grid A).

The prime ecosystem in the EEM is the entrepreneurial ecosystem captured in Grid A. It is characterized by a high level of talents and a high level of incentives. The reason is that they naturally churn out startup companies and high-growth entrepreneurs. Such is known for incubating, nurturing and churning out startup companies, both by faculty members and students. It does not only invest adequately in the development of talents; it also invests substantially in establishing the enabling environment for talents to thrive, conceptualize, create, innovate, build and develop products that are market-ready. Universities that have created this kind of ecosystem are referred to as *Productive Startup Factories*.

## 5. A FRAMEWORK FOR GENERATING STARTUP COMPANIES IN NIGERIAN UNIVERSITIES

The EEM has provided the two vital pillars that define the processing unit of the startup factory. This section, therefore, presents a framework in Figure 5 that shows the inputs, the processing unit and the output.

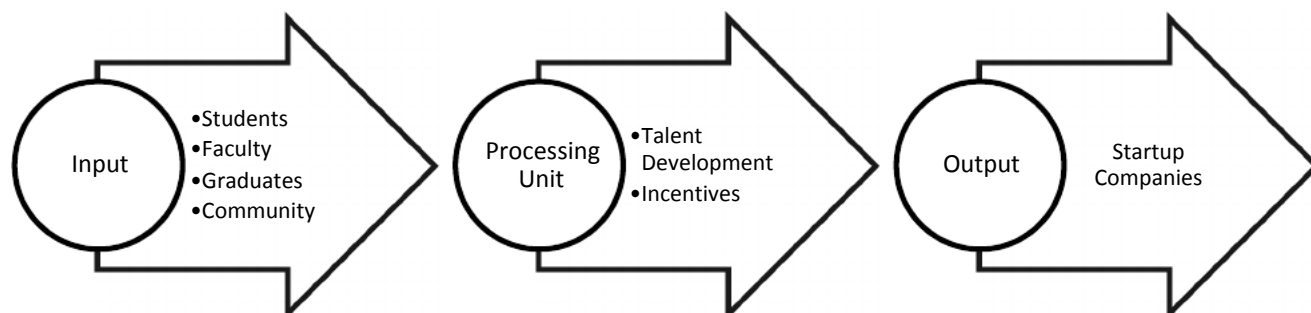


Figure 5: A Framework for universities to operate as factories for generating startup companies

**Source:** Authors

The input, in the framework refers to agents that need to be refined and equipped to become high-growth entrepreneurs and founders of great companies. These agents include students, faculty, graduates (alumni) and members of the community. The processing unit in the framework refers to the pillars of the entrepreneurial ecosystem; hence, it involves the development of talents and incentivizing their creative efforts to generate the expected output—Startup companies.

As students and faculty members get into the university they go through a process that involves the development of their abilities to create, innovate and produce solutions that are valued in the market. Such process also includes the provision of incentives and resources that enables students and faculty members to turn their concepts to products and get them to the market.

## 6. RECOMMENDATIONS AND CONCLUSION

This study proposes the idea of Nigerian universities becoming factories for startup companies. This proposition is to express the possibilities of reducing graduate unemployment and maximizing opportunities by harnessing the university environment for not only knowledge creation and sharing, but also its utilization to create opportunities and wealth through startup venture creation. Further, based on the fact that universities create knowledge through research, develop talents and possess certain infrastructure and facilities that can be shared, the study affirms that universities are veritable platforms for launching startup companies and spinning off enterprises (Stargers, 2014). The article, therefore, developed the EEM to reflect the possibilities that could occur in universities based on the extent of their talent base and the extent to which the talents are enabled and incentivized to be resourceful and enterprising. As a result of these, the article recommends that universities position themselves in Grid A of the EEM, which depicts a productive startup factory. That is, efforts and investments should be made by universities optimally to develop the entrepreneurial capacities of their students and faculty members, expose them to the industry as well as continually provide them the enabling environment and incentives, such as favorable regulations, access to market, funding support, infrastructure, incubation support, technology transfer and the ease of doing business.

