

Theorising the Failure of Technological Innovation Diffusion in the Nigerian Automobile Industry: The Case of Ford Motors Nigeria

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This study examines the impact of knowledge transfer in the Nigerian automobile industry. Attempts at technological transfer in the Nigeria automobile industry date back to 1962; between 1962 till date (2012), automobile technological diffusion was by direct transfer of technological knowledge through the establishments of assembly plants (including Volkswagen of Nigeria (VWON), Peugeot Automobile of Nigeria (PAN), STEYR Nigeria, Anambra motor company (ANAMCO) and Leyland Nigeria). These attempts failed as all the assembly plants are now (as at 2012) closed down. This study relying on the qualitative research methodology and employing narrative/discuss analyses, recommends diffusion of technology through the establishments of automobile industrial clusters, which was the route Malaysia and South Africa (both developing economies like Nigeria) employed towards economic and industrial successes. The industrial cluster development will increase the engineering technological and innovation capability within the Nigerian automobile industry and make Nigeria to be competitive in the global automobile market.

Keywords: Ford Motors Nigeria, Nigerian automobile industry, technological innovations diffusion

Introduction

The attempt at automobile technological transfer started with the establishment of the first Nigerian automobile assembly plant in 1959. The assembly plant was the Bedford truck assembly plant by Niger Motors (a division of UAC of Nigeria) assembling from semi-knock down kits in Lagos (Onwheels 2011). Further to this initiative and as part of the strategic national technological and economic development of the country, the Federal Government of Nigeria established six assembly plants (two for cars and four for trucks); they were Peugeot Nigeria Ltd (PAN) Kaduna, Volkswagen of Nigeria limited (VWON) Lagos, Anambra Motor Manufacturing company (ANAMCO) Enugu, STEYR Nigeria Limited Bauchi, National Truck Manufacturer NTM Kano Fait, Leyland Nigeria Ibadan between 1975 and 1983 (Akigwe, 2002).

Globalisation, multinationalisation and industrialisation have made transfer of knowledge easier according to Peres et al. (2010). They (2010:91) also defined the spread of knowledge as 'diffusion'; they (2010, p. 91) went further to state that 'innovation diffusion is the process of market penetration of new products and services that is driven by social influences, which include all interdependencies among consumers that affect

various market players with or without their explicit knowledge'. Bass (1969) provided the main thread of diffusion model; which looks at the aggregate first-purchase growth of a category of durable goods introduced to a potential. It is assumed that the social network into which it diffuses is fully connected and homogenous; as well as assumes that the adopters join the market as a result of two types of influences, which are: i) external influences such as advertising and other communication channels by the adopting firm ii) internal market influences that may result from interaction among adopters and potential adopters in the social systems.

Knowledge is the main source of economic growth and development as defined by Meran et al. (2011) while learning is the vital process; innovation on the other hand is the most important output of this process, it is a stock variable whereas learning is a flow variable. They further suggested that knowledge other hand is the main source of technical progress and it can be classified as tacit knowledge and organized knowledge Meran et al. (2011).

Product innovation in automobile industry started globally with the establishment of the first car which was built by Karl Benz in 1885, although, innovations in the internal combustion engine started in 1806 (IBM Corporation 2006). It must be said that other forms of innovations have played important roles in the development of

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products in the automobile industry. The assembly line for example was one of the first significant example of process innovation in the industry; vertical integration is another example of how innovation in the company business model can drive significant enterprise value in the past (IBM corporation 2006).

The automobile assembly plants in Nigeria were established among other things to transfer technology, establish viable support industry meant to raise the level of local content, creation of employment and contributing to the overall economic development of the country (Nigerian Business Day Newspaper, 2011). The industry witnessed a lot of challenges which include: recession due to the Structural Adjustment Programme of 1983/84, lack of consistent policies, disappearance of middle class which is a major market segment and preference for imported vehicles account for the decline state of the industry (Federal Government Gazette No.28/1984). The country has become largely import dependent with an annual basis of over 230,000 units of per/annum-of used vehicles from all over the world with only less than 50,000 units of new vehicle imported consequent on the tariff regime (Nigeria Ports Authority Yearly Report, 2010). The major setbacks to the automobile industry could therefore be summarised thus: the issues of aggregate demand, absence of support infrastructure and ancillary industries of Iron and steel and petrol chemical and power.

