



Research Paper

## Mathematical Modeling of Innovation and Creativity Practices For Facilitating Technological Advancement Of Agro-Allied Small Businesses in Nigeria

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**ABSTRACT:** Innovation and creativity are important factors for Sustainable development in advancing technology, be it at country or organizational level. The study seeks to formulate a mathematical model that can facilitate technological advancement among agro-allied small businesses in South-South Nigeria. The instrument of data collection employed in the study is the research questions structured in close-ended five-point Likert scale. The evaluation of the relationship between dependent of sustainable technological advancement and independent variables of strategic entrepreneurship management practice proxied by innovation and creativity was performed using the Ordinary Least Square regression technique. The study found that innovation and creativity have positive and statistically significant relationship with sustainable technological advancement. This implies that innovation and creativity have capacity to sustain technological advancement among agro-allied small businesses in Nigeria. It was recommended that the government at various tiers should review business laws adverse to the sustainable technological advancement of small businesses.; identify supportive infrastructures needed to stimulate agro-allied businesses in order to prioritise the execution of infrastructures needed to facilitate technological advancement, boost sustainable development of agro-allied small businesses and the economy as well as equipping intending investors with adequate knowledge of the agro-allied business due to the specialised and delicate nature of agricultural business in Nigeria to avoid losses of investment.

**Keywords:** Innovation, Creativity, sustainability, Technological advancement

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### I. INTRODUCTION

#### 1.1 Background to the Study

Technology is the most distinctive ingredient of modern society, which not only determines our standard of living, but also our way of life (Afolaranmi, 2010). Moreover, following the pattern of huge wealth created by industrial means, the desire to consume more is aroused, necessitating the need for increased quality production. However, Ifeanyi (2007) argued that, the traditional technologies are less suited to meet rising expectations of wealth creation. Hence, the urgent need for developing countries to develop their own appropriate technology; which is the how of doing something and the way an organisation transfers its inputs into outputs (Adetosó. *et al.*, 2013). For technology to be considered appropriate, Adetosó, *et al.*, (2013), assert

that such technology must be compliant with the following criteria: raw materials used can be locally sourced; equipment and capital goods must be available; skill to operate the technology must be readily available; the size of the market must be adequate; there must be availability of utilities; and there must be availability of infrastructural facilities.

Technology affects product quality and price. Burgelman, Maidique and Wheelwright (1996) explained that a firm's strategy is expressed in the products and services it brings to the market. It should be noted that once technology is mentioned, the means of production is noted. Onodugo (2000), defined technology to be the methods and techniques employed in productive activities. Technology changes as a result of breakthroughs in research and development. The responsiveness of management to changes in technology is a determining factor with regards to the effectiveness of the firm's strategic planning. Oyedijo (2012a) observed that technology is among the most prominent factors that determine the rules of competition. A firm that does not follow up with the changing production methods may be forced out of the market. Primitive or out-dated technologies may not be efficient as new discoveries. The results of inefficiency in the use of out-dated technology may include: low quality products, high prices of products, less quantities of products in the production runs, among others (Ohachosim, Onwuchekwa & Ifeanyi, 2016). Technology has gone a long way in the improvement of management effectiveness. The fact that technology has facilitated office communication, management has overcome the biggest challenge in sending messages and receiving feedbacks.

## **1.2 Statement of the Problem**

Over the last two decades, owing to the rapid and steady decline in strategic and creative thinking, decline in proper decision making by entrepreneurs and policy makers, and the absence of the capacity of small business owners to simultaneously exploit opportunities innovatively to create competitive advantage for business sustainability, emphasis in entrepreneurship literature has centred on basic managerial skills for entrepreneurs; later came the advocacy for accounting skills needed to boost entrepreneurial competencies. However, reports of high rate of business failures owned by entrepreneurs with adequate funds, accounting and managerial abilities calls for further investigations. Evidence from extant literature revealed that the inability of firms to develop and shape effective knowledge base, where new capabilities are created within the operational and dynamic organisational process have put the firms in difficult situations.

The advancement in global technological applications in businesses behoves on SMEs to tap into the numerous advantages that comes with this evolution. As a result, most SMEs are being left behind due to lack of strategic creativity and innovation, which is the ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm. However, the very few SMEs in agro-allied businesses struggle to operate, manage and improve their businesses in order to consistently deliver quality products and services. A review of extant literatures showed relationship between innovation and increase in profit margins of small businesses (Onwumere & Eleodinmuo, 2015); technological capabilities and firm innovation performance (Kalay & Lynn, 2015), however, there is dearth of literature on how creativity and innovation facilitates technological advancement of SMEs operating within the various agricultural value chains.

## **1.3 Objectives of the Study**

Based on the above stated challenges, the broad objective of this study empirically analysed the effect of strategic entrepreneurship management on development of sustainable agro-allied small businesses in South-South Nigeria, a study of small businesses engaged in the agricultural value chain. To achieve this broad objective, the specific objectives were stated based on the decomposed proxies of strategic entrepreneurship management, the independent variable (risk propensity, innovation and creativity, resource mobilisation capacity, knowledge management, strategic alliance and marketing strategy) and sustainable development of agro-allied small businesses (technological advancement, capacity utilisation, employment generation, productivity, financial performance and growth) the dependent variable. Hence, the specific objectives of this study were to examine how innovation and creativity can facilitate technological advancement of agro-allied small businesses in South-South Nigeria. The significance of this study was premised on two major pedestals – first, that agriculture has remained the most crucial sector of the Nigerian economy upon which nearly all other sectors depend for growth and development; and secondly the contemporary nature of the study, since the government is presently seeking ways to improve the productivity of the sector and diversify the economy. Hence, the findings and recommendations of this study would be of enormous benefits to academic works, as it is a significant and major contribution to the body of knowledge, which fills the gap in contemporary literature on the strategic entrepreneurship management and development of sustainable agro-allied small businesses in Nigeria.

