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EFFECTS OF TECHNOLOGY SERVICES ON THE GROWTH OF INCUBATED MICRO AND SMALL ENTERPRISES IN KENYA

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ABSTRACT
Micro and Small businesses are key players in Kenya's economy. While small businesses have been susceptible to high failure rates, there exists resurgence in the survivability of small businesses. One of the reasons for this paradigm shift can be attributed to the advent of business incubators. This study sought to shed light about the effects of technology services offered by incubators on the growth of MSE in Kenya. The research design was descriptive resulting in both qualitative and quantitative data. A sample of 128 incubatee businesses from the target population of 189 governments, private and institutional incubator businesses in Nairobi County was selected using systematic random sampling. A pilot test was also carried out to test the validity and reliability of the research instruments. Data was tabulated and analyzed using descriptive statistics and multiple regression analysis to show the relationship between the independent variables as well as their effects on the dependent variable. Statistical package for social science (SPSS) version 20 was used in data analysis. The study findings show that technical skills contribute to a moderate extent on the growth of MSEs in Kenya. The study Recommendations is that, Incubators should act as entrepreneurship and technological information hubs and consider themselves as service providers and partner with the academia, NGOs, churches and youth entrepreneurship programs.
Keywords: Entrepreneurship, Business Incubation, Technology services, Growth and Micro and Small enterprises.

INTRODUCTION

Technology is hereby defined as knowledge that contributes to the creation, production and improvement of economically and socially useful products and services. Such knowledge thus relates not only to physical artifacts but also to forms of organization for their production, distribution and use (Arnold &Thuriaux, 1997). Science and technology are essential tools in meeting development goals, especially those contained in the United Nations Millennium Declaration (UNSC, 2009). Science, Technology and Innovation (STI) activities have been one of the driving forces of economic and social change for many decades and even centuries. Similarly, STI activities have accelerated growth and brought about social change through the movement of people, goods and services and an increased capacity to generate, transmit and use STI knowledge (OECD, 2006). Science, technology and innovation are important and necessary to increase competitiveness, prosperity and quality of life. STI is used to mean the generation, use

and diffusion of forms of useful knowledge as well as the evolution of associated institutional arrangements (OECD, 2006; Gault, 2008). Technology change is at the heart of development worldwide.

Schumpeter identified innovation as the critical dimension of economic change. He argued that economic change revolves around innovation, entrepreneurial activities, and market power. The process of creative destruction was described in the writings or Joseph Schumpeter (1928, 1942) and refers to the endogenous introduction of new products and/or processes. He sought to prove that innovation-originated market power could provide better results than the invisible hand and price competition. He argues that technological innovation often creates temporary monopolies, allowing abnormal profits that would soon be competed away by rivals and imitators. He also added that these temporary monopolies were necessary to provide the incentive necessary for firms to develop new products and processes. However, Jones (1995) argued that earlier Schumpeterian growth models incorporate a scale-effects property: The rate of technological progress is assumed to be proportional to the level of Research and Development (R & D) investment services (which in turn are produced with a standard constant-returns-to-scale production function).

The development of scale-invariant Schumpeterian growth models draws legitimacy from three important considerations: First, the scale-effects property embodied in earlier models yields the counterfactual prediction that increasing R&D inputs generate higher long-run growth. This prediction is inconsistent with time-series evidence from several advanced countries. Second, in the presence of positive population growth, models with scale effects generate infinite per capita long-run growth. This is clearly unsatisfactory for researchers who are interested in analyzing the long-run properties of growth models. Third, scale-invariant growth models represent another important step towards a unified growth theory that combines the robustness and empirical relevance of the neoclassical growth model and the Schumpeterian mechanism of creative destruction.

Micro and Small Enterprises (MSEs) play an important role in the development of a country. MSEs contribute to the economic development in various ways: creating employment for the rural and urban labour force; providing desirable sustainability and innovation in the economy as a whole. MSEs have their significant effect on the social income distribution, tax revenue, and employment, efficient utilization of resources and stability of the family income (Fida, 2008).

