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Harnessing the potentials of technology incubation centres (TICs) as tools for fast-tracking entrepreneurship development and actualisation of the Vision 2020:2020 in Nigeria

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Abstract
Purpose – Entrepreneurship development in Nigeria requires the adoption and assimilation of enterprise development models from nations with replicable success stories. Technology incubation centre (TIC) is one of the potent mechanisms that launched the “BRIC nations” – Brazil, Russia, India and China – to global prominence as the five biggest emerging economies. This paper attempts to unveil the potentials of TICs as novel tools for entrepreneurship development and actualisation of the Vision 2020:2020 in Nigeria.

Design/methodology/approach – The authors adopt analytical and discursive approaches using qualitative and quantitative data sourced from Industrial policy documents, Goldman Sachs report, online databases of government agencies, Vision 20:2020 policy document and published articles on the subject matter. The generated data were subjected to content and thematic analyses, on the basis of which relevant conclusions were drawn.

Findings – The findings from the research indicate that there are 37 TICs in Nigeria with very weak socio-economic impact on job creation, wealth creation and industrial development in Nigeria. However, for the BRIC nations, adopted as comparative models, TICs have impacted positively on job creation, wealth creation and economic development of the five nations.

The authors thank all the practitioners, scholars and government institutions whose materials were exhaustively reviewed and referenced in this novel work. The moral support of De Montfort University, UK, and Yaba College of Technology, Nigeria, are similarly noted and appreciated.
Research limitations/implications – The paper is essentially discursive and subjective. Further research on this subject matter should explore empirical analysis for an objective assessment of the situation.

Practical implications – This paper underscores the need for harmonisation of policy objectives with policy implementation. At present, there are gaps between TIC policy objectives and woeful performance of the 37 TICs in Nigeria.

Social implications – For Nigeria, to enhance job creation, wealth creation and economic development in the society, there is the need for functional TICs at local, institutional, regional, state and national levels.

Originality/value – The paper unveils the gap between economic theory and practical model implementation in developing economy (Nigeria). It is a major contribution to the functionalist and structuralist debates on why policies fail.

Keywords Nigeria, Entrepreneurship development, Technology incubation centre, Vision 20:2020, Enterprise development models, BRIC nations

Paper type Research paper

1. Introduction
Entrepreneurship development through sustainable promotion of the small and medium enterprises (SMEs) has been a recurring discourse in all Nigeria’s industrial policies right from independence (Federal Ministry of Industry, 2001; Iwuagwu, 2011). Retrospective probe into the industrialisation history of Nigeria revealed that the Federal government had always been passionate and proactive on entrepreneurship development, vocational training and growth of SMEs, hoping through these initiatives to reduce poverty cycle, chronic diseases, rising unemployment, monumental crimes, youth restiveness in turbulent communities, hopelessness, human trafficking and other social malaise (NEEDS Document, 2004, Nigeria’s Vision 20:2020 Blueprint, 2009). Nigeria had experimented with several intervention development programmes like Indigenisation Policy, Enterprises Promotion Policy, Import Substitution Strategy, Operation Feed the Nation, Back-to-Land Agricultural Scheme, Austerity Measures, National Directorate of Employment (NDE), Structural Adjustment Programme, Clusters Development, Technology Business Incubation Centres, National Economic Empowerment Development Strategy, Small and Medium Enterprises Development Agency of Nigeria, Small Medium Enterprises Equity Investment Scheme, National Poverty Eradication Programme, 7-Point Agenda, etc. These laudable intervention development programmes, which were created to fast-track entrepreneurship and growth of SMEs have not produced desirable results, rather they reflected woeful records of failure (Ahmad and Singh, 2003, Raimi et al., 2010; Iwuagwu, 2011).

The emphasis on entrepreneurship, as highlighted above, is not unconnected with its potency in stimulating socio-economic progress, technological advancement and industrialisation. At the national level, one of the impact of entrepreneurship development is the tendency for it to propel growth of SMEs, which are viewed by scholars as the “motors” (Kauffmann, 2005) or “engines” of growth (Newberry, 2006; Tushabomwe-Kazooba, 2006; Roy, 2010). Research studies across Africa and other developing nations confirm that SMEs are the most prevalent business typology providing massive employment opportunities for large number of people with varied skills (Kauffmann, 2005; Newberry, 2006). According to the National Bureau of Statistics (2011a), the total unemployed Nigerians stood at 14 million as against 12 million in 2010. The report noted further that the burden of unemployment is borne
heavily by youth within the age brackets of 15-24 years and 25-44 years. Worse still, the
survey indicates that the national unemployment rate has jumped to 23.9 per cent in
2011 relative to 21.1 per cent figure for 2010 and 19.7 per cent for 2009.

SMEs, if stimulated, have the potency of absorbing the alarming 14 million
unemployed Nigerians stated above, but the development of SMEs is being hindered by
endemic institutional constraints such as poor access to loans due to lack collaterals,
insufficient managerial acumen, inability to compete for tenders, infrastructural
deficiencies especially electricity, dubious legal systems, mindset to remain informal,
inability to afford new technology, unfriendly multiple tax system, local markets lack of
incentives, corruption, rigidities of registration/incorporation, epileptic energy supply,
ineffective partnership among stakeholders in the region, fading culture of
entrepreneurship and rising failure rate among SMEs (NEEDS Document, 2004;
Kauffmann, 2005; Newberry, 2006; Tushabomwe-Kazooba, 2006; Roy, 2010).

The aforementioned institutional constraints have combined to create very weak SMEs
that cannot create jobs, increase gross domestic products (GDPs), improve the quality of
lives of diverse citizens operating in the sector, etc. Worse still, the SMEs in Africa cannot
“effectively compete for the millions of Shillings/Dollars of contracts offered by major public
sector agencies and big corporate bodies…”, which is a critical threat to their business
sustainability in the Third World nations (Republic of Uganda, 2011, p. 9).

Based on the ugly pictures above, there is need for urgent stimulant for SMEs using
technology incubation centre (TIC) as veritable engine, considering the experiences of
nations with success stories (Bubou and Okrigwe, 2011; Tsai and Kuo, 2011). Emphasis in
this research would be on BRIC nations; an acronym that denotes Brazil, Russia, India and
China, viewed by Sachs (2007) as the five biggest emerging economies likely to overshadow
the G-7 nations in few years. The Nigerian economy needs to be repositioned to be at par with
BRIC nations. The repositioning is critical for entrepreneurship development to grow,
innovate and make SMEs competitive in the global market with better technology and
access (Kauffmann, 2005; Abereijo and Ilori, 2010).

