

Empirical Analysis of Factors Affecting Growth of Technology Based Business Incubators in Kenya: The Case of Kenya Industrial Research & Development Institute (KIRDI)

Eunice M. A. Ayodo

Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya

Abstract

Techno-based incubators have been in Kenya since 1967 to support SMEs in the manufacturing sector and nurture them to grow into medium and large industries. Despite the many years of incubation concept, Kenya has experienced slow growth of techno-based incubators, registering only six notable techno-based incubators, most being institutions of higher learning. Further, despite existence of incubators past statistics show that three out of five businesses including those in manufacturing sector still fail within first few months of operation. This paper is a report of an empirical study carried out to analyze factors influencing growth of techno-based incubators in Kenya from the perspective of an existing technology based incubator at KIRDI. The research was qualitative, using descriptive design and employed a case study approach, based on a census of staff running the four KIRDI incubator centres, in both South B and South C Campuses of the Institution. An interview schedule and questionnaires incorporating Likert-type scales were developed to collect data on the variables. The findings established a strong positive relationship ($r=0.751$) between independent variables and dependent variable, however further analyzed each independent variable has its own weight on the dependent variable.

Keywords: Business Incubation, Technology, Small and Medium Enterprises

1.0 INTRODUCTION

Technology based incubators have been in Kenya since 1967 to provide support to micro, small and medium industries in the manufacturing sector and nurture them to grow into medium and large industries (KIE, 2010). Despite the many years of existence of the technology-based incubation concept, Kenya has experienced slow growth of technology based incubators, registering only six notable technology-based incubators, five of which are institutions of higher learning (BIAK, 2010). Further, despite the existence of the incubators Bowen, Morara and Mureithi (2009) say that past statistics in Kenya show that three out of five businesses including those in the manufacturing sector still fail within the first few months of operation.

The growth of technology based incubators worldwide is inhibited by inadequate leadership skills, infrastructure, and/or access to high risk capital (Allen & Rahman, 1985, Smilor & Gill, 1986 as quoted in Eshun 2009). Oftentimes, the incubator operators possess specialized knowledge but lack general business skills and requisite infrastructure to operate and grow a technology-based incubator (Lyons, 2010). Lack of growth of technology based incubators leads to constrained resources to nurture technology based micro and small industries (MSIs) (KIE, 2010), leaves many technology-based MSIs with little support and hence their death within the first three years of operation (Bowen et al, 2009). This further leads to low rate of new industry generation as well as low value addition making Kenya to sell most of its produce in primary form (GoK, 2009). The slow growth of technology-based incubators and subsequent failure to nurture MSIs to grow to large industries leads to serious socio-economic challenges, such as high unemployment, unequal distribution of wealth, high levels of poverty and insecurity (GoK, 2009). The slow growth of technology-based incubators further leads to stunted growth in the manufacturing sector which employs close to three million people and contributes to 12.5% of Kenya's GDP (Entrepreneurstoolkit, 2010). This phenomenon further makes it difficult for MSIs to graduate into medium and large-scale industries, thus the "missing middle". It also results in a weak base for industrial take off and sustainable development of the country (GoK, 2005).

Despite the proliferation of the business incubator concept, Shane and Venkataraman (2009) say that technology entrepreneurship is still a relatively unexplored topic and for several reasons, there is still limited knowledge

about its growth. In addition, little is known about the success and growth of technology-based incubators in Kenya (Marwanga, 2009), nor is it clear about how technology firms make use of incubation support (Soetanto, 2009). There is hardly any empirical study that has been conducted to determine the factors affecting the growth of technology-based business incubators in Kenya, particular, the KIRDI incubator. It is against this backdrop that this study endeavours to analyze the factors influencing the growth of technology based incubators in Kenya; from the case of the Kenya Industrial Research & Development Institute (KIRDI) incubator.

2.0 LITERATURE REVIEW

A business incubator refers to the social organizational environment while business incubation refers to the programs, activities and events that systematically identify and evaluate new and emerging opportunities with the objective of bringing a community orientation and collective action to improvements in the existing products, processes or the development of totally new products, technologies and new business models (Eshun, 2009). The practice of business incubation is like a metaphor of raising chickens and like a mother hen, the incubators help the new ventures to hatch, grow and leave (Temali & Campitel, 1984).