## 7. DECLARATION

### Abbreviations

1. Technology transfer offices (TTOs)
2. Massachusetts Institute of Technology (MIT)
3. International Institute of Information Technology Hyderabad (IIIT)
4. World Economic Forum (WEF)
5. Global Competitiveness Index (GCI),
6. World Development Indicators (WDI).
7. Intellectual Property Rights (IPR)
8. Information Communication Technology (ICT)
9. Entrepreneurial Ecosystem Matrix (EEM).
10. Research and Development (R&D)

### Availability of Data and Material

The data used in this article are sourced from the WEF's Global Competitiveness reports as well as World Bank's WDI.

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### REFERENCE

- [1] Acs, Z. J., Stam, E., Audretsch, D. B., & O'Connor, A. (2017). The Lineages of the Entrepreneurial Ecosystem Approach. *Small Business Economics*, 49(1): 1-10.
- [2] Adegbe, D., Festus, F., & Ota, O. (2013). The challenges and prospects of the manufacturing sector of Nigerian economy. *International Journal of Innovations in Management Science*, 4(2).
- [3] Åsterbro, T., Bazzaziana, N., & Braguinskyb, S. (2011). Startups by recent university graduates versus their faculty: Implications for university entrepreneurship policy. *Research Policy*, 41(4), 663–677.
- [4] Auerswald, P. E. (2015). *Enabling Entrepreneurial Ecosystems: Insights from Ecology to Inform Effective Entrepreneurship Policy*. Arlington: Ewing Marion Kauffman Foundation.
- [5] Basse, G. E., & Atan, J. A. (2012). Labour market distortions and university graduate unemployment in Nigeria: Issues and remedies. *Current research journal of economic theory*, 4(3), 67-76.
- [6] Bezerra, É. D., Borges, C., & Andreassi, T. (2017). Universities, local partnerships and the promotion of youth entrepreneurship. *International Review of Education*, 63(5), 703–724. Retrieved from <https://doi.org/10.1007/s11159-017-9665-y>
- [7] Boje, D., & Smith, R. (2010). Re-storying and visualizing the changing entrepreneurial identities of Bill Gates and Richard Branson. *Culture and Organization*, 16(4), 307-331.
- [8] Campanella, F., Della Peruta, M. R., & Del Giudice, M. (2013). The role of sociocultural background on the characteristics and the financing of youth entrepreneurship. An exploratory study of university graduates in Italy. *Journal of the Knowledge Economy*, 4(3), 244–259. Retrieved from <https://doi.org/10.1007/s13132-013-0157-4>