The Kenya Government has widely recognized that Micro and Small enterprises (MSE's) play a very important role in economic growth and development of a country, (RoK, 2005). In reaction to this, The Kenya Government plan of action is to develop mechanisms to promote business incubation for the small enterprise sector as a strategy to enhance skills and technological capacity (RoK, 2005). In this connection Kenya's vision 2030 flagship projects plans are ready to establish Konza city popularly referred to as silicon savannah. In addition, 47 MSE parks will be established in all counties in Kenya (RoK, 2005). The main reason for this is that in Kenya, employment within the MSEs accounted for 74.2% of total employment and contributes up to 18.4% of the country's gross domestic product. However, in Kenya like in many developing countries, the survival rate for start-up business is only between 10-20% (Kekobi, 2005).

According to Freeman (1982) innovations is the range of organizational activities associated with moving from the conception of an idea to a product or service offered for sale in the market place. This is indeed the genesis of business incubation in Kenya as many of them target spin-offs and spin-outs of academic and research institutions to commercialize inventions and innovations from such institutions. According to research findings on the role of Technology business incubators (TBI's) in helping the new technology-based firms' innovation capacity as new technology-based firms make significant economic growth in the creation of new jobs as well as catalyzing technology and knowledge accumulation (Lewis,2008).

STATEMENT OF THE PROBLEM

In Kenya Business incubation is regarded as an intervention measure to speed up industrialization through commercialization of inventions and innovations. The Ministry of Trade, Export Processing Zone and Department of Micro and Small Enterprise Development plan is to promote business incubation. Similarly, Kenya's vision 2030 flagship projects plans are ready to establish ICT incubators in Konza city popularly referred to as silicon savannah and Nairobi Industrial Technology Park as a joint venture with Jomo Kenyatta University of Agriculture and Technology. In addition, 47 SME parks will be established covering the 47 counties in Kenya (RoK, 2005).

According to Kinoti and Miemie (2011), incubation services provided by incubators in Kenya fall short of incubatee firms' expectations. Disparities of services exists from one incubator to another mainly driven by need for incubator profit. In Kenya, study show that 53.2% of incubated businesses had started from outside the incubator; 36.3% had begun as start-ups in the incubator. Further analyses of the findings, showed that at the time of the field study, 79% of the businesses were residing in the incubator (Kinoti&Miemie, 2011). This shows incubatees preference of operating within the incubator environment and hence incubation growth in Kenya has taken an upward trend. This study therefore sought to find out the effects of technology services offered by incubators on the growth of MSEs in Kenya

Objective

This study sought to establish the effects of technology services offered by incubators on the growth of MSES in Kenya. The specific objectives are:

i. To establish the effects of technology development by incubators on the growth of MSEs in Kenya.
ii. To establish the effects of patenting offered by incubators on the growth of MSEs in Kenya.
iii. To establish the effects of equipment and tools offered by incubators on the growth of MSEs in Kenya.

Scope of the Study

The scope of the study included all business and technology incubators involved in supporting MSEs in Kenya. This considered in-house incubatees that draw services directly from the incubator. According to Lewis (2008), some incubation programs both operate "within the walls" and also deliver entrepreneurial support services to offsite client firms referred to as virtual clients. This is typically referred to as incubation "without walls" or virtual incubation. The researcher assumed that most incubatee enterprises in Kenya are mostly Micro and Small Enterprises hence the scope. "Small Enterprises" are those enterprises employing 1-49 workers and "Micro- enterprises" are those that employ 1-9 workers, (RoK 2005). The key respondents included the Incubatees who deal with the daily operations of their businesses and were useful in articulating their business growth facts emanating from technology services. The incubatees interviewed yielded information about technology services provided by the incubators which constitute the variables of this study.

LITERATURE REVIEW

Incubators are of basic importance in the process of establishing links between research and business (i.e. transfer of technology from universities to industry). They provide support services to start-up firms, "temporarily'; enabling young entrepreneurs with a scientific background to build up their business management know-how and develop their innovative businesses. In 1996, these firms employed a total of 278 people and were responsible for creating a total, including spin - off effects, of 467 jobs in their respective communities, which added $10.1 million to local personal income in 1996. 87 percent of the firms that had graduated from incubators were still in operation in 1996 (Sherman & Chappell, 1998).

DeTienne, and Chandler (2007) identified that entrepreneurs who have been trained in certain business areas are more likely to start new ventures in the area of training and thus entrepreneurs who have been educated and trained in high technology and have received an additional business education are more likely to recognize business opportunities in the technology-oriented sectors of the economy. According to Steward and Gorrino (1997), MSEs are always highly dependent on external knowledge sources, and technological innovation is important for a small firm.

