

The Challenges of Research and Development (R&D) Efforts: A Study of Small-to-Medium Industries (SMIs) in Abia State, Nigeria

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Abstract

This article is on the Challenges of Research and Development (R & D) Efforts on Small-to-Medium scale Industries (SMIs) in Abia State, Nigeria. The survey findings include: that SMIs in Abia State have no R & D activities going on in their firms; their production techniques are both manual and machine operated; they only produce light and consumer – oriented goods; operating below installed capacity, have no relationship with any research institute in the country; have no technical partners; and are technically and technologically dependent the result of all these is that SMIs in Abia State cannot compete effectively both nationally and globally. Based on these findings, the paper made far reaching recommendations in aid of a vibrant research and developments activities by SMIs, the organized private sector (OPS) and government owned research institutes, all to the benefit of the Nigerian economy.

Key words: Small-to-Medium Industries (SMIs); Research and Development (R & D); Commercialization; Mode of operation; Capacity utilization; Technological dependence; Challenges

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INTRODUCTION

Every nation is striving to be relevant in the global economy. This is achieved by being an active participant in international trade and having trade surplus.

This is also made possible by having variety of high quality products in the global markets. Doing this effectively and successfully entail a lot of research and development efforts and programmes, and funding them adequately.

While many newly developed countries (NICs) and advanced nations have impressive records of R & D outputs, most third world nations, including Nigeria, do not. This accounts for why majority of them are technically and technologically dependent and therefore underdeveloped.

There is a correlation between modern industrialization and vibrant research and development policies. Innovation, which is the introduction of new products and services to the market depends on R & D. Manufacturers must innovate because products don't sell forever, again many competitors are introducing many new products all the time to the market. In other words, manufacturing firms must innovate, or they will not have new or improved products to sell and will naturally die.

It is against this backdrop that this article will investigate the challenges of research and development efforts of small to medium scale industries (SMIs) in Abia State, Nigeria.

1. THEORETICAL FRAMEWORK

Since Nigeria got her independence in 1960, several attempts have been made to define and classify SMEs. Based on different criteria-capital outlay, differences in policy forms and various perceptions, different government agencies, NGOs, Universities, donor organizations, etc, have applied (and are still applying) various definitions.

The following bodies – Central Bank of Nigeria (CBN), Centre for Management (CMD), Federal Ministry

of Industry (FMI), Nigerian Bank for Commerce and Industry (NBCI), Nigerian Economic Reconstruction Fund (NERFUND), Family Economic Advancement Programme (FEAP), Nigerian Industrial Development Bank (NIDB), Centre for Research and Industrial Development (CRID), Centre for Industrial Research and Development (CIRD) of the Obafemi Awolowo University, Ile-Ife, Nigerian Association of Small and Medium Enterprises (NASME), Nigerian Export-Import Bank (NEXIM), SMEDAN, the National Council of Industry (NCI), Bank of Industry (BOI), Small and

Medium Industries Equity Investment Scheme (SMIEIS), African Entrepreneurship Initiative (AELI), etc, have used different definitions at various time. Many authors and researchers have also attempted giving their own definitions. For our purpose, we shall adopt only three definitions, namely the classifications of the National Council of Industry (NCI); SMIEIS and AELI. The NCI started in 1992 to classify industries in Nigeria, to be revised every four years. The NCI's definitions have been revised twice – in 1996 and 2001. However, the current national classifications of SMEs are shown on Table 1.

Table 1
Enterprise Classification by NCI

S/N	Type of classification	Total cost (Excluding cost of land but including working capital)	Number of employees
1.	Micro/Cottage Industry	N1.5 million	1 – 10
2.	Small-Scale Industry	N50 million	11 – 100
3.	Medium-Scale Industry	Over N50 million but not more N200 million	101 – 300
4.	Large-Scale Industry	Over N200 million	Over 300

In response to governments' concern for the promotion of SMEs as a vehicle for rapid industrialization, poverty alleviation and employment generation, SMIEIS came into existence. It is a voluntary initiative of the Bankers Committee (i.e Committee of CEOs of banks in Nigeria and CBN), which came into existence on June 19, 2001. The scheme requires all banks operating in Nigeria to set

aside 10 percent of their profit before tax (PBT) as equity investments in Small and Medium-scale Industries (SMIs).

