Standard Research Journal of Business Management (ISSN: 2310-7537) Vol1 (4): 97-109, December 2013
http://standresjournals.org/journals/SRJBM

Research Article

The Role of Innovation in Determining the Competitiveness of the Kenyan Electrical and Electronic Manufacturing Enterprises in Kenya

Rosyln W. Gakure, Margaret K. Chemengich, Anthony Waititu Gichuhi, Paul Katuse

Jomo Kenyatta University of Agriculture and Technology (JKUAT), Nairobi CBD Centre,
Box 62000 00200, Nairobi, Kenya

*Corresponding Author E-mail: chemengichmail@yahoo.com

Accepted 28 December 2013

Abstract

In a globally competitive landscape, competitiveness is sustained through rising productivity originating from innovation, invention, Research and Development (R and D) and service provision (OECD, 2007). R and D continuously feeds into the innovative process of product diversification to create variety for consumers and investors. International trade is increasingly being driven by FDI location and off-shoring making it possible to locate firms in any area of the globe to maximize efficiency. In the case of electrical and electronics, competitiveness is underpinned by networked global production processes locating on basis of competences. This article explores the role of innovation in stimulating the competitiveness of the electrical and electronic sectors in Kenya. It anchors the analysis of the primary data on the theoretical and empirical reviews of past studies in order to establish the significance of the role of innovation in the sector competitiveness. This was analysed on the basis of knowledge acquisition, R and D investments, information access, shares of new products/services and the complementary human resource development for competence enhancement.

Key words: Competitiveness, innovation, knowledge, R and D, partnerships, skill competences

INTRODUCTION

Within the electrical and electronic sector, technology and knowledge intensity is a critical factor in determining sector competitiveness (Haughton and Thorborn, 2004). According to the Economic Commission of Africa (ECA) (1998) report on global trends, the experiences of the more successful economies adopted strategies based on making more effective use of new and existing knowledge and technology throughout the whole economy. More importantly, international competitiveness is increasingly being defined in terms of the ability to access, learn, adapt, utilize and innovate from available technology (ECA, 1998). Firms or nations that fail to innovate lose their competitive positions.

The Kenyan originating electrical and electronic manufactures have remained at the bottom of the technology and knowledge pyramid (ECA, 1998; Magu, 2011). The Kenyan manufacturing sector is predominantly SME based and in family ownership. These sector characteristics are not conducive to partnerships that have better options of infusion of new technology and innovations compatible with emerging paradigm shifts in production changes to meet customer changing needs in a globalised business environment. Consequently, Kenya has hardly exploited the prioritisation of joint ventures, foreign direct investment and hire of technical licenses/contracts to improve its competitiveness

(Magu, 2011). There is also a less than favourable enabling business environment to spur private sector investments (Magu, 2011).

The Kenyan electrical and electronic manufacturing sector continued operation from uncompetitive low technology and knowledge intensity segments lacks the strategic fit to the new paradigm shift of offshoring/outsourcing production processes (Lall, 2000; UNCTAD, 2002; Erumban, 2011).This is in spite of the less restrictive policy environment presented in the Industrial and Commercial Development Corporation Act (Cap 445) (KLR, 2012) and Contracts in Restraint of Trade Act(Cap 24) (KLR, 2012) frameworks with associated regulatory frameworks-Trade Descriptions Act, Chapter 505 (Cap 505) KLR, 2012); Anti-counterfeits (Cap 13) (KLR, 2008), Customs Administration, (Cap 472) (KRA, 2012).

The theoretical underpinning the research on the role of innovations in Kenya's electric and electronic sector competitiveness include the Porters Five Forces (1986) emphasizing the threat of substitutes from efficient high performers, and innovation systems focusing on building individual and collective competences among value chain actors in networks (UNIDO, 2009); Leontief (1933) theory of short product life cycle (PLC) which recognizes that competitive advantage does not last forever; either because firms copy their competitors or new technologies come into operation (Prahalad and Principle, 1990; Teece, 1998; and Spulber, 2007). Other theories consist of diffusion, open innovation and regionalism which are anchored on how change permeates both consumers and producers in a competitive environment (Schumann, 2009; Drucker, 2002; Schumpeter, 1949 and Campos, 2002). Consequently, firms or nations that fail to innovate in order to remain relevant lose their competitive positions in the market.

These theories were supported by a number of local and international studies. At the national level, Magu (2011) and Vision 2030 confirmed Kenya's continued operations from low technology and knowledge intensity segments specializing in the manufacture of limited hardware, electrical machinery and appliances. Most of these products are not traded in the global market. At the regional level, Mwakaje (2010) study demonstrated the innovative role of ICT in improving rural Tanzania farmers' incomes. Similarly, Ajayi (2000) in his study reaffirmed that packaging technology into FDI inflows facilitates less endowed countries to upgrade their product qualities to meet international demand requirements. The competitiveness of the Kenyan manufacturing sector which remains predominantly SME-based is best served through linkages and networks with Multinationals/Transnationals (MNC/TNC). These arrangements allow facilitating the leveraging competences from skilled labour, research, innovation and business sophistication that play a more important role in competitiveness (Lall, 2000). Hidding, Williams and Sviokla (2011) re-emphasized the role of partnerships of integration and competences significant in technology adoption.

Research Study

A descriptive survey based on a stratified sample of 23 firms drawn from the manufacturing sector, policy makers and facilitation agencies informed the findings of the role of innovation in determining the competitiveness of the Kenyan electric and electronic sector competitiveness. On the basis of Babbie (1990) and Mugenda and Mugenda (2003) assertions that a response rate of 60% is good and 70% is very good; the response rate of 87% for a descriptive survey provided a firm basis for making inferences on the whole population (Table 1).