An enabling environment is an opportunity that should be utilized by the small enterprises in Kenya. With changing governments, which come with promises of a better tomorrow and definition of new business policies, reconstruction of economy, improvement of infrastructures and security, small businesses are expected do well (King& McGrath 2002). However, for MSEs to fully develop and use this potential, they need specific policy measures to ensure that technology services and infrastructure are provided. Further, research and development institutions that are publicly funded should be encouraged to target the technology needs of MSEs (Ngahu, 2000). Rothwell, (1999) believes that the innovative advantages of small firms are derived from their flexible managerial structures, which are more responsive to changes in the market place. Freeman (1982) pointed out that the innovation is the range of organizational activities associated with moving from the conception of an idea to a product or service offered for sale in the market place.

Storey (1982) pointed out that for every Racal, there are probably several thousand small firms who have no wish to innovate, and a great deal more who are incapable of doing so. Fast-growth firms are started and run by motivated and capable entrepreneurs, or fliers, while a low-performance firm is conversely associated with trundles (Storey 1994). SMEs are said to face a "liability of smallness." Because of their size and resource limitations, they are unable to develop new technologies or to make vital changes in existing ones. Still, there is evidence that MSEs have the potential to initiate minor technological innovations to suit their circumstances (Ngahu, 2000).

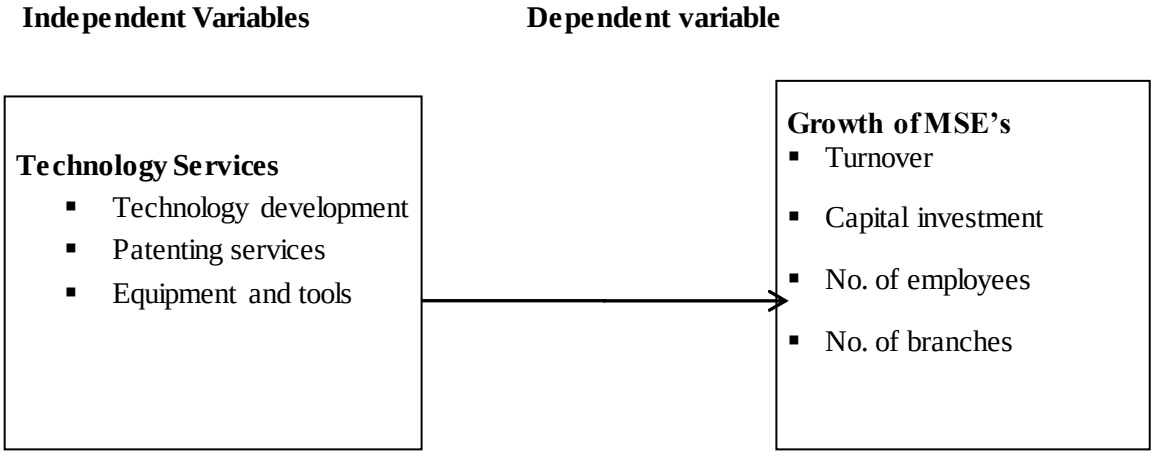

Figure: 1 Conceptual Framework

RESEARCH METHODOLOGY

This study adopted a descriptive research design which yielded both qualitative and quantitative data in order to interpret the relationship of technology services and the growth of SMEs. According to Mugenda and Mugenda (2012), research design describes how the research strategy addresses the specific aims and objectives of the study, and whether the research issues are theoretical or policy-oriented. The study population included all business incubators involved in MSE sector in Kenya and the sample was drawn from Nairobi County. To enhance validity and reliability of research instruments, a pilot test on 5 percent of the population frame who qualifies but excluded from the final study was carried out to pre-test the research instruments. For high precision pilot studies, 1% to 5% of the sample should constitute the pilot test size (Lancaster, Dodd, Williamson, 2010). In this study, 5 percent of 189 incubatees participated in the pilot study; which is 10 incubatee businesses. The population of public incubators which includes Universities and research institutions were 67 incubatee businesses. The private incubators population comprised of 122 incubatees making the total population as 189 incubatees. Each stratum was properly represented so that the sample size drawn from the stratum was proportionate to the stratum share of the total population as indicated in the sampling frame below. This approach is more applicable to this research because it has a higher statistical efficiency and it is much easier to carry out, Zikmund (2010).

