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## Challenges of Technology-Based Entrepreneurial Firms on Performance Drive in Nigeria

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**Abstracts:** In today's continuously changing and dynamic business environment, no industry has been left behind by the revolutionary effect of technology. Technology has caused noticeable fundamental changes in the way companies operate and conduct their activities. This empirical paper was guided by a robust conceptual model that identifies the challenges of technological-based firms that manacle their performance drive. Three typologies of challenges namely, internal, external, and external linkages were examined for their effects on performance. Data was collected from top technology-based firms using factor and multiple regression analyses. We found both similarities and dissimilarities in the outcomes of the study. Specifically, both internal and external challenges are significantly associated with the restraints experienced by technology-based firms performance drive. Theoretical external linkages to contest these challenges and managerial implications of the findings are presented.

**Keywords:** Technology based firms, internal and external challenges, external linkages, performance drive, Nigeria

### Introduction

The term technology-based firms (TBFs) in this paper refers to those companies whose sales revenue is generated through the use of at least 51

percent of technology based operations (such as internet, electronics, mechanical, automobile, clean energy, biomedical, communications, telephone, fax companies, etc) Ajagbe, Long,

Aslan and Ismail (2012). Whereas, new technology based firms were referred to as recently established firms whose competitive strength come from the knowledge and skills of the employees within the fields of the natural sciences, engineering and medicine, and the subsequent transformation of this knowledge into products and services that can be sold on a market” Rickne, and Jacobsson (1999). Technology is said to date back to the history of man in itself, the times where cavemen had to be innovative in developing tools that aided their day to day activities, such as spears, arrows and clubs (King, Covin and Hegarty, 2003). Authors have referred to technology as more than just machine; they have described it as knowledge stored in hundreds of millions of books or billions of the human brain and into the artifacts themselves (King, Covin and Hegarty, 2003; Terjesen, Patel & Covin, 2011).

The indispensability of technology for organizational effectiveness by Pires and Aisbett (2003), show technology as core in generating new possibilities for the development and improvement of market activities as well increasing efficiency in products and helps businesses to save time and reduce costs. Past studies have documented that technological change can be achieved either through pure invention or process innovation especially through artifacts, methods and processes, tools and materials applied to industrial and commercial purposes (Ajagbe, Isiafwe, Ogbari and Sholanke, 2015).

Albert (2013) digressionally believed technology to be more than machines. In his book “Technology and Future” he stressed the fact against the popular belief that technology was all about the human made and manufactured material

that was used in the production process. In line with this belief, Rogers (2003) reported that technology is made up of both hardware and software components.

The high rise of the internet and the explosive growth of computer hardware and software development have led to the phenomenal technological advancement of today. With the high rise of technology, came the rise of technology based firms (Mason and Brown, 2012). Technology based firms which is the main concept in this study has been defined by various researchers as companies that generate sales revenue from the use of at least 51 percent of technology based operations. For example, the internet, electronics, mechanical, automobile, clean energy, biomedical, communications, telephone and so on (Ayodele, Oga, Bundot & Ogbari (2016). This basically implies that the business takes advantage and relies heavily on the use of high technology. The role technology based firms have played in the environment can in no way be overrated. Technology entrepreneurs according to Millar and Choi (2010), use technology as the driving factor in their endeavors to transform resources into goods and services, thereby creating a more conducive environment for the process of industrial growth.

The commercialization of technology based firms have been known to play a tremendously significant role in economic development and has also been regarded as an engine of growth that has brought about rapid industrialization, generated great revenue, wealth creation and improved employment opportunities (Ismail and Ajagbe, 2013). In today’s knowledge driven economy, economic growth

depends greatly on innovation. One of the features synonymous with technology based firms is that they have a high level of innovation and export orientation and industrial development which leads to greater globalization. This is done by virtue of their significant size and quantity and their great economic and social contribution. Small and medium sized enterprises should be considered as an important engine that leads to great economic development of every nation (Ajagbe, Long, Aslan and Ismail, 2012).

The technological revolution has taken our economy by storm and is creating additional investments with facilities, software and hardware and also, services and human capital. With all these positive impacts that have been seen, the business world as we know it is evolving rapidly. This is why it is important for us to ask ourselves that despite the numerous significance of technology based firms to economic development, why are there still a minute number of TBFs established in Nigeria? Hence accordingly, the need for the following hypothesis:

H1: Internal challenges have a significant impact on the performance of technology based firms.

H2: External characteristics have a significant effect on the performance of technology based firms.

H3: External linkages have a significant influence on the performance of technology based firms.