Table 1. Response Rate by Public and Private Sector Categories

Respondents	Questionnaires issued	Returned	Response rate
Private sector:			
Non-KAM Members	6	5	83.3%
KAM-Members	10	8	80.0%
Private sector associations	2	2	100%
Public Sector:			
Ministries	2	2	100%
Parastatals	3	3	100%
Total	23	20	87%

In order to validate the integrity of the survey instrument, a Pilot was undertaken (Project STAR, 2008; Standards Advertising Authority (ASA) (1997); Oksenberg, 1991; and Presser and Blair, 1994). Drawing heavily from similar past researches and different scholar recommendations,a validity cut-off point of 0.30 was adopted for the factor analysis of the field data (Chemengich et al., 2013; Donahue et al., 1997; Sakkinen et al., 2000).

The reliability of the instrument carried out based on Cronbach's coefficient alpha, presented in Table 2, established that the coefficients ranged between 0.701-0.876 (Cronbach, 1946). These are consisted with the minimum requirement of 0.7 (Kothari, 2010; Sekaran and Bougie, 2009). The normality Q-Q tests, on the primary data confirmed the sample characteristics were similar to those of the population. As such competitiveness is normally distributed. In this regard,

statistical inferences can be made against findings of the survey.

Table 2. Reliability Analysis

Variable	Loadings	Cronbach's Alpha
Competitiveness	29	0.744
Technology	8	0.841
Innovation	36	0.762
Regulations	16	0.701
Market Access	38	0.876

A multivariate linear regression analysis model was employed in the data analysis to establish the effect of the independent variables on sector competitiveness. Since, there was a moderating factor; the regression analysis was carried out at two levels, with and without the moderating variable. In the case of innovation, the questions took into account knowledge sharing and learning practices, level of Research and Development (R and D) for continuous renewal, e-business operations and development of human capital to bring new ideas and the level of effort to differentiate products in the market.

The Model took the following forms:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$.....1 (Full Model, f)

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e$.....2 (Reduced model, r)

Where

Y = Competitiveness
β_0 = constants
β_i = slopes of the variables
X_1 = Technology
X_2 = Innovation
X_3 = Regulations
X_4 = Market Access
X_5=Operating Environment
e = error term

DISCUSSIONS

Industrial Structure and Characteristics

Over 54% of the firms were set up before 1980. Technically, the industry runs on obsolete technology. Close to 79% of the firms were privately owned operating from savings. This was consistent with family based SME undertakings. These characteristics were consistent with non-competitive low technology and knowledge intense industry (EAC, 2011; KNBS, 2011; Magu, 2011) lacking linkages and networks with MNC/TNCs and integration to the global economy (Lall, 2000; Abdullah, 2011; ECA, 1998). On the basis of Haughton and Thorborn (2004) knowledge and technology intensity, the Kenyan industry falls within the category of basic services of repair and maintenance and assembly of original equipment.

In spite of the wide knowledge on global value chains, nearly all the Kenyan electrical and electronic firms were not participating in any GVC. Trading was limited to national and regional markets, with the majority (45%) of the firms trading in electronic appliances, computer and office equipment and industrial electronics. All these products are at the bottom of the value chain, characterised by low technology and knowledge quotient.

Electrical and Electronic Sector Competitiveness

In the global competitiveness index (GCI), Kenya was ranked among the top one third countries on innovation during the period 2009-2014 (Table 3). However, the national potential remains under utilised, at less than 50% achievement. Based on the GCI secondary data covering the period 2009-2014 for Kenya, technology readiness though on an upward trend is low, ranked at 50% of the more competitive markets. Market efficiency and regulations effectiveness were at a maximum of 60%. There were substantial variations in the macroeconomic frameworks making the operational environment unstable. The GCI results provide benchmark against which the primary data results were validated.

Table 3. Ranking of the Competitiveness Proxies against the Independent Variables

GCI Indicator	Research Indicator	2009	2010	2011	2012	2013	2014
Technology Readiness	Technology	2.88	2.99	3.3	3.3	3.27	3.36
Innovation	Innovation	3.52	3.41	3.40	3.40	3.41	3.56
Goods market efficiency	Market Access	4.12	4.09	4.10	4.10	4.10	4.21
Business Sophistication	Regulation	4.21	4.18	4.00	4.10	3.96	4.09
Macroeconomic framework	Operating Environment	4.37	3.43	3.40	4.00	3.39	3.64

Source: Annual GCI Reports, 2008/9-2013/14

Role of Innovation in Stimulating Kenya's Electric and Electronic Sector Competitiveness

From the factor analysis, the loading results ranged between 0.042-0.819. Using a threshold cut-off point of 0.30, the broad items that qualified for further analysis in the study included knowledge acquisition, R and D for renewal, information access and shares of new products/services (Donahue et al., 1997; Sakkinen et al., 2000). Internal resources, value addition, development of human capital, R and D tax concessions, support from government institutions programmes and grants were dropped since the factor loadings did not meet the minimum threshold of 0.30.

Knowledge Acquisition

The role of knowledge acquisition in innovation through knowledge sharing and learning, R and D and human capital development to impart new ideas in businesses received strong concurrence form both the manufacturers and facilitators. The research findings presented in Table 4 indicated that 69.2% of the manufacturers were in strong agreement while another 23.1% agreed that knowledge sharing and learning contributed significantly to innovation in the electrical and electronic sector competitiveness. This was evident from a mean score of 4.62 and an SD of 0.650. A minority of 7.7% were indifferent. No disagreement was recorded in as far as knowledge acquisition and sharing in innovation was concerned.