Ford Motor Company was established in 1903 by automotive and industrial pioneer Henry Ford in Dearborn (Bak, 2003). The company was the first to implement a moving assembly line for automotive manufacturing, Ford was able to efficiently mass produce their products than their competitors Batchelor (2003). In 1908 the Model T was introduced and went on to sell over 15 million vehicles which firmly established Ford as the major player globally in the early automotive industry with 50% market share by the 1920s. The company went public in 1956 and since then has grown to be a significant presence in the global automotive market. The Ford Motor Company product portfolio includes cars, trucks, and SUVs from the following brands: Ford, Lincoln, Mercury, Mazda, Aston-Martin, Jaguar, Volvo, and Land Rover Levinson (2002). In addition to its core automotive business, Ford has a finance division, a parts and service division, and they also currently own Hertz Corporation, the largest car rental business in the world. Ford heritage (2004)

Ford Motors is now marketed in Nigeria by Briscoeford and Coscharis Motors; the two companies resuscitated the Ford brand into the Nigerian automobile market in 2003 and 2005 respectively when the present networks were established. (On wheels 2009). Over the last six

years both companies control 4% of the Nigerian automobile market (Lagos Chamber of Commerce: Auto group (2010). The two companies import from various Ford plants in the USA, Spain, Brazil, Thailand and Turkey (Speech by Allan Mullally, CEO Ford Motor Corporation 1/3/2011 Michigan). This study will examine the reasons for the failure of the assembly plants as a vehicle for automobile technological diffusion and recommend the way forward.

Theoretical Background

Rogers (1995) defines innovation as ideas, objects, and methods that are perceived to be new by consumers and users; innovations answer user's needs and it is superior to existing alternatives. Schumpeter (1934) pioneers innovation studies in economic theory and proposed a list of five types of innovations: i) introduction of new products ii) introduction of new methods of production; iii) opening of new markets; iv) development of new sources of supply for raw material or other inputs; v) creation of new market structures in an industry.

Schumpeter (1934) stresses the fundamental role of innovation on the markets and industries with the aim of reducing cost of production and increase demand which invariably will help in creating a new market structure, and improve efficiency and quality of operations. Mainstream or neoclassical economics views innovation as business strategy or part of the set of investment decisions that could create capacity for product development (OECD, 2005, p. 29).

Innovation diffuses by specific channels among individuals in a social system within a time frame; it is a particular type of communication because the messages transferred are related to new ideas (Rogers 1995, p. 5). Diffusion of innovation can explain what the function of novelties in the process of changes of a society; this is crucial to understand the preconditions for successful innovation diffusion, importance of networks and to assess the needs of different customers (Robinson, 2009). Dosi (1988, p. 1120) suggests that firms can change their production costs, their market competitiveness through innovating; innovative activities by firms therefore affect the evolution of industries.

Peres et al. (2010) identify seven most influential diffusion related areas studied in past decade. These are: i) social networks ii), network externalities, iii) take offs and saddles, iv) technology generations v) cross-country influences vi) growth difference across countries, vii) effect of competition on growth:

Social networks: The social network or social system is the substrate onto which an innovation propagates; the structure and dynamics of the social network influence diffusion process, consequently the development of online social networks such as

Face book, twitter and LinkedIn block as led firms to approach directly the social networks of customers in their target markets (Peres, 2010). Goldenberg et al. (2009) explain how fundamentally diffusion shows how the network structure can affect product growth.

Network externalities: The network effects drives faster market growth due to the increasing returns associated with diffusion process; Nair et al. (2004) suggested that network show customer interaction with heterogeneity in price sensitivity, communication therefore play vital role in new product adoption. Diffusion models also predict comprehensive increase in sale that exceeds expectation, with a process usually characterised by inertia and momentum (Van den et al., 2006).

