
Impact of Technology Incubation Programme in Promoting Entrepreneurship in Nigeria

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Abstract: Technology incubators are economic development tools used for promoting the concept of growth through innovation and application of technology, support economic development strategies for small business development. It encourage growth from within local economies, while also providing a mechanism for technology transfer. Incubation is the provision of temporary support to start-up enterprises through the delivery of complex services and special environment with the aim of improving their chances of survival in the early phase of the life span and establishing their later intensive growth. Many Incubation Centres were established to influence and promote entrepreneurship thereby adding to economy of a country. However, the established incubation centres need to be evaluated to measure the effectiveness of the incubation programme in promoting entrepreneurship. In this research, we investigate the added value of Technology Incubation to the growth and development of Entrepreneurship, measuring the role of Technology Incubator thereby, finding out the effectiveness of Technology Incubation Centres in the development of Entrepreneurship in Nigeria. We use questionnaires as a tool for data collection. The result from the respondents of the questionnaires shows that Technology Incubation Centre contribute to the development and growth of entrepreneurs in Nigeria. Most of the entrepreneurs make use of the service of the Technology Incubation Centre. The incubation centres also carried out various program and initiative toward the development of entrepreneurs and also involving them with socio-economic development programs.

Keywords: Incubation, Technology Incubator, Incubatees, Entrepreneurship, Research, Development

1. Introduction

Technology Incubation Centre is an initiative to provide a nurturing environment to technology based on business ideas to prosper and become viable contributors to communities and economy. The development of small and medium scale enterprises (SMEs) is largely dependent on the effective performance of Technology Incubation. Entrepreneurship is a process by which an individual has the vision, skill and mind-

set [1], to start a business". Effective entrepreneurs are internally motivated and have a passion for innovation. Technology Incubation Centres were established by many developing countries including Nigeria, China, South Africa and India [2]. Incubation is a diligent and planned process of 'co-location' therefore needs careful attention to the problems of entrepreneurs extending well beyond providing infrastructure and office services [3]. Technology Incubation helps entrepreneurs identify their talents, strength and

weakness and to develop the ability to recognise when there is an opportunity and be able to seize it and build the business [4]. Technology Incubation programme needs to be evaluated to ascertain its successes. To evaluate the successes and effectiveness of Technology Incubation, it entails measuring its performance (support services) with the rate of success of entrepreneurs that have graduated to determine the impact it has on the development of small and medium scale enterprises.

Technology incubation programmes as an entrepreneurship development tool [5], generally have the economic development capacity to create employments, building wealth by fostering the formation of new venture, fast-tracking research to industries linkages, facilitating innovation etc. In accomplishing these goals, incubators use strategies such as increased access to capital, the one stop shop approach, technical and business management training, contract procurement assistance, creating networking opportunities through clustering, creating access to credit facility, export assistance and technology transfer assistance. These services are provided through collaboration, synergy and liaison with other economic development and entrepreneurship development organization within the same region.

Government all over the world is tirelessly devoting substantial resources to the establishment of small firms [6]. It would be unimaginable to come across any country that ignores the important role of small and medium scale enterprises (SMEs). Such an action would have serious implications for the country's economic growth and development. The focus of this research is on the role of technology incubation in the development of entrepreneurship with special reference to Nigeria. It is important to note that Nigeria is not the only country in which technology incubation has attracted government attention.

Incubation programme was introduced to Africa in 1988 by United Nations Development Programme (UNDP) to test run the concept on pilot scheme in four countries of cote d'ivoire, Nigeria, Equatorial Guinea and Zimbabwe [6]. In 2008, the incubation programmes has spread across Africa with approximately about one hundred incubation centres. Nigeria has about forty-four (44) incubation centres, South Africa with about thirty-six (36) while the rest of the other countries house the remaining twenty (20). Technology Incubation Programme in Nigeria began since 1988 with feasibility study for the establishment of pilot Centres at Lagos, Kano, and Aba. The feasibility study is to ascertain the viability or otherwise of Technology Incubation Centres in these commercial cities.