Table 4. Manufacturers Views on Factor Contributions to Innovation

Knowledge acquisition contributions to innovation	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean Score	SD
	%	%	%	%	%	No.	No.
a. a. Knowledge sharing and learning	69.2	23.1	7.7	0	0	4.62	0.650
b. R and D for continuous renewal	61.5	38.5	0	0	0	4.62	0.506
Average	65.4	30.8	3.9	0	0	**4.6**	**0.578**

Similarly, the public and private sector facilitators' views were equally strong judging from the mean score 4.86 and SD of 0.378 and 100% agreement on the factors contributing to innovation (Table 5). The findings were indicative of strong beliefs from both manufacturers and facilitators' in the knowledge sharing and learning contributions in innovation for improving sector competitiveness.

On the basis of the GCI indices, Kenya is among the top 50% achievers in innovation (GCI, 2008-2014).

Knowledge sharing, particularly in clustered industries, creates opportunities through leveraging of competences of the different players across the globe (MacCommick, 1998; UNIDO, 2009). The net effect was that of high efficiency and quality competitive products tradable globally.

Table 5. Facilitators Views on Factor Contributions to Innovation

Knowledge acquisition Contributions to innovation		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean score	SD
		%	%	%	%	%	No.	No.
a.	Knowledge sharing and learning	85.7	14.3	0	0	0	4.86	0.378
b.	R&D for continuous renewal	85.7	14.3	0	0	0	4.86	0.378
Average		85.7	14.3	0	0	0	**4.86**	**0.378**

With further prodding on additional factors contributing to innovation, there was convergence of mind between both the public and private sector, in prioritizing technology deficiency, exposure to international markets, partnerships, and high costs of doing business making Kenyan originating products uncompetitive. Some of the remedial actions proposed included institutionalized partnerships to facilitate technology transfer, networks, intensified capacity building and forward planning. The results and stakeholder proposals in enhancing the sector performance indicated the need for complementary services that enhance the sector competitiveness.This was borne out by the Kenya government policy on Science, Technology and Innovation (2008) and Education Act 2012 which prioritised innovation as a constituent part of education. Further, the findings were also consistent with the global trends of competitiveness being defined by the dominance knowledge based economies (ECA, 1998; Eramban, 2011).

The implications of these findings are that there is readiness among all stakeholders to participate in knowledge acquisition through sharing and learning. The business community in particular, through knowledge sharing and learning, was ready to adopt what exists from the shelves and put into implementation. The sharing element took into account the possibility of leveraging competences from outside the country. In this regard the learning curve for the local industry would be short.

R and D for Continuous Renewal

In line with the Leontief (1933) short PLC principle, in which research was critical for continuous renewal to sustain competitiveness, both the manufacturers and facilitators concurred in totality (100%) on the necessity of R and D for continuous renewal (Table 6). Nevertheless, funding for R and D received very low approvals by both the manufacturers and facilitators (Table 6). With a mean score of 2.68, sub-contracting and alliances was rated positively by 30.8% of the respondents (Table 7). The tax concessions were the least popular forms of funding research, with no recorded response on agreement. The majority (53.9%) of the respondents were in disagreement. The mean scores of between 2 and 3 further confirmed disagreement to these sources of funding. The existence of research institutions supported by the public sector, have not created any confidence among the manufacturers.

Table 6. Main Sources of R and D Resources

Source of R and D Resources	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean score	SD
	%	%	%	%	%	No.	No.
i) Alliances and cooperative arrangements	15.4	15.4	23.1	23.1	23.1	2.68	1.377
ii) R&D tax concession	0	0	23.1	53.8	23.1	2.15	0.899
iii) Subcontracting from other firms	7.7	23.1	15.4	38.5	15.4	2.62	1.193
Average	20.0	10.8	15.4	33.8	20.0	**2.77**	**1.148**

A follow up question on the proportion of the resources dedicated to R and D in Table 7, indicated that the highest proportion (35%) of the respondents made no provision for R and D. The majority of 30% respondents allocating R and D resources could only manage to set aside less than 5% of their resources. A smaller proportion of 20% set aside between 10% and 20% with even a smaller proportion setting aside more than 20% annually. The results confirmed that very small proportions of resources are set aside for R and D.

Indeed, the policy scenarios complemented with more liberal regulatory and incentive mechanisms, seemed not to have spurred innovations by way of research to improve the African competiveness (Filipetti, 2011). This was in spite of the strong roles that governments and development agencies in developing countries play in influencing their economic competitive and comparative advantage (OECD, 2000; Porter, 1986; UNIDO, 2009). Nevertheless, the role of research, science and technology in development is recognized in Kenya's Vision 2030 (GOK, 2007). However, the bulk of the public funding of research is limited to core sectors of agriculture and health.

Table 7. Proportion of Firm/Organisation Revenue Dedicated to R and D

Proportion of Firm/Organisation Revenue allocated to R and D	0%	Less than 5%	5-10%	10-20%	20-30%
Proportion of firm revenue					
Number of firms, No.	5	3	3	1	1
Facilitators budget spent on R and D					
Private sector Associations, No.	0	0	1	1	0
Public Sector	2	3	0	0	0
Total	7	6	4	2	1
Proportion, %	**35**	**30**	**20**	**10**	**5**

The implications of the research findings were that the solution of increasing R and D resources lies in firm profitability. There was also need to diversify sources of R and D funding to leverage alliance and cooperatives. Better still, would be the strategy to commercialise expired patents or enter into partnerships in order to access more modern technology. The government research resources should continue to be focuses on limited areas of general public interest, which were generally difficult to commercialize.

These findings corroborated Sapprasert (2006) study on the impact of ICT on the growth of the service industry; which demonstrated that IT facilitated networks drive the goods industry. Haines (2005) confirmed the critical role of IT information platforms in easing communication across the different stakeholders along the value chain. McDade and Spring's (2005) study on the New Generation of African Entrepreneurs established the importance of IT facilitated networks in the success of fifty seven (57) businessmen across 10 African countries. Similarly, Mas and Radcliffe (2010) study on the Economics of MPESA in Kenya also confirmed the role of IT in cost reduction and improved access to services.