For the purpose of this scheme a small and medium industry is defined as any enterprise (excluding trading) with a maximum asset base of N200 million, excluding land and working capital; and the number of staff employed by the enterprise shall not be less than 10 and not more than 300.

Table 2
Enterprise Classification by AELI

S/N	Types of classification	Total cost (Excluding cost of land but including working capital)	Number of employees
1	Micro/Cottage Industry	N1.5 – N3.0 million	1 – 30
2.	Small-scale Industry	Over N30 million but not more than N60	31 – 150
3.	Medium-scale Industry	Over N60 million but not more than N250 million	151 – 350
4.	Large-scale Industry	Over N250 million	Over 350

It is worthy of note that the AELI's classification adopts a range approach.

This is for four major reasons:

- The sort comings of straight jacket compartment.
- To accommodate more and more enterprises in each category.
- To take care of inflationary trend, interest and exchange rate fluctuations.
- To take into consideration the global economic crisis and the view that the world is a global village, where SMEs in Nigeria should be in a position to compete globally. (Onuoha, 2010).

The role of SMEs and SMIs in economic development involves more than just increasing per capital output and income, it involves initiating and constituting change in the structure of business and society. This change is accompanied by growth and increased output, which allows more to be divided by the various participants. What in an area that facilitates the needed change and development? Once theory of economic growth depicts

innovation as the key, not only in developing new products (or services) for the market but also in stimulating investment interest in the new ventures being created. This new investment works on both the demand and the supply sides of the growth equation, the new capital created expands the capacity for growth (supply side), and the resulting new spending utilizes the new capacity and output (demand side) (Hisrich & Peters, 1998).

Small to Medium Scale Enterprises (SMEs) are acclaimed, the world over as engines of socio-economic development by fostering innovation, entrepreneurship and facilitating the use of local raw materials and other resources. They also help in balancing industrial development and socio-economic infrastructure of the rural and urban areas. Furthermore, being relatively labour-intensive. SMEs create substantial employment opportunities at low capital cost and being resilient and flexible can better adapt to in expected changes in the economic and financial environments. In agreeing with the above position, Okonkwo (1993) contends that the

industrial future of Nigeria depends critically on the twin pillar of a stable macro-economic environment and a vibrant and dynamic SMI business sector based on a foundation of proactive partnership between government and the private sector.

The contributions of SMIs in an economy are numerous, diverse and integrated. Some of these include: stimulation of indigenous entrepreneurship, transformation of traditional/local industry, creation of countless employment opportunities/openings, linking up the various sectors and sub-sectors of the economy, business interdependence, maintenance of competition, greater innovations and creativity, stemming rural-urban migration, increasing standard of living, paying more taxes which enables governments to provide basic amenities, mobilizing savings and investments, dispersal of business enterprises, competing globally and earning foreign exchange for themselves and the economy, contributing to regional activity/cooperation. Onuoha (2008), Osuala (1993), Baumbach (1992), etc.

To be in a better position to discharge the above mentioned roles, SMIs ought to have robust records of research and development activities. Unfortunately, this is not the situation in this country. Why is research and development (R & D) vital for a strong and competitive small-to medium industries' sub-sector? Research and development activities are critical for new products or improvements in existing products to be assured, which in turn ensure the economic well-being of the citizenry of any nation Ogwo (2002) is of the view that the output of research is essential for the following reasons:

- (1) Products or services which constitute the indices for measuring the quality of life in a society have a life cycle information, growth, maturity and decline. They thus need to be constantly replaced by the new output of research.

- (2) The demand for most products fluctuates, thus companies would need new products to maintain stability in their revenue flows.
- (3) Threats to the supply of inputs (raw materials) for companies often exist suggesting an often compelling need for research to discover alternative supplies or sources of supply.
- (4) Research outputs in their quantum or quality (newness or novelty) terms enhance the status or image of a company.
- (5) Researchers and the output bring about a fuller utilization of resources which otherwise will lie idle.
- (6) Output of research when they lead to additions to the product line, assist the company in diversifying risk.