To harnessed the potentials of SMEs sector, three alternatives intervention growth
models or entrepreneurship policy mix have been prescribed, namely, establishment of
TIC, provision of financial assistance and creation of knowledge-sharing platforms
(Tsai and Kuo, 2011). For Bubou and Okrigwe (2011, p. 139), TICs certainly “hold the key
to Africa’s much touted technological advancement and socio-economic development.”

Based on the forgoing, the main objective of this research is to explore the possibility
of harnessing TICs as tools for entrepreneurship development and actualisation of the
Vision 20:2020 in Nigeria. The specific objectives of this paper are:

• To investigate the number and locations of TICs in Nigeria;
• to highlight the objectives, socio-economic benefits and common services provided
  by Nigeria’s TICs;
• to analyses the impact of TICs on macro-economic variables among BRIC nations
  vis-à-vis Nigeria;
• to examine the factors affecting TICs, as an industrial policy in Nigeria; and
• to develop a framework for harnessing the potentials of TICs as tools for
  fast-tracking entrepreneurship development and actualisation of the Vision 20:
  2020 in Nigeria.
The paper is divided into five sections. Section 1, as the introductory part, provides a concise overview on the paper. Section 2 attempts a review of the literature. It showcases the evolutionary construct of TICs, conceptual definition of TICs, theoretical foundation and policy of Nigeria’s Vision 20:2020, as contained in the blueprint and profile of BRIC nations. Section 3 highlights the methods and materials used for the research with justification for its adoption. Section 4, presents the findings and outcomes of research. Section 5 concludes with recommendations for repositioning the 37 TICs in the six geo-political zones to achieve the goals of this research.

2. Literature review

TICs are mechanisms for promoting SMEs and economic development, thereby boosting competitiveness, job creation, wealth creation and poverty alleviation in the economy. This reason explains the intense competition among developed and developing nations to establish technology business incubators (BIs) as vital engines for industrialisation and entrepreneurship development (Adegbite, 2001; Akçomak, 2009; Iwuagwu, 2011). TICs are established for two motives, viz, non-profit-oriented and profit-seeking TICs (Wikipedia, 2012).

TIC by consensus is a novel initiative developed in Batavia, New York, USA, by Joseph Mancuso in 1957, using Massey–Ferguson facility as an experimental platform for the first incubation centre (Stone, 2008; Akçomak, 2009). The TIC, as an intervention model for SMEs was made popular in the USA in the 1980s by the Small Business Administration at its business conferences and summits; when the tide of TIC spread far and wide, it became expedient to have a central coordinating body for regulating and promoting the incubation model. This culminated in the creation of National Business Incubation Association in 1985 with 40 founding members (Akçomak, 2009). Furthermore, literature note that the success of TIC in the USA led to its introduction in Europe in the early 1980s, at a period when there was a rising interest in SMEs because Europe was recovering from severe economic woes and hopeless unemployment. The business incubation idea worked perfectly, as it grew the SMEs in leaps and bounds in Europe. National Technology Incubator’s Network of Australia (2009) noted that BIs supported the development of technology based companies in the country, thereby acting as catalyst for the refocusing Australia’s economy towards knowledge-based industrialisation.

As of 2009, the number of TICs across the globe was estimated at around 3,500 with “one third... (of TICs) located in North America; about 30 per cent in Europe and the remaining 40 per cent in developing countries most of which are in Brazil and China” (Akçomak, 2009, p. 3). However, three years earlier, official report indicated that there are about 7,000 incubators worldwide, with a total of 1,400 incubators domiciled in North America (Knopp, 2012). Despite the divergence in available data on TICs, the salient point is that TICs is growing at alarming rate across the world. Presently, there are inspiring success stories on TICs in countries BRIC nations, Taiwan, Japan, the USA, Australia and Turkey (Akçomak, 2009).

The success of TICs in the aforementioned nations spurred the regime of General Ibrahim Babangida to adopt TICs, as a veritable model for propelling the SMEs in 1988. Federal Government of Nigeria in collaboration with the United Nations Development Programme (UNDP) officially created the nation’s TICs in 1992 under the auspices of the Federal Ministry of Science and Technology (FMS&T). The first pilot centre was established in Lagos in 1993 in Agege, Lagos (Bubou and Okrigwe, 2011). This was followed by TICs in Kano and Aba in 1994. However, a formal programme on technology incubation was
launched in Nigeria with the promulgation of Decree No. 5 of 1995, which entrusted the supervision and coordination of TIC to the Federal Ministry of Science and Technology with effect from July 1995 (FMS&T, 2005).

An opposing view indicated that TIC was formally introduced in Nigeria in 1992, as an industrial policy for the purpose of accelerating entrepreneurship and small business promotion, learning and tapping from the success stories of India, China, Japan, Taiwan and Britain. He noted that in 1993, Nigeria established three pilot TICs at Aba, Kano and Lagos, which provided enabling environment and infrastructural support services for promising SMEs during their teething start-up periods. The landmarks recorded at the three TICs led to floating of 21 TICs in strategic locations in Nigeria. The day-to-day management and control of the various TICs was handled by the Federal Ministry of Science & Technology. Effective from November 2005, the management and control was transferred to the National Board for Technology Incubation (Odigbe, 2012).

Furthermore, Iwuagwu (2011) noted that TIC was actually part of the Cluster Development Strategy developed in 2007 by the Federal Ministry of Commerce and Industry as Nigeria’s new Industrial Development Strategy. TICs represent start-up centres equipped with facilities to support new firms and inexperienced entrepreneurs who are genuinely interested in starting their own businesses. The intention of government was to set up TICs and attach them to higher institutions (universities, polytechnics and colleges of education) and research institutes. The rationale for this thinking was to build graduates with skills and dexterities needed by employers of labour.