This study led to the establishment of Lagos Centre in 1993, Kano in 1994, and Aba in 1995. The success of these three pilot Centres facilitated the establishment of Minna, Nnewi, and Calabar in 1998. Meanwhile by 2005 there were seventeen (17) Incubation Centres in Nigeria but as at 2018 there are about forty (40) Incubation Centres in the country with about two hundred and eighty-seven (287) entrepreneurs and six thousand two hundred (6,200) job created. The integrated entrepreneurship development approach of technology Incubation Centres in Nigeria has seen to the

successful grooming, fostering and nurturing of potential entrepreneurs/enterprises to a creative technology value added budding entrepreneurs and enterprises.

Technology Incubation Centre Kano, for example, was established on 2nd April, 1994. It became operational in August 1994 with six (6) incubation units and five (5) pioneering entrepreneurs. Since establishment the Centre has received a total of 1141 applications for incubation units. The first set of incubates graduate in the year 1998, so far the Centre has graduate sixty four (64) incubates and currently monitor seven non-resident incubates within and outside ancient city of Kano. The Centre has commercialized nine (9) researches and development result from both Tertiary and Research Institutions. The National Agency for Food Drug Administration and Control NAFDAC has certified and approved 24 various packages of the Centre's Agro Processing and Allied Products. Presently the Centre has forty (40) Residence Incubates, 7 non-resident entrepreneurs, 67 post-incubates, two hundred and thirty-one (231) Incubates staff, 853 Skill Acquisition training, 408 ad-hoc job.

The Centre has contributed a total sales value of four hundred and two million, Six hundred and five thousand eight hundred and sixty three naira (402,605,863.00) to the economy. Training both managerial and technical is one of the mandates of incubation programme. The Centre has organized twenty-seven managerial and eleven technical skills training for entrepreneurs within and outside the Centre. The Centre has finance entrepreneur's business through the Centre's Seed Capital revolving loan to a tune of (2.8m) Two million, eight hundred thousand naira while some of the entrepreneur where linked to Developments Banks, Bank of Industry (BOI) to access the sum of Ten Million Naira for business development. (N10, 000,000.00) and N7.5M Seven million five hundred thousand Naira from NERFUND. Also, the Centre facilitated a Federal Government grant of N10, 000,000.00 each to two entrepreneurs through the You Win programme.

The idea of business incubation started in the USA, conceived in 1959 by Joseph Mancuso as a real estate venture in an effort to make use of unused space at Batavia, New York. In the early years of 1970s, Innovation and technology became the focal point of focus of business incubators in developed countries, followed by synergy with educational institutions in 1980s. UK and Europe got to know about incubation programme through innovation centres, and science parks that are into the support services of Small and Medium Scale Enterprises. A record from the National Business Incubation Association (NBIA) shows that there are about 7,000 incubators worldwide [7].

According to NBIA survey in 2012, in the recent decades, the growth of technology incubation the world over has been phenomenal as there are over 7000 incubation centres around the world. The pace at which the incubation centres are spreading and expanding across the globe is because it has been identified as the backbone of entrepreneurship development and sustainability. The survey also concludes that it is pertinent that most incubation centres around the world lay

more emphasis on provision of infrastructure, facilities, office services etc. than entrepreneurship development.

Monitoring and Evaluation (M & E) are two important tools that keep any organisation, continuous programme, project, institution, ministry, on its toes for effective execution of the laid down aim and objective. Phiri B. [8] presented that M&E should be incorporated as part of the organisations' structures. It should be recommended that managers and staff involved in a project of any programme should be trained on application of M&E for a good performance and concise results. In another research survey by Ngatia, C. N. [9], it was established that monitoring and evaluation programs has drawbacks, so a need for capacity building is required. Thus M&E can provide significant information which can be useful for the improvement of a programme performance and decision making [10]. Management of Monitoring and Evaluation is an important sustainability tool of any programme.