Takeoffs and saddles: The focus here is on the research dealing with two turning points in the product life circle: take-off, which occurs at the beginning and saddle which occurs during the early growth (Golder et al., 1997). Takeoffs times are when dramatic increase in sales occur that distinguishes the cut-off point between introduction and growth stage of the product life circle; while saddles are defined as a pattern in which an initial peak predate a trough of substantial depth and duration that is followed by increase in sales which is attributed to the diffusion which is due to change in technology and macroeconomic events that can be explained by consumer interaction (Peres et al., 2010).

Technology generations: The diffusion process is terminated by a decay of number of new adopters and saturation of the market potential. New product growth across technology generations has garnered interest among marketing scholars such as Bras and Bras (2001, 2004). Theoretically, it is important that technology generation should deal with dependency within a sequence of diffusion process and more broadly within a sequence of diffusion and rigidity of the social system across generations (Peres, 2010). The acceleration of diffusion of innovations over time should therefore be reflected in technology generations.

Cross-country influences: Dimension of national cultures had found positive relationships between individualism, economic sources and other empirical variable of(lifestyle, health status and urbanization) that influence diffusion (Desiraju et al., 2004) The cultural factors influence time to take off whereas economic factors influence factors influences growth (Peres et al., 2010).

Growth differences across countries: These relate to the cultural characteristics and values in high context communication dimensions has found positive relationship in competitiveness in the amongst countries even for the same products in same continent : Ganesh,1998 : The cultural factors influence economic factors that influence growth and diffusion parameter that pattern wealth of the nation (Peres, 2010)

The effects of competition on growth: Competitive forces influence the growth of a new product and decisions made about it. Consumers interdependencies within –brand and cross-brand are compatibility issues thus modify growth processes. The intriguing empirical question is whether competition enhances or delay category growth. Generally, competition has been found to have a positive effect on diffusion parameter (Dekimpe et al., 1998).

Industrial Cluster

Industrial clusters are groups of specialising and producing firms of a particular component or parts of a vehicle, ideally they must be located within a confined industrial area setting or free trade zone but could have customers far beyond the national industrial boundary (Holweg et al 2005). Isbashoiu (2007) citing Marshall (1920) suggested that three conditions for setting an industrial cluster are: (1) existence of a pool of adequate labor, (2) the existence of specialized suppliers and (3) the possibility of external spill-overs (the rapid transfer of knowhow and ideas inside the cluster). In addition, Isbashoiu (2007) expanded this concept using the export-oriented industries and its linkages to other industries.

According to Isbashoiu (2007), there are strong industrial linkages that indicate the existence of an industrial cluster. Porter (1990) popularized the concept of industrial clusters by suggesting two types of clusters: i) *vertical clusters*, made up of industries that are linked through buyer-seller relationships; ii) *horizontal clusters*, that include industries which might share a common market for the products, use a common technology, labor force skills and similar resources. Isbashoiu (2007) points out that regional clusters had their origins in particular local factor conditions, local demand, and the presence of a related industry.

Table 1. Type of cluster.

Type of cluster	Features
Potential cluster	Some good opportunities and some key elements are already in place
Latent cluster	Cluster with a high number of firms but with a low level of interaction due to the lack of trust, low cooperation and high transaction costs
Working cluster	A well developed industrial district

Source: Ishobaoui (2007, p. 8).

Based on different kinds of knowledge suggested by Ishobaoui, (2007), there are two types of competitive clusters: i) *techno clusters*, which are high-technology oriented, well adapted to the knowledge economy; ii) *historic know-how-based clusters*, which are based on more traditional activities that maintain their advantage in know-how over the years.

Conceptual Frame Work

The figure illustrates the conceptual frame work, which shows the knowledge transmission and diffusion in an innovation system. Firms obtain knowledge via public research or private research. Technology transfer and innovation diffusion occurs via conferences, fairs, relations with competitors, suppliers and retailers in a need creation. Automobile engineering knowledge is

expected to be generated by the Nigerian knowledge environment which include the Federal government, through it agencies ,Universities, Polytechnics, Colleges of technology, research and development centres, safety and standard organisations, automotive products regulating council , automotive franchises /dealer networks and principally the consumers, which will assist the industrial cluster to develop, this will be beneficial to the automobile industry in terms of increase in efficiency and effectiveness in the assembly plants; this will be invariably be transferred to the consumers. The overall result of this is expected to enhance development of the economy of Nigeria. In the expanding globalization process, competitive advantage usually refers to innovation capacity through knowledge advantage and human capital superiority embedded in operations, processes and principles.