2.1 Business Incubators

The notion of business incubator was originally derived by Joe Mancuso in 1952 from chick incubation in Bavatia, New York. Since, the heavy-equipment manufacturing was pulled out of Bavatia, he tried to fill the shell left behind by people who would hire other people. A Connecticut based chicken hatchery was one of the first businesses he recruited. Thus was born the Bavatia Industrial Centres (BIC). The idea was to foster the growth of new small businesses that would in turn create new jobs and reinvigorate the local economy. This work led to the new concept called business incubation (Hayhow, 1996).

Different African countries have practiced business incubation programmes in their own capacities, but through the World Bank's support, the African Incubator Network (AIN) was initiated in 2004 as an informal association of incubators in Africa; currently comprising over 100 participants from all over Sub-Saharan Africa. The AIN works to support incubation and other innovative small enterprise development activities in Africa through knowledge sharing, workshops, study visits, and collective advocacy of the need for greater support to small enterprise development (World Bank, 2007).

The history of Incubation in Kenya can be traced back to the mid nineteen sixties, when Kenya Industrial Estates (KIE) Limited was established in 1967 as a subsidiary of Industrial and Commercial Development Corporation (ICDC) with a major role of promoting indigenous entrepreneurship by financing and developing small scale and micro enterprises. KIE was established to facilitate development and incubation of micro, small and medium enterprises (MSMEs) countrywide by establishing industrial parks, providing credit and business development services (BDS) in a sustainable manner. Kenya Industrial Estates is mandated to provide finances, work space, Business Development Services (BDS) and promotions of subcontracting linkages to MSMEs in order to foster the development of indigenous industries countrywide (KIE, 2010).

Several policy declarations have indicated the Government's commitment to addressing issues on entrepreneurship through business incubators. These include section of recent national development plans, Sessional paper No. 2 of 1992 on Jua Kali and the Informal Sector Development, relevant parts of Sessional Paper No, 2 of 1996 on Industrial Transformation by the year 2020 and Sessional Paper No, 2 of 2005 Development of Micro and Small Enterprises for Wealth and Employment Creation for Poverty Reduction. Through these papers a number of Jua Kali sheds have been created in several parts of the country as forms of informal technology based business incubators with the aim of providing entrepreneurs with environments for business development. The management of the Jua Kali sheds (informal incubators) have however been left to the artisans under the umbrella of several Jua Kali Associations.

The most formal modern private business incubator is Kenya Kountry Business Incubator (KeKoBI) which emanated from a grant by the World Bank Group's Information for Development Program (infoDev) in 2004 to establish institutional mechanisms for supporting small enterprise development through ICT-enablement. This

first infoDev grant to plant the ‘seed’ of business incubation in Kenya came through a proposed JKUAT’s Center for Business Innovation (JKUAT-CBI), which evolved and culminated into the establishment of a national umbrella institution with the objective of establishing business incubators countrywide (www.kekobi.or.ke)

According to Business Incubators Association of Kenya (BIAK, 2010) the membership of business incubators in Kenya currently stands at twelve comprising; Ministry of Higher Education Science and Technology (MoHEST), Kenya Industrial Research Development Institute (KIRDI), Kenya Polytechnic University College, Kenya Kountry Business Incubator (KeKoBI), Economic Projects Trust Fund (EPTF), Bridgeworks Africa Limited, Moi Institute of Technology, Catholic Diocese of Nakuru, Kisumu Polytechnic, Sang’alo Technical Training College, Kitale Technical Training Institute, Ramogi Institute Advanced Technology. The member organizations are somewhat involved in business incubation, both formal and informal (BIAK, 2010). Other independent incubators in Kenya include; 1. SACOMA CFE, 2. Strathmore Innovation & Technology Transfer (SITT), 3. Genius Executive Centre, 4. The SME, Solution Centre (SSC) Business Incubator, an IFC initiative designed to accelerate the successful development of entrepreneurial companies through business support resources and services.