Stakeholders are those who are affected by the project like technology incubation programme from start to the finish, bringing in a variety of experiences, expertise and skills to the programme and can assist in project success [11]. Every programme needs a strategy. Mavuti B. M. [12] stated that obtaining new strategies in theory would not contribute to the actualisation of the objectives of the programme and as such, effective implementation is essential. Many research studies have presented that in developing countries, the failure rate in implementations of projects in an organisation is at high level. Involvement of the stakeholders from the onset of the project may help the project managers to avoid future problems or clashes with the stakeholders who may put off the project [13].

The rest of the paper is organised as follows: section 1 introduced the subject matter, section 2 gave details about the Technology Incubation Programme, section 3 gives the methodology used in carrying out the research, section 4 provides the results obtained from data collection through questionnaire while section 5 conclude the research work.

2. Technology Incubation Programme

The technology incubation programme consists of three phases:

1. Pre-Incubation: Pre-incubation is a period of 6 months covering the activities of the entrepreneur prior to admission into the 3-year incubation program. The activities include mentoring, business planning coaching, etc.
2. Incubation:
 - i. Resident Incubation: When an entrepreneur admitted into pre-incubation successfully completes the six months pre-incubation, he/she may be admitted into the Resident incubation in which the entrepreneur is allocated an incubation unit at the Technology Incubation Centre (TIC) for a maximum of 3 years;
 - ii. None-Resident Incubation (Virtual Incubation). This is where incubation services such as access to

knowledge providers, finance, linkages/networking etc. are extended to the entrepreneur outside the Technology Incubation Centre;

3. Post-Incubation - This is a period when an entrepreneur graduates from Technology Incubation Centre (TIC) after staying for 3 years. The entrepreneur continues to enjoy incubation services such as coaching, mentoring, linkages to knowledge providers, etc.

Technology Incubation Centres of the National Board for Technology Incubation (NBTI), offers lot of services to entrepreneurs. These services includes:

- i. Provision of linkages between research institutions, inventors, innovators, and capital/investors.
- ii. Promotion of techno-entrepreneurial culture amongst Nigerians.
- iii. Product design and development.
- iv. Provision of infrastructures such as electricity, water, internet services at highly subsidize rate.
- v. Provision of industrial plot/park upon graduation.
- vi. Provision of professional advice and hands-on-management.

The technology incubators generally focus on nurturing technology intensive enterprises and knowledge-based ventures. The technology incubation system (TIs) is variously represented by entities such as Technopolis, Science Parks, Research Parks, Technology Parks, Technology and/or Business Incubators. These entities operate as separate organizations but are mostly integrated with other players in the innovation system. The terms Science Parks, Research Parks and Technology Parks as well as Technology Incubators (TIs), Technology Innovation Centers (TICs) and Technology Business Incubators (TBIs) are used interchangeably in many countries depending on the level and type of interaction between R&D community, venture funding and industry.

The term incubator is a device for nurturing immature phenomenon to maturity or self-sustenance under a control environment but a business incubator is an initiative that systematizes the process of creating successful new enterprises, by providing entrepreneurs with a comprehensive and integrated range of services, which include floor-space made available on a flexible and affordable, but temporary basis; common services that include secretarial support and shared use of office equipment; hands-on business counselling; mechanical workshop, quality control laboratory, access to specialized assistance such as research and development support and venture capital; and networking activities operating as a reference point inside the premises among entrepreneurs and outside to the local community.

2.1. Significance of Technology Incubators

The aim of technology incubators is to influence the growth and development of technology-based firms, and aid in completion of the technologies under development. They are mostly evident by links to knowledge sources including universities, technology transfer agencies, research centres, national laboratories and skilled R&D personnel. The aim is

also to promote technology transfer and diffusion while encouraging entrepreneurship among researchers and academics.

