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The Role of Research Institutions in Product Innovativeness among Manufacturing Small and Medium Enterprises (SMEs) in Kisumu Town, Kenya

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ABSTRACT

This study aimed at determining the role of research institutions in product innovativeness (PI) in the context of manufacturing SMEs in Kisumu, Kenya. Using a cross sectional survey design with a sample size of 126, a six-predictor logistic model was fitted to the data to test whether collaboration with partners and research institution technology could have an effect on product innovativeness of manufacturing SMEs in Kisumu. Three predictors (search for new product ideas, externally sourced product/market information, and research institutions technology transfer were significant positive predictors of product innovativeness. Therefore, it implies that collaboration with partners and technology transfer by research institutions enhances SMEs' product innovativeness. Therefore the promotion of collaborations with partners and technology transfer by research institutions for purposes of sharing information/ accessing the diverse knowledge base on new product design, development and production.

Keywords: Small and medium-sized enterprises, Manufacturing, Collaborations Research Institutions Product Innovativeness, Kenya

1. Introduction

For SMEs, the knowledge interaction with research institutions offer particular, albeit differently, advantages for innovation and knowledge creation. Inner knowledge interactions make it easy that the information and knowledge obtained from the outside is able to spread to other enterprises. SMEs are more dependent on tacit knowledge and less capable of searching for and using codified knowledge (Bougrain & Haudeville, 2002) published in books, scientific papers or in patent documentations.

Tacit (personalized) knowledge of individuals and groups, including particular experiences and insights developed and owned by researchers and entrepreneurs are very important in innovation. This knowledge cannot be transferred through written documents. Therefore, SMEs tend to rely more on personal networks and localized ways of transferring tacit knowledge and on learning-by-doing and interacting. The more developed the linkages to external knowledge sources are, the more new and valuable knowledge information are transferred to local

enterprises. Based on the foregoing, clustering fosters innovation since SMEs benefit from information contacts and knowledge spillovers and transfers as proximity literally bring business partners together, thus facilitating the exchange of tacit knowledge (Bell, 2005; Presutti, Boar & Majocchi, 2011)

Research institutions are leaders in the knowledge spillovers and knowledge transformation critical to product innovation (Gao, Xu & Yang, 2008).Owing to their outstanding advantage of technical resources and capacity, they improve and create new knowledge and technology. Research institutions play a lead role in innovation, generating new knowledge and technologies, attracting researchers, investments and research facilities, enhancing other firms R&D activities, stimulating demand for new knowledge and creating and capturing externalities. by leveraging on their intellectual and social capital university/research institutions can act as "technological gatekeepers" for the whole region, thus enhancing the dissemination and absorption of new information by SMEs.

R&D in research institutions and universities can be made relevant through knowledge transfer or dissemination through publications. R&D is only useful if its products can lead to economic development, through industrialization, job creation and poverty reduction. It is only through transfer of knowledge that a R&D institution can become relevant to the society. **Nonetheless** research institutions are constrained by funding, human resource (research scientists and engineers), lack of state of the art equipment, research facilities and pilot plants.

Despite the constraints the collaboration between enterprises and university/research institutions is an important type of knowledge creation and knowledge transfer (Lan & Zhangliu, 2012). Gao et al., (2008) posit that firms can obtain new scientific knowledge as well as technological knowledge through university/research institutions collaboration. Therefore, the innovation advantage of enterprises cluster is closely related to the interaction and cooperation between enterprises and university/research institutions. As a headstream of knowledge and the supplier of professional personnel, university/research institutions promote the knowledge, information and technology transfer and diffusion by education, training and R&D extension cooperation. So, the industry-research institutions do play an indispensable role in the development of novel products.

This therefore underscores the importance of undertaking a study on the role of university/research institutions on product innovativeness among manufacturing SMEs in Kisumu Town; Kenya. Specifically, the study sought to:

1. examine the effect of collaboration between manufacturing SMEs and university/research institutions on product innovativeness
2. determine the effect of research institutions technology transfer on product innovativeness among manufacturing SMEs

The paper is organized as follows. Relevant literature is reviewed and synthesized, followed by research methodology. The results are then presented along with discussion. Finally, conclusions and implications are discussed.