2.1 Conceptual definition
TIC attracts diverse definitions in the literature. Other nuances for describing TICs are technology business incubation centres (TBICs), BIs, incubators, etc. (Adegbite, 2001; Mendoza, 2009, Akçomak, 2009; Iwuagwu, 2011). Broadly, four typologies of incubators have been identified across the globe, these are: university BIs, business innovation centres, independent private incubators (IPIs) and corporate private incubators. The types have the same objectives, but the scope differs (Grimaldi and Grandi, 2005; Akçomak, 2009). According to Mendoza (2009, p. 2), technology BIs are intervention “programs designed to accelerate the successful development of entrepreneurial companies through an array of business support resources and services, which are developed and orchestrated by incubator management and offered in the incubator.” An old definition of business incubation indicated that it is a “building which may house several small enterprises, the rent they pay slightly lower than the average market rate. A BI provides general-use equipment, office and administrative services, mail receipt and dispatch, leasing conference rooms, computers, etc.”. Whereas, Scaramuzzi (2002, p. 4) defines TIC as development institution that “[...] catalyzes the process of starting and growing companies, providing entrepreneurs with the expertise, networks, and tools they need to make their ventures successful”.

Besides, Akçomak (2009, p. 4) asserts that business incubation is:

[…] a dynamic process of business enterprise development which: (i) nurture young firms, help them to survive and grow during the start-up period when they are most vulnerable, (ii) provide hands-on management assistance, access to financing and orchestrated exposure to critical business or technical support services, and (iii) offer entrepreneurial firms shared office services, access to equipment, flexible leases and expandable space – all under one roof.
From the diverse definitions provided above, the adopted definition of TIC in this paper is an entrepreneurship support centre established to accelerate the growth and success of SMEs through the provision of enabling business environment, infrastructural support services, state-of-the-art technology and subsidised outlets for the purpose enhancing the survival and growth rate of small businesses at critical start-up periods. The support services and infrastructural facilities are viewed as essential because of the vulnerability of SMEs during the early years of their establishment (NBIA, 2009). TICs, irrespective of domains (whether government-owned, private sector-owned, non-governmental organization (NGO)-owned and those owned by tertiary institutions), admit small business owners as tenants in their early developmental stages and provide them with basic support services such as technology, capital, managerial know-how, through these services TICs promote development of start-ups and transfer of technologies (Adegbite, 2001; Kim and Ames, 2006). At the various incubators domiciled in all the nations mentioned above, many SMEs were assisted in developing their raw ideas from the prototype stage to the commercial stage (NTIN, 2009; Akçomak, 2009).

It is apt to conclude this section that TICs are vital to technological development of progressive economies; hence, they are heavily funded by international development agencies, governments, academic institutions and private sector organisations.

2.2 Theoretical foundation
The models that provide theoretical groundings for TICs in this paper are: economic growth models (Lewis, 1954; Fei and Ranis, 1964); inclusive business models (Jenkins, 2007; Jenkins et al., 2007); building business linkages (Nelson, 2007; Murphy, 2010); creating shared value (Porter and Kramer, 2011) and entrepreneurship social responsibility (Blundel et al., 2008).

2.2.1 Theory of economic growth. There is no peculiar theory developed for TIC, and hence this paper relies on known development theories. Theory in the academic literature is defined as “an established set of propositions” with universal applicability and relevance irrespective of fields (Culler, 2011, p. 2). In other words, theory provides clear understanding and direction for any type of research. According to Sanusi (2010), economic growth theories and models are the established means of attaining economic growth and meaningful development emulating the historical experiences of the developed and industrialized countries of Europe and America. He posits further that the four popular growth theories are linear stages-of-growth models of W.W. Rostow, Harrod and Domar, patterns of structural change models of W. Arthur Lewis, international dependence revolution otherwise called centre–periphery theory and neoclassical/free-market counter-revolution theory (Raimi and Ogunjirin, 2012).

The growth theory that is relevant to the concept of TICs is the structural change theory. The structural change growth theory advocates the need for transformation of a developing nation like Nigeria from a traditional, agrarian economy and oil-dependent economy to a modern, industrial economy through the mechanism of structural change (Sanusi, 2010). The proponents of popular growth theories are Lewis and Fei and Ranis.

Arthur Lewis’s model and Fei-Ranis model used modern economic theory and statistical analysis to explain the internal process of structural change, and stresses that for developing countries to succeed economically, they must undergo and replicate the developmental experiences of their developed counterparts with the view to reducing poverty, illiteracy, diseases, bad governance, lack of self-esteem, corruption,
unemployment, poor amenities, inequality in income and wealth, etc. (Sanusi, 2010; Raimi and Ogunjirin, 2012).

The growth rates of key sectors in Nigeria have not been very commendable as reported in the 2009 economic blueprint. The document indicates an annual average growth rate of real GDP of 5.6 per cent for a period of 10 years. The non-oil sector shows an annual average growth rate of 9.48 per cent, while the dominant oil sector was a source of disappointment and a critical element of instability in the GDP growth pattern (Nigeria Vision 2020, 2009).

From the forgoing, TICs, when effectively embed in Nigeria, could offer the needed impetus to sustainable economic growth because in several parts of the world, especially in BRIC nations, they are the secrets behind the structural change, technological progress and industrial development. It is therefore worthwhile if Nigeria can change its economic structure through the adoption of TICs as drivers of SMEs and its moribund industrial policy. Bubou and Okrigwe (2011) lend credence to the submission above that the commendable experience of the developed knowledge-driven nations has made TICs viable engines for Africa’s technological advancement and socio-economic development. The revolution of TICs was replicated in countries like China, Australia, Turkey, Taiwan, Japan and India (Akçomak, 2009).

2.2.2 Bottom of the pyramid (BOP). This is a development model that represents “a source of entrepreneurship and innovation where economic activity can be stimulated and grown […] from the bottom up” using sustainable approaches, projects and programmes. TICs fall within this model. Furthermore, BOP has also been described as a deliberate intervention for “poverty eradication and asset building” among the neglected poor in the society (Boyle and Boguslaw, 2007, p. 109). BOP was developed to attack the socio-economic roots of poverty across the globe and especially in the less developed nations of Africa, Latin America, Asia and other poverty-ridden continents, where “a small peak of about 100 million people earning $50 a day…[whereas another] 4 billion people earning less than $8 a day” (Jenkins et al., 2008, p. 6).

