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Effect of Knowledge Transfer and Spillover on Product Innovativeness: The Case of Manufacturing Small and Medium Enterprises (SMEs) in Kenya

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Abstract
The aim of this study was to determine the effect of knowledge transfer and spillover on product innovativeness (PI) in the context of manufacturing SMEs. in Kisumu, Kenya. To answer the questions this empirical study raised, a sample of 126 MSEs on the basis of the manufacturing hubs of Kisumu, Kenya. This study provided evidence in support of knowledge transfer and on the contrary, knowledge spillover on PI. Further research is needed to confirm and extend the present results by replicating the principal features of this study with MSEs in other regions within Kenya. The conclusions drawn from this study could inform efforts in designing different knowledge transfer supportive actions for different manufacturing MSEs based on their product knowledge gaps within the wider innovation policy initiatives.
Keywords: Small and medium-sized enterprises, Manufacturing, knowledge transfer and spillover, Product Innovativeness, Kenya

1.0 Introduction

In today's global economy, knowledge is considered a precious commodity and concepts like knowledge sharing and lifelong learning have become increasingly prevalent in business practices (Senge & Scharmer, 2001). In this new environment, the nexus of sustainable economic development rests upon the ability of partners to learn, create and harness knowledge collaboratively and continuously (Florida, 1995). In the transition to a learning-based economy, the 'new regionalism' focuses on social and institutional learning as the prime driving forces behind regional economic growth (MacKinnon, Cumbers, & Chapman, 2002).

The concept of collective learning lies at the base of the innovative and creative milieu theory, whereby the presence of common knowledge goes beyond the individual firm yet remains within the boundaries of the milieu or, as the case may be, cluster domain (Cumbers, Mackinnon, & Chapman, 2002). Collective learning is generally defined in the literature as "a social process of knowledge accumulation", whereby knowledge creation through interaction and continuity provides an important vehicle for the transfer of knowledge over time (Capello, 1999, 720-721). Through collective learning, regional clusters can reduce uncertainty, foster innovative milieux, and augment creative capacity for firms by way of information and knowledge diffusion throughout the local network (Amin, 1999; Marceau & Dodgson, 1998; Storper, 1997). By formulating networks in which socially a variety of regional agents and institutions take part in interactive learning processes, it is believed that regions can create competitive advantage (Amin & Thrift, 1995; Lundvall & Johnson, 1994; Morgan, 1997).

1.2 The Problem

Despite the widely held view that clustering can play an important role in fostering incipient industrial development, especially in poor regions (Schmitz & Nadvi, 1999) and also enhance the ability to innovate (Frisillo 2007), little is known of the effect that clustering and knowledge spillover has on product innovativeness among manufacturing SMEs in developing countries such as Kenya. In order to remain competitive, SMEs do need to continually improve and enhance their products innovation (Salavou & Avlonitis, 2008). Most of the manufacturing SMEs in Kisumu Town seem to be operating in clusters, manufacture similar

products and target the same market, thus their product innovatinness levels seem to be low. This has resulted in an increased inter-firm rivalry since firms are competing for not only customers but also skills supply in the labour market. This therefore underscores the importance of undertaking a study on the effect of clustering and knowledge spillover on product innovativeness among manufacturing SMEs in Kisumu Town, Kenya. 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, conclusion and implication are discussed.

2. Literature Review

2.1 Theory and Hypothesis Development

2.1.1 Knowledge spillover theory

According to Webster's Dictionary, knowledge is "the body of facts accumulated by mankind." Yang et al. (2010) posit that the creation of new knowledge consists of the recombination of existing knowledge and the creation of new ways through which elements of knowledge are reconfigured. This means that firms use their existing knowledge as a boost of innovation (Kostov, 2010). One of the major drawbacks of firms using existing knowledge and competences is that they limit their innovations to incremental advancements but this problem could easily be overcome by the incorporation of external knowledge in the organization (Yang et. al., 2010). One popular way of incorporating external knowledge in the corporation is through knowledge spillovers.

Knowledge spillover has been widely discussed in research literature, and may be referred to as the positive externalities firms receive in terms of knowledge from the environment (Bougrain & Haudeville,2002;Davenport, 2005); is a result of personal contact between individuals in a specific cluster (Aharonson, Baum & Feldman, 2007; Andersen, 2010). Marshall (1920, p.225) argues that shared knowledge occurred in a type of "industrial atmosphere" and that "the mysteries of the trade become no mysteries; but are as it were in the air". Hence, clustering would enable easier sharing of product knowledge, production technology, production process, and market information. Such knowledge spillover in cluster SMEs to a great extent occurs either voluntarily or involuntarily when carrying out knowledge activities. The rationale behind the concept of knowledge spillovers is that the spillovers are only available to the actors within the boundaries of the cluster, and that stand-alone firms will have a disadvantage relative to the firms within the cluster. It is therefore often termed as *localized knowledge spillovers,* and may allow firms operating nearby the knowledge sources to introduce innovations at a faster rate than firms operating outside a cluster (Bell, 2005).