Kenya Industrial Research & Development Institute (KIRDI), is a national research Institute under the Ministry of Industrialization. The Headquarters is situated in South C area along Popo Road, Off Mombasa Road. The Institute has other two campuses namely; South B Campus and KIRDI Western Regional Centre (KWRC) – Situated in Kisumu City and coordination offices in Mombasa City and Garissa. As it is today, it was established under the Science and Technology Act, Cap 250 in 1979 and mandated to undertake multidisciplinary research and development in industrial and allied technologies including; Civil Engineering, Mechanical Engineering, Textile Technology, Electrical Engineering, Mining, Power Resources, Chemical Engineering, Industrial Chemistry, Food Technology, Ceramics, Information and Communications Technologies (ICT), and Clay/ceramics Technology (KIRDI, 2010).

Kenya Industrial Research and Development Institute’s Business Incubator Programme was established in 2006, with the goal of nurturing technology-based MSMI that form the basis of Kenya’s manufacturing sector. According to KAM (2010) the manufacturing sector is broadly categorized into twelve namely; Building, Construction and Mining, Chemical and Allied, Consultant and Industrial Service, Energy, Electrical and Electronics, Food, Beverages and Tobacco, Leather Products and Footwear, Metal and Allied, Motor Vehicle Assembly and Accessories, Paper and Paperboard, Pharmaceutical and Medical Equipment, Plastics and Rubber, Textile and Apparels and Timber, Wood Products and Furniture. However the incubation programme started off with information technology software development in the Information Technology and Communication Centre (ICTC) before being rolled out to other divisions namely; Food, Mechanical Engineering, Chemical Engineering, Leather and Ceramics. Each centre has unique facilities and capabilities and therefore offers only incubation services relevant to its activities, except for business development services which are common to all incubator tenants (KIRDI, 2010).

2.2 Infrastructure

Yawson (2002) identifies infrastructure development as one of the vehicles that will enable industry and other sectors of economy to provide basic needs of the society, giving the importance of technology based incubators in Ghana’s economy development. Yawson (2002) notes that the government should provide science and technology machinery, infrastructure and programmes that are responsive to national needs.

According to Atherton & Hannon (2006), one of the suggested factors was that among a range of obstacles to successful rural incubation, included lack of available and appropriate premises, or real estate, for the incubator tenants to operate. A study carried out by National Incubators Association (NBIA, 2001) linked the under-performance of rural based business incubators to operating shortcomings such as inadequate facilities.

World Economic Forum (2010) places Singapore at position one worldwide in ICT infrastructure development. This is because approximately four billion Singapore dollars (approximately US\$ 2.4 billion) were allocated for

R and D under the 1996 National Technology Plan. A total of 13 public research institutes/centres and two universities linked to these R and D establishments received funding for infrastructure development. The action plan entitled Singapore One is a major milestone in the realization of the IT2000 vision focused on the creation of information infrastructure, including (i) a broadband infrastructure level of high-capacity networks and switches, and (ii) advanced applications and services built on the technological advantages of the infrastructure (Garrett-Jones, 2000).

Meeder (1997) suggests that incubators fall into three categories, the good, the bad and the ugly. Good incubators are said to have a minimum of 3,000 square metres net leasable space, are primarily identified by the sponsor's clientele and the staff as deliverers of locally unique service programmes. They have healthy cash flows from rentals, utilities, fees for businesses support services and other contributions. Bad incubators are said to lack the foregoing characteristics and often metamorphose into multi-tenant commercial property. Failure is attributed to lack of comprehensive business support, predominantly service rather than manufacturing-based clients, and badly designed or specialist incubation premises. These factors affect the number of graduates and the incubator is able to produce. The Ugly may have financial problems related to the physical premises in which they operate, such as the need for remedial work on buildings.

According to paper presented by InfoDev at the 2nd Global Forum in October, 2006 on business incubation on Bahrain Technology based Business Incubator, there are a number of factors affecting success of business incubator. Such factors differ from one country to another, but notable ones are management, funding, infrastructure and tenant selection. Technology based incubator requires continuous updating of the infrastructure to ensure that the goods products at the incubators are competitive in the market (World Bank, 2007).