The BOP thesis enunciated above describes Nigeria’s poverty paradox as self-imposed because the country is blessed with enormous oil wealth that could have been used to fast-track economic growth, empower SMEs, stimulate technological advancement and diversification of the nation’s economy that was mismanaged and/or stolen by successive regimes in Nigeria. Watts (2009) reported that a total of $700 billion oil revenues that accrued to the Nigerian government coffers from 1960-2009 have added little or nothing to the living standard of Nigerians. He submits that:

Eighty-five per cent of oil revenues earned overtime is shared among the influential one per cent of the population, with the possibility that 40 per cent or more of the national accumulated wealth might have been stolen by the privileged ruling elites, technocrats and bureaucrats (p. 3-4).

To reverse the negative picture painted above, there is the need to move the nation away from reliance on oil wealth to sustainable wealth creation through serious promotion of entrepreneurship and industrial development by establishing TICs.

2.2.3 Creating shared value (CSV). CSV advocates strong involvement of private corporations and government in stimulating entrepreneurship development in the contemporary times through shared value, not just profit per se. CSV, according to the proponents, will propel the new wave of innovation and productivity growth in the
global economy. CSV focuses on improving techniques and access of small firms to better technologies and strengthening the local cluster of small suppliers to increase efficiency, yields, product quality and sustainability. The role of the government within the CSV is simply regulation and provision of enabling environment for robust business relationships because “capitalism is an unparalleled vehicle for meeting human needs, improving efficiency, creating jobs, and building wealth…” (Porter and Kramer, 2011, p. 4).

TICs align with the CSV proposition because its main objective is to enhance the capacity of SMEs operating in the TICs and industrial clusters. The role of government under CSV model is to facilitate job creation through promotion of entrepreneurship, as being practised in countries like El Salvador, Israel, Latvia, Uganda and Vietnam, which have made positive efforts in building the entrepreneurship potential of their people emulating China and India (Oteh, 2009). The era of government earmarking billions of naira for job creation to absorb frustrated graduates and unskilled members of the society in the already over-blotted cost of governance in Nigeria is gone (BusinessDay, 2012; Chiedu, 2012).

2.2.4. Building business linkages. The model stresses that the poor around the world are potential assets waiting to be exploited for mutually beneficial ends. The public and private sectors can tap into the latent potentials of poor SMEs by adopting any of the four linkages listed below to expand opportunities for small businesses in the society:

1. creating inclusive business models;
2. developing human capital;
3. building institutional capacity; and
4. helping to optimise the rule of the contemporary business through exposure on regulatory, legal and policy frameworks within the business domain.

The inclusive business models empower starters and inexperienced promoters of SMEs among segments of the business community, while the other three strategies are purely complementary, as they serve as intervention support services for SMEs. TICs fall within the purview of the building business linkages (BBLs) (Jenkins, 2007, Jenkins et al., 2007, 2008; Murphy, 2010).

There several inclusive BBLs models used by transnational corporations like Chevron, GE, Motorola, Microsoft, Vodacom, etc. and localised corporations around the world to expand economic and business opportunities for the neglected poor small businesses. More importantly, BBLs business models create the following benefits:

- increased employment and wealth creation for local firms and communities;
- Enhanced skills, standards and capacity;
- Access to foreign market;
- Diversified clients in the market;
- Facilitation to access to credit; and
- Risk-sharing through joint funding among other SMEs in cluster or TICs (Jenkins, 2007).
2.4. Nigeria’s Vision 20:2020


The Vision 20:2020 blueprint is designed to improve the living standards of all ethnic nationalities in Nigerian, thereby repositioning the country among the Top 20 emerging economies with “a minimum GDP of $900 billion and a per capita income of no less than $4000 per annum” (Vision 20:2020 Blueprint, 2009, p. 9). The framework for its implementation was approved by the Federal Executive Council. In apex body coordination, the sound implementation is the National Council on Nigeria’s Vision 20:2020 in collaboration with the National Planning Commission. For the avoidance of doubt, the Vision Statement of Nigeria’s Vision 20:2020 is stated hereunder Figure 1.

2.6 Profile of BRIC nations and macro-economic statistics

The choice of BRIC nation as replicable success stories is based on the encouraging socio-economic profiles and positive macro-economic statistics. Sachs (2007) presented the following macro-economic statistics on BRIC nations (Table I).

3. Methods and materials

This paper adopts both analytical and discursive approaches, relying on qualitative and quantitative data to justify the potentials of TICs as novel tools for entrepreneurship development and actualisation of the Vision 20:2020 in Nigeria. The relevant qualitative and quantitative data were sourced from industrial policy documents, Goldman Sachs report, online databases of government agencies, Vision 20:2020 policy document and published articles on the subject matter. The data generated were subjected to content and thematic analyses, on the basis of which informed conclusions were drawn (Sweeney, 2009; Howitt and Cramer, 2010). The presentation of qualitative and quantitative data was done using descriptive statistics like tables, graphs and models. These approaches are in line with the research methodology for explorative research (Cooper and Schindler, 2003; Bubou and Okrigwe, 2011; Saunders et al., 2012).
4. Results/Findings

4.1 Number of TICs in Nigeria

An exhaustive investigation and review of government policy papers on TICs revealed that Nigeria has 37 TICs across the country (Federal Ministry of Science and Technology, 2004) (see complete list in Table II).

4.2 Objectives, socio-economic benefits and common services of TICs

A careful review of varied official documents of the Federal Ministry of Science & Technology and development literature revealed that TICs have been established to serve as mechanisms for actualizing a number of industrial policy objectives, which may include:

- job creation for teeming unemployed citizens in poverty ridden economies;
- sustainable wealth creation through start-ups;
- promoting entrepreneurial culture and mind-sets;
- fostering local technology and its applications;
- economic diversification;
- strengthening the growth of industrial clusters;
- encouraging enterprise development and sustainability;
- developing women entrepreneurship;

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<td>8th</td>
<td>3rd</td>
<td>2nd</td>
</tr>
</tbody>
</table>

**Table I.**
Macro-economic statistics of BRIC nations

**Source:** Compiled by Authors from Sachs (2007)
• boosting spin-in or spin-out enterprises;
• community development;
• nurturing new firms from scratch to maturity;
• commercialisation of prototypes/outcomes of R&D institution;
• platform for linkages and symbiotic relationships among firms;
• platform for display of creativity and innovativeness; and