With the positive lessons from the internet and mobile telephony, the Kenyan business community was ready to embrace IT facilitated operations in managing their businesses. In fact many are likely to be willing to invest in order to either generate new business lines or reduce costs of operations. In spite of the failed IT assisted Kenyan electoral processes in 2013 (Reuter, March 30th 2013), the media with the help of the same IT platforms kept Kenyans informed all through.

Firms or nations can only remain competitive provided they continuously innovate in order to remain relevant in the market (Prahalad and Priciple, 1990; Teece, 1992; Spulber, 2007). In this regard, the public sector leadership through demonstration and incubation centres including provision of adequate incentives to the private sector should be sustained. Strategic partnerships with MNC/TNCs would provide a cheaper avenue for the continuous renewal of the Kenyan electrical and electronic sectors.

Information Access

Taking cognizance of the fact that innovations come through technology adoption, the evaluation of alternative partnership arrangements, presented in Table 8 explored the options of different partnerships including R and D funding partnership. The results indicated that 46.2% of the respondents agreed on the need for partnership of R and D institutions and universities in technology development. The majority (53.9%) were either neutral or negatively disposed to such institutional partnerships for technology development purposes. The mean score of 3.69 and SD of 1.032 underwrote this challenge. However, partnerships with professional associations were well received with 84.6% of the respondents in agreement. The mean score of 3.92 underscored the general agreement in spite the variation of views based on the SD of 1.032. On the other hand, partnerships with suppliers and consumers were equally well rated by 84.6% in both categories with mean scores in excess of four (4) and Standard Deviation (SD) less than one. None of the respondents disagreed with this type of partnership. These results confirmed that partnerships were still a challenge in the industry.

Table 8. Partnerships as Source of Information on New Technological Developments

Partnerships with	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Mean score**	**SD**
	%	%	%	%	%	No.	No.
(i) R and D institution, university	23.1	23.1	30.8	15.4	7.7	3.69	1.032
(ii)Professional or industry associations	23.1	61.5	7.7	7.7	0	3.92	1.038
(ii) (iii)Suppliers	30.8	53.8	15.4	0	0	4.14	0.689
(iv)Customers	15.4	69.2	15.4	0	0	4.00	0.577
Average	23.1	51.9	17.3	5.8	1.9	**3.94**	**0.834**

The implications of the findings were that there was urgency in addressing the non-market challenges impacting negatively on partnerships. Intensified research on designs is most often carried out by institutions that are separate from those that commercialize them. Research on new technology remains a very expensive undertaking. Partnerships would allow MNC/TNC companies to locate and take up partnerships with local firms, since the regional markets offer better prospects. However, the unique challenge of family ownership would still get in the way. Under this scenario, it would be prudent for the government to review the investment framework to make it attractive for investors to locate in Kenya for purposes of serving the region.

As presented in Table 9, professional publications and journals were the preferred modes of disseminating new information of technology developments by 92.3% (with a mean score of 4.08) of the respondents, with the remainder (7.7%) being indifferent. Conferences were equally popular. Over 80% of them agreed with discussions at conferences and trade shows and industry networking functions (84.6% and mean score of 4.00). Trade and Industry magazines attracted lower proportion of 76.9% with a mean score of 3.77. A small group of 15.4% was indifferent while 7.7% disagreed. Instead discussions at industry network function carried a stronger value for the Kenyan business community with 84.6% in agreement and the remainder of 15.4% being indifferent. The mean score of 4.00 and Standard Deviation (SD) of 0.707 underscored this commitment. The results confirmed that new innovations are either disseminated at conferences, sector networking functions or through publications.

Table 9. Conferences and Publications as Sources of Information on New Technological Developments

	Strongly agree %	**Agree** %	**Neutral** %	**Disagree** %	**Strongly disagree** %	**Mean score** No.	**SD** No.
(i) Professional publications and journals	23.1	69.2	7.7	0	0	4.08	0.641
(ii)Trade and industry magazines	15.4	61.5	15.4	7.7	0	3.77	0.832
(iii)Discussions at conferences & trade shows	23.1	61.5	15.4	0	0	4.00	0.707
(iv)Discussions at industry networking functions	30.8	53.8	15.4	0	0	4.00	0.707
Average	23.1	61.5	13.5	1.9	0	**3.79**	**0.811**

Consistent with the government open data policy on information access as guaranteed in the constitution (2010), most government departments have uploaded pertinent information on their websites. Indeed Kenya was among the first sub-Sahara African (SSA) countries to adopt the open data initiative. The results further corroborated Haines (2005) contestation of packaging of information content for the different stakeholders along the value chain.

With universal access to the internet, it is possible for most of the staff to check out the status of technology in any industry. However, few staff, in the relevant professional fields check out the latest technology in the related industry. Nevertheless, from the above analysis the interest for searching for relevant information technology was limited to a few members of staff. It was prudent that dedicated professional staffs are recruited to manage the technology departments in both firms and facilitating institutions.

The implications of the study findings were that the Kenyan electric and electronic sector did not appear to take full advantage of the power of the internet as a marketing platform. Neither had the industry leveraged the mandatory information disclosure in the public sector ensured that departmental researches were made public, leaving no choice for the business community to engage on the same platform. The continued dependence on round table discussions was characteristic of an industry that is underdeveloped.

Development and Shares of New Products and Services

The development of new products/services was explored product through branding and ICT platforms for coordination, management and information access. Customer loyalty to company branded products was acceptable by 77% of the manufacturers with a mean score of 4.00 and SD 0.900 (Table 10). However, 7.7% were indifferent and another 7.7% disagreed. Similarly, close to 70% of the manufacturers agreed that IT facilitated communication networks were critical for the coordination and collaboration manufacturer's production.