## **II. REVIEW OF RELATED LITERATURE**

### **2.1 Conceptual Framework**

Creativity, self-reliance, and flexibility refer to an entrepreneur's capacity to be open-minded, learn quickly, and develop new capabilities and perspectives (Collura & Applegate, 2000). Creativity is very important for the success of organisations. Thus, encouraging creativity is a strategic choice which firms should take into consideration, since it creates a significant contribution to organisational innovation (Amabile, 1996).

Creativity is marked by the ability to create, bring into existence, to invent into a new form, to produce through imaginative skill, to make to bring into existence something new. Creativity is not ability to create out of nothing (only God can do that), but the ability to generate new ideas by combining, changing, or reapplying existing ideas (Okpara, 2007). Some creative ideas are astonishing and brilliant, while others are just simple, good practical ideas that no one seems to have thought, of yet (Harris, 1998). Creativity is also an attitude, the ability to accept change and newness, a willingness to play with ideas and possibilities, a flexibility of outlook, the habit of enjoying the good, while looking for ways to improve it (Okpara, 2007).

Creativity is ability to effectively generate novel solutions to relevant problems It can be a source of significant competitive advantage, especially in rapidly changing environments. Creativity is important to entrepreneurs because it is the first stage in the process of innovation, providing the stimulus for opportunity discovery and new venture creation (Ndesaulwa & Kikula, 2016). As new entrants, Rebound (2008) asserted that entrepreneurs often justify themselves upon the same dimensions as creativity: novelty, usefulness, and appropriateness. Arguably, one of the first tasks demanded of an entrepreneur is to manifest creative ability through the conceiving of new product-market opportunities and unique value propositions (Rouse, 2013). From these initial acts of creativity, entrepreneurs must build effective organisations that can repeatedly bring ideas to commercially valuable forms in order to survive and grow.

Innovation is introducing new / improved processes, products or services based on new scientific or technology knowledge and/or organisational know-how (OECD, 2015). An invention is the first occurrence of an idea for a new product or process whereas innovation is putting it into practice. Innovation is the process that renewing something that exist or not, the birth of something new (Gartner, 1988).

Innovation capability is ability to continuously transform knowledge and ideas into new products, processes and systems for the benefit of the firm and its stakeholders (Lawson and Samson ,2001). It includes several dimensions: vision and strategy; harnessing the competence base; leveraging information and organisational intelligence; possessing a market and customer orientation; creativity and idea management; organisational structures and systems; culture and climate, and management of technology. Innovation capability as the provider of potential for effective innovation , involves many aspects of management, leadership, technical aspects, strategic resource allocation, market knowledge, organisational incentives, and others.

Innovativeness relates to perceiving and acting on business activities in new and unique ways. It creates or adopts an idea or behaviour new to the organisation. Innovation is the characteristic tool of entrepreneurs as it is a means of exploiting change to accomplish different businesses or services (Mirela, 2008), and also an important factor in a firm's survival, development and business success. The necessary conditions for accomplishing a successful innovation are: the existence of a clear strategy; the availability of all essential resources for the innovation effort; the realistic evaluation of individual's innovation potential; the detailed knowledge of market demand, the anticipation of future needs; the evaluation of innovation projects criteria; the maintenance of a close contact with beneficiaries; and the settings for limited periods of accurate objectives to which all innovating efforts should be dedicated to.

There are different types of innovation in business (Trott, 2008). It can be related to new products or services, new production processes, new marketing techniques, and new organisational or managerial structures (Rebound, 2008). Innovation may also involve technology, intellectual property, business, or physical activity (Sundbo, 2003). Ndesaulwa and Kikula (2016) opined that both product and process innovations are important towards sustainable development, be it at country or organisational level. Product innovation is introducing of a good or service that is new or significantly improved regarding its characteristics or intended uses; including significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (OECD, 2015). Rouse (2013) contended that product innovation generally means the organisation's process for introducing new ideas, new products/commodities, new technology, workflows, new manufacturing methods, new services and new distribution and delivery. It is generally posited that the product innovation becomes the most important source of structural change in an economy because it alerts the mix of products, industry and jobs, which make up an economy (Bail, 1988).

A process innovation, on the other hand, refers to the new procedures, policies, organisational forms and knowledge embodied in the distribution channels, products, applications, as well as customer expectations, preferences, and needs (Gupta, 2013), it is coupled with the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. It

can substantially lead to decreased unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products (OECD, 2015). Gupta (2013) stressed that while the introduction of new products is commonly assumed to have a clear, positive effect on the growth of income and employment, process innovation, due to its cost-cutting nature, can have a more hazy effect on performance.

An imperative question arises at this juncture on what are the main drivers of innovation in the business world. In literature the following can (do) affect product innovations, business process innovations or their combination. These include industry maturity, customer (users) needs and expectations, technological opportunities, investment attractiveness, intensity of competition, and company size and origin of ownership (Petsas, 2005).

Empirical literature studies by Ho and Koh (1992), Robinson *et al.*, (1991) and Cromie (2000) illustrated that entrepreneurs are considerably more innovative than non-entrepreneurs. Morrison (2000) believed that businesses that act entrepreneurially are those that survive the changes embarked upon by doing things differently and innovatively. Such innovative ideas are usually implemented when traditional systems and ways of doing business are no longer effective. However, research results in organisational innovation literature are inconsistent (Wolfe, 1994), and not all entrepreneurs are uniformly innovative, but the degree to which they are innovative depends on their level of formal education and managerial experience (Maxwell & Westerfield, 2002).