### **Review of Relevant Literature**

The concept of technology based firms have been treated by scholars with divers' perceptions, holistically or sectionally. Maine, Shapiro and Vining (2010) defined these new technology based firms as the young and originally small firms that engage in research and

development intensive sectors. While (Maula, 2001; Maula, Keil & Zahra, 2013) describe technology based firms as those companies that are privately held which have been in existence for less than six years and carry out operations in the biotechnological, medical and health science, communications, computer software and services, computer hardware or semiconductor industries. These definitions imply that technology based firms are those organizations whose major activities depend on technologically inclined products.

Ajagbe, Long, Aslan and Ismail (2012) gave a comprehensive definition of technology based firms which took recognance of organizational revenue as pivotal to its definition. They argued technological based firms as those companies whose sales revenue is generated through the use of at least 51 percent of technology based operations e.g. internet, electronics, mechanical, automobile, clean energy, biomedical, communications, telephone, fax companies and so on. This can be interpreted to mean that the basic activities of the business rely greatly on the use of high technology.

Mason and Brown (2012) also viewed technology based firms as those businesses that have dealings with either technology related products, processes or services. Technology here can be classified as high, medium or low technology. in line with this study, "new technology based firms were referred to as recently established firms whose competitive strength comes from the knowledge and skills of the employees within the fields of the natural sciences, engineering and medicine, and the subsequent transformation of this knowledge into products and services

that can be sold on a market” Rickne, and Jacobsson (1999).

### **Characteristics of Technology Based Firms**

Daramola (2012) grouped technology based firms into the following categories. The high-technology, medium-high-technology, medium – low-technology and low-technology based firms. He believed technology based firms should be categorized according to the type of technology it uses whether it be, a low level of technological products, or a high level of technological innovation.

Another categorization of technology based firms which is extremely similar to the previously stated categorization is that given by Saemundsson (1999) where he divided these firms into the new technology based and the medium technology based firms. Here, the new technology based firms are viewed as the newly developed firms who use their employees’ knowledge, skills and expertise in their areas of specialty such as the sciences and engineering to gain competitive advantage by producing innovative products and services (Rickne and Jacobsson, 1999). While the medium technology based firms are seen as an extension of the original technology based firms who have undergone several developments which in turn result in the expansion of these firms. Although very similar, these categorizations differ in the sense that while Daramola (2012) focus was on the level of technology and innovations used in the organization Saemundsson (1999) was more particular about the actual size of the organization and its growth level.

It is usually more likely to find new technology based firms than the medium sized firms. Carpenter and

Peterson (2002) accredit it to the fact that it is difficult for new technology based firms to obtain the financing they need from external sources which in turn impedes the firm’s growth and prevents it from becoming a medium sized firm. Another researcher who worked on the characteristics of technology based firms is Zakrzewska-Bielawsk (2010). He described them firstly as an innovative enterprise, then his second categorization was that they are knowledge-based enterprise, and lastly as a company which makes use of modern information technology. Taking a look at technology based firms as an innovative enterprise shall be the first concept we analyze. Schumpeter propounded the classical theory of innovation which opines that innovation is the process of creating new products and services and developing new production technologies also recognizing unique raw materials for formulating advanced solutions for the economy.

### **The Role of Technology Based Firms in Economic Development**

The famous economist, Porter (2003) defines economic development as the process of obtaining a continuous level of advancement that helps increase the standard of living of the citizens in a nation and enables a country to maintain a higher purchasing power over other countries. His belief was focused on the lives of the citizens and the economy as a whole. Another definition which agrees with that given by Porter is, Fitzgerald and Leigh (2002) who believe that it is the job of economic development to ensure the sustenance and elevation of a country’s standard of living especially through the development of both human and

physical infrastructure from a long term perspective.

It is believed that it is the characteristics that make up this technology based firms that are to be held responsible for the positive effect these firms have on economic development. Zakrzewska-Bielawska (2010) discussed these characteristics in his work and described them as companies based on knowledge, research and development, and effectively utilizes these resources to allow for greater inventions, innovations and technologically advanced products that determine the performance of the whole economy.

The concept of technology based firms cannot be fully discussed without mentioning their impact on economic growth and development. They have been seen to affect other firms directly or indirectly by their number and growth or by providing specialized input for them (Saemundsson 1999). Countries are now paying significant consideration to the issue of industrial reformation. Studies by researchers such as Jacobsson and Philipson (1996) have shown that the strength of most of developing countries industries is found within their traditional industries whose growth rate is usually slower than average. Schumpeter (2013) was one economist responsible for showing us that the prime movers in this modern economic developing world are the new business ventures and their entrepreneurs. They are responsible for encouraging technological innovations in industries, creating new jobs, and generating wealth for the society (Tushman, and Anderson, 2004).

