Technological Know-How, Entrepreneurship And Sustainable Economic Development In Emerging Economies

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Abstract :
The role of information and communication technology (ICT) in improving all human endeavours is enormous. This study investigates the effect of technology-know-how on entrepreneurship growth in emerging economies of the world. Data were sourced from World Development Indicator for the selected economies of Nigeria, Brazil and Malaysia for 25 years ranging from 1989 to 20132012. Variables such as Information, communication and technology service exports as % of service exports (ICT) and High-technology exports as percentage of manufactured exports (HI-TECH) serve as independent variables and entrepreneurship growth (EG) as dependent variable were incorporated into the model. The data were analyzed using multiple regression analysis of Ordinary Least Square (OLS) and cointegration technique. The OLS result revealed that technological-know-how has significant positive effect on entrepreneurship growth in Nigeria and Brazil but negative insignificant effect in Malaysia. There is a long run relationship between Entrepreneurial Growth and Technology Know-how in Emerging Economies. The study concludes that Hi-tech can help revolutionize the way people in emerging economies conduct their daily lives and business activities.

Keywords: Entrepreneurship, technology, sustainability, emerging economies,

INTRODUCTION

Information and communication technology (ICT) is an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computer and network hardware and software, satellite systems etcetera as well as the various services and applications. ICT has contributed to the development of every facet of human endeavour. After electricity and water supply, ICT is perceived as the next major utility service. The incorporation of ICTs in various sectors is seen as the cornerstone of the new digital revolution for mass inclusion in the "e-era' and the 'M-era'. Within the last decade, mobile communication has become one of the largest and fastest growing industries worldwide. In 2010, there were an average of 72.2 mobile phone subscribers per 100 people in the world and about 5.3 billion mobile

cellular subscribers in the world. Presently, more than 90 percent of the world's population lives within the range of a cell phone tower and there are approximately 6 billion mobile subscribers globally. Experts had predicted that by 2020, mobile phone could replace the computer as the primary means of accessing the Internet.

The rapidly evolving communication technologies could become a means to an end for bridging the digital divide by connecting the remote and providing the deprived with varied services and solutions for various sectors. Technology innovations can become an engine for economic development for emerging economies. Innovation creates companies, mobilizes resources, reduces operating costs, provides equity in access to the under-served, helps create inexpensive products and services, creates jobs and fosters socio-economic development of an economy. Innovation

is the route to sustainable economic growth of a country vis-à-vis developing new products, services, ensuring survival of any business the competitive world as it provides ample opportunities for growth and profitability. Innovation is the creative transformation of knowledge and ideas into products, processes and meeting market needs. A research report from a repository of 202 ICT innovations in emerging economies featured mobile payments, mobile banking, branchless banking, e-health, e-agriculture and education and the report indicated that these ICT innovations have impacted positively on socio-economic development (Ruchir, 2012).

Through advances in all types of technology have proliferated, it is ICT-networking and telecommunication services, Internet and intranet access, e-mail, instant messaging mobile phones, VOP and web-conferencing that enables global growth in emerging markets. The global expansion in communications infrastructure and the adoption of networked-based services are leading indicators of widespread economic development. World Bank surveys of more than 20,000 businesses in 50 developing countries suggest, "Firms using ICT see faster sales growth higher productivity and faster employee growth. Technological entrepreneurship is not a new concept based on twenty first century computer whiz kids. In the eighteenth and nineteenth century British technical entrepreneurs such as James Watt and Alexander Graham Bell made significant breakthroughs that built up vast industries and changed the lives of millions. Many of present day's breaking innovations were not developed by large multinational corporations but were based on the ingenuity and invention of individual entrepreneurial scientists. With the decline of many traditional sectors such as coalmining, steel manufacturing and textiles, many nations have realized that industries characterized by rapid technological markets, result in increased industrial output, employment

and prosperity (Cooper, 1997; Oakey, 1995; Harrison, 2004).