Table 10. Manufacturers Views on Factors Contributing to Innovation

Factors Contributing to Innovation	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %	Mean Score No.	SD No.
a. Branding	30.8	46.2	15.4	7.7	0	4.00	0.900
b. IT facilitated Communication networks for coordination and collaboration	30.8	38.5	23.1	7.7	0	3.92	0.954
Average	30.8	42.4	19.3	7.7	0	**3.96**	**0.927**

In the case of facilitators, 85.7% of the facilitators were in agreement on both the role of branding and IT facilitated communication networks in innovation (Table 11). The remainder of 14.3% was neutral. The results were indicative of general agreement by both manufacturers and facilitators on the unique role of branding as a feature for building customer loyalty to their products.

Table 11. Facilitators Views on Factors Contributing to Innovation

Factors Contributing to Innovation	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly disagree %	Mean score No.	SD No.
a. Branding	57.1	28.6	14.3	0	0	4.43	0.787
b. IT facilitated Communication networks for coordination and collaboration	42.8	42.9	14.3	0	0	4.29	0.756
Average	64.3	21.5	14.2	0	0	**4.61**	**0.602**

The analysis of the introduction of new products in the Kenyan market, as presented in Table 12, established that the highest number of such products took place between 5 to 10 years ago. Less than 25% of the firms introduced new products within the last year of the study. The results further indicated that the introduction of new products was a more recent phenomena coinciding with the expansion of regional markets starting in 2000.

Table 12. Share of Products/Service Sales Introduced in the Last Ten Years (No)

Products/services introduced	KAM Members	Non-KAM members	%
Within the last year	3	0	23.1
Between 1 and 5 years ago	2	2	30.8
Between 5 and 10 years ago	3	3	46.1
More than 10 years ago	0	0	0

The findings corroborated Mas et al., (2010) study on the Economics of MPESA in Kenya which demonstrated the role of IT in introduction of new services in the financial sector and service delivery in Kenya. The internet platform had also diversified communication in the social sectors. However, the Kenyan electrical and electronic sectors had as yet to modernize their production to meet the global market demands. The results further implied that the Kenyan electrical and electronic sector manufacturers had to transform their production structures to introduce new products in order to take advantage of wider market outlets.

Regression Analysis

The degree of correlation and levels of significance between innovation and competitiveness in the electrical and electronic sectors was 0.623 with a p-value of 0.003. This was an indication of a strong and significant relationship between innovation and competitiveness (Table 13).

Table 13. Correlation Analysis: Innovation and Competitiveness

Variable	Coefficient Type	Competitiveness	Innovation
Competitiveness	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	20	
Innovation	Pearson Correlation	.623	1
	Sig. (2-tailed)	.003	
	N	20	20

The findings corroborated Njoga's (2013) study which recommended further training for KPC employees to upgrade their skill competences. Similarly, Mwangi's (2011) study established that those entrepreneurs with higher technical/vocational education tended to excel in their operations. These made their products more competitive. The findings confirm the need for knowledgeable and skilled staff in the electric and electronic sector if competitiveness is to be guaranteed. In this regard, more openings should be added in the technical colleges for upgrading the skills of those in employment. The establishment of village polytechnics, as highlighted in the new Kenya education act, is a step in the right direction.

The coefficient of determination (R Square) of 0.388 indicated that the model explained 38.8% of the variation or change in the dependent variable. This meant that innovation on its own could explain only 38.8% of the variation in the competitiveness of the electronic and electrical sectors. The remainder of 61.2% of the variations in the electric and electronic sector competitiveness was explained by other factors.

Table 14. Goodness Fit Model Summary- Innovation on Competitiveness

Indicator	Coefficient
R	0.623
R square	0.388
Adjusted R Square	0.354
Standard Error Estimate	46.66287

With a significant (p-value=0.000) constant of 351.288, the study concluded that even without innovation, the electric and electronic sector displayed some form of competitiveness. Further, the gradient of 9.853 indicated that a unit change in innovations leads to 9.853 units of competitiveness. Against a constant of 351.288, the model estimate for innovation on competitiveness is now of the form:

$Y = 351.288 + 9.853X_2$

Table 15. Model Coefficients: Innovation on Competitiveness

	Unstandardized Coefficients		Standardized Coefficients		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
Constant	351.288	43.585		8.060	.000
Innovation	9.853	2.917	.623	3.378	.003

The study findings corroborate Kleynhan's (2006) study evaluating the role of human capital in the manufacturing sector competitiveness. It established that the level of human capital in South African industries was much higher than the general perception though there were challenges of absenteeism due to AIDS and other factors. This included a shortage of artisans with proficiency in modern technology and innovation which limits competitiveness (Kleynhans, 2006). Similarly, the research carried out on the USA economy established its growth correlated closely with human capital competencies of the 20th century (USDC, 2012).

The implications of the study highlighted the critical role of quality human capital in sustaining competitiveness. There was need for continuous training in order to sustain high levels of innovation. In this regard, the Kenyan electrical and electronic sectors have to invest in human capital development and R and D.

In determining the effect of the operational environment on the independent variables, the regression was carried out with and without the operational environment. The coefficient of determination in the reduced model was 0.8836 indicating that the collective effect of the independent variables in the model without the moderating variable explained 88.36% of the variations in the electrical and electronic competitiveness. In the full model, the coefficient of determination was 0.8987 implying that the model explained 89.87% of the variations. This implied that the moderating effect of the operational environment had a positive effect on the variables. As such, the model was suited for study and worked better with the inclusion of the operational environment.