From several bodies of knowledge, we can come to the consensus that these firms, especially the new technology-based firms' play a great part in

contributing efficiency of the economy (Audretsch, 2003). Pinkwart and Proksch (2014) in their research on new technology based firms found out that these firms are responsible for a large number of new jobs, the development of new technologies, and are an important source of growth for the economy.

### **Challenges of Technology Based Firms**

Large bodies of work from researchers have always focused on what technology based firms mean and what they are all about. We have continuously been told that technology based firms are a major tool for economic development. But for us to truly have an in-depth understanding of technology based firms, it is crucial for us to understand that these firms face a lot of challenges even more than ordinary startups and these problems impede their growth and are responsible for some of the reasons why some of these firms pack up and die. For the purpose of this study, we have divided the problems into three categories (Lee, Lee and Pennings, 2008).

The first problems are the internal challenges these firms face which consists of factors such as; entrepreneurial orientation, finance, and other factors. The second category refers to the external problems. It takes a look at factors such as competition, technological advancement and the unpredictable market place. The last source of challenges would be observed from the perspective of the role of external linkages; these are factors such as the partnership and sponsorship.

### **Internal Challenges**

The resource based literature suggests that a firm's competitive advantage is determined by its internal resources (Mason and Brown (2012). It believes

that how the firm functions and carries out its activities essentially affects its performance. Therefore, importance has been placed on analyzing the internal challenges faced by a firm. It is believed that these challenges are very important and can be responsible for organizational failure if not properly handled and controlled. The internal challenges adopted for this study include entrepreneurial orientation, technological capabilities, financial stability, lack of qualified personnel, and attitude of employees towards change.

### **Entrepreneurial Orientation**

The concept of entrepreneurial orientation refers to the methods and styles an organization uses to apply the start-up's founding strategy (Lumpkin and Dess, 1996; Miller, 1983). Entrepreneurial orientation is viewed at the firm level rather than at the individual level. Miller (1983) propounded the three dimensions of entrepreneurial orientation which are innovativeness, risk-taking propensity, and proactiveness. These have also been accepted by other researchers such as Covin and Slevin, (1989), Lumpkin and Dess (1996) who have extended the studies on them.

A number of studies have compared the relationship between entrepreneurial orientation and an organizations performance and it has been proven that a firms entrepreneurial orientation plays a major role in determining the organizations success (Covin and Slevin, (1991); Lumpkin and Dess, (1996)). It is important to note that entrepreneurial orientation is not a commodity that can be bought in the market, rather it is an intangible concept that has to be embedded in an organizations activities and routines and

should be adopted by all the members of an organization.

The first dimension of entrepreneurial orientation is innovativeness. Innovativeness is a term which refers to a firm's ability to continuously generate new ideas, to experiment on new ideas and products, and also to ensure that it carries out proper research and development to create new products and processes (Lumpkin and Dess, 1996). Innovation is particularly essential for technology based firms considering the dynamic nature of technology.

### **Technological Capabilities**

Technological capabilities are an important part of the resource based view of any organization. They refer to the level of an organizations internal technological know-how. Technological capabilities include a firm's technological knowledge, its patents, its production processes and practices, and all those technologically based factors that act as a source of sustainable competitive advantage for organizations (Zakrzewska-Bielawska, 2010). Every TBF is established and based on technology innovations. Their main activities are focused on exploiting these innovations. These capabilities are particularly important to technology based firms especially due to the fact that the relevance of these firms are based on their continuing improvement on their technological capabilities (Yu-Shan Su, Tsang and Peng, 2012).

### **Financial Stability**

Financing is a very important input in high-tech business enterprises majorly for the smooth running of daily operations such as the acquisitions of assets and the employment of qualified employees. The major source of finance for technological firms is loans from

banks and other finance companies. TBF's depend to a great extent on them to fund them for their research and development, investments, and production processes (Ajagbe, Long, Aslan and Ismail 2012). But these firms face a lot of problems while trying to obtain financial resources. Lending institutions do not tend to lend to TBF's due to the following reasons.

First of all, the lack of expertise in this sector is a source of concern to banks when considering these companies for loans. For financial institutions to finance TBF's, it is required that they are very knowledgeable about which industries they are investing into and they should be familiar with the technologies and technological processes (Mason 2010). But with the rate of innovations in these TBF's, banks are not always knowledgeable about all these, which then prevent them from investing in these companies (Lerner 2010).

Secondly, we have the unavailability of collateral security as a factor that hinders banks from investing in TBF's this is especially the case in new technology based firms. New technology based firms are sometimes known for exploiting new technological innovations and traditional and the very conservative lending institutions are not readily willing to invest in ideas. They prefer to invest in ideas that are old and tested. In the case of debt financing, NTBF's may find it difficult to raise debt finance as it is required of them to provide sufficient collateral (Lerner 2010).