According to Nigeria's Federal Ministry of Science and Technology [14], the Technology Incubation Program is an integrated support program provided by governments, educational institutions and private sector, either individually or in partnership with the intention of providing and nurturing of budding value-added and technology-based enterprises. It is designed to speed up the commercialisation of technologies by effectively linking talents, technology, capital and know-how in order to accelerate the development of new enterprise, both start-ups and fledging.

2.2. Incubatees' Business Performance

Incubatees business performance is a multidimensional concept. There exists no conscience on the performance dimensions appropriate to study new ventures or incubatees. Different researchers used different indicators to measure incubatees' business performance as a result of incubators' services and infrastructure provided to incubatees. Studies to access the impact of business incubators can be divided into two categories - those that examine the impact of incubators on an organizational level and those that focus on the

incubators' impact on the incubatees associated with them. The second category is the focus of this study.

According to Nigeria's Federal Ministry of Science and Technology [14], the following performance indicators are used to measure the performance of incubatees' businesses in all the technology incubation centres across the country.

- i. Sales Growth Rate
- ii. Profit Growth Rate
- iii. Direct Job Creation; and
- iv. Asset Growth

According to Khalil, M. et al. [15], Incubatee performance can be measured based on profitability growth as used in different incubation studies. The incubatee business performance can best be measured by the following indicators: market share, sales, net profit and return on assets [16]. According to Azih E. et al. [17], the best incubatee performance indicators are output, sales turnover, number of employees and net worth as used in various incubation studies.

Voisey P. [18] classified performance indicators as measures for evaluating incubatees' or incubators' performance in an incubation study ibased soft indicators and hard indicators as presented in the table below:

Indicators of Incubatee Performance

Table 1. Performance Indicators.

	Incubatee – specific	Incubator - specific
Soft Indicators	Professionalism Business skills Confidence in sell and business Networking with peers Knowledge Cost savings Positive publicity	Expertise or experience of staff Recognition by enterprise community Stakeholder support Internal evaluation
Hard Indicators	Sales turnover Profitability Growth of enterprise Graduation	Number of incubatees Number of business graduated Meeting targets Continued operation or success

Source: Voice et al. (2006).

2.3. Business Support Services

Business support services are services offered to incubatees either directly by the technology incubation centre or through its collaborating partner [14].

These services include:

- i. Advertisement and promotion of incubatees' products and services.
- ii. Networking and collaboration with relevant government agencies, institutions and private organizations for the benefit of incubatees.
- iii. Coaching and mentoring of incubatees on aspects of business development skills such as business plan, record and book keeping, marketing strategies and general entrepreneurship.
- iv. Technical support such as technology commercialization, value addition, product design and development etc.
- v. Facilitating the process of raising funds by the

incubatees through soft loan with little interest or grant from government.

- vi. Monitoring and evaluation of incubatees' business performance to determine the level of their progress, etc.

2.4. Infrastructure Supports

Infrastructure supports are supports provided to incubatees directly by technology incubation centre within its premises [14]. These supports include:

- i. Incubation unit (a spacious production room) for daily operation of incubatees' businesses within the technology incubation center.
- ii. Office space for daily administrative activities of incubatees within the technology incubation center.
- iii. Quality control laboratory for testing the incubatees' products to ensure that they meet the required standard before entering the market.
- iv. Mechanical workshop for assisting the incubatees to have

access to machineries and equipment which are beyond their capability as start-up or small scale businesses.

- v. Electricity and water supply for assisting the incubatees to produce their products regularly and at lower cost.
- vi. Security (24 hours) for ensuring the safety of incubatees' businesses within the technology incubation center.