2.3 Leadership

Koontz (1984) defined leadership as 'the art or process of influencing people so that they will strive willingly and enthusiastically toward the achievement of group goals'. According to Kim and Renee (1992) leadership is the ability to inspire confidence and support among the members of the group who are needed to achieve organizational goals. Dubrin (2004) revealed that leadership has several definition including: interpersonal influence, directed through communication toward goal attainment; the influential increment over and above mechanical compliance with directions and orders; an act that causes others to act or respond in a shared direction; the art of influencing people by persuasion or example to follow a line of action.

An incubator can be viewed as a firm or an enterprise that requires to be effectively managed for it to realize its contribution to the success of creating new enterprises, giving them opportunity for growth and independence. New opportunities for exploring methods for enhancing incubation processes and outcomes are leading to greater focus on many critical aspects of incubation, in particular: governance and control; management and leadership; professionalism and personal development; client monitoring and tracking and impact assessment and evaluation (Hannon, 2003). Studies have emphasized the need for improving the quality of incubation management to enhance the performance standards of both incubation projects leading to successful graduation of tenant enterprises (Albert, 2002).

Hamel (2007) says what ultimately constrains the growth of an organization is not its business model, nor its operating model, but its management model. He argues that management innovation has a unique capacity to create a long-term advantage for a company, and outlines the steps one must take to first imagine, and then invent, the future of management. Young and Mooweon (2003) argue that despite the increasing number of business incubators, many problems in the operation of those incubators have surfaced due to the lack of training of capable incubation managers and staffs, poorly structured incubator post-management and networking, and failure to adapt to the local business environments. Notably, according to these scholars, the success of an incubator depends on many factors, but it is worth noting that all other factors may be favourable but without proper organization and structure, the incubator may not meet its objectives

2.4 Products

Products of an incubator in some cases referred to as business development services and cover a wide range of professional business counseling or mentoring services including development of business plan and offering support in strategic planning, accounting, financial management, sales or marketing advise, legal advice, educating the tenant enterprises on government regulations, product development and employment assistance (Abduh, D'Souza & Burley, 2007). Typical incubators also offer training or educational services such as short courses, seminars, or workshops (Dowling, 1997, Rice 1992). Since capital is necessary at various stages to the business development process, business incubators also offer or assist their clients to obtain capital by acting as a broker to facilitate the interaction between the clients and the potential investors (Wolf, 2001).

In China, in addition to infrastructure-related services, business incubators directly and indirectly help to enhance the credibility and visibility of tenant businesses in several ways, including promoting the business through positive campaigns, counseling, networking, education/training among other services. In addition the business incubators focus on business creation with leaner staff with shared facilities such as a finance department available to deliver bookkeeping and financial services, including a general office to give administrative and secretarial services. The incubators since their inception have assisted firms to grow and enter international markets successfully (Xu, 2010).

A report published by International Labour Organization (ILO) on behalf of the Donor Committee on Small Enterprise Development made up of representatives of the major international agencies, donors and non-government organizations involved in MSE development spelt out the best practices in BDS, based on an extensive review and analysis of the approaches used in the area of BDS by the members of the Committee (Business Development Services for Small and Medium-Sized Enterprises. There is increasing recognition that it is services that add value to commodities, goods and processes, allowing businesses to compete more effectively, access new markets and operate efficiently and hence grow (ADB, 2002).

2.5 Networking

In the modern society, no economy entity is able to be self-developing within a complete closed environment. The technology business incubator develops into a certain scale and gradually become a new industry. There exist the demands to establish the network through which business incubators could exchange information and experiences, implement mutual collaboration, organize personnel training and normalize the management. So it should give birth to the association or the network of business incubators. The networking management model will be a major trend of business incubators in near future (Wang, 2009). In china, there are several city-based collaboration network such as Beijing Business Incubation Association, Wu Han Business Incubator Network and Hang Zhou Business Incubator Network. Some network not only consists of technology business incubators, but also have some intermediate service agencies or venture investors (Wang, 2009). The Helsinki business incubators keep a database called KORE that makes experts and donors easily identified and able to be contacted (Abetti, 2004).