The third factor that prevents financial institutions from investing in TBF is the high risk nature in that sector. Institutions can never fully predict which investments are good or bad

(Harrison (2010) and Moore (1994)). Banks usually do not employ enough specialists; therefore it is cumbersome when it becomes time for them to analyze these TBF's as they do not understand which companies are good investments and which ones not to invest in (Ajagbe, Long, Aslan and Ismail 2012). Technology firms are viewed as being very risky due to the nature of their job description therefore it is harder for them to obtain financial assistance from financial institutions and they usually have to pay a certain fee to obtain external resources from banks, suppliers or other firms (Lee, Lee and Pennings 2008).

### **External Challenges**

A firm's external environment according to Pearce et al, (2012) and Machuki and Aosa (2011) can be defined as the totality of all environmental factors that affect an organization's activities and impact its performance level. It consists of opportunities, problems, or any other constraints. It is impossible for any organization to survive without interacting with its external environment. The external environment is outside the organizations control, therefore it is the job of the organization to design its internal environment in such a way that it would cope with the changes in its external environment. For organizations to perform well, it needs to have an avid understanding of the environment which it operates in and know which factors that can either help or inhibit its success (Sayedoff, 1998). It is through the analysis of the external environment that managers and employees are able to develop strategic plans for the organization (Ward and Lewandowska, 2008).

### **External Linkages**

According to Pfeffer and Salancik (1978), organizations tend to depend largely on their external environment due to their inability to cover the entirety of their value chain. Some organizations are lacking when it comes to their needed resources therefore they outsource certain parts of their value chain and find other organizations with the ability to complement them in the areas where they are lacking.

According to (Aldrich and Zimmer, 1986) these networks are very important to developing firms as they help in discovering business opportunities; they serve as a medium for testing ideas and also help in the gathering of resources. Due to the high risk nature of technology based firms, potential sponsors and partners are usually unwilling to be linked and invest their time, capital and resources in these technology start-ups since their survival rate is never certain. Uzzi (1996) believes that reliable ties with strong standing partners or sponsors can go a long way in enhancing the position of these start-up firms. For the purpose of this study, we shall be observing the 'partnership based linkages' and the 'sponsorship based linkages'.

### **Partnership Based Linkages**

Partnership based linkages also known as cooperative bilateral relationships are relationships between organizations and environmental constituents or external factors. Lee, Lee and Pennings (2008) believed there to be four kinds of partnership-based linkages responsible for promoting start-up performances which include other enterprises, venture capitalists, universities and research institutes

The first partnership based linkage is the strategic alliances with other

enterprises. This includes relationships with other bodies which might serve as a complementary factor to these technology based firms such as the customers, suppliers and other organizations. Strategic alliance has been seen to have two positive advantages on technology based companies. The first way strategic alliance provides help to technology based firms is the direct approach whereby these firms provide the necessary knowledge and information, technical, managerial and financial assistance and any other needed resources (Hitt et al., 2000). The second method is less direct whereby the partners help the technology start-ups gain the necessary resources from third parties. Strategic alliances with already well established companies gives new technology based firm the image of an organization with a viable rate of success (Stuart et al., 1999).

Venture capitalists serve as the second partnership based linkage. Situations whereby venture capitalists invest in new technology start-ups tend to be very favourable for these organizations based on the fact that the venture capitalists not only provide financial assistance but also give advice and play a part in the management of the organization to ensure return on their investment (Sapienza, Manigart, and Vermeir, 1996). External elements such as suppliers, investors, buyers and employees view the involvement of venture capitalists in a positive light. According to Stuart et al., (1999) this partnership shows to outsiders that the start-up enjoys favourable prospects.

The third source of partnership linkages for technology start-ups is collaboration with universities and research institutes. These bodies serve as a very useful tool

for technology based firms because due to the dynamism of technology, these organizations need access to a continuous source of technological knowledge. Partnering universities also help to further the education of employees (Saxenian, 1994). Ultimately, this partnership gives technology based firms access to high-caliber researchers which help this technology based firms remain relevant. Therefore, universities have been seen to be of use both by encouraging technology development and providing qualified employees (Powell, Koput, and Smith-Doerr, 1996).

To be concise, partnership based linkages of technological start-ups aid the organization in obtaining complementary assets from external bodies.

### **Sponsorship Based Linkages**

Sponsorships can be viewed as a one way relationship where by an outside party provides support for another firm. Certain researchers view it as a marketing tool that companies have been known to take advantage of to enable them develop a higher customer base and obtain more profits (Oladunni 2010). This enables such firms to gain a higher advantage when dealing with competitors. Lagae (2005) defines sponsorship as a business agreement between two parties whereby one party known as the sponsor provides money, goods, services or know-how while in exchange, the sponsored party (individual, event or organization) offers rights and associations that the sponsor utilizes commercially.