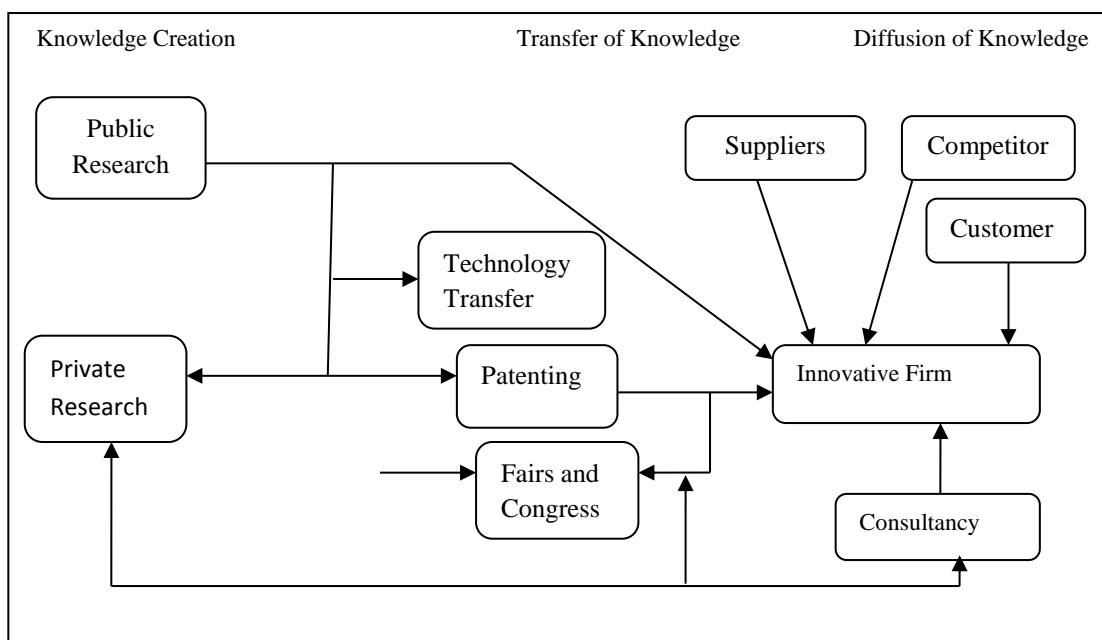


Figure 1. The conceptual frame work.

Diffusion of innovation

Diffusion of innovation theory describes the process through which new ideas, practices, or technologies are spread into a social system (Rogers, 2003). Rogers (2003) was the most prominent developer of diffusion of innovation theory. His book, *Diffusion of Innovations*, was first published in 1962 and is now in its fifth edition. Formalized research on the diffusion of innovations began in 1943 with a study by Bryce Ryan and Neal Gross, from the field of rural sociology, on the diffusion of hybrid corn in Iowa (Rogers, 2003). Diffusion of innovation theory has since spread to many different fields, and thousands

of studies support its tenets (Rogers, 2003, 2004). The academic disciplines in which the theory has been applied include anthropology, communication, geography, sociology, marketing, political science, public health, technological and economics (Moseley, 2004; Rogers, 2004). Diffusion of innovation theory holds that innovation diffusion is “a general process, not bound by the type of innovation studied, by who the adopters [are], or by place or culture” (Rogers, 2004, p. 16), such that the process through which an innovation becomes diffused has universal applications to all fields that develop innovations.

Diffusion is defined as “the process in which an innovation is communicated through certain

channels over time among the members of a social system” (Rogers, 2003, p. 5). An innovation is defined as “an idea, practice, or object that is perceived as new by an individual or other unit of adoption” (Rogers, 2003, p. 12). Examples of innovations in the professions include new and revised techniques, theories, practice materials, assessment instruments, and technologies to create changes and improvement from the original state (2010).