The existence of technology such as office computers; lasers, robotics, integrated circuits and semiconductors change the manner in which businesses are conducted. This affects organisations ability to produce goods and services (Ganotakis & Battisti, 2006). Ndubuisi (2016) stated that recently, e-business, e-commerce and e-marketing which are the use of business and marketing principles and methods via electronic media and more specifically over the internet is perceived to have replaced the traditional ways in which businesses are now being conducted. As such, E-business technologies and practices are changing the tools employees' use (Maxwell & Westerfield, 2012), where they work, who they employ and their interactions with clients, customers, suppliers, managers and colleagues (Colombo & Delmastro, 2010), which require more complex skills and knowledge on how entrepreneurs should handle their businesses (Audretsch, 2011). In order for entrepreneurs to keep pace with its competitors and survive, they must pay attention to their technology and technological innovations by carefully monitoring their current developments (Andries & Debackere, 2006). Also, entrepreneurs are advised to first of all think through their ideas of introducing e-business technologies and practices and how they will affect the work process and not rush in to e-business, forgetting the work process and the training of support staff. This, Ndubuisi (2016) stated helps formulate informed decisions about investments in new technological development, required by operations and manufacturing techniques.

It is evidenced that hardly can you talk of entrepreneurship without production. More so, Schumpeter in Holt (2005) posited that, the entrepreneur seeks to reform or revolutionize the pattern of production by expecting an invention or more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, by opening up a new source of supply of materials or a new outlet for products (Adetoso, Akesinro & Oladejo, 2013).

According to Gushesh (2013), technical design is influenced by society since human needs are seen to have cultural base. Thus, cultures and societies would have different definitions of technology that would be appropriate to the context of that society. That would explain why modern technologies that have succeeded in developed countries, fail in less developed countries and hence the need to engage local communities in participatory approaches when developing technologies appropriate to their context.

The integration of strategic entrepreneurship management techniques in achieving long-term businesses goals entails integrating innovative technical strategies, and value addition mechanisms for sustainable growth (Eisenhardt & Martin, 2002). The strategies of innovation and niche markets which requires providing unique competencies and customised products with proximity to the customers (Nooteboom, 2002) demands developing technological capacity as a means for competitive advantage. The advent of globalisation seem to place SMEs at a disadvantaged position, owing to the superior technological capacities and advancements of multinational corporations, and firms in the industrialised nations, who flood local markets with quality and cost effective products the local SMEs cannot compete favourable with.

Technological advancement encompasses the constant application of mechanised or automated engineering principles in the design, development, manufacture, selection, testing, adoption, operation and maintenance of tools (Srivastava, Carrol, Roger & Dennis, 2006), implements, machines, structures and other technological systems and gadgets (Ugwuishiwi & Onwualu, 2009). The application of technology to agriculture aims at eradicating human drudgery, enhance effectiveness and efficiency of agro operations, processing and production activities (Lamidi & Akande, 2013), increase quantity of harvesting and processing of agricultural produces, enhance the quality and storage life of agricultural products (Azogu, 2009).

The roles and contributions of strategic entrepreneurship management techniques to advancement of technological adoption and utilization (Ituen, 2009) among agro allied SMEs cuts across industries in various



countries of the world. Adoption of strategic entrepreneurship management, Dike (2011) asserted has facilitated detailed risk assessment of factors affecting agricultural productivity and the poor performance of the sector (agro-allied SMEs). Remaining competitive in the face of increasing market forces and substitute products is bridged by strategic financing of production and processing technological capacities (Isa, 2015), to match the creativity and innovation as demanded by contemporary challenges; thus, mobilizing of appropriate finance for technological acquisition and advancement forms one of the core impact of strategic entrepreneurship management towards strengthening of the agro value chain, by value creation and addition through product quality and standardization. The adoption and application of technology in agro-allied SMEs, Ugwuishiwu and Onwualu (2009) assert is not an end in itself, however, the type and degree of technological input is often a decision facilitated by the strategic goals of the business and the need to stay in business.

The application of technology and mechanization has been seen as the pivot to agricultural revolution in many parts of the world and has contributed greatly to increased output of food crops and other agricultural products to meet the demands of the ever increasing world population (Zubeiru, 2018). Through application of technology, many industrial raw materials are produced for the rapidly expanding world industries, and further transformed into diverse industrial and consumer goods (Ituen, 2009).

The entrepreneurial mind-set and strategic actions of large and small scale farmers around the world stimulated the introduction of various levels and sophistication of agro processing technologies for continuous tackling of food insecurity challenges globally. In America, Srivastava *et al.*, (2006) stated that only about 3 percent of the population is engaged in farming now and one American farmer produces enough food to feed 60 people and also a family can manage up to 1200 hectares of farmland. India was once hit by severe famine due to the menace of droughts and floods and this created a precarious situation. Through concerted efforts by the Indian government, coupled with entrepreneurial strategies of small, medium and large scale farmers (Odigbo, 2011), supported researches in Universities and agricultural institutions to develop experimental plot machines and high yielding varieties of crops and associated production and protection technologies which brought about green revolution (Ituen, 2009).

## **2.2 Theoretical Framework**

According to Teece (2007), dynamic capabilities are ‘the foundation of enterprise-level competitive advantage in regimes of rapid (technological) change’. Teece, further argued that dynamic capabilities are component capabilities that are ‘necessary to sustain superior enterprise performance’ (capacity utilisation, production efficiency and productivity) in a highly dynamic environment. Auger and Teece (2009) refined this definition of dynamic capabilities to “the ability to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets with the aim of achieving a sustained competitive advantage”.

According to Auger and Teece (2009), the dynamic capabilities approach builds upon the theoretical foundations provided by Schumpeter (1934). Schumpeter’s ideas were further developed in subsequent literature such as architectural innovation (Abernathy & Clark, 1986), and combinative capabilities (Kogut & Zander, 1992). Henderson and Cockburn (1994) hold that dynamic capabilities build on earlier work on distinctive competence (Learned *et al.* 1969), core competence (Prahalad & Hamel 1990), core capability and rigidity (Leonard-Barton 1992), organisational routine (Nelson & Winter, 1982). Ambrosini, *et al.*, (2009) argued that the dynamic capability theory can be considered as an extension of RBV thinking. Extending these studies, Teece, *et al.*, (1997) developed the notion of dynamic capabilities.