Furthermore, participation in the incubation programme provides new firms with the chance to interact with its counterparts, suppliers, customers, and venture capitalist; thus creating more opportunities for those start-ups to join a value network. The importance of the value network for the success of small firms was emphasized in studies in entrepreneurship (for example, MacMillan, 1983; Birley, 1985). Social Capital theory, in explaining new business success, claims that this network is very important in acquiring the requisite resources such as funds, technology, marketing information, human resources, and vertical integration (Bollingtoft and Ulhoi, 2005). Similarly, Hansen (2000) concluded that access to an organized network of companies was the vital factor for incubators to succeed.

Linkage with universities has been recognized as a major success factor in studies on the performance of incubation programmes (Mian, 1996). Linka and Scott (2003) investigated the formal and informal relationship between science parks and universities and suggested that benefits include enhanced research output (e.g., publications and patents), increased extramural funding, and improvements in hiring and placement capabilities

if the relationship is a formal one.

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The study adopted descriptive research design but used case study approach to realize the research objective which was to analyze the factors influencing the growth of technology based business incubators in Kenya. The design determines and reports the situation within its real life context and also attempts to describe such items as possible behaviour, attitudes and values and characteristics (Mugenda & Mugenda, 2003). The study was restricted to fact-finding and resulted in the formulation of important principles of knowledge and solutions to significant problems. The goal was to offer phenomena of interest from a specific perspective (Kothari, 2008). Studies can adopt either a single-case or multiple-case design depending on the issue in question. In cases where there are no other cases available for replication, the researcher can adopt the single-case design. This study adopted single-case study because KIRDI Incubator is the only technology-based business incubator of its kind in Kenya. According to Yin (1994), generalisation of results from case studies, from either single or multiple designs, stems on theory rather than on populations.

3.2 Target Population

The population that under study was 32 members of staff who are involved in the day to day running of KIRDI incubator. On the basis of the staff segment, the study considered the overall population to be heterogeneous in four strata as shown in the table 3.1.

Table 3.1: Target Population

Segment	Population Size
Senior Management	4
Researchers/Scientists	15
Technologists	13
Total	32

Source: Kenya Industrial Research & Development Institute, personnel data (2010)

3.3 Sample Size and Sampling Technique

Kothari (2004) states that when the universe is small then all the units of the population may be used as samples. In this case, there was no need of sampling; instead a census was taken for survey.

3.4 Data Collection Instruments

The study adopted a questionnaire with both closed-ended and open-ended questions for the purpose of collecting data (Chambers & Skimmer, 2003). Semi-structured interview questions were also be used for data collection and specifically targeted the senior management of the incubator, especially to collect data on growth trends.

3.5 Data Processing and Analysis

Data from questionnaires and interview schedules was processed with the help of Statistical Package for Social Sciences (SPSS) package Version 17, which offers extensive data handling capabilities and numerous statistical (Muijs, 2004). Answers from open ended questions and interview responses were analyzed for their contents. The assumption was that words and phrases mentioned most often are those reflecting important concerns in every communication (Krippendorff, 2004).

4.0 RESULTS AND DISCUSSIONS

4.1 Descriptive Analysis

Table 4.1 shows a mean growth of 20% per annum, with a standard deviation of about 3.4 for graduated enterprises per year. Some of the KIRDI incubator tenants have been in the incubator for more than 5 years (KIRDI, 2011). The results do not agree with the United States of America, Department of Commerce (1997) that an incubator's main goal is to produce successful graduates, businesses that are financially viable and free standing when they leave the incubator, usually within two or three years. However, the results are in line with the findings of Akcomak, (2007) that in some developing countries, tenant firms tend to remain in the incubator even though the incubation period has expired.

The growth trends of the incubator shows minimal improvement in the last 5 years, particularly in the number of incubator tenants graduated, which is the main area of focus for an incubator's success and eventual growth. With this kind of trend, not many entrepreneurs may benefit from the incubator.