2. METHODOLOGY

This is essentially a survey research. The area covered by the study is broadly Nigeria and specifically manufacturing firms in Abia State. Emphasis was on those that are members of trade associations in this case, Manufacturers Association of Nigeria (MAN), Abia State Chapter.

Out of hundreds of SMIs in Abi State, only 45 are registered members of MAN in Abia State at the time of the study. Majority of SMIs are located in Aba, the main industrial/commercial centre of Abia State. Aba is also the MAN's State office. Through judgmental sampling, eighty-five percentage of the population was chosen. By simple random sampling, 38 firms were selected, and questionnaire that centre largely on the modes of operation and research and development efforts of these firms were distributed to their Managing Directors/General Managers. Out of the 38 questionnaire distributed, 33 were correctly filled out and returned. This represents 87% response rate.

3. SURVEY FINDINGS

Table 3
Companies' Mode of Operation I

Question No	Question	Response	Respondents	Total		
				%	No	%
1.	What are the major product of your company?	a) Light and consumer oriented goods	24	73		
		b) Partly industrial and partly consumer products	5	15		
		c) Heavy and non consumer oriented goods	4	12	33	100
2.	What is the basic production technique?	a) Mainly manual	4	12		
		b) Mainly machine operated	5	15		
		c) Completely automated	2	5	33	
		d) (a) and (b)	22	67		100
3.	How are your machines procured?	a) Sourced locally				
		b) Mainly imported	27	82		
		c) Partly locally and partly imported	6	18	33	100

To be continued

Continued

Question No	Question	Response	Respondents	Total		
				%	No	%
4.	What percent of your production materials is sourced?	a) Locally:				
		i) 20-40%	14	42		
		ii) 41-60%	15	45		
		iii) 61-80%	03	09		
		iv) Above 80%	01	03	33	100
		b) Imported				
		i) 20 – 40%	3	09		
		ii) 41 – 60%	13	39		
5.	Have your company used any research findings from any of our research institute?	Yes				
		No	29	88	29	88
6.	If yes, include the particular research findings and from which institutions?	None	00	00	00	00
7.	If no, give reasons?	No relationship				
		Policy gap				
		Institute no getting inputs from them Unaware of the research findings, etc.				

Source: Survey Data

The table above shows the companies' mode of operations covering a range of issues. Majority of the companies surveyed 24(73%) were producing light and consumer oriented goods. About 15% of firms' products were partly industrial and partly consumer goods, and 4(12%) of the firms' were producing heavy and non-consumer oriented goods. Some of the light and consumer oriented goods included: beverages, soft drinks, sachet water, refined PKO oil, vegetable oil, ice cream, wine and spirit, cosmetics, polythene bags, paints, soap and detergent, issue paper, pharmaceuticals, shoes, stockings, rubber products and plastics. Some of the industrial products were palm kernel oil, industrial paints, solid minerals, automotive paints, industrial coating, wood vanish, lubricating oils, jumbo rolls, adhesive, bread wrappers, pvc, pipes, wire and nails. Examples of heavy and non consumer goods include: Switch gears, electrical/mechanical fabrications.

The information on the basic production techniques showed that 4(12%) were mainly manual operation; 5(15%) were mainly machine operated, 2(6%) were completely automated, and the bulk of the firms, 22(67%) were operating based on both manual and machine operated

techniques. On procurement of machines, 27(82%) of firms imported their machines, while 6(18%) of the firms' machines were procured partly locally and partly imported. In other words, the machines of most manufacturing firms in Abia State had high foreign content.

On sourcing of production materials, either locally or imported. On the local level the picture was as follows; 14(42%); 15(45%); 3(9%) and 1(3%) sourcing. On the imported level were; 3(9%); 13(39%); 16(48%) and above 01(80%) sourcing. No firm had used any research findings from any of our research institutes. Some of the reasons given for this were:

No relationship existed between the research findings and the mode of business operations.

There were policy gaps between the research institutions and government on one hand and between government and the intended beneficiaries of research finding on the other.

The research institutes often do not get inputs (information and others needs) from the manufacturing firms.

Some business organizations claimed to be unaware of the existence of the research findings.