<table>
<thead>
<tr>
<th>SN</th>
<th>Name of TIC</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lagos Technology Incubation Centre</td>
<td>Lagos State</td>
</tr>
<tr>
<td>2</td>
<td>Aba Technology Incubation Centre</td>
<td>Abia State</td>
</tr>
<tr>
<td>3</td>
<td>Kano Technology Incubation Centre</td>
<td>Kano State</td>
</tr>
<tr>
<td>4</td>
<td>Calabar Technology Incubation Centre</td>
<td>Cross River State</td>
</tr>
<tr>
<td>5</td>
<td>Minna Technology Incubation Centre</td>
<td>Niger State</td>
</tr>
<tr>
<td>6</td>
<td>Nnewi Technology Incubation Centre</td>
<td>Anambra State</td>
</tr>
<tr>
<td>7</td>
<td>Benin Technology Incubation Centre</td>
<td>Edo State</td>
</tr>
<tr>
<td>8</td>
<td>Birnin Kebbi Technology Incubation Centre</td>
<td>Kebbi State</td>
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<td>9</td>
<td>Bauchi Technology Incubation Centre</td>
<td>Bauchi State</td>
</tr>
<tr>
<td>10</td>
<td>Maiduguri Technology Incubation Centre</td>
<td>Bornu State</td>
</tr>
<tr>
<td>11</td>
<td>Warri Technology Incubation Centre</td>
<td>Delta State</td>
</tr>
<tr>
<td>12</td>
<td>Uyo Technology Incubation Centre</td>
<td>Akwa Ibom State</td>
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<tr>
<td>13</td>
<td>Akure Technology Incubation Centre</td>
<td>Ondo State</td>
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<tr>
<td>14</td>
<td>Sokoto Technology Incubation Centre</td>
<td>Sokoto State</td>
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<tr>
<td>15</td>
<td>Gusau Technology Incubation Centre</td>
<td>Zamfara State</td>
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<tr>
<td>16</td>
<td>Lokoja Technology Incubation Centre</td>
<td>Kogi State</td>
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<tr>
<td>17</td>
<td>Lafia Technology Incubation Centre</td>
<td>Nasarawa State</td>
</tr>
<tr>
<td>18</td>
<td>Makurdi Technology Incubation Centre</td>
<td>Benue State</td>
</tr>
<tr>
<td>19</td>
<td>Ibadan Technology Incubation Centre</td>
<td>Oyo State</td>
</tr>
<tr>
<td>20</td>
<td>Oshogbo Technology Incubation Centre</td>
<td>Osun State</td>
</tr>
<tr>
<td>21</td>
<td>Ado-Ekiti Technology Incubation Centre</td>
<td>Ekiti State</td>
</tr>
<tr>
<td>22</td>
<td>Enugu Technology Incubation Centre</td>
<td>Enugu State</td>
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<tr>
<td>23</td>
<td>Owerri Technology Incubation Centre</td>
<td>Imo State</td>
</tr>
<tr>
<td>24</td>
<td>Abakaliki Technology Incubation Centre</td>
<td>Ebonyi State</td>
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<tr>
<td>25</td>
<td>Damaturu Technology Incubation Centre</td>
<td>Yobe State</td>
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<td>26</td>
<td>Yola Technology Incubation Centre</td>
<td>Adamawa State</td>
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<td>27</td>
<td>Gombe Technology Incubation Centre</td>
<td>Gombe State</td>
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<td>28</td>
<td>Jalingo Technology Incubation Centre</td>
<td>Taraba State</td>
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<td>29</td>
<td>Katsina Technology Incubation Centre</td>
<td>Katsina State</td>
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<tr>
<td>30</td>
<td>Kazaure Technology Incubation Centre</td>
<td>Jigawa State</td>
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<tr>
<td>31</td>
<td>Kaduna Technology Incubation Centre</td>
<td>Kaduna State</td>
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<tr>
<td>32</td>
<td>Abeokuta Technology Incubation Centre</td>
<td>Ogun State</td>
</tr>
<tr>
<td>33</td>
<td>Yenogoa Technology Incubation Centre</td>
<td>Bayelsa State</td>
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<tr>
<td>34</td>
<td>Port Harcourt Technology Incubation Centre</td>
<td>Rivers State</td>
</tr>
<tr>
<td>35</td>
<td>Jos Technology Incubation Centre</td>
<td>Plateau State</td>
</tr>
<tr>
<td>36</td>
<td>Ilorin Technology Incubation Centre</td>
<td>Kwara State</td>
</tr>
<tr>
<td>37</td>
<td>Abuja Technology Incubation Centre</td>
<td>Abuja, FCT</td>
</tr>
</tbody>
</table>

Source: Federal Ministry of Science and Technology (2004)

From the literature so far reviewed above, the following are benefits that TICs could give to the economy at large:

• Promotion of indigenous industrial development by strengthening the nation’s industrial base at the SMEs level.
• Commercialisation of R&D findings from research institutes, universities and similar institutions.
• Easy avenue for the fostering of innovation through such schemes as provision of patent data, research results and other essential support services for budding SMEs.
• Economic diversification through the development of SMEs in manufacturing and services.
• Linkage with big suppliers, thereby reducing dependence on imports.
• Job creation and thus reduction in unemployment in the country.
• Contributing to the national revenue generation through payment of VAT, Excise Duty and Tax.

In Nigeria, the comprehensive range of intervention services, provided by the 37 TICs to SMEs include:

• provision of incubation space for starters at highly subsidised rate;
• availability of enterprise counselling/mentoring/training;
• access to shared secretarial support especial legal advice;
• non-interest revolving loan as start-up funds/seed capital;
• timely help with product development and marketing;
• business planning and counselling to curb mortality rate;
• access to R&D for prompt technical support;
• management support on book-keeping/accounting and marketing advice; and
• establishment of a functional database of SMEs, as well as a directory of business services available in the TICs.

On the strength of the policy objectives of TICs and its inherent benefits, it is right to conclude that SMEs and emerging entrepreneurs operating in TICs are shielded “temporarily from outside tribulations so that they can focus on critical business building” (Carayannis and Von Zedtwitz, 2005, p. 105).

4.3 Impact of TICs on BRIC nations
TICs have impacted positively on key macro-economic variables among the BRIC nations. The BRIC nations with the exception of Russia have success stories as far as TICs are concerned. China and Brazil combined have almost 1,000 incubators and are rated third and fourth on TICs ownership, respectively, systematically following the
USA and Germany, which have been ranked first and second, respectively (Akçomak, 2009). A country-by-country review is discussed below.