Table 4.1 Growth Trends of the Incubator Results

Year	2006	2007	2008	2009	2010	Mean	Std. Deviation
Common facilities	25	35	40	53	65	43.6	15.65
Incubator staff	15	18	25	28	32	23.6	3.981
Incubator Tenants	6	10	13	22	25	15.2	8.044
Graduated incubatees	0	2	5	6	8	4.6	3.36
Networks	26	28	37	46	53	38	11.5

Factor Analysis

Table 4.2 below shows the extraction of components of factors with eigenvalues that have been used for analysis.

Infrastructure/Facilities: Under Infrastructure, three (3) components influencing growth of technology based business incubators in Kenya were identified as (i) Quality of facilities, (ii) Innovation enabling facilities and (iii) Availability and appropriateness of the facilities. The presence of these components are supported by Yawson (2002) noting that quality of infrastructure, World Economic Forum (2010), highlighting the case of Singapore being placed number one worldwide in ICT infrastructure development, and Atherton & Hannon (2006), suggesting that among obstacles to successful incubation includes lack of available and appropriate facilities for incubator tenants to operate.

Leadership Style: Four (4) components of the factor influencing growth of technology based business incubators in Kenya were identified as (i) Management model composed of regular training and development of incubator staff, professional management, clear leadership structure and succession plan and defined incubation process, from admission to graduation, (ii) Management/client relationship and (iii) Selection Criteria. The presence of these components are supported by Hannon (2003), emphasising on greater focus on governance and control, client monitoring and tracking as well as good evaluation criteria as a critical aspect of business incubation.

Products: Four (4) components of the factor (products) influencing growth of technology based business incubators in Kenya were identified as (i) Piloting composed of Prototype development and testing, product commercialisation and technology commercialisation assistance and Intellectual Property Management, (ii) Versatility composed of information and communication technology and business processing, (iii) Logistics composed of distribution and (iv) Marketing function. The component of products as a factor are in line with the findings that have been highlighted in the studies carried out by scholars including; Abduh, D’souza and Burley (2007), Wolf (2001), Xu (2010).

Networking Opportunities: Under Networking opportunities, as highlighted four (4) components of the factor, influencing growth of technology based business incubators in Kenya were identified as (i) Collaborations, (ii) Benefits of Networking comprising (iii) Exposure through exhibitions and trade fairs being and Publicity and public relations. The results of this factor and the components are in line with findings of studies carried out by Wang (2009, 2010), Abetti (2004) and Bollingtoft and Ulhoi (2005), as highlighted in the literature review.

Table 4.2: Total Variance Explained on Factors influencing Growth of Techno-based Incubators

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.181	18.456	18.456	12.181	18.456	18.456	7.235	10.962	10.962
2	8.841	13.395	31.851	8.841	13.395	31.851	7.159	10.846	21.808
3	6.644	10.066	41.917	6.644	10.066	41.917	5.134	7.778	29.586
4	5.212	7.897	49.814	5.212	7.897	49.814	4.561	6.911	36.497
5	4.647	7.040	56.854	4.647	7.040	56.854	4.428	6.709	43.207
6	3.786	5.736	62.591	3.786	5.736	62.591	4.375	6.628	49.835
7	3.543	5.368	67.958	3.543	5.368	67.958	4.059	6.150	55.985
8	3.177	4.814	72.772	3.177	4.814	72.772	3.890	5.894	61.879
9	2.949	4.468	77.240	2.949	4.468	77.240	3.840	5.818	67.697
10	2.640	4.000	81.240	2.640	4.000	81.240	3.770	5.711	73.408
11	1.971	2.986	84.226	1.971	2.986	84.226	2.775	4.204	77.612
12	1.757	2.663	86.889	1.757	2.663	86.889	2.767	4.193	81.805
13	1.573	2.384	89.273	1.573	2.384	89.273	2.706	4.100	85.905
14	1.468	2.224	91.497	1.468	2.224	91.497	2.320	3.515	89.420
15	1.341	2.033	93.529	1.341	2.033	93.529	2.160	3.273	92.693
16	1.162	1.761	95.290	1.162	1.761	95.290	1.714	2.597	95.290
17	.948	1.436	96.726						
18	.841	1.274	98.000						
19	.533	.807	98.807						
20	.423	.641	99.448						
21	.365	.552	100.000						

Extraction Method: Principal Component Analysis.

