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Role of Technology Incubators and Spin-off Companies in Commercialization of Intellectual Properties (IPs)

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Abstract: *Intellectual property (IP) is an umbrella term used for human innovations and creativity that are capable of being protected under national law and international treaties. IP includes a diverse range of technologically based commercial assets from patents for new inventions through to copyright protected artworks. The object of business advancement, enhancement and development which measures a country's economic development is a progression whose rate is proportional to the rate at which pertinent IPs are commercialized. Thus two important activities which must be set to work continuously and simultaneously if the county's industrialization is to be realized are the production of requisite IPs and their simultaneous commercialization. Spin-off companies are firms created out of an existing parent firm or institution. Many spin-off companies evolve from IPs evolved in the course of executing the task of the parent institution. As a result, shareholders of the parent company normally receive a proportionate number of shares in the new entity. Spin-off companies created from research activities in academic institutions are mostly results of IPs by way of inventions and innovations stemming from academic work. Basically both IPs generation by R&D companies and IPs generated in the course of academic research work are of little value until effectively developed and commercialized to impact on the economy of the nation. Technology Incubation programme (TIP) is a popular economic development tool which has been used by both the development and developing economics to fast track local and regional economic development. The whole idea of Technology Incubation is that it provides an enabling environment for budding entrepreneurs to get past their teething phase, where the risk of survival is greatest (high liability of newness) and grow into adulthood. The companies under the programme are enabled to develop. This paper discusses how TIP and Spin-off companies can be employed for the commercialization of IPs to fast track the industrialization of Nigeria.*

Keywords: *Technology Incubation, Spin-off companies, IPs, Commercialization*

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I. Introduction

Realizing its inability to meet Vision 20:2020 goals years after the country embarked on an ambitious agenda to be among the top 20 economies in terms of GDP size, President Muhammadu Buhari, on Wednesday in Abuja, inaugurated National Steering Committee to oversee and actualize Nigeria Agenda 2050 and Medium-Term National Development Plan (MTNDP), (Guardian, 2020). Achieving this vision depends on our creation, assimilation, proliferation and utilization of science, innovation and technology and other developmental processes and procedures like spinoff companies' generation and business incubation programme which has been employed by advanced countries to ensure economic development in all sectors.

The progress and well-being of humanity rest on its capacity to create and invent new works in the areas of technology and culture. Also the legal protection of such new creations encourages the commitment of additional resources for further innovation; while the promotion and protection of intellectual property spurs economic growth, creates new jobs and industries, and enhances the quality and enjoyment of life. An efficient and equitable intellectual property system can help all countries to realize intellectual property's potential as a catalyst for economic development and social and cultural well-being. Technology plays a fundamental role in wealth creation, improvement of the quality of life and real economic growth and transformation in any society. Analysis of technologically advanced economies shows that at each level of the economy, science and technology provide the engine for economic growth. Science and Technology creation as well as its practice grows through knowledge production by way of generation of need driven and solution based intellectual properties (IPs) developed and proliferated through the creation of such IPs based companies or spinoffs which are aided from start-up to independence using Technology business incubation programme and other economic transformation tools.

Business Incubators have been particularly receiving an increasing interest as a tool to promote new business formation, prevent business failures and establish a vibrant entrepreneurship sector not only in developed countries but also developing and less-developed countries in recent years. Thus, the number of Business Incubators has been rising rapidly around the world as an evidence of the importance attributed to the Business Incubators. Many governments has been devoting considerable amount of resources to establish and operate business incubators (Ozdemu and Shitoglu, 2013).

The concept of Technology Incubation was introduced to the Nigerian Government by the United Nations Development Program (UNDP) and the United Nations Fund for Science and Technology for Development (UNFSTD) in 1988. The Federal Government then commissioned a consortium of three firms to advice on the desirability and implementation modality. Eventually, the first Technology Incubation Centre (TIC) in Nigeria was established in Agege in 1993, followed by the ones in Kano and Aba in 1994 and 1996 respectively (Adelewo et al, 2012). The objectives of technology business incubation in Nigeria as summarized by Adelewo et al 2012 are (a): to boost the industrial base of the country, commercialization of R&D results, upgrade and enhance the application of indigenous technologies. (b): to nurture the start-up and growth of new innovative businesses engaged in value added and low, medium, and high technological related activities over a period of time, and (c): to promote functional linkage between research and industry. Today, the country has established 28 TICs and six extensions, under the National Board for Technology Incubation (NBTI).