The dynamic capabilities theory suggests that in order to compete successfully in their markets, firms need two types of capabilities: ‘Ordinary’ capabilities allow organisations to operate their chosen lines of business efficiently and effectively, while ‘dynamic capabilities’ help them to upgrade their ordinary capabilities, or to create new ones (Winter, 2003). Teece, *et al.*, (1997) argued that dynamic capabilities are particularly important for performance in situations of environmental change when a firm’s needs to rejuvenate its set of capabilities are greatest. According to Easterby-Smith and Prieto (2008), dynamic capabilities can take on multiple roles in organisations, such as changing resource allocations, organisational processes, knowledge development and transfer, and decision making.

In the dynamic capabilities framework, Teece (2007) argued that, sustainable advantage comes from improving internal processes, structures and procedures to generate innovations, be they technological or organisational. He further argued that the dynamic capabilities framework recognizes analytical functions which must be performed at the enterprise level to sustain success. Thus, dynamic capabilities theory seeks to explain what it is that enables organisations adapt to environmental changes to either sustain or acquire competitive advantage for sustainable technological advancement, capacity utilisation, employment generation, productivity and production efficiency, financial performance and business growth.

The global competition among businesses has validated the need to understand how firms can achieve sustainable development via competitive advantage. The concept of dynamic capabilities, Kitenga and Thuo

(2014) asserted has become fundamental towards gaining the desired competitive advantage, as it provides a coherent framework to integrate existing conceptual and empirical knowledge on competitive advantage. According to Ambrosini, Bowman and Collier (2009), the dynamic capability notion lies at the heart of the entrepreneur's ability to enact change in a systematic way that gives the firm competitive advantage over his contemporaries.

Though, Kitenga and Thuo (2014) argued that, there is no broad consensus on an operational definition of dynamic capabilities and this makes it difficult to identify a generally acceptable scale for measuring dynamic capabilities. However, dynamic capabilities according to Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece and Winter (2007), are organisational processes in the most general sense or routines which may have become embedded in the firm over time and are employed to reconfigure the firm's resource base by deleting decaying resources or recombining old resources in new ways (Sirmon & Hitt, 2003). Teece, Pisano and Shuen (1997) defined dynamic capabilities as the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments. Zollo and Winter (2002) defined dynamic capability as a pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness. Pavlou and El Sawy (2011) defined dynamic capabilities as those capabilities that help units extend, modify, and reconfigure their existing operational capabilities into new ones that better match the changing environment.

Eisenhardt and Martin (2000) stated that dynamic capabilities involves the organisational processes by which resources are utilized to create growth and adaptation within changing environments and permit the renewal and reconfiguration of a firm's resources. According to Teece, et al, (1997), dynamic capability deployment involves sensing and shaping market opportunities, seizing market opportunities and redeploying and reconfiguring (creating, extending and modifying) the resource base.

### **2.3 Empirical Review**

Hussain, Afzal, Asif, Ahmad and Bilal (2011) a study investigated the impact of increased demand, innovation and technology on entrepreneurship. The study employed a sample size of 21 respondents, while data was analysed using descriptive statistics and ANOVA. The findings show the positive relationship between increased demand and Entrepreneurship which is denoted by H1 and the Innovation and Entrepreneurship which is denoted by H2. Technology and entrepreneurship are negatively correlated in the findings, denoted by H3. Which is ( $\beta = -.014$ ,  $p < .10$ ) not significant. Also, the study revealed that there is a positive impact of Innovation on Entrepreneurship with ( $\beta = .294$   $p < .001$ ) significance. In western culture there is the positive relationship between Technology and entrepreneurship but in Pakistan its significance show that there is inverse proportion.

Onwumere and Eleodinmuo (2015) in a study critically analyzed the innovation types and the effect on the performance of the leather based manufacturing enterprise in Abia state. The study has four specific objectives which were to examine the socio economic characteristics of the respondents, analyses of the various types and strategies of innovation, the effect of innovation on the performance of the enterprise as well as the determinant of innovation and performance. Random samples of 120 leather based manufacturing firms were obtained and the data were collected using a well-structured questionnaire. The tools used for data analysis were tables, frequencies and percentages, correlation analysis, probit regression and multiple regression analyses. It was observed that the innovations used to enhance performance among leather based agro-industries were product, market and technological innovations. Specifically, innovation has a positive significant effect on the performance (profit) of the enterprise. The significant determinants of innovation were enterprise size, competitors, output level, and credit availability for the venture and education status of firm operators. Also, while innovation was one of the significant determinants of enterprise performance, it therefore recommended that the enterprise should embark on a continuous innovation to enhance their performance.

Kalay and Lynn (2015) in a recent research investigated the impact of strategic innovation management practices on firm innovation performance, with focus on innovation strategy, organisational structure, innovation culture and technological capability. Data collected from 132 managers at 66 firms operating in the manufacturing sector in the TRB2 zone of Turkey were analyzed. The partial least squares structural equation modeling (PLS-SEM) method was used to test hypotheses of study. The analyses revealed that innovation strategy, organisational structure and innovation culture significantly increased firm innovation performance. However, no significant impact of technological capability on firm innovation performance was determined.

Reichert and Zawislak (2014) in a study examined technological capacity and firm performance, aimed at determining the relationship between investments in technological capability and economic performance in Brazilian firms. Through the use of secondary data and key indicators, 133 Brazilian firms were analyzed. Given the economic circumstances of an emerging economy, which the majority of businesses are primarily based on low and medium-low technology industries, it is not possible to affirm the existence of a positive relation between technological capability and firm performance. There are other elements that allow firms to achieve

such results. Firms of lower technological intensity industries performed above average in the economic performance indicators, adversely, they invested below average in technological capability. These findings do not diminish the merit of firms' and country's success. They in fact confirm a historical tradition of a country that concentrates its efforts on basic industries.