Methods

This study will be qualitative employing interviews techniques in collecting data; the data so collected will rely on Narrative / discourse analyses following the traditions Saunders, (2009). Qualitative research methods are sensitive to their context ,while researches can be carry out in their natural settings; this brings to the research three main advantages; which are: explorations can take place, hiding features can be brought out and examine in details (Creswell 1997; 1998); while reporting detail views of informants, as well as conducted in a natural setting.

This study is employing the qualitative methodology with face-to face interview data collection technique because the issue of diffusion of innovation is very sensitive and it a very relatively new field, care should be taking as to how to go about. Moreover, Nigeria is still a developing country where everyone wants to keep ‘information’ as secret as possible. Interview research technique relies on face to face discussions. The advantage of this technique is that the respondents are more likely to cooperate, if all they do is talk rather than put thoughts on paper called questionnaires.

Study population

According to Malthus (1993) a research population is known as a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait. Rosset (1887) explain that a sample is simply a subset of the population. The concept of sample arises from the inability of the researchers to test all the individuals in a given population. The sample must be representative of the population from which it was drawn and it must have good size to warrant statistical analysis. Research sample size according to Elston (1994) in an essay on population, sample and study design opined that sound conclusion can always being drawn from the qualitative sample size population of informed practitioner interviewed for a subject matter. This will rely on the following ‘core informants’; who will be face to face interviewed and recorded:

-The Director of Research National Automotive Council of Nigeria (the policy making agency on automobile industry in Nigeria.)

-The Managing Director GM Motors Ltd: The first assembly plant in Nigeria private sector owned plant.

- Managing Director, SUBARU (Nigeria) Ltd.

-Chairman Transport group of Lagos Chamber of Commerce and Industry, Olu Tikolo

-Toyota Nigeria LTD Head of marketing Nigeria Andy Ajuyah

-The National President *National association of motor mechanic of Nigeria* Engr. M. Oseni

This study employs Narrative analyses for the data analyses because it is the story of how the assembly plant set to diffuse technology failed and the attempt to transfer the success story of industrial cluster experience from Malaysia, Thailand, India and South Africa to Nigeria.

Research Findings

-An interview with the managing director of GM Nigeria LTD,

Question: In your view, what account for the failure(s) of the Assembly plants in the automobile industry landscape?

Answer: the inability of assembly plant to embrace technological changes through innovation, diffusion and the absence use of industrial cluster to sustain production activities.

-An interview with managing director of SUBARU Nigeria ltd;

Question: What reason(s) could you ascribe to the failure(s) of the (6) six assembly plants in Nigeria?

Answer: the assembly plants mismanaged the technological advancement and diffusion processes and its effects on the industrial take-offs.and revamping initiatives of the automobile manufacturing activities in Nigeria.

- An interview with the Director of research at the National Automotive Council of Nigeria;

Question: Considering the huge investments and national sovereign wealth sunk into vehicle assembly in Nigeria, what could have been responsible for the failure of the six (6) automotive assembly plants?

Answer: Assembly plant managers could not infuse technological changes catch-up as a function of innovation diffusion agenda for the national automobile development policies and growth.

-An interview with Chairman of the Transport Group of the Lagos chamber of commerce and industry (The umbrella body of private sector automobile companies); Olu Tikolo.

Question: What is responsible for the dysfunctional state of the Assembly plants in Nigeria?

Answer: Power as a major infrastructure deficiency that affected the operation capabilities of the plant. The cost to provide alternative power was huge and

made the assembly plant venture less attractive to investors and the entrepreneurs.

-An interview with Head of Marketing Toyota Nigeria Ltd (Brand franchise with largest units in operation) Andy Ajuyah.

Question: what role did product demand and customer acceptance play the sustenance of assembly plants in Nigeria?

Answer: The earlier concern of the plants centred on production efficiency and issue of aggregate demand that could not justify their survival; couple with neglected customer acceptance challenges lingering in the market space. There was no import FBU (fully built units) differential Tariff regime, which further compounded the assembly plants predicaments, in a nation with porous import, unlike Malaysia and India which had a protectionist approach in their automobile assembly journey.

-An interview with National president Motor mechanic association of Nigeria (MOTAN) Engr. M. Oseni.

Question: As a staking holding group in the automobile sector in Nigeria, what do you think went wrong with the assembly plants initiatives of Government?