Within the past three decade, many economies have experienced marked structural shifts. Developed western economies have seen the decline of many traditional industrial sectors and a dramatic increase in the role play by services within the economy, with particular growth in the contribution of small firms to employment. While traditional manufacturing sectors have been changing, expansion has occurred in technology-based field that make an increasingly important economic contribution. The dramatic emergence and growth of high-areas, brought technical entrepreneurship under the spotlight. Studies in small business indicated that firms in new technology has been growing in popularity. A principal reason for the growth is the increasing emphasis from government development planning agencies on new forms of enterprise. In addition, academics interested in the development of new technology-based sectors have focused their attention on the firm in general, and in particular, the role of the entrepreneur in its establishment and growth. Local, regional and national agencies with an economic remit are concerned to identify ways in which the environment can be improved, to facilitate the emergence and growth of new firms. They wish to target resources at initiatives that will bear entrepreneurial fruit and thus draw on in-house and academic research to help them understand the influences on founders and identify the needs of fledging and established technology-based businesses to maximize economic regeneration and growth.

Policy-makers have realized that the future competitiveness of industry, and success in accelerating growth and increasing employment, depend upon the capacity of firms to innovate in response to changing external conditions including the continuing rapid pace of technological development. Given this scenario, it is no surprise that firms working in high-

technology sectors such as electronics, software and biotechnology have been hailed as vehicles for the creation of new jobs, for regional economic regeneration and for enhancing national rates of technological innovation and international competitiveness. Previously, it was thought that only large firms could take advantage of technological innovation with global markets, focus has now moved towards development of small entrepreneurial ventures. There are a number of reasons for this development.

(1)   Small firms are more innovative than large firms as small enterprises are less bound by convention and are more flexible.

(2)   Small firms are organic organizations and network-based structure, contrasting with the mechanistic and bureaucratic framework common to many large organizations.

(3)   Small firms make important contribution to economic growth and vitality by offering alternative career possibilities to those engineers and managers who do not function most effectively in large enterprises.

(4)   In many respects, small businesses are better able to deal with the volatility inherent in numerous technology–based sectors, especially when fast-moving technology life-cycles reveal market niches suitable for exploitation by enterprising small firms.

(5)   As firms are forced to innovate and develop new products and services on continuous basis and as competitors enter and overtake their market position, those working within such fields are forced to become acclimatized to a culture of instability and change, risk-taking and dynamic action which is best suited to the management and business style of technologically oriented

entrepreneurial small firms (Maleck, 1991; Cooper, 2001).

In the face of all these gains, it becomes pertinent to find out the extent to which technological know-how lead to entrepreneurship for sustainable economic development in emerging economies.

REVIEW OF RELATED LITERATURE

Gabraith (1985) comments that high-tech firms operate on the basis of factors different from those for other type of manufacturing, the one common element being the importance of a complex local infrastructure including universities, government research labs and mature companies, implying that the influence of materials and transport so important in traditional location model are less relevant in the context of new technology-based sectors. Poter (1998) states that clusters as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions such as universities, standard agencies and trade associations in particular fields that compete but also cooperate. In the context of technology firms, the presence of institutions such as universities or research establishments play a multi-dimensional role in encouraging and supporting new enterprise development (Keeble & Wilkinson, 2000).

Institutions act as sources of entrepreneurs and ideas on which firms are based and support innovation through provision of specialist technical help to companies. There is a debate between those who believe that universities and science parks play a role in stimulating industrial development (Monck, 1988; Oakey, 1985).

Technology includes any equipment tools or operating methods that are designed to make work more efficient. Technological advances involve the integration of technology into a process for changing inputs into outputs. Technology has

made it possible to enhance this production process by replacing human labour with electronic and computer equipment. Some high-tech organizations rely heavily on robots. Robots perform repetitive tasks much more quickly. Robots are not subject to health problems caused by exposure to chemicals or other hazardous materials. Technology also makes it possible to better serve customers. Technology is not used only in manufacturing enterprises, but also in banking and marketing (e-banking) and e-commerce.