- [9] Carayannis, E. G., & Von Zedtwitz, M. (2005). Architecting gloCal (global–local), real-virtual incubator networks (G-RVINs) as catalysts and accelerators of entrepreneurship in transitioning and developing economies: lessons learned and best practices from current development and business incubation practices. *Technovation*, 25(2), 95-110.
- [10] Cohen, B. (2006). Sustainable Valley Entrepreneurial Ecosystems. *Business Strategy and the Environment*, 15(1): 1-14.
- [11] Corcoran, A., & Gillanders, R. (2015). Foreign direct investment and the ease of doing business. *Review of World Economics*, 151(1), 103-126.
- [12] Croce, A., Grilli, L., & Murtinu, S. (2013). Venture capital enters academia: An analysis of university-managed funds. *Journal of Technology Transfer*, 39(5), 688–715. Retrieved from <https://doi.org/10.1007/s10961-013-9317-8>
- [13] Dana, L. P., & Dana, T. E. (2005). Expanding the scope of methodologies used in entrepreneurship research. *International Journal of Entrepreneurship and Small Business*, 2(1), 79. Retrieved from <https://doi.org/10.1504/IJESB.2005.006071>
- [14] Entezari, Y. (2015). Building Knowledge-Based Entrepreneurship Ecosystems: Case of Iran. *Procedia-Social and Behavioral Sciences*, 195: 1206-1215.
- [15] Ferreira, A. da S. M., Loiola, E., & Gondim, S. M. G. (2017). Motivations, business planning, and risk management: entrepreneurship among university students. *RAI Revista de Administração E Inovação*, 14(2), 140–150.
- [16] Fogel, G. (2001). An analysis of entrepreneurial environment and enterprise development in Hungary. *Journal of Small Business Management*, 39(1), 103-109.
- [17] Gagné, F. (2005). From gifts to talents. *Conceptions of giftedness*, 2, 98-119.
- [18] Giardino, C., Unterkalmsteiner, M., Paternoster, N., Gorschek, T., & Abrahamsson, P. (2014). What do we know about software development in startups?. *IEEE software*, 31(5), 28-32.
- [19] Grossman, L. (2010). Mark Zuckerberg. *Time magazine*, December, 15.
- [20] Hochberg, Y. V. (2016). Accelerating Entrepreneurs and Ecosystems: The Seed Accelerator Model. *Innovation Policy and the Economy*, 16: 25-51.
- [21] Holienka, M. (2015). Entrepreneurial Environment in Slovakia: Multiperspective Comparison with Innovation-Driven Economies. *Procedia-Economics and Finance*, 34: 437-444.
- [22] Hsu, D. W. L., Shen, Y., Yuan, B. J. C., & James, C. (2015). Technological forecasting & social change toward successful commercialization of university technology: Performance drivers of university technology transfer in Taiwan. *Technological Forecasting & Social Change*, 92, 25–39. Retrieved from <https://doi.org/10.1016/j.techfore.2014.11.002>
- [23] Iborra, A., Alvarez, B., Martinez, R., Suarez, T., & Requena, F. (2017). Cloud incubator HUB: Startup ecosystem for engineering students: Connecting with other European ecosystems through the Startup Europe initiative. In *Global Engineering Education Conference (EDUCON), 2017 IEEE* (pp. 945–950). IEEE.
- [24] Isenberg, D. (2010). How to Start an Entrepreneurial Revolution. *Harvard Business Review*, 88(6): 40-50.
- [25] Isenberg, D. (2011). *The Entrepreneurship Ecosystem Strategy as a New Paradigm for Economic Policy: Principles for Cultivating Entrepreneurship*. Boston: The Babson Entrepreneurship Ecosystem Project.
- [26] Jansen, S., van de Zande, T., Brinkkemper, S., Stam, E., & Varma, V. (2015). How education, stimulation, and incubation encourage student entrepreneurship: Observations from MIT, IIT, and Utrecht University. *International Journal of Management Education*, 13(2), 170–181. Retrieved from <https://doi.org/10.1016/j.ijme.2015.03.001>