Table 4
Companies' Mode of Operation II

Question No	Question	Response	Respondents	Total		
				%	No	%
8	Do you have any technical partners?	Yes				
		No	33	100		
9	If no, what are your reasons	Have adequate technical manpower				
		Operations do not require technical partner				
		Continuous training and retraining of own technical staff				
10	Do you give your products indigenous or foreign brand?	Indigenous (but in English)	28	85		
11	If you give foreign brands, state why?	Foreign				
		-	-	-	-	-

To be continued

Continued

Question No	Question	Response	Respondents	Total		
				%	No	%
12	What percentage of the installed capacity of the machines are you utilizing?	10 – 20%	03	09		
		21 – 30%	11	33		
		31 – 40%	17	52		
		41 – 50%	02	06		
		Above 50%			33	100
13	Does your business have any research and development relations with any multinational in the country?	Yes	00	00		
		No	33	100	33	
14	Is your firm involved in any in-house research and development activities/ programmes?	Yes	00	00		
		No	33	100	33	100
15	If yes, to what extent	-	-	-	-	-
		a) Lack of funds	15	45.5		
16	If No. State reasons	b) No R&D Unit/Staff	05	18.2		
		c) Don't know what it is	04	12.1		
		d) Limited scope of operation	04	12.1		
		e) No government support	02	6.0	33	100

Source: Survey data

On capacity utilization 3 firms were utilizing machines between 10-20%, 11 firms, between 21-30%; 17 firms, between 31-40%; 2 firms, between 41-50% and no firm is operated above 50% installed capacity. This implied that virtually all the manufacturing entities were operating below 50% installed capacity. Indeed majority of them (52% of firms) were operating between 31-40% of installed capacity.

None of the firms surveyed had any research and development relationship with any multinational corporation in this country. This means, that the so-called claim of transfer of technology by multinational corporations to indigenous firms could not be ascertained.

From the above, all the manufacturing firms indicated that at the period of this research work, they did not have any technical partner. However, seven of the business claimed they had technical partnership at inception. The reasons for not having technical partner(s) were adduced thus:

- (1) They had adequate technical manpower.
- (2) Present operations did not require technical partner.
- (3) Continuously, the firm business had trained and retrained their staff.
- (4) High cost of maintaining technical partner (partnership).
- (5) High cost of foreign exchange (rate) due to the depreciation in value of the national currency, the Naira.

On whether the companies' products were given indigenous or foreign brand names, 28(85%) gave products local brand names, in any case, in English language. They created these brand names. No firm accepted to have given its products copied foreign names.

Unfortunately, none of the firms under study, has an in-house research and development activities or programmes. Some of the factors responsible for this include: lack of funds, no research and development unit or research staff; limited scope of operation (mostly within Abia State and South-East); and non-existence of government support in this direction.

4. CHALLENGES OF R & D EFFORTS OF SMIS

Nigerian firms have poor records of research and development (R&D). As such, they are neither technological leader (pioneering innovations) non-technological followers (experts of imitating the products of competitors). Bateman and Snell (2011:591) have highlighted the advantages and disadvantages of technological leadership. The advantages – first-mover advantage, little or no competition, greater efficiency, higher profit margins, sustainable advantage, reputation for innovation, establishment of entry barriers, occupation of best market niches and opportunities to learn. The disadvantages – greater risk, cost of technology development, costs of market development and customer education, infrastructural costs, costs of learning and eliminating defects and possible cannibalization of existing products.

Firms that emphasize growth through acquisitions over internal development tend to be less innovative than others in the long run (Hitt *et al.*, 1996). Research suggests that companies must have at least a minimal R&D capability if they are to correctly assess the value of technology developed by others (Wheelen & Hunger, 2008). This is called a company's "absorptive capacity" and is a valuable by-product of routine in-house R&D activity (Cohen & Levinthal, 1990). Absorptive capacity is a firm's ability to recognize, assimilate and utilize new external knowledge (Lane & Lubatkin, 1998).

What are the implications of all these for most enterprises particularly, manufacturing, ICT-based and oil and gas companies operating in the country and for the nation at large? The include that these companies are technologically dependent; and the nation is technologically backward. Technology dependence and backwardness allow the developed countries to exercise control over what we produce and how, hence our rate of development is at their whims and caprices (Onuoha, 2012).