The factual fact is that Nigeria is technological backwards making the realization of the Vision 2020 difficult and elusive. It is opined that when requisite solution based intellectual properties (IPs) are created in our universities, research institutions and companies engaged in R&D, the products would be used to create spin off companies which shall be fostered through Technology incubation Programme (TIP) already established in the country to usher in the needed technological revolution that would take the country to the next level.

II. Statement of the Problem

A country is said to be technologically backward when:

- **i.** It cannot produce capital goods such as tractors, lathe machines, drilling machines, cars, trains, and other earth moving equipment.
- **ii.** It is unable to exploit her natural resources except with the help of foreigners who will normally provide the technology and expertise to undertake the exploitation of her natural resources.
- **iii.** It is unable to mechanize her agriculture i.e. crude implements are still used for agricultural production activities by a large percentage of those who are involved in agricultural production.
- **iv.** It depends on other countries for the supply of its spare parts for industrial machinery
- **v.** It exports raw materials to other countries as against finished products
- **vi.** It is unable to produce her own military hardware with which to defend herself if the need arises.

A critical examination of Nigeria reveals that all the points itemized above are present in the country. Thus Nigeria as spelt out thereto is a technological backward country. (Uwaifo and Uddin 2009)**.** Correlating this obvious fact Eneh opines that Technology diffusion is at the lowest ebb in Nigeria and that with Nigeria's educational system in prolonged crises of decaying infrastructure and the attendant agitation of staff for a change, R&D which is the most significant driver of industrial performance is poor and therefore cannot be appropriated for meaningful development in Nigeria. (Eneh, 2011).

The fact is that we all know where we are and no matter the words different Nigerians choose to describe the situation, the truth is that we are grossly technologically backwards. Virtually all products consumed in the country are imported. Our raw materials are exported while the refined products of our raw materials are sold back to us at exorbitant costs. It is comforting however that there are things we can do to reposition ourselves and fast track the technological and economic development of our dear country Nigeria.

III. Intellectual Property and Spinoff Companies

Intellectual property is a "power tool" for economic development and wealth creation that is not yet being used to optimal effect in all countries, particularly in the developing world. It is a practical guide to using those intangible assets – such as knowledge, information, creativity and inventiveness – that are rapidly replacing traditional and tangible assets – such as land, labor and capital – as the driving forces of economic health and social well-being. The premise underlying IP throughout its history has been that the recognition and rewards associated with ownership of inventions and creative works stimulate further inventive and creative activity that, in turn, stimulates economic growth (Idris, 2003).

The continuum from problem ➔ knowledge ➔ imagination ➔ innovation ➔ intellectual property ➔ the solution, in the form of improved products and new technologies continues to be a powerful driver for economic development.

Intellectual property rights (IPR)—the copyrights, patents, trademarks and similar rights upon which the lion's share of creative and innovative products and services rely—have a vital role in growing the economies of developed and developing countries all over the world, in spurring innovation, in giving large and small firms a range of tools to help drive their success, and in benefitting consumers and society through a continuous stream of innovative, competitive products and services and an expansion of society's overall state of knowledge (Dixon, 2015). For many years, economists have tried to provide an explanation as to why some economies grow fast while others do not; in other words, why some countries are rich and others are not. It is generally agreed that knowledge and innovation have played an important role in recent economic growth. It is presently realized and theorized that the accumulation of knowledge is the driving force behind economic growth. Countries promote growth by encouraging investment in new research and development (R&D) and subsidize programs that develop human capital (Idris, 2003).

Academic spinoff is defined as "a new company founded to exploit a piece of intellectual property created in an academic institution." Thus, the idea of academic spinoff is a subset of all start-up companies created by students and employees of academic institutions. Other schools of thought has a similar interpretation, proposing that an academic spin-off is to be defined as a "new firm created to exploit commercially some knowledge, technology or research results developed within a university or research institution (Grimaldi et al, 2007).