As already established, companies established for the main purpose of exploiting an innovation are not always known to possess a certain level of financial security. According to Miller

(1983), small firms are responsible for a greater amount of innovations than firms which have been in existence for a long period of time. This has been found to be so because new and small firms are greater risk takers than the bigger firms in the market.

Lee, Lee and Pennings (2008) believe that the availability of sponsorship plays a great role in increasing the availability of external resources, and lead to greater organization growth. These have been seen to reduce the potentially harmful effects that are usually found in the beginning stages of technology based firms. New technology based firms seek the support of sponsors because these sponsors have been found to protect new establishments from the adverse environmental threats.

Sponsorship from companies with high rankings tends to enhance the legitimacy and improve on the prestige of newly established technology based firms (Stuart et al., 1999). Research has also shown( that support from government bodies goes a long way in opening doors and providing access to scarce resources for technology based firms (Davis, Bagozzi, and Warshaw, 1989; Saadé, Nebebe and Tan (2007). Innovations are built on knowledge, therefore sponsorships from universities and educational bodies provide technology based institutions with access to their required knowledge (Alharbi and Drew, 2014). In summary, sponsorship based linkages of a technological start-up helps the firm to gain complementary external resources, to enable them dispose the output with better terms, and to identify and develop new entrepreneurial opportunities (Lee, Lee and Pennings, 2008).

Recent studies (Onetti, Zucchella, Jones and McDougall-Covin, 2012) have been

carried out in different contexts in an attempt to determine the relationship between the challenges technology based firms face and their performance. Lee, Lee and Pennings (2008) carried out a research on the relationship between “Internal Capabilities, External Networks, and Performance: A Study on Technology-Based Ventures”. These researchers strongly believed that the challenges in the internal environment and external networks of technology based firms have a major impact on the firms overall performance. While carrying out their study, they viewed internal capabilities from the resource based perspective, where they used elements such as entrepreneurial orientation, technological capabilities, financial stability, lack of qualified personnel, and attitude of employees towards change to analyze the internal environment of the organization. They concluded that entrepreneurial orientation has a positive effect on firm performance. From their research, they discovered that high level of innovativeness, risk taking and proactiveness may not lead to a significant increase in sales growth during their first two years, but after the first two years, it tends to have a significant impact (Onetti, Zucchella, Jones and McDougall-Covin, 2012). Lee, Lee and Pennings (2008) realized that linkages to other enterprises through partnerships do not have any main effects or interaction with internal capabilities. Sponsorships and partnerships were found to be rare with the TBF. The companies which had strategic alliances were seen to be aligned with other small firms and therefore these ties were not able to provide sufficient resources or reputation. In contrast, companies that

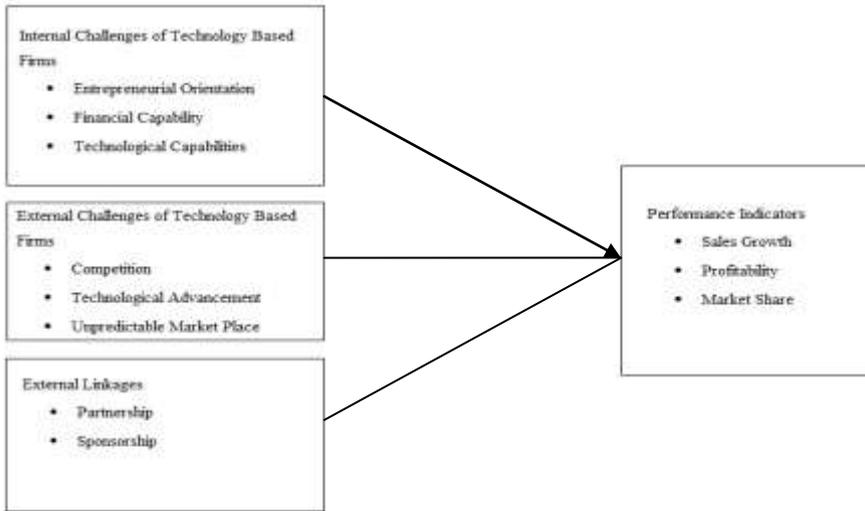
were aligned to venture capital companies were found to be impacted significantly. This is based on the fact that venture capital companies that invested in the startups had an incentive to see the firm succeed. Venture capitalists were also found to provide financial resources and management skills which helped the TBF’s generate more wealth from their internal capabilities (Onetti, Zucchella, Jones and McDougall-Covin, 2012).