Technological advancements are also used to provide better more useful and timely information. The term e-commerce encompasses presenting products on web-sites and filling orders. In contrast, e-business refers to the full-breath of activities included in a successful internet-based enterprise. It includes developing for running internet-based companies, improving communication between employees, customers and suppliers and collaborating with partners to electronically coordinate design and production. The term e-organization (e-orgs) refers to applications of e-business concepts to all organizations. E-orgs include not only business firms, but also schools, hospitals, museums, government agencies, and the military. Technological innovation represents a way for developing nations to foster economic development, improve levels of education and training as well as address gender issues within society (Bourke, Eitzey & Nolan, 2000; Kesner, 2002; Strout, 2000).

Hi-Tech Services

Over the past three decades, there had been a dramatic emergence and growth of high-technology-based areas and this has brought technical entrepreneurs under spotlight. This development has resulted in marked structural shifts as developed economies have experienced the decline of many traditional industrial sectors and an upsurge in the role played by services within the economy, with particular growth in the contribution of small firms to employment. The emergence and growth of new sectors obviously linked with issues of entrepreneurship since the business-founder drives the enterprise development process. Technology-based sectors have attracted the attention of policy-makers as they are viewed as 'sunrise industries' capable of compensating for declining traditional activities. A high proportion of technology start-ups result from positive stimuli, but a sizeable number still occur due to the entrepreneurs being pushed by redundancy or frustration (Cooper, 2001; Harrison & Masian, 2004).

Oakey and Cooper (1991) caution politicians, government and policy-makers eager to capitalize on opportunities offered by emergent key technologies not to assume automatically that "encouragement of any new technology will result in rapid and sustained industrial growth. There are numerous niches suitable for entrepreneurial activities, and setting up businesses need to be encouraged as a positive action rather than a response to a negative occurrence. Most people spin-off locally, suggesting that initiatives to increase levels of entrepreneurship will be most effective if they are predominantly at local people. The use of local role models would encourage individuals with ideas to appreciate that not all technical entrepreneurs are like Bill Gates.

The prevalence of local spin-offs assists the development of agglomerations of businesses adding new firms, potential new suppliers, customers, contractors and service providers, which in turn encourage the inward movement of entrepreneurs. For a location to remain attractive, firms have to continue to innovate and adopt new techniques, otherwise, the vitality of the agglomeration is reduced and competing clusters develop to become innovative centres, generally spin-offs and attracting inward investment. Many founders in technology-based sectors have little business background.

cite as: Technological Know-How, Entrepreneurship And Sustainable Economic Development In Emerging Economies;Vol.3|Issue 05|Pg:2142-2155

2016

Theoretical Framework

Much of the existing empirical evidence about entrepreneurship viewed the concept in terms of employment generation, character-traits of successful entrepreneurs and psychology of owner-managers (Wever, 2000). Research studies on entrepreneurship as a catalyst for economic development in emerging economies are sparse and fragmented. Scholars argue that economic development lacks a "general theory" of entrepreneurship and is a multidimensional approach. Available related research studies indicated that entrepreneurship plays significant role in economic development, innovation and poverty alleviation in developed economies. Regrettably, it is least studied in emerging economies (Acs & Audretsch, 1990).

Carree VanShuteel and Thurrik (2002) stated that in the theory of economic development, Joseph Schumpeter emphasized the role of the entrepreneur as prime cause of economic development and described how the innovating entrepreneur challenges incumbent firms by introducing new inventions that make current technologies and products obsolete. This process of "creative destruction" is the main feature of Schumpeter "Mark 1 regime". Continuing, the authors stressed that in capitalism, socialism and democracy, Schumpeter focused on innovative activities by large and established firms and described how large firms out-performed their counterparts in the innovation and appropriation process through strong positive feedback loop. This is what Schumpeter called "Mark 2 regime".

In this study, the theory of economic development using entrepreneurship as a tool for sustainable economic development was the focus of this section. The concepts of entrepreneurs, entrepreneurship and entrepreneurial process were discussed from the behavioural point of view of entrepreneurs.