4.3.1 Brazil and TICs. The literature noted that Brazil’s experiment with TICs dated back to a period of 30 years as of 2009. The first TIC was launched officially in 1986, and the number rose astronomically to 40 TICs within a period of 10 years (Akçomak, 2009). Brazil’s TICs were mostly domiciled in the higher institutions, that is, the country opted for university-driven incubation. Lalkaka and Bishop (1996; cited by Akçomak, 2009, p. 12) noted that majority of Brazil’s incubators were located in a university or a research institute and more than 80 per cent of the tenants were spin-offs from academia and other companies. Universities played vital role in establishing incubators. The university was instrumental to the acceptance of the idea of TICs “as a tool to promote entrepreneurship”, a phenomenon described as a bottom-up economic development process, as opposed to government-driven incubation, termed top-bottom economic development process (Etzkowitz et al., 2005; Chandra, 2007). Like other nations, Brazil has its own share of frustration in TIC model, which includes inadequate personnel, insufficient business support services, poor operational infrastructure, constraint of government bureaucracy, insufficient seed capital, etc. (Akçomak, 2009).

4.3.2 Russia and TICs. The development of TICs in Russia became imperative because of the collapse of communism and departure from a central supply system of production and distribution. To expand the SMEs sector, there was the need to create TICs. Consequently, Russian’s first incubator was established in 1991. The various science research centres and some military facilities were used as templates for model BIs in Russia (Lukianenko and Orlova, 1998). Like the tradition in other parts of the globe, Russia formed the National Business Incubator Association of Russia in 1996, which manages more over 30 small BIs domiciled in small towns (SPICA Directory, 2012). The government of Russia through its 1998 Federal Programme provided massive support for TICs in the forms of vocational training for small business owners – leasing of the buildings to incubatees and financial support for small-scale entrepreneurship – training for industrial companies, development of new technologies – innovations that could be adopted and commercialised – and consultancy/office services. The adoption of TIC model as a tool for industrial development in Russia yielded positive result as:

[…] the number of small general-type commercial enterprises went up almost 20 times over 1991-1994; growth in the field of science and scientific services was 8.5 times; the figure for trade and public nutrition equalled 3.4, and in construction the increase was twofold” (Zlobin and Zatzepin, 1998, p. 14.).

As at 2005, Russia boosts of 60 BIs, over 40 technology innovation centres and about 60 techno-parks (Kaganov, 2005). Russia has continued to enjoy sustainable economic growth year-in year-out on account of its vibrant TICs.

4.3.3 China and TICs. China has been ranked third among nations with success stories on TICs (Akçomak, 2009). In a 2011 evaluation, Bubou and Okrigwe, (2011) ranked China second among developing emerging economies with a total of 550 incubators serving varieties of corporate organisations. On account of its communist ideological posturing, TICs in China are very large and funded fully by government with support from non-government players, unlike Brazilian TIC model that is smaller and university-based. TIC was official established in China in 1988, the same period as with
Nigeria, as Chinese National Incubation Program (Torch Program). The day-to-day management was placed in the hand of the Ministry of Science and Technology (Scaramuzzi, 2002). For a period of 12 years, over USD150 million was spent on TIC development. The 2006 statistics sources indicate that 200 incubators were created under the Torch Program. TICs in China were instrumental to the creation of 18,000 new high-tech enterprises across the country with special focus on development of “new materials, environmental technologies, biotechnology, aerospace and information technology” (Scaramuzzi, 2002, p. 17). Further information indicated that Shanghai alone had 13 TICs, which nurtured over 40 enterprises, while the Tianjin Women’s Business Incubator proudly promotes women visibility in the small businesses, thereby stimulating job creation and curbing cycle of poverty in China (Scaramuzzi, 2002).

4.3.4 India and TICs. As far back as the 1950s, the Indian government has continued to encourage SMEs with its entrepreneurship policies and regular training programmes. These initiatives were supplemented in 1982 with the setting up of National Science and Technology Entrepreneurship Development Board to strengthen SMEs facing a number of environmental constraints through the TIC model. The model TIC was created in “1980s as policy tool for promoting entrepreneurship and stimulating new venture creation” in India (Akçomak, 2009, p. 16). TICs were slow in growing at the onset because of government support, the bulk of the finances were provided by United Nations (Lalkaka, 2002). In 2009, reports indicate that there are 50 diverse TICs in India, of which 15 are specialised TBICs (Akçomak, 2009). Apart from government-established TICs, the international development agencies provide grants to private sector organisation promotes TICs. InfoDev attracted a grant USD1.1 million, which it used for the establishment of five TICs, namely, IndiaCo (Mumbai), TREC-STEP (Tiruchirappalli), SRISTI (Ahmadabad), TeNeT (Chennai) and VIT-TBI (Tellore). The services provided by government and private-sector TICs to incubatees include: provision of office space, seed capital for start-up firms, mentoring support, consultancy services, information and communications technology facilities and other incubator support services (InfoDev, 2008; Akçomak, 2009) (Tables III and IV).

4.4 Factors affecting the performance of TICs in Nigeria
As laudable as the TIC model is, there are numerous factors affecting industrial policy of TICs and other national economic blueprints. The successes of the TICs could be assessed by the number of new enterprises and jobs created for the citizens. The SME sector is serviced by citizens who are skilled but unemployed. In emerging economies like Japan, China, South Korea, Indonesia, Malaysia and India, where favourable government entrepreneurship policies have favoured SMEs, the sector contributes between 70 to 90 per cent to employment with about 40 per cent contribution to their respective GDPs. It will be difficult, therefore, to rebuild the Nigerian economy if the roles of the SMEs, as important employment and economic growth drivers, are not identified (Chiedu, 2012). Looking at the rising unemployment rate in Nigeria, the researchers are forced to conclude that TCIIs with respect to Nigeria has not really created jobs for the teeming population, especially of the young people. The National unemployment data in Table I indicate an upward trend in unemployment (Table V).