Table 16. Model Summary-Goodness Fitness Test of the Overall Model with and without the Moderating Variable

	Full Model	Reduced Model
R	0.9480	0.9400
R square	0.8987	0.8836
Adjusted R Square	0.8759	0.8715
Standard Error Estimate	0.0142	0.0152

In order to further validate the role of the moderating variable on the independent variables, a partial correlation analysis was undertaken for comparison with results from the model without the moderating variable (Table 17). In addition to the estimation of the partial coefficients on the independent variables, the same were compared with coefficients obtained when other variables were held constant. In the partial analysis, the correlation coefficients ($p<0.05$) for all the variables were significant implying that the operational environment had an effect on impact of independent variables on the competitiveness of the electrical and electronic sectors. These findings imply that there was a positive relationship between the electronic and electric sector competitiveness and the intensity of technology, innovation, market access and regulations.

Table 17. Comparison of Partial and Independent Variable Coefficients

Control Variable	Variables	Partials		Individual variable	
Operational environment		Correlation	Sig.	Correlation	Sig.
	Competitiveness	1.000		1.000	
	Technology	0.465	0.045	0.466	0.038
	Innovation	0.542	0.017	0.623	0.003
	Market Access	0.457	0.049	0.580	0.007
	Regulations	0.590	0.008	0.399	0.082

The findings corroborate Kohlbacher et al., (2013) study in which environmental dynamism and competitiveness positively moderated the effect of explorative innovation. Similarly, Slater and Narver (1994) study established that market orientation effects are long term while those of business environment are transient but impact positively on performance. Further, institutionalised business arrangements as presented in Valsamakis and Sprague's (2001) and Hazen and Byrd's (2012) confirmed that operational business arrangements are effective. The supplier-buyer relationships linking transnationals to small- medium-sized manufacturers (SMMs) within supply chains generated effective working relationships with customers. The relationships are enhanced through IT-platforms providing interconnectivity. Newton's (2008) study on the other hand established that even with the 9/11 terrorist attack, investors were not deterred from locating in the USA. Efficiency and conducive business environment (Dunning, 1998) were stronger than the threats of terrorism. Similarly, governance challenges in China have not deterred investments either. However, liberalization in the case of Morocco enhanced the role of fragmentation in the electrical and electronic sectors (Afif, 2009).

Fragmented production systems are globalized and as such efficiency and competences remain the cornerstones of such production systems leading to competitiveness. The electrical and electronic manufacturing sector in Kenya should explore the options of participating in global value chains in order to be part of the global business groups. In this regard, policy architecture should facilitate technology and innovative culture.

CONCLUSION

Innovation underpinned by R and D is critical for continued renewal for product adaptation to changing consumer tastes in highly competitive markets. This would be heighted with strategic partnerships with MNC/TNCs to leverage to leverage international competences in developing new branded products in order to gain electrical and electronic sector competitiveness. There are good movements in innovation judging from ICT related achievements in the financial sector and mobile telephony. Kenya is among the top 50 high achiever countries in matters of innovation. Lessons from the Kenyan EPZs and BPOs should inform the policy directions for the electrical and electronic sector policy reviews. The Kenyan electric and electronic sector did not appear to take full advantage of the power of the internet as a marketing platform. These results were consistent with an industry that has stagnated in the low technology and knowledge segments of the pyramid. However, the software research has picked up.

These findings are consistent with the Global Competitiveness Indices (GCI) which indicated that the factor performances underpinning competitiveness were average and as such might not facilitate Kenyan firm integration into

the global value chains. In particular, the good potentials in innovative society (Kenya being ranked among the top 50) and wide regional and global market access remain under utilised. The private sector companies were too small to undertake innovative R and D on their own. Strategic partnerships with universities stand to benefit the whole economy. In addition, the mandatory information disclosure in the public sector will ensure that departmental researches are made public, leaving no choice for the business community to engage on the same platform.

The findings underscore the urgency for the Kenyan business community to adapt to the changing global production techniques and new global products in order to remain in business. These same priorities are consistent with Vision 2030 enablers targeted for urgent intervention in order to improve the business environment.

RECOMMENDATIONS

With universal access to the internet, it is possible to leverage and commercialize expired patents or enter into partnerships in order to access more modern technology. This can be achieved through strategic partnerships with MNC/TNCs who provide a cheaper avenue for technology transfer, linkages into GVCs, markets, access to R and D for continuous renewal and exposure to modern efficient managerial competences and technical skills. For a start, the linkages with MNC/TNCs could be exploited through EPZ arrangements that come along with key production based incentive packages.

There is need to enhance and leverage these competences and expand the scope of core R and D outside agriculture and health sectors. Under this scenario, it would be prudent for the government to review the investment framework to make it more attractive for investors to locate in Kenya for purposes of serving the region. The setting up of accreditation institutions to link academia with industry has gone a step further in establishing Konza Techno city to spearhead transformation into a knowledge economy.

Areas for Further Study

This study did not cover the full complement of the factors considered in measuring the GCI. Nevertheless, in the case of Kenya, further research on what is really keeping away electrical and electronic investors from Kenya is needed. In particular, there will be need to establish the lack MNC/TNC interest in partnering or outsourcing to Kenyan market. This may include exploring the nexus for unlocking the stringent culture of family based ownerships and the strong affinity to traditional manufactures to move into the more lucrative outsourced production arrangements, align production with global demand to diversify the country's product/service range. It would also explore the possibilities of migrating part of the electrical and electronic sector into the EPZ facilities and the dedicated investment parks within the framework of Vision 2030 in order take advantage of the lucrative incentives and infrastructure.