2. Theory and Hypotheses

2.1 Product Innovativeness

Ali, Krapfel and LaBahn (1995) defined product innovativeness as the uniqueness or novelty of a new product to the customer. According to Van de Ven (1986) product innovation refers to the development and implementation of a new product in the adopting firm or markets. Similar to Rogers' (2003) innovation characteristics of a new product (relative advantage, compatibility, complexity, observability, and trialability), product innovativeness refers to the radicalness, uniqueness, and meaningfulness of a new product. Based on the review of existing literature, this study operationalizes product innovativeness as the propensity of a firm to innovate or develop new products that meet and / or exceed customers' expectations or the extent of unmet market needs as reflected in its uniqueness in comparison to similar products offered in the market.

2.2 Research Institution's Technology Transfer

Currently technology transfer from R&D institutions to industries is low because of   low R&D funding, weak linkages between R&D and industries and lack of technology transfer culture. Efficient technology transfer to Kenyan industries has been hampered due to lack of industrial and technology information service, limited use of patent information and uncoordinated reverse engineering in the informal sector. The direct product of research is new knowledge. It can be in the form of publication, new technology /product/process or improvement in existing product, process, and technology.

To support a broader innovation agenda, universities / research institutions are introducing a holistic, market driven approach to new product development, which means that SMEs can get assistance to design and develop new products from a multi-disciplinary team of marketing, engineering, design and manufacturing specialists. This capability reflects the need for innovation through new product development, and in particular the need for manufacturers to diversify from traditional product sectors into new markets with new innovative product offerings.

This type of support for businesses reflects the importance to economic growth of introducing new products into the market place and a sustainability strategy based upon the evidence that the most successful manufacturers are those that are product developers. Furthermore, the use of a systematic product development approach with an integrated, concurrent engineering process ensures that design solutions are fit for purpose, will meet the market needs, and are ready for economic manufacture. In supporting SMEs design and develop new products in this way not only do the universities / research institutions help firms to design new products, but also demonstrate the value of adopting a rigorous, market-led, milestone driven design and development process, i.e. "process innovation" where an effective, efficient, faster process produces more successful new innovative products. Hence, the study hypothesizes that:

Hypothesis 1: Collaboration between manufacturing SMEs and research institutions has effects on a firm's product innovations.

Hypothesis 2: Research institutions technology transfer has effects on manufacturing SMEs product innovativeness.

3. Methodology

3.1 Design and data collection

A cross-sectional survey design was adopted to provide a numeric description of the fraction of the population – the sample -through data collection process, using a questionnaire and observation guide at one point in time, with the findings being generalized to a population (Creswell, 2009).

3.2 Population and Sample

The focus of this study was the firm level. The sampling frame were all manufacturing SMEs registered and licensed within Kisumu town The sample size was determined according to Krejcie and Morgan (1970) survey table of samples that recommend a sample size of 196 for a population of 342, at 95% confidence level with 5.0% margin of error. Purposive sampling was then used to select the respondent entrepreneurs .

3.3 Data Analysis

Of all the 142 questionnaires returned, only 126 were found usable and included in the analysis. The dimensions of collaboration and technology transfer measures were the predictor variables and product innovativeness measures were the criterion variables. Data was analyzed using binary logistic regression to test the effect of collaboration / research -universities technology transfer on product innovativeness of manufacturing SMEs in Kisumu Town.