Kim and Lee (2017) examined the influence of the technological diversification on a firm's innovation capabilities and investigated the effect of various strategies on the firm's productivity in a technology-oriented environment. The study employed the entropy measurement to calculate technological diversification with 2095 patents, which are applied from years 2009 to 2011 by 507 firms that have participated in Korean government Information Technology (IT) Research and Development (R&D) supporting programs. The results revealed that a firm should develop differentiated competitiveness through specialization by prioritizing its capabilities, and then exploit unrelated technological diversification to search for new opportunities.

Dzever, Ayoola, Alakali, Ater, Sanni, Ngadi and Kok (2016) carried out a study to analyse the technical efficiency among small and medium scale entrepreneurs (SMEs) in high quality cassava flour (HQCF) processing in Nigeria. Multi-staged purposive and random sampling techniques were used in selecting 104 SMEs from four out of six existing geopolitical zones. Data collected using structured questionnaires and interview schedule were analyzed using descriptive statistics and stochastic frontier production function. The results revealed that the coefficients for cassava tuber and capital were significant and positively influence HQCF processing at 5 percent level of probability. Household size and access to credit were negatively and significantly related to technical efficiency at 5 percent level of probability; while gender and processing experience were positively related to technical efficiency at 5 percent and 1 percent levels of probability respectively. The average technical efficiency of 79 percent implies that HQCF processors could further increase the efficiency of resource utilization by 21 percent. It was therefore recommended that policy measures should aim at delivery of supervised credit to processors, skill development especially for women, expanded production of raw cassava and enhanced capital base in form of appropriate machineries for processing HQCF.

Siyabola, Egbetokun, Olumuyiwa, Olamide, Aderemi and Sanni (2012) in a study aimed to advance the position that Nigeria's indigenous technologies present significant opportunities for local economic transformation and to some extent, for global competitiveness. A content analysis and review of existing literature of three major indigenous technology clusters in Nigeria was done, as well as a review of three successful country cases was performed. The study revealed that, Indigenous Knowledge (IK) and Indigenous Technology (I-Tech) systems over the years have been employed in local production and Agricultural processing in Nigeria. The study recommended that, the government should facilitate and finance acquisition of modern technologies and technical knowledge for improved capabilities of SMEs and local manufactures for global competitiveness.

Isa (2015) carried out a study to determine the Influence of Agricultural Mechanization on Crop Production in Bauchi and Yobe States. The population for the study comprised of contact farmers from the five Agricultural Development Programme Zones in Bauchi and Yobe States. Multi-stage sampling technique was used to select three hundred and sixty-eight contact farmers. Questionnaire was used as instrument to collect data from the respondents, with a four rating scale for the respondents to indicate their degree of agreement or disagreement. The bio-data was analysed using the simple percentage, while the mean average was used to answer the research questions. The answers from the research questions indicated that agricultural mechanization has a significant influence on crop production. The null hypotheses were tested using Chi square statistics. The results showed that they were all rejected because their calculated significant (p) values of 0.00 were lower than the 0.05 level of significance. The findings revealed that there was increase in crop yields, size of farm, income of the farmers and improvement in their standard of living. All the five null hypotheses were rejected. It was concluded that influence of agricultural mechanization on crop production was significant. The study recommended that mechanized farm tools and equipment should be provided to the farmers by the government in form of subsidy and ensures that it is the right category of farmers' benefits. The study also recommended that there should be better funding of extension services programmes so that the extension workers can discharge their duty effectively.

Lamidi and Akande (2013) in their study reviewed status, challenges and prospects of Agricultural Mechanization in Osun State, Nigeria. Personal observation, oral interview, past records and questionnaire were used to collect data from various establishments visited in the nine selected Local Government Areas (LGAs) in Osun State. The data collected for the study were analyzed using simple percentage (%). During the research study, two hundred and ten (210) questionnaires were administered. Out of these questionnaires, 198 were collected back. The study revealed that, the low rate of adoption and utilization of appropriate mechanization technologies has remained one of the major factors militating against agricultural production in Nigeria. This finding is buttressed by the results of the analysis which identified shortage of capital, land tenure, small farm holding and fragmented land, poor infrastructural facilities, poor attitudes toward adoption of new innovation and non-availability of storage means as problems. There was a range of 385.5% - 394.4% for settlers than non-

settlers in arable crops; 91% of non-settlers/local farmers' belief that uses of farm inputs has negative side-effect on crops and soil. 68% of the farms have functional implements while 32% of the stations have non-functional implements, 52% of the respondents partially mechanized their agricultural production. 62.5% of the stations visited have maintenance, 53% of the respondents in these stations agreed diverting the money earmarked for maintenance in their budget to other things. Infrastructural problem was identified by 60 percent of the respondents. The deprivation in abundance amongst farmers in the state and in their produce is partly due to inability to mechanize agriculture to improve its efficiency, cost effectiveness, diversity and competitiveness. The study concluded that, the low rate of adoption and utilization of appropriate mechanization technologies has remained one of the major factors militating against agricultural production in Nigeria.

There exists theoretical and empirical studies on entrepreneurship development of small businesses in the agricultural sector, studies on strategic management application on small businesses mostly in manufacturing concerns and studies on development of small businesses; however, there appears to be relatively none that has completely integrated strategic entrepreneurship management as a single construct, as it affects small business development; thus, creating a gap in literature.

Also, a critical review of extant literatures indicates that very scanty empirical studies exist on sustainable development of SMEs in Nigeria, as the few available ones are of foreign origin of which their findings are not fully compatible with the Nigerian situation, because of the highly dynamic and turbulent nature of the Nigerian business environment. Thus, this study therefore is going to fill the gap in both literature and empirical studies regarding how the component of strategic entrepreneurship management affects sustainable development (employment generation, technological advancement, productivity, capacity utilisation, growth and financial performance) of small businesses.