Personality Approach. Personality theory is often loosely defined in terms of irregularities n actions, feelings and thoughts that are characteristic of the individual. There is supposed to be a set of characteristics or traits that stable across situations and time. This presumes that one hopes to find an entrepreneurial personality profile that can help to better understand which characteristics that lead to success and which to failure. Such personality characteristics could be financial risk, exposure of venture capitalist and could be limited by giving them effective selection instrument. It may be possible to encourage those with the winning personalities to engage in an entrepreneurial career (Audretsch, Thurick, Verhuel and Wennerkers, 2002).

Mellers and Stenberg (2004) observe that there are individual characteristics that are supposedly related to entrepreneurs and their intention to pursue an entrepreneurial career. The characteristics are:

- Risk-taking propensity
- Need for achievement
- Locus of mind
- Over optimism
- Desire for autonomy

The first four concepts; risk-taking, need for achievement, locus of control and over-optimism are closely related to each other as they affect our decision-making under risk and uncertainty. The fifth concept is closely related to the choice of becoming an entrepreneur as autonomy and freedom are often quoted as among the most important reasons to start a business.

Risk-taking propensity. According to economic theory, one of the important roles of the entrepreneur is the role of economic risk-taker or risk-bearer of the economic system. (Buchanan & DiPierro, 1980; Carrillo, 2002; Meyer, 1988). Research findings indicated that there is no significant differences between entrepreneurs and

others when measuring risk propensity. In addition, empirical results on examining tolerance for ambiguity which is a concept related to risk-taking revealed that entrepreneurs have somewhat greater degree of tolerance than managers. Tolerance of ambiguity is an emotional reaction to ambiguity and uncertainty, and low tolerance results in stress and unpleasantness in a complex situation. Individuals with high tolerance on the other hand, find such situations desirable and challenging. The conclusion was that individuals with high tolerance would expose themselves to high risks than individuals with low tolerance who prefer well-understood situations, that is risk-taking is dependent of the situation (Peacock, 1986; Shane & Venkatraman, 2000). Health and Tversky (1991) and Cooper (2005) disagree and argue that individuals take considerably more risks in situations in which they feel competent; and that risk-taking is extremely dependent on either a perception of the situation or if decision-makers perceive themselves as experts in the field.

The search for the entrepreneurial personality stumbles upon several problems such as inconsistency, static nature of entrepreneurial characteristics, obsolescence and bias in performance rating. The inability to handle these problems in the field of entrepreneurship has led to the abandonment of the attempts to identify a single trait.

Social Psychology Model. Research attention has shifted to social psychology models characteristics and social contexts that appear to understand entrepreneur and also defining entrepreneurship and understanding how an entrepreneur performs. This approach assumes that entrepreneurs are homogeneous groups, but this is not so as individuals would start businesses for different reasons. Examples, some are only interested in having an extra income in addition to paid job while others may only want to create business large enough to support them and their

families. There may also be others who want to create a fast-growing expanding business. More recent and complex approach to the study of entrepreneurs and entrepreneurship is that the terms, (entrepreneur and entrepreneurship) could be studied at various states of an entrepreneurial venture development and that entrepreneurs as a group are very heterogeneous. The striking feature of this approach is that research moved towards trying to explain the performance of the enterprise by examining the link between different personality characteristics of the entrepreneurs and contingency variables such as of the firm, industry affiliations and government policies.

Available related literature revealed that social psychology models are still weak, that the performance of a firm is not determined by a simple criteria but through a complex measure such as survival of firm, firm growth and firm profitability. These performance measures can be operationalized in a number of ways, thus adding to more confusion To remove this drawback led to the use of distal and proximal factors affecting individual's behavior. A **distal factor** explains general behavior such as, eating, sleeping, sex drives and these distal factors have little ability to explain how individuals act in a specific situation. A **proximal factor** looks at factors defining the situation in which the individual took action or performed. Proximal factors explain actual behavior such as task characteristics (Ackerman & Humphrey, 1990; Campbell, 2003). Stenberg (2004) and Baron (1998) however, posit that the failure of the above stated theories led to **Cognitive approach.**