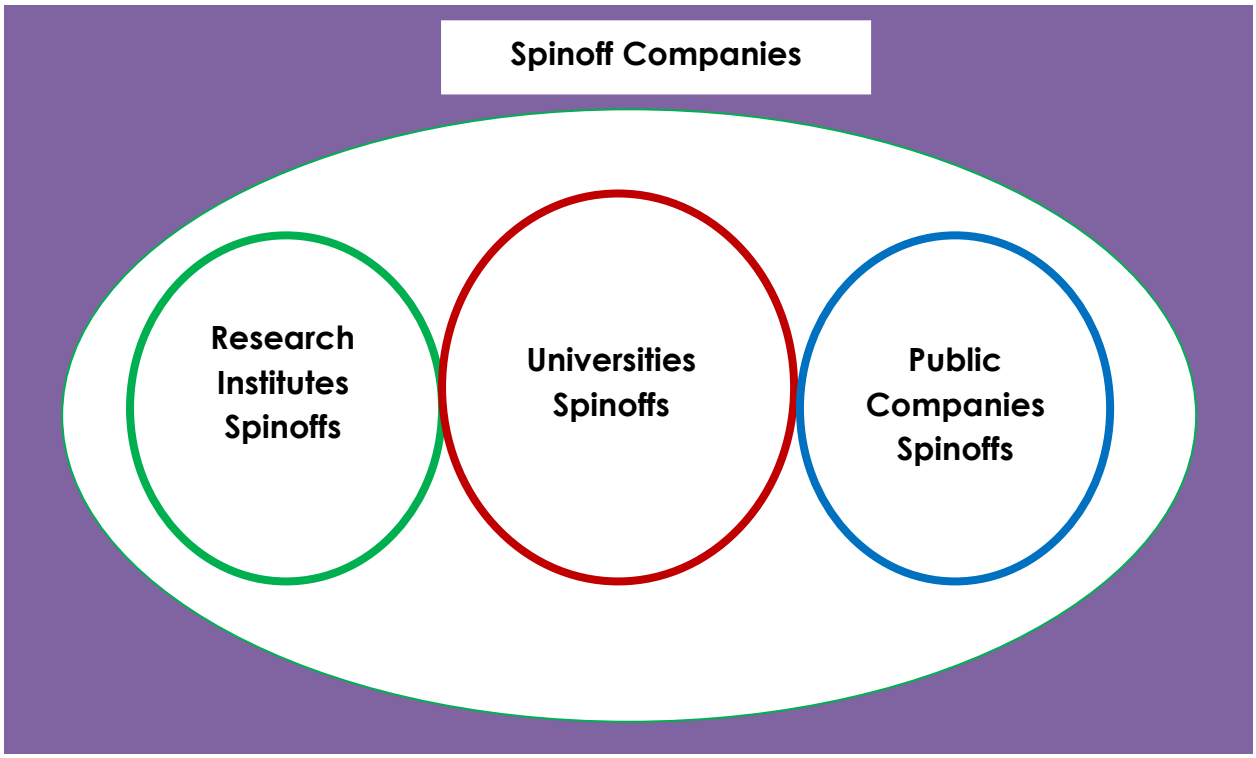

Figure 1: Three sources of Spinoff companies' generation

Broadly speaking a research institution or an existing company yielding products or services equally generate spinoffs. University spin- offs therefore are a subset of all start- up companies created by universities, research institutions and companies doing R&D to promote innovation in their work (Figure 1). As such, Spinoffs focus on the opportunities (based on intellectual property of a university, research institute or companies executing R&Ds) exploited by new business start- ups, rather than on the business founders themselves. The intellectual property exploited by university spin- offs typically involves patented inventions; industrial designs and copyright protection. Scholars and research institutes have remarked that university based spin-offs are very robust companies, having significantly higher survival rates than other startups. Also thanks to these reports, in the last ten years the idea of the university spin-off company has attracted increasing interest among policy makers and academics. Partly this can be attributed to the fact that they represent a relatively cheap way of fostering the development of knowledge economies in different places (Grimaldi et al, 2007).