The challenges of SMIs in Nigeria are reflected in their modes and scope of operation; financial constraints; harsh business environments, governments' poor funding of research institutes, and the inability of these firms to commercialize the findings and inventions of these research institutes. All these have far reaching consequences.

The research effort reveals a number of unhealthy developments, inimical to effective technological and industrial development of the economy. They are:

(1) Majority of manufacturing enterprises in Nigeria generally and Abia State specifically are into the production of light and consumer-oriented goods.

(2) Their mode of operation technique is both manual and machine operated. Complete automation of operations is till a far cry.

(3) Their major machines and raw materials are imported with the attendant foreign exchange implications.

(4) Most of them had never used the research findings of some of our research institutes, have no technical partner, operating below installed capacity on average at 40%, the national average is 48.8% and have no research and development relationship with any multinational corporation or university in the country.

(5) They are all engaged in downstream industrial activities such as light, labour-intensive, and low capital manufacturing, with very low export potentials.

All these go to show the low level of indigenous technology in Nigeria. Our manufacturing enterprises are more or less completely dependent technically and technologically. We lack innovative technology culture, as is the case by the happy experiences of countries like India, China, Brazil and Indonesia, etc, the economic development of which has depended on the ability to acquire, adapt, modify and improve foreign technology, and their large populations.

The country is culpably underdeveloped in terms of technology development – an essential ingredient for industrial development. The implication also, is that our notable research institutes like Federal Institute of Industrial Research, Oshodi (FIIRO), Raw Materials Research Development Council (RMRDC), Project Development Agency (PRODA) among others, have not made the desired impact. Some of the factors responsible for this are:

(1) Weakness of the private sector executive capacity.

(2) The low level of personal income limiting the scope of individual efforts with regard to science and technology and precipitating the incidence of drain in the country.

(3) The need to develop a critical mass of scientists and technologists and the basic infrastructure of higher education.

(4) The cost of industrial R&D hardware and software have become prohibitive.

(5) Fiscal policy of reduced budgetary allocation resulting in inadequate funding of industrial R&D activities.

(6) Inability to effectively engage in technology transfer or acquisition due largely to inadequate

negotiating capability, exorbitant payments for acquired technology, inclusion of restrictive clauses, etc. (Industrialization Handbook, 1992). All these are inimical to the country's industrial development.

On his own part, Maiyaki (2002) lists the following as the major challenges to research and development efforts, which are public sector led: inadequate infrastructure, a culture of anti-intellectualism, poor financial support, insufficient educated managers, dependence of foreign companies on their puppet companies, insufficient information sources, low quality of output of our tertiary institutions, very limited opportunities for Nigerian researchers to participate in international workshops, seminars and conferences, political instability, government policy on federal character and loss of competent academic staff.

In the area of indigenous firms' inability to effectively utilize indigenous inventions from our research institutes and universities, Oyowole (2004) lists the major constraints to include:

(1) Non-availability of information on commercialisable inventions and R&D result;

(2) Poor technological entrepreneurial culture in educational institutions and research institutes;

(3) Inadequate curricular in the educational institutions;

(4) Inadequate government support for spin-off companies;

(5) Inadequate infrastructures;

(6) Inadequate motivation for the commercialization of inventions/research results;

(7) Instability of government, poor planning and execution of policies;

(8) Inadequate operation and coordination of spin-off promotional agencies;

(9) Lack of funding organizations; and

(10) Inadequate patent education and ineffective enforcement of intellectual property rights.

In summary, the financing problems of SMIs are:

- Poor capital structure.
- Inadequate sources of funds for investments.
- Low credit rating by financial houses.
- Poor financial management practices including untrue and misleading financial records.
- High cost of bank financing and high debt ratio,
- Inability to employ qualified and professional financial/accounting personnel.
- Multiple taxation and other economic levies, at all tiers of government.
- Aversion of financial and accounting disclosure.
- Lack of medium and long-term investment funds.
- High costs of company quotation and share issue.
- Lack or inadequate collateral security.
- High default rates on bank loans due to indiscipline on the part of the SMEs operators, who direct loans to non-business activities like taking chieftaincy titles, marrying more wives, building houses, buying expensive cars and reburying their parents.