### **III. METHODOLOGY**

#### **3.1 Research Design**

The research design used in this study was the cross-sectional survey design, associated with the deductive approach used for descriptive research purpose. The study area of this research covered six (6) South-South states of Nigeria, viz: Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers states..

#### **3.2 Population of the Study**

The population of SMEs for this study consisted of all agro-allied SMEs in the selected States, of the South-South region, registered with the states' MSME development agencies and the states' Ministries of Trade Commerce and Industry; with a minimum capital base of one million Nairas. The population therefore comprised a total of eleven thousand, six hundred and seventy three (11,673) agro-allied small scale businesses operating within the agricultural sector.

#### **3.3 Sample and Sampling Technique**

For the purpose of determining the minimum returnable sample size from the given population, the Taro Yamane (1967) sample size estimation technique was employed.

Based on the applied sample estimation technique, a sample size of three hundred and eighty seven (387) was arrived at.

Furthermore, for the purpose of this study, the multistage random sampling techniques were adopted. This was because the study captured multi-chain aggregate study groups which formed different clusters (firms in various stages of the value chain); hence, the multistage sampling technique. The stratified sampling was adopted to select only SMEs in Agricultural related businesses, from registered SMEs in Akwa Ibom, Delta and Rivers states; the cluster sampling was adopted to further group the SMEs according to the value chain they belong; while the random sampling was adopted to give every member of the population the opportunity of being selected.

#### **3.4 Instrument for Data Collection**

For the purpose of this study, both primary and secondary data were collected for the purpose of analysis and test of postulated hypotheses. The primary data for the study were collected through the administration of a structured and close-ended questionnaire, which served as the instrument for data collection. The structured questionnaire was administered to respondents cutting across various small and medium scale enterprises in crop and livestock farming; agro processing/production; agro marketing, distribution and trading; agro services and supplies in the agricultural value chain system operating in Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers states of Nigeria, which facilitated the collection of appropriate data required for the study.

The questionnaire being an instrument of primary data collection based on stated research The reliability of the items in the instrument was established using Cronbach's Alpha.



**Table 3.7: Reliability Test Result**

S/ N	Questionnaire Constructs	Cronbach Alpha Reliability Result	Number of Items	Remark
1	Strategic Entrepreneurship Management (SEM)	0.776	6	Reliable
2	Sustainable Technological Advancement (STA)	0.825	5	Reliable
3	Sustainable Capacity Utilization (SCU)	0.769	5	Reliable
4	Sustainable Employment Generation (SEG)	0.792	5	Reliable
5	Sustainable Increase in Productivity Level (SIP)	0.920	5	Reliable
6.	Sustainable Financial Performance (SFP)	0.888	5	Reliable
7.	Sustainable Business Growth (SBG)	0.931	5	Reliable

**Source: SPSS 22.0**

Reliability test was conducted for each of the latent variable based on the number item that measured it. The result indicated that all the variables are reliable and are certified for further analysis, as all the variables have values of the Cronbach Alpha above 0.7. A value of 0.7, Pallant (2004) asserted is generally recommended, however, Hinton, Brownlow, McMurray and Cozens (2004) stated that, an “Alpha score above 0.75 is generally taken to have a high reliability. Reliability or internal consistency of the items within the structure of this study was assessed by indication of Cronbach’s alpha and gives the average value of 0.84 for the questionnaire. Each item in the questionnaire was accompanied by a Likert-type scale, allowing perceived indication of the extent to which the item contributed to sustainable development of agro-allied SMEs.

**3.5 Method of Data Collection**

For the purpose of primary data collection, a total of five hundred and ninety five (595) copies of the structured close-ended questionnaire were administered in Akwa Ibom (214 copies), Delta (110 copies) and Rivers (271 copies) States in South-South, Nigeria

**3.6 Data Analysis Techniques**

Data generated for the study were analysed using descriptive analytical techniques. The analytical techniques included the use of simple percentage frequency distribution tables to analyse data from the questionnaire, while the formulated hypotheses were tested using the Ordinary Least Square regression analysis. The evaluation of the relationship between dependent and independent variables was performed using the Ordinary Least Square regression technique. The first step involved defining the variables of interest.

**3.7 Model Specification**

The coefficient of the variables measured the effect of the proxies of the independent variable (SEM) on the dependent variable proxies (SAS). Therefore, the general form for the model is given as:

$$Y = f(X_1, X_2, X_n) \dots\dots\dots (1)$$

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \dots\dots\dots + X_n + e \dots\dots\dots (2)$$

$a_0$  = constant

$x_1, x_2, x_3, \dots\dots\dots, x_n$  are independent variables

$e$  = residual or stochastic term (which reveals the strength of  $x_1 \dots x_n$ ; if  $e$  is low, this implies that the amount of unexplained factors is low, then the residual  $R$  and  $R^2$  will be high and vice versa.

$$STA = (INN, CRE) \dots\dots\dots (3)$$

$$STA = a_0 + a_1INN + a_2CRE + U_i \dots\dots\dots (4)$$

Where:

$INC_2$  = Innovation and Creativity

$STA$  = Sustainable Technological Advancement

$$STA = \beta_0 + \beta_1INC_1 + u_1 \dots\dots\dots (5)$$

where:

$\beta_0$  = Unknown constant to be estimated

$\beta_1$  = Unknown coefficients to be estimated

$U_i$  = Error Term

$\beta_1 > 0$

The ‘a priori expectation’ in the model is that the independent variable is expected to have a positive relationship and effect on sustainable development of agro-allied small businesses, measured by sustainable technological advancement, sustainable capacity utilization, sustainable employment generation, sustainable productivity (output and efficiency), sustainable financial performance and sustainable business growth. The mathematical expression is represented as;  $\beta_1 - \beta_5 > 0$  implying that a unit increase in the independent variables will lead to increase in Sustainable Development of Agro-allied Small Businesses by a unit.