University spin- offs such as Genentech and Google are companies founded to exploit university intellectual property. They serve to transform technological breakthroughs from university research, which would probably remain unexploited otherwise. Therefore, policy makers have become very interested in university spin- offs as a means for technology transfer and economic growth. However, creating university

spin- offs is not easy. Some universities generate more spin- offs than others. Furthermore, university spin- off activity creates several difficulties, such as the potential conflict of interest between commercial and academic work and the risk to university reputation if founders of spin- offs act inappropriately. On the other hand, academic entrepreneurs feel sometimes that their behavior is not welcomed by the university, or that the university procedures hinder the development of their venture. Therefore, there is a need for knowledge that guides designing universities to foster the creation of university spin- offs, while balancing the different activities, cultures, objectives and interests of universities (Elco van Burg, 2010).

The technology-based spin-off company appears to be a potentially powerful mechanism for transferring technology from an R&D organization to a commercial organization. Furthermore, several studies indicate that the formation of spin-off companies is a more successful route to commercialization than licensing. Pertinent reasons why spin offs are important entities are identified: (a). They are supportive of local economic development; (b). They knock down barriers to economic development in poor regions; (c). They create high economic value; (d). They create new job opportunities; (e). They induce investments in university and research institutions' technology; (f). They encourage inventor participation; (g). They are the best commercialization mechanism for uncertain technologies; (h). They foster additional research; (i). They are "magnets" in attracting and retaining the best professors; (j). They help to train students; (k). They are high performing companies (Grimaldi et al, 2007). The significance of intellectual property rights in economic activity differs across countries and depends (1) on the amount of resources countries devote to creating intellectual assets as well as (2) the amount of protected knowledge and information used in production and consumption. One useful indicator for the magnitude of resources devoted to the creation of new knowledge and information is a country's expenditure on research and development (R&D) (Braga et al, 1999).

IV. Technology Business Incubation

Business incubation is a business support process that accelerates the successful development of start-up and fledgling companies by providing entrepreneurs with an array of targeted resources and services. These services are usually developed or orchestrated by incubator management and offered both in the business incubator and through its network of contacts. A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding. These incubator graduates have the potential to create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies.

In general, a business incubator will focus on a range of services on clients that are designed to help them launch well managed businesses. This mix of services is generally drawn from: administrative services (photocopying, bookkeeping, etc.); business advice services (coaching, counseling, mentoring, training), technical services (technical advice, access to expensive equipment, etc.), finance raising, and networking opportunities (between clients, links to wider business community). Other services (loan & venture capital funds, lobbying for special services/bureaucratic treatment, etc.) are sometimes developed to help clients overcome specific problems in the given business environment. Clients can be resident, non-resident or affiliated to the incubator. The services targeted on clients are costly in relation to many other types of business development services (training programs, advice services) but are justified by supporters as "investment in success" because the concentrated support services should lead to higher survival and growth rates of incubated businesses (InfoDev., 2010).

Figure 2 depicts the general incubation process. The prospective incubatee after meeting the entry criteria is admitted and during incubation is supported with training, business advice, funds and technology knowledge. On graduating from the TIC, the graduated entrepreneur is still eligible to access some advice as "After Care Services" (referred to as Post incubation in the TIP scheme) till he becomes financially viable and freestanding. Business incubation practice, all over the world is structured in the pattern shown in Figure 2 above, but the objectives may differ from country to country. For instance the Jewish State of Israel in 1991 launched Nationwide Technology Incubation programme to utilize the S&T potentials of immigrants from the Soviet Union. The programme is a tremendous success. When the United States recognized the existence of critical mass of scientists, technical infrastructure, ethnically diverse and world-class universities in the system they launched the "Silicon Valley Incubator" which generated 7,000 electronics and software companies, 300,000 top scientists (1/3 born abroad) with many new firms and new millionaires made almost every month. (Adelewo et al, 2012).