The scary unemployment rates reported above is further reinforced by the report of the National Bureau of Statistics (2011b), which puts the total number of Nigerians who are unemployed at 14 million. To engage the current 14 million unemployed Nigerians,
there is the urgent need for governments at all levels, private sector organisations and higher institutions to rescue the situation by stimulating entrepreneurship through the establishment and massive funding of TICs. According to Adegbite (2001), Mendoza, (2009) the factors affecting TICs in Nigeria include:

- **Inadequacy of numbers of TICs.** For the geographical size of Nigeria, 37 TICs are grossly inadequate to meet the needs of SMEs. SMEs that cannot be accommodated in existing facilities are forced to wait until matured colleagues

<table>
<thead>
<tr>
<th>Nations</th>
<th>Year of establishment</th>
<th>No. TICs</th>
<th>Effective date of statistics</th>
<th>Ranking by no. of TICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1986</td>
<td>40</td>
<td>2009</td>
<td>3rd</td>
</tr>
<tr>
<td>Russia</td>
<td>1991</td>
<td>&gt; 30</td>
<td>2012</td>
<td>5th</td>
</tr>
<tr>
<td>India</td>
<td>1980s</td>
<td>50</td>
<td>2009</td>
<td>2nd</td>
</tr>
<tr>
<td>China</td>
<td>1988</td>
<td>550</td>
<td>2011</td>
<td>1st</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1992</td>
<td>37</td>
<td>2012</td>
<td>4th</td>
</tr>
</tbody>
</table>

**Sources:** Akçomak (2009), Bubou and Okrigwe, (2011), SPICA Directory, 2012

---

<table>
<thead>
<tr>
<th>Nations</th>
<th>GDP</th>
<th>Growth rate</th>
<th>Population</th>
<th>Urbanization</th>
<th>Trade openness</th>
<th>Inflation</th>
<th>FDI/GDP</th>
<th>Foreign reserve</th>
<th>Exchange rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>1,068</td>
<td>2.3</td>
<td>187</td>
<td>84.2</td>
<td>22.7</td>
<td>4.2</td>
<td>1.7</td>
<td>109.2</td>
<td>57</td>
</tr>
<tr>
<td>Russia</td>
<td>988</td>
<td>6.2</td>
<td>43</td>
<td>73.3</td>
<td>43.4</td>
<td>9.9</td>
<td>1.9</td>
<td>394.4</td>
<td>82</td>
</tr>
<tr>
<td>India</td>
<td>915</td>
<td>7.2</td>
<td>1,113</td>
<td>28.7</td>
<td>33.2</td>
<td>5.6</td>
<td>0.8</td>
<td>200.7</td>
<td>91</td>
</tr>
<tr>
<td>China</td>
<td>2,701</td>
<td>9.8</td>
<td>1,314</td>
<td>40.5</td>
<td>65.2</td>
<td>1.5</td>
<td>3.2</td>
<td>1,157.4</td>
<td>92</td>
</tr>
<tr>
<td>Nigeria</td>
<td>115</td>
<td>5.6</td>
<td>150</td>
<td>48.3</td>
<td>71.0</td>
<td>9.4</td>
<td>3.6</td>
<td>43.2</td>
<td>101</td>
</tr>
</tbody>
</table>

**Source:** Sachs (2007:136)

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<table>
<thead>
<tr>
<th>Survey period (Year)</th>
<th>Composite rate of unemployment (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>13.1</td>
</tr>
<tr>
<td>2001</td>
<td>13.6</td>
</tr>
<tr>
<td>2002</td>
<td>12.6</td>
</tr>
<tr>
<td>2003</td>
<td>14.8</td>
</tr>
<tr>
<td>2004</td>
<td>13.4</td>
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<td>2005</td>
<td>11.9</td>
</tr>
<tr>
<td>2006</td>
<td>12.3</td>
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<tr>
<td>2007</td>
<td>12.7</td>
</tr>
<tr>
<td>2008</td>
<td>14.9</td>
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<tr>
<td>2009</td>
<td>19.7</td>
</tr>
<tr>
<td>2010</td>
<td>21.1</td>
</tr>
<tr>
<td>2011</td>
<td>23.9</td>
</tr>
</tbody>
</table>

exit the TICs facilities. Consequently, there is the need to encourage states, NGOs and private individuals to establish more functional incubators all over the country.

- **Paucity of support services to SMEs tenant firms.** Contrary to the objectives of TICs, as contained in Government documents, the array of support services (like counselling and monitoring, training and assistance, financial assistance and seed capital funding, technical assistance, marketing and promotion of products and linkage with large-scale enterprises, research institutes, universities, etc.) promised to SMEs/tenants are usually not forthcoming.

- **Lack of measurable targets and objectives for TICs.** TICs going by Nigerian experience lack measurable targets and clearly defined objectives, thus resulting in poor socio-economic impact and weak multiplier effect. TICs appear to be a colossal waste and failing model because of faulty programme conception, formulation, implementation and evaluation/supervision of TICs. Consequently, existing TICs cannot boost of meaningful record of success.

- **Existing TICs reflect weak operational structures.** In India, Australia, Taiwan, etc., the strength of TICs is hinged on the effectiveness and efficiency of the management structure. The TICs managers and support staff are sufficiently knowledgeable about incubator management. The day-to-day management is therefore not compromised. The inability of existing TICs to impact on the economy is traceable to weak institutional structure.

- **Dominance of Government and inadequacy of private sector-driven TICs.** Sequel to the point raise in challenge (first bullet point) above, there is need for multiplication of TICs going by the rising demand for incubators by emerging entrepreneurs and SMEs promoters. The NGOs, trade associations and industrial unions need to be involved in the issue of private sector participation in the establishment and/or management of the incubators.

- **Non-viability of existing incubators.** Existing TICs suffer from myriads of problems arising from poor project conception and implementation, failure TICs to address issues of land ownership and cost of acquisition, provision and cost of infrastructure, cost of capital (interest rate) and inaccessibility to institutional credit from Bank of Industry (BOI), National Poverty Eradication Programme (NAPEP), Nigerian Agricultural and Rural Development Bank (NACRDB), etc.

- **Refusal of SMEs (tenant firms) to vacate TICs for new entrants.** A critical reason that is responsible for the small number of spin-off firms is the refusal by tenants to move out of TICs to suitable locations. There is, therefore, the need to enforce the terms and conditions of tenancy for SMEs through clear polices. A periodic review of turnover of tenants is also imperative to facilitate admission of new intakes so that the model would be sustainable and yield the desired socio-economic impact.