2.5. Business Incubation Model

According to Lewis D. A. et al. [19], some researchers divided incubators into four categories:

a. Incubator with Walls

Incubator with walls is the so-called business incubator with multi-tenant facility and on-site management. Although an incubator with walls offers the entrepreneurs a space in which to operate their businesses, the focus of the program remains on the business assistance services provided to the start-ups, not on the building itself.

b. Incubator Without Walls (Virtual Incubator)

Those are business incubators that do not provide on-site space for their tenants or incubatees. This kind of program is cheaper since the location costs are eliminated and is appropriate for rural areas where the client base is often spread out or in cases where firms prefer not to be located in an incubator. On the other hand, beside the common challenges that all incubators are facing, virtual incubators have encountered the crucial challenge of providing networking environments for their clients.

c. International Incubators

This is a new form of business incubation program which focuses on helping firms enter foreign markets. These incubators concentrate on providing a "soft landing" for international firms that want to access foreign markets, partner with foreign firms, or access other resources. Some specialized services offered by such incubators include translation services, language training, business licenses, cultural training, immigration and visa assistance as well as housing assistance.

d. Accelerators

The business incubation industry has inspired the development of the "business accelerator". Some professionals use the terms 'accelerator' and 'incubator' interchangeably. Although they are similar and may overlap, a firm enters an accelerator program after graduation from the incubator program. Accelerator provides guidance and mentorship for firm to grow just like incubators do, but in a more matured stage of the firm's life circle.

3. Methods of Data Collection

The study will be based on primary and secondary source of data which will be gathered and obtained through questionnaire, records and documents which relates to the study. The researcher would also go through standard textbooks, Magazines, Seminar papers, Annual reports and Circulars, Newspapers, Statistical Summaries, Hand books workshop materials etc.

A questionnaire is a research instrument consisting of a set of questions (items) intended to capture responses from

respondents in a standardised manner [21]. Questionnaire may be structured or unstructured. Unstructured questionnaire ask respondents to provide a response in their own words, while structured questionnaires ask respondents to select an answer from a given set of choices.

The instrument used in this study has been tried in various incubation studies such as those of Khalil, M. et al. [15]. Questionnaires were administered to the respondents by the researcher who is assisted by well-trained research assistant.

3.1. Sample Size

To determine a sample size for this study, the sample size determination procedure using a table developed by Krejcie R. V. et al. [22] is adopted. The table is used to determine a sample size of any given population. The table contains columns of N and S, where "N" represents a given population size and "S" represents the corresponding sample size for any given population. Therefore, the sample size is determine by locating the size of a given population of the study which is 95 under the "N-column", and the corresponding figure under the "S-column which is 76 is the sample size for this study.

3.2. Method of Data Analysis

The data will be analysed using manual and electronic based methods through the data preparation grid and statistical package for the social sciences, (SPSS). The utilization of structured grids allows specific responses to be located with relative ease and facilitate the identification of emerging patterns. Also descriptive, statistical and content analyses techniques was used in the analysis of the data collected.

The study will use the descriptive analysis to achieve the mean, frequency distribution and percentage results of the research work. The study made use of statistical tools which include: analysis of variance (ANOVA), correlation efficient and regression analysis in testing hypotheses where applicable. The study made use of Simple linear regression analysis test for hypotheses 1 to 4 since they are measuring significance and impacts and not relationship between variables which makes use of correlation analysis.

4. Presentation of Data

The research questionnaire was administered to sixty (60) respondents which is the sample size in representing the study population of the existing and graduated entrepreneurs in Technology Incubation Centre Kano State Nigeria. Of this lot, fifty one (51) questionnaires representing 85% were returned, and nine (9) questionnaires representing 15% were not returned. The table below shows the details at a glance.

Table 2. Analysis of Response Rate.

Questionnaire	Respondents	Percentage (%)
Returned	51	85
Not Returned	9	15
Total Distributed	60	100

Source: Field survey (2020).

Return Rate

$$\frac{\text{Number of question got back}}{\text{Number of question sent out}} \times 100$$

$$\frac{51}{60} \times 100 = 85\%$$

Table 3. Sex Distribution of Respondent.

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Male	29	56.9	56.9	56.9
Female	22	43.1	43.1	100.0
Total	51	100.0	100.0	

Source: Field survey (2020).