Table 1: Sample of the Study

Category	Population	Calculation	Sample
Public enterprises	67	(127/189) x 67	45
Private enterprises	122	(127/189) x 122	82
Total	189		127

Primary data was obtained from incubatees owning enterprises as key informants and derive various incubator services that constitute the objectives of the study by use of semi-structured questionnaire. Secondary data sources included books, documented research, journal articles, and electronically stored information (internet). In data analysis, the questionnaires were examined, cleaned and sorted to ensure that all the relevant data is coded, categorized and stored for analysis using statistical package for social science (SPSS) Version 20 computer software. Data on variables was analyzed using descriptive statistics which included measures of central tendency, measures of dispersion and measures of association.In this case measures of central tendency showed the distribution of the data around the common expected relationship of technology services and the growth of MSE's. Analysis of Variance (ANOVA) was used to analyze the degree of relationship between the variables in the study. Relationships between variables were established through multiple regression analysis.

From the conceptual frame work, the statistical model was developed. In this case business growth being the dependent variable takes the variable [Y]. The coefficients of the independent variables x_1, x_2….x_3 are significant in showing the rate of how the independent variables affect the dependent variable. Data was analyzed using the following statistical models;-

$$\mathbf{Y=\beta_{0+}\ \beta_1x_1+\ \beta_2x_2+\ \beta_3x_3+e}$$

Where

Y= Growth of MSEs

$\boldsymbol{\beta_0}$ = coefficient of Intercept

$\boldsymbol{\beta_1}$..... $\boldsymbol{\beta_3}$ = regression coefficients of independent variables

$\mathbf{x_1}$ ..... $\mathbf{x_3}$ = independent Variables (Technology development, patenting services, equipment and tools).
e = Error term

RESULTS AND DISCUSSION

Table 2: Incubator Technology Services

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Has the incubator technology development improved your product design and process?	.0%	.8%	4.1%	69.9%	25.2%
Has availability of equipment and tools increased you production efficiency?	.0%	.0%	2.4%	53.7%	43.9%
Do patenting and copyrights services affect your competitive advantage?	.0%	8.9%	17.9%	60.2%	13.0%
Do you think assistance in product design is adequate	.0%	4.1%	43.1%	37.4%	15.4%
My business has received enough received enough guidance in production methods	.0%	9.8%	7.3%	75.6%	7.3%
Patenting and copyrights assistance is effectively provided by the incubator	.0%	11.4%	57.7%	18.7%	12.2%
Important Equipment and tools are lacking in the incubator	.8%	81.3%	4.1%	9.8%	4.1%
Average	**0.11%**	**16.61%**	**19.51%**	**46.47%**	**17.30%**

As shown in Table 2, incubator technology development improved the product design and process of 95.1%, (69.9% agreed and 25.2% strongly agreed). Similarly, 53.7% and 43.9% of the respondents agreed that availability of equipment and tools increased their production efficiency.
Patenting and copyrights services were found to affect the competitive advantage of 73.2% while this did not affect 8.9% of the respondents. Another 17.9% of those who responded were not sure of this. When adequacy in assistance product design was measured, 4.1% disagreed, 37.4% agreed and 15.4% strongly agreed that assistance in product design was adequate. Those who were not sure were very high, at 43.1%. 75.6% agreed that their businesses have received enough guidance in production method, another 7.3% strongly agreed to this. 9.8% disagreed while 7.3% were not sure.
Patenting and copyrights assistance was effectively provided by the incubator to a small percentage of the respondents (18.7% agreed and 12.2% strongly agreed). 11.4% disagreed that patenting and copyright assistance was effectively provided by the incubator. For this question, those who were not sure were very high at 57.7%. Most of the respondents 81.3% disagreed that important technological services were lacking in the incubator. A total of 13.9% either agreed (4.1%) or disagreed (9.8%) that important technological services were lacking in the incubator. This clearly indicates that incubators are keen on offering technology solutions to their clients cushioning them from start-up financial crisis since most technologies are expensive. Technology services in an incubator also include training on technology adaptation, use and the logistics of property protection.