Cognitive approach try to explain behavior by individuals perceiving and interpreting the information around them. Cognitive theories are better able to explain the complexity inherent in entrepreneurial behavior and these theories assume that individuals do not possess a perfect knowledge of the world (environment) as there

are too much information to grapple with. As a result, these information have to be selected, sieved, analyzed and interpreted based on previous experience. Example, a situation that is perceived as business opportunity for one person may be seen as an enormous problem. Taylor (1998) observe that individuals are actively involved in the construction of their own realities. Cognitive theories enable a better understanding of why people engage in an entrepreneurial behavior and this may lead to understanding of the interaction between characteristics of the situation and characteristics of the entrepreneur. Behavioural patterns are the product of two psychological processes – selection of environments and through the production of environment. The available related literature summarized that the question of who is an entrepreneur and what drives the individual to be entrepreneurial should be addressed using complex model called cognitive motivation theories. These theories provide a good support to understand the choices made by entrepreneurs, such theories are easy to operationalize and have proven validity. Entrepreneurial behavior should be regarded as the consequences of Person-situation interactions.

Schumpeter's theory of innovation "creative destruction". Schumpeterian entrepreneurs are mostly found in small enterprises, who establish autonomous firms that are change-agents and by their action creatively destroy existing markets and structures (creative destruction). Through this economies have leveraged economic development.

Theory of development used was theory of stagnation (Traditional and modernization.) This theory used various models to indicate how subsistence or traditional economy migrated to modern economy using entrepreneurship as a tool for sustainable economic development (Galar & Moar, 2002 citing Louis 1954).

Empirical Studies

Gala and Moar (2001) examined the impact of technology on sustainable economic development in Organisation for Economic Co-operation and Development (OECD) countries. The explanatory variables were telecom businesses, hi-tech firms, internet access. The method of study was expost facto design using Cross-country panal data from Global Entrepreneurship sample of 2002. The research finding was that technology has positive significance on sustainable economic development.

Lenzner (2010) and Ruchir (2012) carried out a survey to assess the effect of ICT on economic development in developing economies using 20,000 business in 50 developing countries. The variables of the study were Computer usage, access to internet ICT compliance. The findings showed that ICT has co-integration effect on economic development.

More so, Willian and Sawyer (2005) carried out a comparative analysis of 202 ICT innovations to understand the effect of the use information technology on entrepreneurship in developing economies; and the variables in the study were mobile payments e-banking, e-health, e-education. Findings from the Panel analysis showed that technology innovation have positive impact on socio-economic development.

The Gap

The relationship between entrepreneurship and economic development is embedded in several strands of theoretical, empirical and conceptual literature based on advanced economies. The review has shown that available related literature on the effect of Entrepreneurship on sustainable economic development is sparse and fragmented and has not been adequately researched in the context of emerging economies. The existing literature on entrepreneurship and economic

development are based on affluent/wealthy economies (Ciccone & Matsuyama, 1996; Pereira, 2007). This study aimed to bridge the gap and extend the frontiers of knowledge by studying entrepreneurship for sustainable economic development in emerging economies using quantitative tools to investigate country-specifics of economic variables in Nigeria, Malaysia and Brazil.

3.0 METHODOLOGY

Nature and Sources of Data Collection

This study employed the secondary data sources from the World Development Indicators (WDI, 2013). The data covered macroeconomic variables for Nigeria, Brazil and Malaysia covering 25 years (1989 – 2013). This period was used because the data on the selected variables are available for all the countries from 1989 till 2013. The series are expressed in US dollar currency. The variables used in this study included the variables of entrepreneurship education which served as the dependent variable and the variables of sustainable development as the explanatory (independent) variables. As all the data (variables) were collected from the World Development Indicator (WDI), the description to these variables is in line with those of the WDI metadata indicator source notes.