In terms of sex distribution, the above table shows a predominantly male population with 29 (56.9%) and female 22 (43.1%) of population. One can therefore assess that male dominated the entrepreneurs in Technology Incubation Centre.

Table 4. Age distribution of respondents.

Age range	Frequency	Percentage	Valid percent	Cumulative Percent
Below-20	23	45	45	45
21-30	17	33.3	33.3	80
31-40	5	9.7	9.7	89.7
41-50	3	5.8	5.8	95.5
51-above	3	5.8	5.8	100
Total	51	100%	100%	

Source: Field survey (2019).

The table above depict the age of the respondents of the respondents in below-20 and make 45% of the sample but 14 respondents fall within 21-30 with 33.3%. This shows that most of the entrepreneurs in Technology Incubation Centre fall within their prime age which gives them the ability to face the banking stress and rigor required by the job. 5 respondents all within 31-40 with 9.7 respondent fall within 41-50 with 5.8%.

Table 5. Marital Status.

Variable	Frequency	Percentage	Valid percent	Cumulative Percent
Married	22	43.2	43.2	43.2
Single	17	33.3	33.3	76.5
Divorce	10	21.2	21.2	97.7
Widow	2	3.8	3.8	100
Total	51	100%	100%	

Source: Field survey (2020).

The analysis in table 5 above indicate that 22 (43.2%) of the respondents are married while 17 (33.3) are single one of them claimed to be a divorcee 10 (21.3%) and which shows that none of them were either widow or widowers. Considering the analysis above relies on the entrepreneurs in Technology Incubation Centre.

Table 6. QUESTION: Responses on the extent of using technology incubation centres services.

Responses	Frequency	Percentage (%)	Valid percent	Cumulative Percent
To a large extent	37	72.5	72.5	72.5
To some extent	10	19.6	19.6	92.1
Not at all	3	7.9	7.9	100
Total	51	100%	100	

Source: Field survey (2019).

Classifies the opinion of respondents on testified agreed that used the service of technology incubation centres while 7.9% of the respondents indicated no we can therefore assume that the 92.1 % that indicate used the service of the incubation centre.

Table 7. QUESTION: Does technology incubation centres provide the needed support for the growth of entrepreneur?

Responses	Frequency	Percentage (%)	Valid percent	Cumulative percent
Yes	40	78.5	78.5	78.5
No	7	13.7	13.7	92.2
Undecided	4	7.8	7.8	100
Total	51	100	100	

Source: Field survey (2020).

From the above analysis 78.5% of the respondents felt that the technology incubation centre has total commitment to the pursuit of growth of entrepreneur. 13.7% of the respondent also feels that the management of the technology incubation centre has not shown a meaningful commitment. While 7.8% of the respondent are not sure of the commitment of the management of the technology incubation centre

5. Conclusion

In this paper, we present the needed analysis to show that technology incubation programme has greatly impacted on entrepreneurship, through the administering of questionnaires to respondents. The research work can be concluded by saying that proper use of performance appraisal is a vital instrument for encouraging organisation effectiveness and long term competitiveness. The paper observes through respondents, that the majority of the Technology Incubation Centre contribute to the development and growth of entrepreneurs in Nigeria. Most of the entrepreneurs make use of the services provided by the Technology Incubation Centres to promote its growths. It is also observed that incubation centres also carried out various program and initiative toward the development of entrepreneurs and also involving them with socio-economic development programs. Incubator can help universities to become entrepreneurial organisations by establishing "institutional-based Technology Incubation Centres".

Incubation programme helps to build innovation through Research and Development and makes University to be successful in the area of knowledge transfer and to also generate employment opportunities for graduates. Incubator

generates self-employment and high quality jobs thereby reducing the rate of unemployment in the Country. It is a vehicle for idea creation, business development and commercialisation. It is safe to conclude that technology incubation programme is a veritable tool for promoting entrepreneurship in Nigeria.

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