Saemundsson (1999) in his work analyzed various perspectives and how they affect firm growth. His opinion of the innovation system was that it leads to the growth of these TBF. He observed that some companies are great producers of innovative technologies while some are not involved in innovation practices at all. The fastest growing companies were seen to be those with the highest level of research and development (Freeman, 1994).

The second factor that was analyzed in his work was growth willingness. According to Davidsson (1989) a relatively few number of owners of small firms are innovative, change oriented and seek out new business opportunities. This can be linked to the entrepreneurial orientation of the manager or owner. Organizations that accepted change and viewed it in a positive light were more likely to grow than their counterparts who were afraid of change. Although Davidsson had this belief, researchers such as; (Onetti, Zucchella, Jones and McDougall-Covin, 2012) found no direct link between the willingness of the firm to grow and actual future growth of the firm. This study shows us that technology based firms face a number of challenges and these challenges are what affect the

growth of new technology based firms into medium technology based firms.

Schematic Model Capturing Technology based firm Challenges



Source: Authors’ own conceptualization.

**Materials and Method**

The study adopted the cross-sectional longitudinal research design with a mixture of descriptive, survey and ex-post-facto research design. The survey is suitable in recitation of large populations, being cost effective coupled with its ability of high information accessibility. Consequently, very large samples are feasible, making the results statistically significant even when analyzing multiple variables (Anderson 2010). Inferential and descriptive statistical analysis were used for different aspects of the study in relation to the internal and external challenges of technology based firms in Nigeria (Lou, Cao, Zhang & Ahn., 2017). The study was designed to combine primary survey – based data from headquarters of five top-technology based companies in Lagos metropolis with secondary information from Ebsco online data base and past researches on topics related to this

work. The choice of Lagos is due its proximity and strategic locations of large technology based companies from where a purposive selection of the top five technology based firms were selected for the study but due to the stipulations of the organizations and lack of adequate time, only two of the top technology firms were eventually used. The total of the five firms gave a total of 366 employees as the sample size, but the two selected firms gave a total of 175 employees. Therefore, a total of 175 employees were randomly sampled. According to Hair, Black, Babin and Anderson (2010) it was argued that 100 to 200 questionnaires are suitable enough for a large population.

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 22.0. The comprehensive nature of the package provided opportunity to extract

exhaustively all desired information and statistics. Data were disaggregated by companies possibly to show inherent variations among various characteristics of the two companies sampled. The hypotheses formulated were tested using multiple regression analysis to predict relationships. Overall, data were segregated by companies to show variations that are existing among some selected variables. Content validity of the questionnaire was used to enhance the review of questionnaire items used by previous researchers while the face validity was attained by experts re-examining the instrument and relevant adjustment implemented. The coefficient alpha ( $\alpha$ ) or Cronbach's alpha was used to measure the internal consistency between the multiple measurements of the variables. To estimate the effect of challenges on performance drive, the regression were operationalized. The independent

variable was referred to as repressor or predictor variable (X) while the dependent variable (Y) is referred to as the response has the following equations:

$Y=f(x)$ , where Y represents performance and X represents challenges of TBFs.

$Y = (y_1, y_2 \dots y_n)$  where we have  $Y_1 =$  Profitability,  $Y_2 =$  Sales growth,  $Y_3 =$  Market share. Similarly,  $x = (x_1, x_2 \dots x_n)$  where:  $X_1 =$  Internal challenges,  $X_2 =$  External challenges and  $X_3 =$  External linkages

**Analysis and Findings**

**Hypothesis One**

H01: Internal challenges have no impact on the performance of technology based firms

Ha1: Internal challenges have an impact on the performance of technology based firms

Table 1, ANOVA output for hypothesis one

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	29.295	9	3.255	11.109	.000 <sup>a</sup>
	Residual	43.892	150	.293		
	Total	73.188	159			

a. Predictors: (Constant), quali, aggre, inno, react, fina, capa, auto, risk, Attitu

b. Dependent Variable: perf

Source: Author's Field Survey Result (2017)

The F-value is the Mean Square Regression (3.255) divided by the Mean Square Residual (0.293), yielding  $F=11.109$ . From the results, the model in this table is statistically significant (Sig =.000) and hence the null hypothesis was rejected. Therefore, internal challenges have significant

effect on the performance of technology based firms at  $F = 11.109$ . Hence, the alternative hypothesis is accepted.

**Hypothesis Two**

H02: External characteristics do not affect the performance of technology based firms

Ha2: External characteristics have an effect on the performance of technology based firms.