#### IV. RESULTS AND DISCUSSION

Table 4.1: How innovation and creativity facilitate technological advancement of agro-allied small businesses in South-South Nigeria

Variables	Agreement Scale				
	SA (%)	A (%)	UN (%)	D (%)	SD (%)
Innovation and creativity as indicators of SEM can facilitate better usage of manual technology for various value chain processes	131 (27%)	273 (56%)	24 (5%)	44 (9%)	15 (3%)
Innovation and creativity as indicators of SEM can facilitate ease and optimum utilization of locally manufactured technology	161 (33%)	292 (60%)	10 (2%)	19 (4%)	5 (1%)
Innovation and creativity as indicators of SEM can facilitate productive use of modern technologies for all operation processes	141 (29%)	326 (67%)	10 (2%)	10 (1%)	5 (1%)
Innovation and creativity as indicators of SEM can facilitate effective use of technology for optimal movement and distribution of products	170 (35%)	302 (62%)	5 (1%)	5 (1%)	5 (1%)
Innovation and creativity as indicators of SEM can facilitate and ensures the use of technology for storage and preservation are highly effective	166 (34%)	292 (60%)	15 (3%)	5 (1%)	10 (2%)

Source: Field Survey (2018)

Table 4.1 shows analysis of data on research question two, which sought to determine whether innovation and creativity as indicators of strategic entrepreneurship management can facilitate better usage of manual labour for various value chain processes. The analysis revealed that, 27% of the respondents strongly agreed and 56% agreed with the statement, 5% remained undecided, while 9% and 3% disagreed and strongly disagreed respectively. This implies that, 83% of the sample size agreed that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate better usage of manual labour for various value chain processes.

On whether innovation and creativity as indicators of strategic entrepreneurship management can facilitate ease and optimum utilization of locally manufactured technology, the analysis indicates that, 33% of the respondents strongly agreed and 60% agreed with the statement, 2% remained undecided, while 4% and 1% disagreed and strongly disagreed respectively. This implies that, 94% of the sample size agreed that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate ease and optimum utilization of locally manufactured technology.

On whether innovation and creativity as indicators of strategic entrepreneurship management can facilitate productive use of modern technologies for all operation processes, 29% of the respondents strongly agreed and 67% agreed with the statement, 2% remained undecided, while 1% and 1% disagreed and strongly disagreed respectively. This implies that, 96% of the sample size agreed that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate productive use of modern technologies for all operation processes.

Also, on whether innovation and creativity as indicators of strategic entrepreneurship management can facilitate effective use of technology for optimal movement and distribution of products, 35% of the respondents strongly agreed and 62% agreed with the statement, 1% remained undecided, while 1% and 1% disagreed and strongly disagreed respectively. This implies that, 97% of the sample size agreed that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate effective use of technology for optimal movement and distribution of products.

Finally, on whether innovation and creativity as indicators of strategic entrepreneurship management can facilitate and ensures the use of technology for storage and preservation are highly effective, 34% of the respondents strongly agreed and 60% agreed with the statement, 3% remained undecided, while 1% and 2% disagreed and strongly disagreed respectively. This means 94% of the sample size agreed that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate and ensures the use of technology for storage and preservation are highly effective.

**4.1 Results**

Table 4.2: Regression Result on innovation and creativity of strategic entrepreneurship management and capacity to facilitate technological advancement

Dependent Variable: STA  
 Method: Least Squares  
 Date: 06/08/18 Time: 20:27  
 Sample: 487  
 Included observations: 487

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INC	0.027630	0.055492	3.497919	0.6188
<hr/>				
R-squared	0.594043	Mean dependent var	8.732218	
Adjusted R-squared	0.405957	S.D. dependent var	3.181354	
S.E. of regression	2.024732	Akaike info criterion	4.263288	
Sum squared resid	1930.883	Schwarz criterion	4.324349	
Log likelihood	-1011.926	Hannan-Quinn criter.	4.287294	
F-statistic	117.7710	Durbin-Watson stat	1.696468	
Prob(F-statistic)	0.003849			

Source: Author’s Computation, 2018 (E-views 9.0)

$$STA = 0.03 \text{ INC} + U_t \dots\dots\dots (4)$$

SEE = 0.06

$t^* = 3.49$

$F^* = 117.8$ : Prob. (F-statistic) = 0.0038

$R^2 = 0.594$

**4.2 Interpretation of Result**

From table 4.2, the calculated t-value for INC is 3.49 (STA model) and the tabulated value is given as  $\pm 1.96$ , under 95% confidence levels. Since the calculated t-value is greater than the tabulated value ( $3.49 > 1.96$ ), we therefore, reject the null hypothesis ( $H_0$ ). We conclude that innovation and creativity has capacity to facilitate technological advancement of agro-allied small businesses in South-South Nigeria.

Also, by examining the overall fit and significance of Sustainable Technological Advancement (STA) model, it can be observed that the model does have a good fit, as indicated by the relatively high value of the F-statistic, 117.8 and it is insignificant at the 5.0 per cent level; that is, the P Value (rho value) of 0.0038 being less than 0.05 probability levels implies that there is a 0.0038 chance that the equation as a whole is not significant.

More so, the  $R^2$  (R-square) value of 0.594043 shows that the model does have a good fit too. It indicates that about 60 percent of the variation in Sustainable Technological Advancement explained by INC, while the remaining 40 percent is captured by the error term.

From the analysis of research instrument, the findings of this study revealed that, 127 respondents are into livestock and crop farming, 133 respondents are into various agricultural processing and production ventures, 173 respondents are into marketing, distribution and trading of various agricultural products, while 54 respondents are into services and supplies of various agricultural products in various agro-allied value chains. These various agro-allied businesses have about 227 micro and small businesses operating in rural areas of the state, while over 53% (260) of the micro and small businesses operate in urban areas of the State.