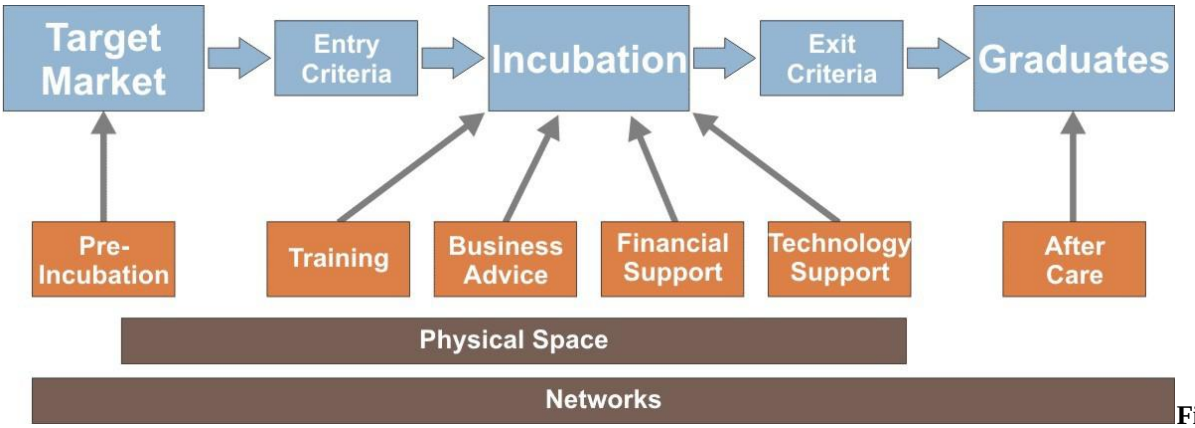

Figure 2: A typical business incubation process (InfoDev., 2010).

The role of the National Board for Technology Incubation (NBTI), is to coordinate the Technology Incubation Programme (TIP) in Nigeria while the actual incubation process takes place at the Technology Incubation centers (TICs) spread all over the country. The functions of NBTI inter alia are policy implementation and coordination which involves development of operational guidelines. Other roles include supervision, monitoring and evaluation; Financial Management and Control; Sourcing of fund; National and International Liaison; Program Planning and Development as well as provision of legal services. (Obaji et al, 2012**).**

At the TIC level the incubation process is initiated if a prospective entrepreneur has an idea and wants to be incubated. He will then put his proposal in writing together with the technical and business plans for consideration by the management of the TIC and if it is analyzed and found to be proactive, then he will be admitted. (Jibrin, 2013). The goal of TIP is to assist small scale budding entrepreneurs to overcome the initial hurdles of carrying viable R&D results as well as innovative efforts into profitable enterprises (FMST, 2005). And the mandates are:

i. Provide a platform for speedy commercialization of technologies by effectively linking talents, technology, capital and knowledge.
ii. Create, nurture and develop value-added technology-based enterprises.
iii. Promote the establishment of and management of viable science and technology parks, technology incubators and technology-based enterprises.
iv. Enhance linkage of tenant/technology know-how and capital in order to develop techno-entrepreneurship culture based on continuous value addition.
v. Promote and facilitate the application of indigenous technologies and knowledge.
vi. Set standards for and regulate the establishment and management of Science and Technology parks and Incubators

V. Recommendations

Nigeria boasts of at least one Federal University and one State university in virtually every state with several sciences, engineering and technology faculties, schools and departments which generate lots and lots novel intellectual properties mostly stemming from the final year projects of graduating students. The Federal and state Ministries of Science, technology and agricultural related sectors also has several research and development institutions for targeted R&Ds in various areas. These research institutions and agencies as well as other private and public companies engaged in R&D activities, churn out several innovative needs driven intellectual properties which usually end either in the blueprint or in the prototype. These intellectual properties from the entire R&D spectrum can be used to create profitable solution based spinoff companies to drive the technological and economic development of the country.

Technology Incubation Programme (TIP) in Nigeria is doing fine but very far from the full utilization of its potentials. It is suggested that a tripartite collaboration between academic and research based institutions with NBTI and individual entrepreneurial stakeholders shall enable the creation of several pertinent spinoff companies using the institution's IPs. These companies shall then be admitted as entrepreneurs of technology incubation centres (TICs) where they would be aided to access administrative, financial and technological advice as well as available access to finance until they grow and become freestanding.

VI. Conclusion

Nigeria is technologically backwards. Vision 2020 would be difficult or elusive if nothing is done to change the situation. Technology backwardness is synonymous to economic retardation. The difference between advanced and developing countries has been identified with the disparity in their technology knowledge production and utilization. Our R&D institutions appear to have produced lots and lots of intellectual properties presently in blueprint or as prototypes. It is opined to create spinoff companies from the products of these IPs and then use technology incubation programme as a tool to transform them into full-fledged freestanding companies thereby industrializing the nation.

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