Empirical Results: Regression analysis on the Factors Affecting Growth of Techno-based Incubators.

Table 4.3 tabulates the results of multiple coefficients indicating that all the four factors do not have equal explanatory power of the dependent variable. The infrastructure influences most of the variance in growth of technology-based incubators in Kenya (is the most important) according to the un-standardized beta coefficients (beta=0.792, t=2.06) which was found to be statistically significant at 5% level. As infrastructure improves, it positively influences growth of techno-based incubators. The variable should therefore be positively adjusted. The second most important factor was found to be leadership style (beta = -5.85, t=1.96) also found to be statistically significant. The results indicate that with a negative beta, the variable must be adjusted downwards by loosening the bureaucracy of centralized leadership and allowing the incubator autonomy to operate independently in order to increase growth of technology-based incubators.

The third variable which was networking opportunities had a positive beta (beta=.433,t=1.568) and the fourth variable product with a (beta=0.292, t=1.036) all were statistically significant at 5% level (t=2.080), higher than the computed t-value of the t-value for networking opportunities and that of the products. The results indicate that with a positive beta, the two variables must be adjusted positively in order to increase growth of technology-based incubators.

Table 4.3 Coefficients of the Independent Variables Results

Model	Un-standardized Coefficients			
	B	Std. Error	T	Sig.
(Constant)	-3.176E-17	.141	.000	1.000
REGR factor score: Leadership Style	-.585	.298	1.96	.778
REGR factor score: Products	0.292	.282	1.036	.313
REGR factor score: Networking opportunities	.433	.276	1.568	0.23
REGR factor score: Infrastructure/facilities	.792	.384	2.06	.000

In order to show how the four variables together influence the growth of technology-based incubators, the multiple regression was computed as tabulated in Table 4.4. The results indicate that there is a strong correlation between the independent variables and the dependent variable (R=0.751, p=0.000) which is statistically significant at 5%. In addition, the influence of the predictor variables as indicted by the study variables was found to be 47.8% (adjusted R square = 0.565) implying that the chance factors or random factors influence growth of technology based incubators by 52.2%.

The influence of infrastructure (facilities) on the growth of technology-based business incubators in Kenya

Majority (79%) of the respondents were in agreement that infrastructure (facilities) influence growth of technology based incubator. 10% slightly agreed, while only one respondent did not agree, with two other respondents slightly disagreed. The findings are in line with Adegbite (2001) who records that one of the reasons behind the low performance and growth of Nigerian incubators is poor and insufficient infrastructure. The study confirms that infrastructure influences the growth of technology based incubators through, quality of facilities, innovation enabling facilities, fitness for use, facility improvement and adequacy of the facilities. The study has also established that there is a strong relationship between infrastructure and growth of technology-based incubator. The results are supported by findings of Balachandran, (2004) on the role of business incubation systems to facilitate technology transfer and development.

The influence of leadership style on the growth of technology-based business incubators in Kenya

Majority (17) of respondents strongly agreed that leadership influences growth of technology-based incubators, 7 slightly agreed, one was not sure while three slightly disagreed. The results are in line with Tornatzky (1996) as quoted by Hannon (2003) that technology incubation is all about integrating talent (people), technology (ideas), and know-how (knowledge). The results are an indication that majority of the respondents feel that a technology-based incubator would need a good management model in order to grow.

Table 4.4: Results of Multiple Regressions between Variables

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Sig.
	.751 ^a	.565	.478 ^b		.70749804	0.000

a. Predictors: (Constant), REGR factor score: infrastructure/facilities, REGR factor score: products, REGR factor score: networking opportunities, REGR factor score: leadership style.

b. Dependent Variable: REGR factor: Growth of technology-based incubators

The research established that leadership influences the growth of technology based incubators through the factor components namely; incubator management, incubator opportunities, selection criteria, admission, and delegation of authority. According to Chandra (2007), government ownership of incubators has proved dysfunctional. Further, the study established a strong and negative relationship between leadership and growth. The results are supported by Hannon (2003) quoting (UKBI 2003, Albert , 2002 and CSES, 2002), noting that the establishment of clear management frameworks may help to address sustainability issues concerning incubator growth.