References

Abdullah MP, Majid S(2011l). Equitable Allocation of Transmission Usage and Losses in Competitive Electricity Market. *IST Transactions of Electrical* and Electronic Systems-Theory and Applications, 4(2):739-744. ISSN (Print): 1913-8288. ISSN CDROM): 1913-8296. Retrieved from http://www.istpress.com

Afif S(2009). Production Fragmentation in Electrical Components, Lund, Sweden, Lund University. Lund, Sweden. Retrieved from http://www.lunduniversity.lu.se/ASA, (1997). *How to conduct pre-testing: section on survey research methods*. Alexandria: American Statistical Association.

Ajay SI(Ed.) (2010). *Foreign Direct Investment in Sub-Saharan Africa*: Origins, Targets, Impact and Potential. Nairobi: African Economic Research Consortium.

ASA (1997). *How to conduct pre-testing: section on survey research methods*. Alexandria: American Statistical Association.

Babbie E(1990). *Survey research methods 2nd Ed.* Belmont, CA: Cengage Learning. ISBN-10: 0534126723.

Campos L(2002). The Determinants of Artistic Innovation: Bringing in the Role of Organizations. *J. Cultural Econ. 26(1):29-52.*

Margaret K Chemengich, Rosyln W Gakure, Antony Waititu Gichuhi, Paul Katuse(2013). Role of technology in determining the competitiveness of the Kenyan electrical and electronic manufacturing enterprises in Kenya. Stand. Res. J. Bus. Manag.1(2): 52-59. Retrieved from http://www.standresjournals.org/journals/SRJBM/Pdf/2013/August/Chemengich%20et%20al.pdf

Cronbach LJ(1946). Response Sets and Test Validity. *Educational and Psychological Measurement. 6*(4):475-494.

Donahue RP, Bean AJ, Donahue DR, Goldberg RB, Prineas RJ(1997). Does Insulin Resistance Unite the Separate Components of the Insulin Resistance Syndrome?: Evidence from the Miami Community Health Study. *Arterioscler Thromb Vasc Biol. 17*(11)*:2413–17.*

Ducker PF(2002). The Discipline of Innovation. *The Harvard Business Review*. Retrieved from www.hbr.org/2002/08/the-discipline-of-innovation/ar/1

Dunning J(1998). Location and multinational enterprise: a neglected factor? *Journal of International Business Studies*, (*29*)**,** 45–66;

EAC(2011). *EAC Trade Report 2009-10*. Arusha, Tanzania: Author , EAC

ECA(1998). The Contribution of Science and Technology to African Development, *Annual General meeting, Abuja, Nigeria.* ECA, Addis Ababa.

Erumban AA, Los B, Stehrer R, Timmer MP, de Vries GJ(2011). *Making Room for China: a Global Value Chain Approach*. Goningen, Nedtherlands: University of Goningen, Groningen Growth and Development Centre. Retrieved from http://final.dime-eu.org/files/Erumban Los etal B2.pdf

Filippetti A(2011). Innovation modes and design as a source of innovation: a firm-level analysis. *Euro. J. Innovation Manag.14*(1):5-26. Retrieved from