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- [27] Jensen, R., & Jones, M. (2011). University startups and entrepreneurship: New data, new results. In ... *Conference on Entrepreneurship* Retrieved from [https://www.nlaw.northwestern.edu/faculty/programs/searlecenter/workingpapers/documents/Jensen\\_and\\_Jones\\_5-17-11.pdf](https://www.nlaw.northwestern.edu/faculty/programs/searlecenter/workingpapers/documents/Jensen_and_Jones_5-17-11.pdf)
- [28] Jha, S. K. (2018). Entrepreneurial Ecosystem in India: Taking Stock and Looking Ahead. *IIMB Management Review*, 30: 179-188.
- [29] Lindh, I. (2017). Entrepreneurial development and the different aspects of reflection. *The International Journal of Management Education*, 15(1), 26–38.
- [30] Maina, S. (2014). The role of entrepreneurship education on job creation among youths in Nigeria. *International Letters of Social and Humanistic Sciences*, 4, 87-96.
- [31] Mansor, M., & Othman, N. (2011). CoBLAS: Inculcating entrepreneurial culture among higher education institutions' students. *International Journal of Social Science and Humanity*, 1(1), 86.
- [32] Miner, A. S., Gong, Y., Ciuchta, M. P., Sadler, A., & Surdyk, J. (2012). Promoting university startups: International patterns, vicarious learning and policy implications. *Journal of Technology Transfer*, 37(2), 213–233. Retrieved from <https://doi.org/10.1007/s10961-010-9194-3>
- [33] Munari, F., Pasquini, M., & Toschi, L. (2015). From the lab to the stock market? The characteristics and impact of university-oriented seed funds in Europe. *Journal of Technology Transfer*, 40(6), 948–975. Retrieved from <https://doi.org/10.1007/s10961-014-9385-4>
- [34] Munari, F., Sobrero, M., & Toschi, L. (2018). The university as a venture capitalist? Gap funding instruments for technology transfer. *Technological Forecasting and Social Change*, 127, 70–84.
- [35] Oluwatobi, S. (2015). Innovation-Driven Economic Development Model: A Way to Enable Competitiveness in Nigeria. In L. Leonard, & M. Gonzalez-Perez, *Beyond the UN Global Compact: Institutions and Regulations (Advances in Sustainability and Environmental Justice* (pp. 17: 197-218). Emerald.
- [36] Oluwatobi, S., Olurinola, I., Alege, P., & Ogundipe, A. (2018). Knowledge-driven economic growth: the case of Sub-Saharan Africa. *Contemporary Social Science*, DOI: 10.1080/21582041.2018.1510135.
- [37] Oppong-Tawiah, D., & Chan, Y. E. (2016). The influence of IT and knowledge capabilities on the survival of university IT startups. *International Journal of Technoentrepreneurship*, 3(2), 150–172.
- [38] Paço, A., Ferreira, J., & Raposo, M. (2017). How to foster young scientists' entrepreneurial spirit? *International Journal of Entrepreneurship*, 21(1), 47–60.
- [39] Page, L., Brin, S., Motwani, R., & Winograd, T. (1999). *The PageRank citation ranking: Bringing order to the web*. Stanford InfoLab.
- [40] Payumo, J. G., Arasu, P., Fauzi, A. M., Siregar, I. Z., & Noviana, D. (2014). An entrepreneurial, research-based university model focused on intellectual property management for economic development in emerging economies: The case of Bogor Agricultural University, Indonesia. *World Patent Information*, 36, 22–31.
- [41] Pitan, O. S., & Adedeji, S. O. (2012). Skills mismatch among university graduates in the Nigeria labor market. *Online Submission*. (Where is the Uniform Resource Locator (URL) of the paper?)
- [42] Rao, B., & Mulloth, B. (2017). The role of universities in encouraging growth of technology-based new ventures. *International Journal of Innovation and Technology Management*, 14(4): 10.1142/S0219877017500146.
- [43] Roach, M. (2017). Encouraging entrepreneurship in university labs: Research activities, research outputs, and early doctorate careers. *PloS One*, 12(2), e0170444.

- [44] Roundy, P. T., Bradshaw, M., & Brockman, B. K. (2018). The Emergence of Entrepreneurial Ecosystems: A Complex Adaptive Systems Approach. *Journal of Business Research*, 86: 1-10.
- [45] Roundy, P. T., Brockman, B. K., & Bradshaw, M. (2017). The Resilience of Entrepreneurial Ecosystems. *Journal of Business Venturing Insights*, 8: 99-104.
- [46] Sakkab, N. Y. (2002). Connect & develop complements research & develop at P&G. *Research-Technology Management*, 45(2), 38-45.
- [47] Salami, C. G. E. (2013). Youth unemployment in Nigeria: A time for creative intervention. *International Journal of Business and Marketing Management*, 1(2), 18-26.
- [48] Siegel, D. S., & Wright, M. (2015). Academic entrepreneurship: Time for a rethink? *ERC Research Paper No.32*, 26(32), 1–39. Retrieved from <https://doi.org/10.1111/1467-8551.12116>
- [49] Vise, D. (2007). The google story. *Strategic Direction*, 23(10).
- [50] Westlake, E. J. (2008). Friend me if you Facebook: Generation Y and performative surveillance. *The Drama Review*, 52(4), 21-40.
- [51] Wolf, G. (2017). Entrepreneurial university: A case study at Stony Brook University. *Journal of Management Development*, 36(2), 286–294. Retrieved from <https://doi.org/10.1108/JMD-06-2016-0113>
- [52] World Economic Forum. (2017). *the Global Competitiveness Report*. World Economic Forum
- [53] Wright, M., Siegel, D. S., & Mustar, P. (2017). An emerging ecosystem for student start-ups. *Journal of Technology Transfer*, 42(4), 909–922. Retrieved from <https://doi.org/10.1007/s10961-017-9558-z>
- [54] Zuckerberg, M. (2008). Facebook. Retrieved July, 15, 2010.

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