4. RESULTS

The results of logistic model to test the research hypotheses are presented in Table 1 below:

Table 1: Result of Logistic Regression Analysis: Effects of Collaboration and Technology Transfer on Product Innovativeness

	B	SE β	Wald's χ^2	Df	p	Exp(B)
Predictor						
Partner with other firms	.214	.170	1.597	1	.206	1.239
Benchmark	.255	.174	2.153	1	.142	1.291
New product ideas from partners	.616	.201	9.374	1	.002*	1.852
External sourcing of market information	.664	.197	11.326	1	.001**	1.943
Research partnerships	.399	.159	6.281	1	.012*	1.491
Partnership in design/dev/testing	-.096	.169	.326	1	.568	.908
Constant	-6.523	1.659	15.454	1	.000	.001
Test			χ^2	df	p	
Overall model evaluation						
-2 Log likelihood			132.500			
Score test			42.173	6	.000	
Goodness-of-fit test						
Hosmer- Lemeshow			7.658	8	.468	

*$p < .05$, **$p < .001$

When product innovativeness was regressed on the collaboration variables, the Hosmer–Lemeshow (H–L) was insignificant χ^2 = (8, n = 126) = 7.658, p = .468, suggesting that the model was fit to the data. The overall model was significant (χ^2 = 42.173, p < .001) with a -2 log likelihood value of 132.500.The model as a whole explained only between 28.4% (Cox & Snell R^2) and 37.9% (Nagelkerke R^2). The model's explanation rate was 70.6%, meaning its categorization was good enough to classify SME product innovativeness as high (71.4%) or low (69.8%).

The results in Table 1 reflects the significant positive association of search for new product ideas from partners (β=-.616,,p<.05), external sourcing of product/market information (β=-.664,,p<.05), and research institutions partnerships (β=.399,,p<.05) on the probability of SMEs manufacturing highly innovative products.

Though bench marking (β=255, p>.05) and partnership with other firms (β=.214,,p>.05) had positive coefficients their effects on the probability of the SMEs manufacturing highly innovative products were low. Nonetheless, lack of partnership in design/dev/testing (β=-.096,,p>.05) negatively affects SMEs product innovativeness

These results indicate that SMEs in Kisumu Town do collaborate to a large extent. This is a positive finding because collaboration is an important element of product innovativeness. The

finding supports the view of Waits (2000) that it is necessary for firms to collaborate, and work with other institutions to meet their needs and their interests. The SMEs in Kisumu City have adopted this strategy. Within the cluster, SMEs tend to cooperate not only with other firms in the same cluster but also with potential innovative partners such as suppliers, customers, universities, and research institutions that have specific kinds of resources and know-how. This is also what Moyi and Njiraini (2005) recommend. The study is in agreement with Gao *et al.,* (2008) that university/research institutions should play a lead role in the cluster innovation, in generating new knowledge and technologies, attracting researchers, investments and research facilities, enhancing other firms R&D activities, stimulating demand for new knowledge and creating and capturing externalities. Steinmo and Rasmussen (2013) posit that such knowledge should be passed on to SMEs through collaborative programmes to enhance product innovativeness.

Nonetheless, as Gemunden *et al.,* (1996) posit, the entire set of collaborative activities established might become a network and SMEs collaborations differ in importance and intensity. SMEs must build up and maintain only those relationships which are valuable to them. The study has established that SMEs in Kisumu do collaborate with other firms in their endeavour to manufacture innovative products.

5. Conclusion

Data analysis showed significant positive effect of collaboration on product innovativeness. The study indicates that as the SMEs embrace new product ideas from partners, the odds of manufacturing innovative products would increase. Similarly, as the SMEs become more aggressive in externally sourcing product/market information, the odds of manufacturing innovative products would increase. Finally, as the research institutions / universities technology transfer improve, the odds of the SMEs manufacturing innovative products would increase.

5.1 Recommendation

Since innovativeness is influenced by collaboration and research institutions / universities technology transfer, it would be advantageous for manufacturing SMEs entrepreneurs to maintain their close collaborations with partners if they are to sustain continual product innovativeness. Specifically, collaboration between the SMEs entrepreneurs, partners and clients or between the SMEs entrepreneurs and research institutions/ universities is critical to facilitating information transfer pivotal to innovative product development. The government should take a lead on this and build on the gains so far made by the research institutions' / universities. . In the medium and long run, more benefits will result from partnerships involving manufacturing SMEs entrepreneurs, the government and the private sector organizations with interest in this sector.

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