On average 0.11% of the respondents strongly disagreed with the statements provided on Incubator Technology 16.61 disagreed,19.51% were not sure, 46.47% agreed with the statements while 17.30% strongly agreed with the statements provided on Incubator Technology. This shows that there is a strong relationship of technology services and the growth of SMEs (63.77%) probably because most of the incubators are technology-based and have an innovation catchment from institutions spin-offs. DeTienne, and Chandler (2007) identified that entrepreneurs who have been trained in certain business areas are more likely to start a new ventures in the area of training and thus entrepreneurs who have been educated and trained in high technology and have received an additional business education are more likely to recognize business opportunities in the technology-oriented sectors of the economy.

Linear regression Model of growth of MSEs in Kenya / Technology Services

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657[a]	.431	.426	3.21899

a. Predictors: (Constant), TECHNOLOGY SERVICES

Table 4: ANOVA[b]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	950.391	1	950.391	91.720	.000[a]
	Residual	1253.791	121	10.362		
	Total	2204.182	122			

a. Predictors: (Constant), TECHNOLOGY SERVICES

b. Dependent Variable: GROWTH

Table 5: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.558	1.399		3.973	.000
	TECHNOLOGY SERVICES	.899	.094	.657	9.577	.000

a. Dependent Variable: GROWTH

Table 3 shows the linear regression analysis model of the relationship between the dependent variable which is growth and independent variable which is Technology Services. The coefficient of determination (R^2) and correlation coefficient (r) shows the degree of association between Technology Services and growth of MSEs in Kenya. The results of the linear regression indicate that R=.431 and R^2= .426 this is an indication that there is a positive relationship between Infrastructure and Facilities and growth of MSEs in Kenya.

Table 4 shows the results of ANOVA test which reveal that Technology Services have significant effect on growth of MSEs in Kenya. Since the P value is 0.000 which is less than 5% level of significance. This is depicted by linear regression model Y=B0+BX+e where X is the Technology Services the P value was 0.000 implying that the model Y=B0+ BX+e was significant.

Tables 5 show the results of Coefficients. The results help to generate the model technological service and growth Y=5.558+0.899X+e which implies for every unit measure of technological service offered by incubators to the Incubatee it leads to increase in growth of the business by a rate of 89.9%. Technological services offered by incubators such as the incubator technology

development, availing of tools and equipment, patenting and copyright services and guidance in production methods improved product design, competition and production efficiency of businesses. Technological services need to be provided especially to research and development institutes which incubators target since they boast growth.

According to Ngahu (2000), research and development institutions that are publicly funded should be encouraged to target the technology needs of MSEs. Technological services offered by incubators were a great help to incubatees since they personal don't have enough resource to pursue and develop new technologies. SMEs are said to face a "liability of smallness." Because of their size and resource limitations, they are unable to develop new technologies or to make vital changes in existing ones. Still, there is evidence that MSEs have the potential to initiate minor technological innovations to suit their circumstances (Ngahu, 2000).

CONCLUSIONS AND RECOMMENDATION

Since the mid-1990s there has been a growing concern about the impact of technological change on the work of micro and small enterprises. Even with change in technology, many small business entrepreneurs appear to be unfamiliar with new technologies. Although earlier findings on incubatee's perception of incubator services that actual services received fall short of incubatees expectations, this study concludes that majority of incubatees perceive incubator technology services as adequate. These services such as the incubator technology development, tools and equipment, patenting and copyright services and guidance in production methods improved product design, competition and production efficiency of businesses.

The study concluded that the Kenyan government supports SMEs development through provision and dissemination of relevant industry data and publications that enhance innovation in the industry. This has led to the increased growth of SMEs in the country and the spread and growth in the use of the internet have enhanced innovations. Through online interactions, the entrepreneur is aware of what is going on in other parts of the country and the world and is able to innovate. Business incubation programs have facilitated innovations and created synergy among incubatees hence growth of the SMEs in Kenya.

Although it is established that the Kenyan government supports SMEs development, this study recommends that both the National and County governments should collaborate with and support business incubators. In this, the governments should facilitate incubation program success through funding with both financial and technical requirements. Through this, the incubators' availability, accessibility and capacity will be increased targeting spin-offs and spin-outs institutional innovations which will in turn increase the number of incubation graduates in the economy. In addition, Incubators should act as entrepreneurship and technological information hubs and consider themselves as service providers and partner with the academia, NGOs, churches and youth entrepreneurship programs.

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