Model Specification

The model is premised on the theoretical postulation that Technology Know-How encourages entrepreneurial growth. The empirical model developed to capture this relationship is adapted from the work of (Brower, 2002). The function relationship can be written as follows:
EG = f(ICT, HI-TECH)

$$(1)$$

In this relationship, EG is the dependent variable while ICT and HI-TECH are the variables of

Technology know-how which are the independent variables. The equation can be rewritten as follows:

$$EG_i = d_{0i} + d_1 ICT_i + c_2 HI\text{-}TECH_i + \mu_i$$

$$(2)$$

Where:

EG = entrepreneurship growth

ICT = Information, communication and technology service exports as % of service exports

HI-TECH = High-technology exports as percentage of manufactured exports

The (i) in each coefficient represents the individual countries included in the study, viz, Nigeria, Brazil and Malaysia. μ is the error term. The coefficients are represented with d_0, d_1 and d_2, which capture the relationships that exist between the dependent and the independent variables. d_0 is the constant. The appriori expectation of the model is that entrepreneurship should have positive relationship with sustainable development.

Techniques for Data Analysis

The analytical tools used were co-integration technique and ordinary least square regression technique. The analyses involved country-specific study. The study employed country by country analyses for comparison of the country situations.

DATA ANALYSIS AND INTERPRETATION

Statistical Properties of the Variables

Table 1 described the statistical properties of the variables for Nigeria, Brazil and Malaysia respectively. The table provides analyses of the mean, median, standard deviation, maximum and

minimum as well as the Jarque-Bera statistics of each variable, for each country. The employed variables presented in Table 4.1 included Entrepreneurial growth (EG), Information and Communication Technology (ICT) service exports as percentage of service exports (ICT), and High-technology exports as percentage of manufactured exports (HI-TECH). The means and standard deviation of the variables are interpreted to explain the characteristics of the variables for analyses. The mean, median and standard deviation of the variables (EG, ICT and HI-TECH) suggest that the variables are well behaved. The probability values of the Jarque-Bera Statistics as presented in the table show probability greater than 5% level which indicate that they are normally distributed. This suggests that the variables employed in this study are normally distributed. All the employed variables have 25 data point observations which means that the thesis is a long term study.

Table 4. 1: Summary Statistics Properties of the Variables Employed

	NIGERIA			BRAZIL			MALAYSIA		
	EG	COM	POW	EG	COM	POW	EG	COM	POW
Mean	0.63	2.32	1.90	1.74	10.20	45.22	2.33	21.81	48.07
Median	0.59	2.19	1.13	1.75	11.21	42.97	2.29	19.48	46.12
Maximum	0.99	4.39	13.39	2.76	19.24	55.75	2.84	29.36	59.57
Minimum	0.25	1.43	0.02	0.54	3.95	32.64	1.64	16.87	38.21
Std. Dev.	0.22	0.72	2.82	0.58	4.28	6.28	0.22	4.39	7.67
Jarque-Bera	1.79	22.44	143.08	0.50	0.83	0.41	13.56	3.13	2.41
Probability	0.41	0.00	0.00	0.78	0.67	0.82	0.00	0.21	0.30
Observations	25	25	25	25	25	25	25	25	25

Unit Root/ Stationarity Test

The variables employed in the analysis are tested for stationarity using two unit root tests, namely, Augmented Dickey-Fuller test and Phillips-Perron test, to determine whether they are stationary or non-stationary series. The two tests are employed to reinforce one another, to ensure their robustness and boost confidence in their reliability. The tested null hypotheses for both unit root tests are the presence of a unit root. The results of the unit root tests as presented in Table 4.3 for Nigeria, Brazil and Malaysia respectively. The interpretation of the unit root result is done below. All the variables for Nigeria are stationary at 5% at level (for HI-TECH), first difference (EG and ICT). For Brazil, the variables are stationary at 5% in their first difference for EG, ICT, and HI-TECH. For variables in Malaysia, EG is stationary at level. while ICT and HI-TECH are stationary at first difference. As most of the variables are stationary at first differences, this implies that the variables do not have unit roots at least, in their first differences and at 5% level of significance.

cite as: **Technological Know-How, Entrepreneurship And Sustainable Economic Development In Emerging Economies;Vol.3|Issue 05|Pg:2142-2155**

2016

Having established that, at most, all the variables in all cases of Nigeria, Brazil and Malaysia were stationary at first difference or 1(1). We then applied the Johansson co-integration to determine presence of long run relationship in the models.