Answer: The policy and governance are key to industrialization of any nation; the Nigeria government was not specific of the local content milestone in the establishment framework for the automobile plants. Hence, she could not enforce or support the implementation of production content plan, engage the local OEM entrepreneurs and technological transfer to the Nigeria mechanics, unlike Thailand automotive cluster and South Africa MIPD initiatives.

Interpretations

-Significant to the findings, the respondents attributed failures of the automobile plant, to the firms' inability to integrate technological innovation diffusion to the industrial assembly model. It was evident that the non existence of industrial clusters for a flourishing production and failure to develop the original equipment manufacturer (OEM) component parts activities in a cluster, made failure of the plant inevitable.

- Nigeria gained political independent in 1960 and just three (3) years after in 1963, we began the assembly plants operations through the establishment of auto assembly plants without a proper political, economic and technological philosophical foundation/policy framework as a nation to sustain such ventures for economic development.

-The manpower capabilities needed to keep automotive assembly base was deficient in the technological knowledge acquisition and accumulation. This among other factors accounted

for the failure of the Nigerian automobile assembly plants.

-The issue of inadequate infrastructure especially power and CKD (completely knock down) component inflow to operate the plant at installed capacities constitute a major failure index for assembly plants.

Discussion and Conclusion

Innovation is an endogenous phenomenon that is shaped through interaction between firms and their environments. The government policy of establishing industrial cluster as means of technological innovation diffusion, would encourage global players to participate actively in the infrastructure investments and fundamentally assist the development of human capital with the emphasis on basic skill of artisans and engineers for the automobile sector. The diffusion of technology has the potential for high volume of employability, by creating jobs, bringing industrial stability and assisting stakeholders to appreciate innovations. With the proper policies and proper regulatory environments for automobile manufacturing in Nigeria, diffusion of innovation would contribute to the nation's economy in its quest to achieve / enhance technological acquisition and accumulation.

At the national level, governments of Nigeria should form innovation systems through national innovation productivity development (NIPD) program, whose primary goal is to create conditions at which science and technology can flourish and then transfer their findings through private sector into new revolutionary products and services; thus creating innovation culture in the cluster company. Through stimulating engagement of industry, research and project centre with strong national automotive development policy delivering on new ideas, failures would have been averted.

While some of the points mentioned above refer to the common set of innovation policy instruments, the final argument of "clusters" as useful instrument for the focused technological innovation diffusion deserves special attention. The *Styrian "automotive cluster"* is a particularly instructive example in this case (Steiner-Jud-Pöschl- Sturn, 1996): Built upon high level performance of local enterprises in motor technology (piston engines) and gear units a successful agglomeration of related companies covering assembling as well as special automotive components has gathered in this south-eastern province of Austria. Creating a sort of brand name for the business location by means of the cluster notion proved to be a helpful instrument to attract further foreign direct investment.

Another example of cluster oriented policies by the Federal Government of Nigeria through its agencies is the special initiative of the Nigerian

Bank of Industry (BOI) whereby it charges 2% of the cost of every fully built automotive imported into the country. The aggregation of the fund could jump start the establishment of original component manufacturing in the industrial cluster or be used to finance the new free trade zone concept.

Nigeria stands a chance of being an international player in the automotive world, as the country is well endowed with strategic natural resources of iron ore deposits at ITAPKE/AJAOKUTA that can be mined to flat sheet, foundry for engines and other steel components for the automobile production. The oil and gas, leading to the establishment of petrochemical plant in PORTHARCOURT, for the production of plastics, thermo sets and vital component derivable and the abundant cheap manpower / labor from over 160 million Nigerians. The entire raw materials mentioned above are very fundamental, as they constitute the basis for aggregate demand of the automobile products for the assembly plants survival.

To sum up, cluster analysis (a) helps to define priorities within the given set of policy instruments; (b) is much more responsive to the particular needs exhibited in the systemic feedback mechanisms at the micro level than any sort of crude “picking-the-winner strategy” would be, and – based on the experience of the NNEWI industrial cluster (c) rarely lends support to big government initiatives, but instead emphasizes the important role of eliminating regulatory barriers and distortions, creating complementary educational institutions, or marketing business locations with internationally perceptible competence profiles.

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