Table 2, ANOVA output for hypothesis two

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17.617	3	5.872	16.494	.000 <sup>a</sup>
	Residual	55.570	156	.356		
	Total	73.188	159			

a. Predictors: (Constant), dyna, advan, compe

b. Dependent Variable: perf

Source: Author’s Field Survey Result (2017)

The F-value is the Mean Square Regression (5.872) divided by the Mean Square Residual (0.356), yielding F=16.494. From the results, the model in this table is statistically significant (Sig =.000) and hence the null hypothesis is rejected. Therefore, external characteristics has significant effect on the performance of technology

based firms at F = 16.494. Hence, the alternative hypothesis is accepted.

**Hypothesis Three**

H03: External linkages have no influence on the performance of technology based firms

Ha3: External linkages have an influence on the performance of technology based firms

Table 3, ANOVA output for hypothesis three

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	21.372	2	10.686	32.382	.000 <sup>a</sup>
	Residual	51.815	157	.330		
	Total	73.188	159			

a. Predictors: (Constant), sponsor, partner

b. Dependent Variable: perf

Source: Author’s Field Survey Result (2017)

The F-value is the Mean Square Regression (10.686) divided by the Mean Square Residual (0.330), yielding F=32.382. From the results, the model in this table is statistically significant (Sig =.000) and hence the null

hypothesis was rejected. Therefore, external linkages influence the performance of technology based firms at F = 32.382. Hence, the alternative hypothesis is accepted

Table 4, showing Results of Model Analysis

Proposed Relationship	Hypothesis	Coefficient	T -Statistics	Rejected/Accepted
IC→T	H <sub>1</sub>	.234	1.312	Accepted
		.019	3.339	Accepted
EC→T	H <sub>2</sub>	.249	3.308	Accepted
		.329	4.592	Accepted
EL→T	H <sub>3</sub>	.453	6.626	Accepted
		.223	3.271	Accepted

**Discussion of Findings**

The findings from Hypothesis one showed that internal environment has a significant effect on performance of technology based firms. This is in line with the study of Onetti, Zucchella, Jones and McDougall-Covin, (2012) who argued that high level of innovativeness, risk taking and proactiveness may not lead to a significant increase in sales growth during their first two years, but after the first two years, it tends to have a significant impact. Subsequently Hypothesis two indicated that external environment has a significant effect on performance of technology based firms. This aligns with the study of Lee, Lee and Pennings (2008) which showed that the challenges in the internal environment and external networks of technology based firms have a major impact on the firms overall performance. In the same vein, hypothesis three revealed that external

linkages influence the performance of technology based firms. This supports the study of Saemundsson (1999) which showed that companies that were aligned to venture capital companies were found to be impacted significantly

**Summary and Conclusion**

In this study, the authors examined the challenges of technology based firms. The possible challenges of these firms were explored. In addition, both the internal and external environment of these firms was evaluated and the findings showcased the level of contributions of each of these environmental factors. Based on the findings of this study, it can be concluded that internal challenges especially the level of entrepreneurial orientation of the firm as well as the external environment and external linkages affect the performance of technology based firms.

**References**

Ajagbe, A. M., Ismail, K., Isiyawe, D. T., & Ogbari, M. E. (2015). Barriers to Technological and non-Technological Innovation Activities in Malaysia. *European*

*Journal of Business and Management*, 7(6), 157-168.  
 Ajagbe, A. M., Long, C. S., Aslan, S. A., & Ismail, K. (2012). Investment in technology based small and medium sized firms in Malaysia: Roles for commercial

- banks. IRACST-International Journal of Research in Management & Technology (IJRMT), 2(2), 147-153.
- Albert, (2013), *Technology and the future* Published July 1st 1999 by St. Martin's Press (first published December 12th 1951).
- Alharbi, S., & Drew, S. (2014). Using the technology acceptance model in understanding academics' behavioural intention to use learning management systems. *International Journal of Advanced Computer Science and Applications (IJACSA)*, 5(1).
- Asika, N. (1991). *Research methodology in the behavioural sciences*. Lagos: Longman Nigeria Plc, 90-96.
- Audretsch, D. B. (2003). *Entrepreneurship policy and the strategic management of places. The emergence of entrepreneurship policy: Governance, start-ups, and growth in the US knowledge economy*, Cambridge University Press, New York, NY, 20-38.
- Carpenter, R. E., & Petersen, B. C. (2002). Capital market imperfections, high-tech investment, and new equity financing. *The Economic Journal*, 112(477), F54-F72.
- Daramola, A. (2012). *New Technology-Based Firms and Venture Capital Policy in Nigeria*. *Journal of Innovation Economics & Management*, (1), 163-181.
- Davidsson, P. (1989). *Entrepreneurship—and after? A study of growth willingness in small firms*. *Journal of business venturing*, 4(3), 211-226.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
- Dorf, R. C., & Byers, T. H. (2008). *New technology ventures*.
- Fitzgerald, J., & Leigh, N. G. (2002). *Economic Revitalization: Cases and Strategies for City and Suburb: Cases and Strategies for City and Suburb*. Sage Publications.
- Ismail, K., & Ajagbe, A. M. (2013). The Roles of Government in the Commercialization of Technology Based Firms. *Middle-East Journal of Scientific Research*, 16(2), 229-236.
- Jacobsson, S., & Philipson, J. (1996). Sweden's technological profile: What can R&D and patents tell and what do they fail to tell us? *Technovation*, 16(5), 245-267.
- King, D. R., Covin, J. G., & Hegarty, W. H. (2003). Complementary resources and the exploitation of technological innovations. *Journal of Management*, 29(4), 589-606.
- Lee, C., Lee, K., & Pennings, J. M. (2008). Internal capabilities, external networks, and performance: a study on technology-based ventures. *Strategic management journal*, 22(6-7), 615-640.
- Maine, E. M., Shapiro, D. M., & Vining, A. R. (2010). The role of clustering in the growth of new technology-based firms. *Small Business Economics*, 34(2), 127-146.
- Mason, C., & Brown, R. (2012). *Technology-Based Firms in Scotland. A Report for Scottish Enterprise*.