The influence of products on the growth of technology-based business incubators in Kenya

Majority 36% of the respondents slightly agreed that products influence growth of technology-based incubators while almost a similar number (32%) strongly agree, 4% are not sure while 18% slightly disagree and 11% strongly disagree. The results give a mixed reaction from the respondents. Although Allen & Rahman (1985) argue that incubators should strategically select the products provided and monitor their use to evaluate their relevance to incubator tenant needs,

KIRDI being a national industrial technology research institute expected provide almost similar product to all other clients (GoK, 1979) may feel that differentiating products for in-house incubatees may deny other prospective techno-based entrepreneurs a chance especially in contract processing. The weak link therefore, may be as a result of non-differentiation of product offered to incubator tenants and those offered to others. The study revealed a number of components through which product influences the growth of technology based incubators. These include product versatility, support, marketing, development, assistance, distribution and intellectual property management. In addition, the study established that there is a moderate and positive relationship between products and growth of technology-based incubators. Akcomak (2009) notes that requirements for successful incubator include simple demand-supply framework of its products.

The influence of networking opportunities on the growth of technology-based business incubators in Kenya

Majority (13) of respondents strongly agreed that networking opportunities influence growth of the incubator, 5 respondents slightly agreed, 9 slightly disagreed, while 2 strongly disagreed. From table 4.7, the highest percentage of collaboration is with the Government. The findings are in line with research done by Aldrich and Wiedenmayer, (1993) who found that social ties connecting entrepreneurial actors to resource providers facilitate acquisition of resources and exploitation of opportunities.

The positive link may also be attributed to the fact that KIRDI is a government agency, which receives its funding through the exchequer, hence a direct link to the incubator growth. In addition, the Institute works closely with the public universities for collaborative research and the community for resource mapping, research and technology dissemination. Many of the clients of the incubator are private entrepreneurs (KIRDI, 2011). Donors and lending institutions also play a role in the financing the operations of the incubator and incubator tenants respectively. For KIRDI, collaborations and networking are not only for resource sharing but also for research and development as well as new technological innovations and inventions for incubator growth (Bollingtoft & Ulhoi, 2003).

The study established that networking opportunities influences growth of technology based incubators through collaborations, coverage, benefits of networking, exposure to competition, and publicity. The results also indicated a strong and positive relationship between networking opportunities and growth of technology-based business incubators in Kenya. Wang (2009), notes that networking is the new development trend of business incubator, which should include local, regional, national and international networks.

5.0 CONCLUSIONS

The objectives of the research of analyzing the factors influencing growth of technology-based business incubation in Kenya were positively achieved. The framework of the study had conceptualized that Infrastructure, Leadership, Products and Network opportunities influence the growth of the technology based business incubation in Kenya. However, the researcher found apart from the fact that this is true, each of these variables is depend on other underlying and inherent components within them. In fact, it was found that the component factors within these variables greatly affect the way these four variables influence the growth of the technology-based business incubators. The analysis revealed that chance factors or random factors influence growth of technology-based incubators by about 52.2%.

It is therefore concluded that the reason for slow growth of the technology based incubators is the complexity of factors that influence its growth. The influencers are in layers which mean that before a technology-based business incubator takes a growth trajectory, it must carefully address the identified components of the factors. The results from the case study of KIRDI incubator can therefore, be inferred to other technology-based incubators in Kenya with the same characteristics.

6.0 SUGGESTIONS FOR FURTHER RESEARCH

This paper focused on analyzing the factors influencing the growth of technology based business incubators in

Kenya. Further research could be done on this aspect on the incubatees (incubator enterprises) to determine the factors of the incubator that drive the survival of incubatees beyond their third birthday. A replication of this study could be carried out in the service based incubators. Such a study would be important in highlighting the competitive factors that incubators need to consider in order to improve their growth

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