http://www.emeraldinsight.com/journals.htm?issn=1460-1060
GCI(2006/2007). Global Competitiveness Report (2006/2007). IESE Business School and the support of / y el apoyo de Anselmo Rubiralta Center for Globalization and Business Strategy
GOK(2007). *Kenya Vision 2030. A Globally Competitive and Prosperous Kenya*, Government Printers, Nairobi.
Haines M(2005). Optimize Your Role in the IT Channel Value Chain - Ways you can ensure that a weak link won't sink your company. *CRN Magazine-News and Analysis for Resellers and Solution Providers.* Retrieved from http://www.crn.com/news/channel-programs/163105266/optimize-your-role-in-the-it-channel-value-chain.htm#social (31 May, 2008)
Haughton J, Thorborn L(2004). The Victorian Electronics Industry Cluster, *Yearbook of World Electronics Data:* Volume 1, 2004. Availablehttp://www.instat.com/catalog/ on Australian ee sector).
Hidding JG, Williams J, Sviokla JJ(2011). How platform leaders win.
J. Bus. Strategy. 32(2):29 – 37. Available from http://www.emeraldinsight.com/journals.htm.
Kleynhans EPJ(2006). The Role of Human Capital in the Competitive Platform of South African Industries. *A J. Human Resource Manag.(Tydskrif vir Menslikehulpbronbestuur).4*(3):55-62. Retrieved from http://www.sajhrm.co.za/index.php/sajhrm
KLR(2008). *The Anti-Counterfeit Act No. 13 of 2008*. Nairobi, Kenya. Nairobi, Kenya: Author. Retrieved from www.kenyalaw.org Retrieved from www.kenyalaw.org
KLR(2012). *Industrial and Commercial Development Corporation Act, Chapter 445 (Rev 2012).* Nairobi, Kenya: Author. Retrieved from www.kenyalaw.org
KLR(2012). *Trade Descriptions Act, Chapter 505 (Rev 2012).* Nairobi, Kenya: Author. Retrieved from www.kenyalaw.org
KLR(2012). *Contracts in Restraint of Trade Act, Chapter 24 (Rev 2012)*. Nairobi, Kenya: Author. Retrieved from www.kenyalaw.org
KNBS(2011). *Economic Survey*. GOK, Government Printers, Nairobi, Kenya
Kohlbacher M, Weitlaner D, Hollosi A, Grünwald S, Grahsl H(2013). Innovation in clusters: effects of absorptive capacity and environmental moderators, *Competitiveness Review: An Int. Bus. J. incorporating J. Global Competitiveness*. 23(3):199 – 217.
Kothari CR(2010). *Research Methodology: Mothods and Techniques*, 2ne ed, New Age International Publishers, New Dheli, India
KRA(Rev2012). The Customs and Excise Act (Cap 472)
Lall S(2000). The Technological Structure and Performance of Developing Country Manufactured Exports. *Oxford Development Stud.* 28(3):337-369.
Leontief WW(1933). The Use of Indifference Curves in the Analysis of Foreign Trade, *Quarterly J. Econ. 57:*. 493-503.
Magu DM(2011). Modern technology adoption trends of small and medium electrical/electronic manufacturing enterprises registered in Nairobi. Manufactured Exports. Pp. 1985-1998. Retrieved from http://ir-library.ku.ac.ke/handle/123456789/1835
Mas I, Radcliffe D, Bill and Melinda Gates Foundation(2010).Mobile Payments go Viral; M-PESA in Kenya. In P, Chuan-Pole and Angwafo. M. (Eds) *Yes Africa Can: Success Stories from a Dynamic Continent, World Bank.*
McCormick D, Pedersen PO(eds.) (1996). *Small Enterprises: Flexibility and Networking in an African Context*. Longhorn, Kenya. ISBN 9966 49 915 6.
Mcdade BE, Spring A (2005). The 'new generation of African entrepreneurs': networking to change the climate for business and private sector-led development. *Entrepreneurship and Regional Development, 17*(1), 17–42.
Mugenda MO, Mugenda AG(2003). *Research Methods:* Qualitative and Quantitative Approaches. ACTIS Press
Mwakaje AG(2010). Information and Communication Technology for Rural Farmers Market Access in Tanzania. *J. Info. Technol. Impact, 10*(2):111-128. Retrieved from http://www.jiti.net/v10/jiti.v10n2.111-128.pdf
Mwangi SM(2011). Enhancing Competencies of Electronic Craftsmen in the informal Sector in Kenya: Is Technical and Vocational Education and Training the answer? Int. *J. Edu. Social Sci.(Ijess). 1*(3). Retrieved from http://www.3kbioxml.com/3k/index.php/IJESS/article/viewFile/151/81
Newton BA(2008). *The Factors Affecting the Location of Foreign Direct Investment by U.S. Companies Pre and Post 9-11* (Senior Scholars Thesis, Texas A&M University, Texas). Retrieved from http://repository.tamu.edu/bitstream/handle/1969.1/85742/Brent%20A.%20Newton%20Thesis.pdf
Njoga AL(2013). Factors Affecting Effective Stores Management In The Public Sector: A Case Of Kenya Pipeline Company, *Int. J. Social Sci. Entrepreneurship. 1(3):149-157.* Retrieved from http://www.ijsse.org/index.php?option=com_content&view=article&
OECD(2000). *Main Determinants and Impacts of Foreign Direct Investment on China's Economy*. *Working Papers* (Working Paper No. 2000/4). Paris, France: OECD
OECD(2007). Sustainable Development Programme.Invitation to Workshop on Sustainable Manufacturing Production and Competitiveness. Copenhagen, Denmark, 21-22 June 2007. of quantitative tools to determine the expected performance of unit processes in of the Royal Statistical Society, Series B. 48:170–182.
Oksenberg L, Cannell CF, Kalton G(1991). New strategies for pretesting survey question. *J. Official Statistics. 7*(3):349-365. Retrieved from http://www.jos.nu/Contents/jos online.asp
Porter ME(1986). *Competitive Strategy*. Harvard Business School Press.
Prahalad CK, Hamel G(1990, May-June). *The core Competence of the Corporation*. Harvard Business Review, 79-90. Retrieved from http://hbr.org/magazine
Presser J, Blair J(1994). Survey Pretesting: Do Different Methods Produce Different Results? In P.V. Marsden (ed.), *Sociological Methodology, 24*, (73-104). Washington, DC: American Sociological Association. Retrieved from Retrieved from http://smx.sagepub.com/
Sakkinen PA, Wahl P, Cushman M(2000). Clustering of procoagulation, inflammation, and fibrinolysis variables with metabolic factors in insulin resistance syndrome. *Am. J. Epidemiol. 152:897–907.*
Sapprasert K(2006). *The Impact of ICT on the Growth of the Service Industry*. Oslo, Norway: University of Oslo, Centre for Technology, Innovation and culture. Retrieved from http://www2.druid.dk/conferences/viewpaper.php?id=399&cf=8.
Schumann H(2009). *Building an innovative enterprise.* Insight and Foresight.
Schumpeter J(1949). Economic Theory and Entrepreneurial History- Change and the entrepreneur, Postulates and Patterns for Entrepreneurial History. Cambridge, M.A.: Havard University.
Sekaran U, Bougie R(2009). *Research Methods for Business: A Skill Building Approach*, 5th Edition, John Wiley and Sons, ISBN 978-0-470-74479-6.
Slater SF, Neerver JC(1992). Developing a market orientation: An organizational Strategy Perspective. *Int. J. Res. Marketing.* 9:225-245.
Spulber FD(2007). *Global Competitive Strategy.* New York, NY: Cambridge University Press.
Teece DJ(1998). Capturing Value from knowledge Assets: The New Economy, Markets, for Knowhow, and intangible Assets. *California Management Review*. *40*(3):55-79.
UNCTAD(2002). *Trade and Development Report*. New York and Geneva: United Nations. Retrieved from http://unctad.org/en/Pages/Home.aspx
UNIDO(2009). Value *Chain Diagnostics for Industrial Development*. Vienna, Austria: United Nations Industrial Development Organization. Retrieved from http://www.unido.org/fileadmin/user_media/MDGs/IVC_Diagnostic_Tool.pdf

USDC(2012). The Competitiveness and Innovative Capacity of the United States USDC, http://w ww.eda.gov/AboutEDA/AbtEDA.xml, 1st Sept 2011
Valsamakis VP, Sprague LG(2001). The role of customer relationships in the growth of small- to medium-sized manufacturers. *Int. J.Operations. Prod. Manag. 21*(4):427 – 445.