- Maula, M. V. (2001). Corporate venture capital and the value-added for technology-based new firms. Helsinki University of Technology.
- Maula, M. V., Keil, T., & Zahra, S. A. (2013). Top management's attention to discontinuous technological change: Corporate venture capital as an alert mechanism. *Organization Science*, 24(3), 926-947.
- Millar, C. C., & Ju Choi, C. (2010). Development and knowledge resources: a conceptual analysis. *Journal of Knowledge Management*, 14(5), 759-776.
- Onetti, A., Zucchella, A., Jones, M. V., & McDougall-Covin, P. P. (2012). Internationalization, innovation and entrepreneurship: business models for new technology-based firms. *Journal of Management & Governance*, 16(3), 337-368.
- Otokiti, S. O. (2005). *Methodologies and Mechanics of Computational System*. New Delhi: Sultan Chan and Son.
- Pinkwart, A., & Proksch, D. (2014). The Internationalization behavior of German high-tech start-ups: an empirical analysis of key resources. *Thunderbird International Business Review*, 56(1), 43-53.
- Pires, G. D., & Aisbett, J. (2003). The relationship between technology adoption and strategy in business-to-business markets: the case of e-commerce. *Industrial Marketing Management*, 32(4), 291-300.
- Porter, M. E. (2011). *Competitive advantage of nations: creating and sustaining superior performance*. Simon and Schuster.
- Rickne, A., & Jacobsson, S. (1999). New technology-based firms in Sweden-a study of their direct impact on industrial renewal. *Economics of innovation and new technology*, 8(3), 197-223.
- Saadé, R. G., Nebebe, F., & Tan, W. (2007). Viability of the 'Technology Acceptance Model' in Multimedia Learning Environments: A Comparative Study. *Interdisciplinary Journal of knowledge and learning objects*, 3(2), 175-184.
- Saemundsson, R. J. (1999). *New technology-based firms growing into medium-sized firms* (Doctoral dissertation, Chalmers tekniska högsk.).
- Saemundsson, R., & Dahlstrand, Å. L. (2005). How business opportunities constrain young technology-based firms from growing into medium-sized firms. *Small Business Economics*, 24(2), 113-129.
- Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (Vol. 55). Transaction publishers..
- Schumpeter, J. A. (2013). *Capitalism, socialism and democracy*. Routledge.
- Ayodele, S. O., Oga, O. E., Bundot, Y. G., & Ogbari, M. E. (2016, October). Role of power supply towards e-learning acceptance: VBSEM-AMOS. In *Information Communication and Management (ICICM), International Conference*. (pp. 151-155).IEEE.
- Terjesen, S., Patel, P. C., & Covin, J. G. (2011). Alliance diversity, environmental context and the value of manufacturing

- capabilities among new high technology ventures. *Journal of Operations Management*, 29(1), 105-115.
- Anderson, P., & Tushman, M. L. (Eds.). (2004). *Managing Strategic Innovation and Change: a collection of readings*. Oxford University Press.
- Lou, Y., Cao, J., Zhang, S., & Ahn, C. (2017). Sample size calculations for time-averaged difference of longitudinal binary outcomes. *Communications in Statistics-Theory and Methods*, 46(1), 344-353.
- Zakrzewska-Bielawska, A. (2010). High technology company–concept, nature, characteristics. In *Proceedings of the 8th WSEAS International Conference on Management, Marketing and Finance, Recent Advances in Management, Marketing and Finances* (pp. 93-98).