- Poor incentives for banks to finance SMIs due mainly to high administrative costs associated with disbursing loans to SMIs (Onuoha, 2008).

Finally, the financing problems of SMIs are further compounded by the reluctance of banks to credits to them. The reasons for this reluctance have been articulated by Onoh (2005). These include:

- (1) Banks have not forgotten so quickly that the default in the repayment of loans granted SMIs in the 70s and 80s, with the encouragement of government, contributed largely to the bank distress syndrome of the late 80s and most of the 90s, and eventually led to the collapse of many of them. One bitten twice shy;

- (2) Banks consider the costs of laon administration too prohibitive, as the SMIs have to be monitored constantly to ensure correct management and accountability;

- (3) Banks consider SMIs high-risk customers, because some SMIs managers have virtually no training in enterprise management, and the production technology of may of the enterprises are outdated. Consequently, the cost of production continues to rise as the profit continues to fall correspondingly. Such as situation will not guarantee loan repayment;

- (4) Banks groom SMIs in the hope that they would one day grow to be big and qualify for listing in the Stock Exchange, and enjoy economies of large scale. Banks will in turn benefit from doing business with the new large enterprise it have helped to groom. To grow big and be listed at the stock exchange is not the ambition of some SMIs. To many SMIs managers, going public is a sure way of losing control in the business, and they would not like o see that happen.

5. RECOMMENDATIONS

Nigeria has poor records of research and development activities. The few research efforts are public sector driven. The SMIs we surveyed and the whole of the organized private sector (OPS) of the nation's economy have insignificant research programmes. It is against this backdrop that this article will make the following recommendations.

- It is imperative that the federal government takes the lead in jumpstarting enormous research activities in the country. The existing research institutes are poorly funded. They need better funding and enabling environment to enable them to execute their mandates particularly, those that have direct impact on SMIs and industrialization.
- In the same direction, all Universities of technology and agriculture need serious upgrading and better funding. Agriculture and manufacturing hold the key to any nation's economic advancement.
- The federal government should urgently

consider the establishment of Research and Development Commission (RDC) to map out the research and development requirements of the nation; coordinate all the research activities in the public and private sectors of the economy; and encourage active participation of industries (medium scale, large scale and multinationals) in funding research and development.

- Efficient and functional infrastructures must be provided. These are critical to the success of all our national research and development efforts. Thus, it is important to address the following:

- (1) Physical infrastructure such as water, transportation, communication, power generation and information network;

- (2) Infrastructure for scientific research, such as equipment, instruments, chemicals, facilities, etc. The facilities in the research institutes should be refurbished or replaced with modern functional ones. Efforts should be made to ensure resource sharing and adequate maintenance of the available facilities, and

- (3) Infrastructure for education and training facilities for teaching science, engineering and technology. There is need to give relevant training to our graduates so as to prepare them for the problems of society that they would be expected to tackle after graduation, Abubakar (2002).

- Small and medium industries, and indeed all industries operating in the country should regularly approach research institutes with their peculiar needs/requirements.

- Efforts should be made to commercialize research outputs and innovations in the country. They will not have meaning to people until these research outcomes reach the market place.

- Scholarship and generous bursary awards should be available for students of science subjects, engineering, technology and those generally interested in research and development.

- All efforts must be geared towards sustainable collaborative and exchange programmes and relationships between Nigerian researchers and scientists and their counterparts in the newly developed and advanced nations.

- Finally, it is very strategic that we develop innovative technology culture. This can be achieved by putting in place incentives (i.e monetary, national honours, etc) for individuals, corporations, institutes or universities for technological breakthroughs or innovations. This had helped such countries as Japan, South Korea, Brazil, Taiwan, Singapore, China, Israel, etc to attain global prominence in technological cum economic advancement. The country has to develop the capability to acquire, adapt, modify and improve on foreign technology, Onuoha (2012). No country willingly transfers its technology. It is a proprietary right.

CONCLUSION

Small to medium scale industries in Nigeria lack the capacity to engage in serious research and development activities. In fact, research findings and available evidence across the nation have shown that Nigeria has poor research and development records. These are hindering the development and technology agenda of this poorly governed country. The paper made far reaching recommendations which if religiously implemented will assist the country to attain the vision of being one of the biggest economies by the 2020.

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