- **Nepotism and favoritism in placement of SMEs at TICs.** The placement of SMEs as tenants in TICs is subject to political and ethnic partisanship rather than on merit and commercial viability and prospect of the projects to be incubated in the TICs. Consequently, some brilliant innovators and creative small business promoters are denied placement in preference for individuals with strong
connection with powerful government officials. Placement procedures at TICs need to be critically streamlined.

- **Changing policies and constraint of funding to TICs.** It is no news that TICs are starved of funding on account of changing government policies. Underfunding is the bane of incubator programme in Nigeria. This is not peculiar to TICs, NDE suffer similar fate.

4.5 Framework for harnessing TICs, entrepreneurship and vision 20:2020

The framework for harnessing the potentials of TICs as tools entrepreneurship development and actualisation of the Vision 20:2020 in Nigeria is as presented in this concluding section of the paper. The paper links two models to achieve this research objective. From the review of literature and experiences of BRIC nations, the USA and Europe, there is an input – outcome relationship between TICs and economic development, employment and other macro-economic variables. The first model is by Scaramuzzi (2002), which provides a graphic relationship between the incubator resources (input) and expected outcomes (economic objectives/benefits) (Figure 2).

The second model is the Nigeria’s Vision 20:2020, which accommodates TICs in its policy objectives. Nigeria’s Vision 20:2020 has two broad objectives, viz, optimizing human and natural resources to achieve rapid economic growth, and translating that growth into equitable social development for all citizens. These objectives have been articulated into social economic, institutional and environmental dimensions. Nigeria’s Vision 20:2020 Blueprint (2009) stipulates: “[…] aspirations (of the blueprint) are defined across four dimensions:

1. **Social dimension:** A peaceful, equitable, harmonious and just society, where every citizen has a strong sense of national identity and citizens are supported by an educational and healthcare system that caters for all, and sustains a life expectancy of not less than 70 years.

2. **Economic dimension:** A globally competitive economy that is resilient and diversified with a globally competitive manufacturing sector that is tightly integrated and contributes no less than 25 per cent to Gross Domestic Product.

![Figure 2. Relationship between incubator resources and incubator objectives](image-url)
(3) **Institutional Dimension**: A stable and functional democracy where the rights of the citizens to determine their leaders are guaranteed, and adequate infrastructure exists to support a market-friendly and globally competitive business environment.

(4) **Environmental dimension**: A level of environmental consciousness that enables and supports sustainable management of the nation’s God-given natural endowments to ensure their preservation for the benefit of present and future generations (Ibid, p. 9).

From the foregoing four dimensions of Vision 20:2020, it is clear that the concept of TICs fall within the economic dimension of the blueprint (Figure 3).

From the two models above (TIC model of Scaramuzzi (2002) and Nigeria’s Vision 20:2020 model, this paper proposes an intervention framework in Figure 4.

5. **Conclusion/policy recommendations**
This research paper has successful explored the potentials of TICs, as tools for entrepreneurship development and actualisation of the Vision 20:2020 using content analysis. Further research on this subject matter should explore empirical analysis for an objective assessment of the situation. By and large, when TIC is promoted as mechanism for entrepreneurship development, the common deliverables are job, creation, economic diversification, global competitiveness, value addition to GDP and SMEs innovativeness, while for the Nigeria’s Vision 20:2020, the deliverables of TICs are:

- prospect of TICs guaranteeing the productivity and wellbeing of the people;
- possibility of TICs optimising the key sources of economic growth; and
- TICs fosters sustainable social and economic development.

---

**Figure 3.**

**Source:** Nigeria’s Vision 2020 (2009, p.21)
Nigeria has not been able to actualise its industrial policy objectives with regards to TICs compared with BRIC nations because of the inhibiting constraints such as inadequate number of TICs, poor support services at TICs, lack of measurable targets for existing TICs, weak operational structures, dominance by government as opposed to growing involvement in TICs by the private sector, non-viability of existing TICs, refusal of incubatees/tenants to leave the TICs, nepotism/favouritism in allocating spaces/facilities at TICs and inconsistent government policies on industrial policies.

To redress the above mentioned institutional constraints facing the thirty-seven (37) TICs in Nigeria as well as the bottlenecks created by incubatees, the paper presents the following recommendations:

1. Existing government-owned TICs should be managed through the public-private partnership model. The role of government should be regulatory and provision of enabling environment, while the private sector organisations should be charged with the day-to-day management of the TICs. In other words, existing 37 TICs should be restructured, empowered and transfer to the private sector agencies for optimal performance.

2. Universities, polytechnics and colleges of education should be actively involved in the creation of TICs for better and effective promotion of entrepreneurship education. This is the model in Brazil, Australia, the USA and other economies.

3. TICs in the universities, polytechnics and colleges as suggested in b (above) can effectively be sustained through diverse means such as:
   - town–gown linkages (industry–tertiary institutions);
   - regular workshops and seminars; and
   - investors forum and exhibitions.

These platforms would bring together stakeholders, investors and entrepreneurs together to brainstorm on how to make research outcomes of SMEs useful for economic growth and entrepreneurship development.
Multinational companies should establish their own TICs as part of their corporate social responsibility programmes for their host communities. This approach is better than short-lived palliatives like charity, gifts and settlement of turbulent youths. It also has greater prospect of mitigating political tension and promoting economic and environmental sustainability.

The inventions, innovative products and other creative designs of the SMEs domiciled at the existing TICs need to be commercialised, diffused and promoted both locally and internationally for adoption by large companies and multinationals. There is therefore the need for organised research collaborations among government agencies like National Office for Technology Acquisition and Promotion, Raw Materials Research and Development Council, National Agency for Science and Engineering Infrastructure (NASERI), Federal Institute of Industrial Research Oshodi (FIIRO), Projects Development Institute (PRODA), among others in this direction.

To curb the phenomenon of overstay by incubatees at the TICs, the terms and conditions of tenancy of incubatees, rent and time of exit should be clearly stated and enforced.

From the findings and research outcomes presented above, Nigeria’s poor economic growth and development can be redressed through sincere implementation of recommendations provided above. Nigeria has the human and material resources to rehabilitate and restructure its TICs for maximum efficiency. After all, Russia has over 30 TICs and its economic growth; industrial progress and technological advancement exceed those of Nigeria as depicted in the various tables presented above.

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Akçomak, I.S. (2009), Incubators as Tool for Entrepreneurship Promotion In Developing Countries, UNU-WIDER, Maastricht University, Department of Economics, The Netherlands.


Further reading


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