Table 2: The Unit Root Test Results for the Selected Variables

Variables		Augmented Dickey-Fuller test	Phillips-Perron test	Conclusion
	Nigeria			
EG	Level	-3.400512**	-2.979960	1(1)
	First Diff	-5.366556*	-4.630019*	
ICT	Level	-2.636808	-4.040082*	1(1)
	First Diff	-4.837366*	-8.186790*	
HITECH	Level	-4.393866*	-5.825297*	1(0)
	Brazil			
EG	Level	-2.449503	-2.117711	1(1)
	First Diff	-5.291412*	-6.561968*	
ICT	Level	-2.114129	-1.566611	1(1)
	First Diff	-3.357645**	-2.789008***	
HITECH	Level	-2.130651	-1.803892	1(1)
	First Diff	-3.183698**	-5.350340**	
	Malaysia			
EG	Level	-4.585180*	-5.999559*	1(0)
ICT	Level	-1.214201	-2.011618	1(1)
	First Diff	-3.718617**	-6.435705*	
HITECH	Level	-1.299138	-1.347158	1(1)
	First Diff	-3.740311**	-4.744983*	

Notes:

- The null Hypothesis is the presence of unit root. All unit roots analyses included a constant (no linear trend). *, **, *** denotes significance at 1%, 5% and 10% respectively.
- For ADF test (Lags were selected based on Modified Schwartz Information Criterion for all variables); for PP test (The Bandwith was chosen using Newey-West method with Barttlet Kernel spectral estimation.)
- The Critical values for ADF test are -3.7497 (1%); -2.9969 (5%) and -2.6381 (10%) at level; and -3.7667 (1%); --3.0038 (5%) and -2.6417 (10%) at first differences
- The Critical values for PP test are -3.7343 (1%); -2.9907 (5%) and -2.6348 (10%) at level; and -3.7667 (1%); --3.0038 (5%) and -2.6417 (10%) at first differences
- Decision rule -The critical value should be larger than the test statistical value for unit root to exist

Tests for Co-Integration

Co-integration tests are carried out to ascertain the existence of long run relationship among the variables employed for each model. The results of the cointegration analyses were validated using the Johansen (1991, 1995) approach. The Johansen's framework provides a number of

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2016

cointegrating equations and estimates of all
cointegrating vectors in the multivariate cases.

Table 4.3 Test of Co-integration among EG, ICT, HITECH

Hypothesized No. of CE(s)	Likelihood Ratio			Critical Values	
	Nigeria	**Brazil**	**Malaysia**	5 Percent	1 Percent
None	42.52250*	31.49654*	39.07154**	29.68	35.65
At most 1	14.55281	17.33962*	13.06510	15.41	20.04
At most 2	5.422484	5.737299&	4.312252	3.76	6.65

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
For Nigeria: L.R. test indicates 1 cointegrating equation(s) at 5% significance level
For Brazil: L.R. test indicates 3 cointegrating equation(s) at 5% significance level
For Malaysia: L.R. test indicates 1 cointegrating equation(s) at 5% significance level

The presence of long run relationship between Entrepreneurial Growth and Technology Know-How in Emerging Economies is investigated with the Johansson Cointegration Technique. The variables of the model are EG, ICT, HI-TECH. The results of the cointegration test for Nigeria, Brazil and Malaysia are shown on Tables 4.14, 4.15 and 4.16 respectively. The Likelihood Ratio statistic indicates that the model as one (1) cointegration equation for Nigeria and Malaysia; and two (2) cointegration equation for Brazil. This indicates that there are long run relations among the variables employed in the model. Thus, the study concludes that there is a long run relationship between Entrepreneurial Growth and Technology Know-How in Emerging Economies.