The findings showed a worrisome declining trend in the number and percentage of businesses according to the years of operation; however, the analysis also indicated that more than 50% of the micro and small businesses have operated long enough to witness different turbulence in the Nigerian business environment; hence, they understand the need for sustainability of business. Also, majority of these businesses, about 214 are micro businesses with business capital of less than N1.5m, while about 39% of the sample size operate with between N1.5m and N10m capital. Hence, majority of the micro and small agro-allied businesses (436) have less than 10 employees in their respective employments.

Competitive advantage was found to facilitate business growth, creativity and innovation gives technical expertise a boost to achieve tasks more effectively and efficiently, group work was found to encourage creativity and innovation through knowledge sharing. Also, while availability of needed resources and infrastructure is needed to encourage business growth, however, in their absence, a lot of entrepreneurs have been able to think out of the box, seeking and discovering alternatives to achieving same task in the agricultural

value chain system. Hence, creativity and innovation make effective coordination of resources produce better results.

#### **4.3 Discussion of Results**

The finding is in agreement with Hussain, Afzal, Asif, Ahmad and Bilal (2011) whose study found that there is a positive impact of innovation on entrepreneurship with ( $\beta = .294$   $p < .001$ ) significance. The finding is in agreement with the findings of Onwumere and Eleodinmuo (2015) whose results revealed that, the innovations used to enhance performance among leather based agro-industries were product, market and technological innovations. The study also aligns with the findings of Siyanbola, Egbetokun, Olumuyiwa, Olamade, Aderemi and Sanni (2012), whose finding revealed that, indigenous knowledge (creativity and innovation) and indigenous technology (I-Tech) systems over the years have been employed in local production and agricultural processing in Nigeria. However, the finding of the study was in contrast to the findings of Kalay and Lynn (2015), whose finding showed that that innovation strategy, organisational structure and innovation culture had no significant impacts on technological capability.

### **V. CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

This study was concluded by making deductions from the major findings. Based on finding of hypothesis 2, the study concludes that, innovation and creativity has capacity to facilitate technological advancement of agro-allied small businesses in South-South Nigeria. This is confirmed by the analysis of research question two which shows that, innovation and creativity as indicators of strategic entrepreneurship management can facilitate better usage of manual labour for various value chain processes; ease and optimum utilization of locally manufactured technology, productive use of modern technologies for all operational processes; effective use of technology for optimal movement and distribution of products; and can also the use of technology for storage and preservation.

#### **5.2 Implications of the Study**

The educational implication of this study was multidimensional, as it among others

The study filled the existing gap in both literature and empirical studies regarding the absence of any study on the effect of strategic entrepreneurship management on development of sustainable agro-allied small businesses operating in South-South States of Nigeria. Prior to this study, extant literature variedly discussed the concepts of entrepreneurship and strategic management (concerned with growth and wealth creation (Amit & Zott, 2001; Hitt & Ireland, 2000; Hitt, Ireland, Camp & Sexton, 2002; Morris, 1998; Priem & Butler, 2001) and strategic entrepreneurship (concerned with entrepreneurial actions, strategic actions, entrepreneurial orientation and strategic renewal as listed by Singh, 2009); however, this study projected strategic entrepreneurship management as a new concept. Since there was no extant literature that completely integrated strategic entrepreneurship management as a concept, this concept was developed as an improvement on the works of Amit and Zott (2001), Hitt and Ireland (2000), Hitt, Ireland, Camp and Sexton (2002), Morris (1998), Priem and Butler ((2001) and Singh (2009), to successfully integrate risk propensity, innovation and creativity, resource mobilisation capacity, knowledge management, strategic alliances and marketing strategies as components of strategic entrepreneurship management concept, and thus lays foundation for strategic entrepreneurship management model and theory, which is a significant contribution to the body of knowledge.

Furthermore, this study established the fact that, the trend in mortality rate and stagnant nature of agro-allied businesses in South-South Nigeria can be reversed to businesses with sustainable performance, growth and development in terms of technological advancement, capacity utilisation, employment generation, increasing productivity (output and efficiency), financial performance and growth, with the adoption and integration of strategic entrepreneurship management practices. This study serves as a reference point for students, researchers, scholars, consultants and practitioners who are desirous in carrying out further research to retest and deepen the validity of strategic entrepreneurship management as a new concept and model and to extend the research to areas not covered in this study.

The policy implications of this dissertation on the empirical analysis of the effect of strategic entrepreneurship management on development of sustainable agro-allied small businesses in Nigeria, among others include; Integration of the strategic entrepreneurship management model into the training and capacity development modules for empowerment schemes prior to disbursements of loans and grants. This will help reduce mortality rate of businesses and foster increased collaborations to sustain development of agro-allied businesses in Nigeria; reduce constraints to accesses to long-term agricultural loans needed for economic activities, promote technological advancement, encourage employment generation and boost productivity for sustained diversification and economic growth; prioritise the provision of supportive infrastructures needed to drive the agro-allied sector, as this will provide a platform for sustainability of business productivity, growth



and expansion; stimulate innovative and creative participation of youths in the agricultural sector to reduce the rising unemployment and insecurity in Nigeria.

### 5.3 Recommendations of the study

Since the finding of hypothesis two revealed that, innovation and creativity has capacity to facilitate technological advancement of agro-allied small businesses in Nigeria, it is therefore recommended that since the focus of the government is on agriculture as a viable means of diversifying the mono economic nature of Nigeria, it is recommended that, concerted effort should be channelled towards incentivising participation to stimulate innovative and creative ideas to transform the agricultural sector into the theatre of technological innovations for sustainable development of small businesses. Since the findings revealed that majority of the respondents make use of manual and locally manufactured technology for operational processes, it is recommended that efforts should be made to support the manufacturing of agro-allied related indigenous technology to promote both local manufacturers and develop innovative and creation of local technologies and tools to boost agro-allied business revolution in Nigeria. Since it has been established that supportive infrastructure and needed resources are grossly inadequate, it is therefore recommended that agro-allied small business owners and entrepreneurs should acquire relevant technical expertise to boost their creative and innovative efforts to improvise in order to remain operational and productively grow the business.

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