Table 4: Estimated Results of the OLS Regression for Entrepreneurial Growth and Technology Know-How Model in Nigeria, Brazil and Malaysia

Variable	Nigeria Coefficient	Brazil Coefficient	Malaysia Coefficient
ICT	0.127725**	0.036226*	-0.007081
HI-TECH	-0.030001**	0.077513*	-0.004435
C	0.388809*	-2.130174	2.698168**
R^2	0.675983	0.921728	0.046422
F-stat.	6.627713*	129.5363*	0.535504
D-W stat.	1.845417	1.612941	1.999590

Dependent Variable: EG

Note: * denotes significant at 1%, ** denotes significant at 5%; *** denote significant at 10%

The report of the Entrepreneurial Growth and Technology Know-How Model, specified to capture the effect of entrepreneurial growth on technology know-how in emerging economies (of Nigeria, Brazil and Malaysia) is presented in Table 4.20. The result of the model as presented in the table show that ICT has positive, while HI-TECH has negative effect, on entrepreneurship growth in Nigeria. This indicates that a one percent increase in ICT leads to 12.77% increase

in entrepreneurship growth in Nigeria. On the contrary, a one percent increases in HI-TECH leads to 3% fall in entrepreneurship growth in Nigeria. Both variables (ICT and HI-TECH) are statistically significant at 5% level.

For Brazil, both variables of technology know-how (ICT and HI-TECH) have positive effect on entrepreneurial growth. This means that a percent increase in ICT contributes 3.62% and HI-TECH contributes 7.75% to entrepreneurship growth in Brazil. The result showed that ICT and HI-TECH have statistically significant effect on entrepreneurial growth in Brazil.

The coefficient in Malaysia indicate that both variables of technology know-how (ICT and HI-TECH) have negative effect on entrepreneurial growth. This means that a percent increase in ICT decreases entrepreneurship growth by 0.07% in Brazil. Likewise, one percent increase in HI-TECH decreases entrepreneurship growth by 0.04% in Malaysia. The result further showed that ICT and HI-TECH does not have statistically significant effect on entrepreneurial growth in Malaysia.

The coefficients of determination (R^2) for the model are 0.675 for Nigeria, 0.922 for Brazil and 0.046 for Malaysia. The result indicates that 67.5% of changes in entrepreneurship growth in Nigeria are explained by the model. For Brazil, about 92.2% is explained and only 4.6% explained in Malaysia.

The F-statistic at 5% significance indicate that technological know-how has significant effect on entrepreneurial growth in Nigeria and Brazil. In Malaysia, that technological know-how does not have significant effect on entrepreneurial growth.

Summary, Conclusions and Recommendations

Technological-know-how has significant positive effect on entrepreneurship in Nigeria and Brazil

but negative insignificant effect in Malaysia. There is a long run relationship between Entrepreneurial Growth and Technology Know-how in Emerging Economies. At 5 percent significance, OLS result revealed that technological know-how has significant effect on entrepreneurial growth in Nigeria and Brazil, but in Malaysia. The theory of economic development stressed that human society strived to transform itself from subsistence to modern economy through rapid change in technology based on physical and human capital accumulation (Hansen and Prescott 2002). Nelson and Pack 1999 used dual economy model to reveal that determinant of transformation of any economy is the rate of assimilation of technology, examples; Korea and Taiwan characterized by "craftsectors transformed to modern sector based on technology.

Sustainable economic development needs to be created through initiatives and policies that would encourage small enterprises because of their innovativeness and flexibility. Computer villages/clusters should be harnessed and given incentives. There should be positive stimuli for technological transformation. The tempo of emerging economies expanding at extra ordinary rates should be sustained, through economic liberalization which would make emerging economies ultimate destinations for foreign investments. Entrepreneurship starts and accelerates economic development and this serves as springboard to sustained economic development in emerging economies.

Hi-tech can help revolutionize the way people in emerging economies conduct their daily lives and business activities. Connectivity to internet should provide people in emerging economies with basic financial services, access to credit for start-ups, information to basic health, provision of educational materials and total transformation of the economies (Aronson 2002).

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