To promote innovativeness, the firm must possess the necessary human capital which is regarded as reflecting a firm's competence, skills, and intellectual ability to absorb, assimilate and develop new creative ideas, knowledge and technology (Bartel & Lichtenberg, 1987; Cohen & Levinthal 1990; Rose, *et al.,* 2009). Several empirical studies found that technological change tends to be skill-based and changes the relative labour demand in favour of highly skilled and educated workers (Bougrain & Haudeville, 2002; Henard & McFadyen, 2012). Hence, the study hypothesizes that:

Hypothesis 1: Knowledge spillover among cluster manufacturing SMEs has a positive effect on product innovativeness.

2.1.2 Knowledge transfer from University/research institutions to cluster manufacturing SMEs has an effect on product innovativeness.

For SMEs, the knowledge interaction inside and outside cluster 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 clustering 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).

University/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 excellent technology. University/research institutions play a lead role in the cluster 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. University/research institutions use external knowledge to a greater extent than firms operating in the cluster, by leveraging on their intellectual and social capital, they

can act as "technological gatekeepers" for the whole region, thus enhancing the absorption of new information into the cluster and facilitating its internal dissemination.

Lan and Zhangliu (2012) aver that the collaboration between enterprises and university/research institutions is an important type of knowledge creation and knowledge transfer. 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 cooperation. So, the industry-university-research institutes do play an indispensably role in the development of novel products. Hence, the study hypothesizes that:

Hypothesis 2: Knowledge transfer has an effect on cluster manufacturing SMEs has an effect on product innovativeness.

3. Research Methodology

3.1 Design and data collection

This study adopted a cross-sectional survey design, 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 is at the firm level with the unit of analysis being the manufacturing SME. The sampling frame were all manufacturing SMEs registered and licensed within Kisumu town as contained in the Official Registry of SME Associations of Kisumu, (2011), 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 342, at 95% confidence with 5.0% margin of error. Purposive sampling was then used to select the 136 respondent owner-managers.

3.3 Data Analysis

Of all the 142 questionnaires returned, only 126 were found usable and included in the analysis. Descriptive analysis means, and multiple regression analyses were conducted to examine the various aspects and relationship s among variables. In the current study, the dimensions of collaboration measures were the predictor variables and the product innovativeness measures were the criterion variables.

4. Results

4.1 Knowledge Spillover through Product Innovation

Studies have shown that novel products play an important role as a mechanism of knowledge spillovers in MSEs. In this study, product innovation was measured in terms of the type and number of new products launched in the market, the results being presented in Table 1.

Table 1: The type and number of product innovation of manufacturing MSEs

Variable	Categories	n	Min	Max	Total
No. of innovations	In the market	71	1	10	150
	Significantly improved	57	1	6	93
	New to firm	87	1	7	188
	New to Kisumu	88	1	9	153
	New to World	30	1	4	42
No of patents		30	1	2	44

The number of product innovations is shown in figure 1.

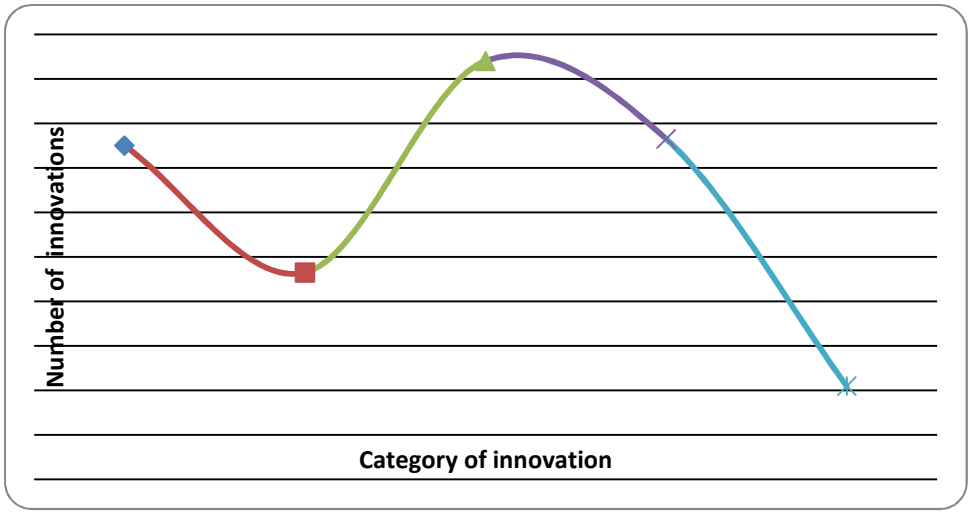

Figure 1: Number of product innovations by Category

Out of the reported 150 innovations in the market, 93 innovations were significantly improved products, 42 were new to the World. The study also found that adopted innovations to the firm were 188 with product innovations new to the Kisumu market being 153. Although there are high levels of declared innovations, the last two categories are products that were developed and later introduced based on borrowed technological solutions from partners and other collaborating firms. This is also reflected in the low number of patenting. According to Petrov *et al.* (2010) the low patent activity of MSEs implies that there is hardly any innovation with international significance.

4.2 University/research institutions knowledge creation and knowledge transfer

Staff training is critical to innovation presumably due to the enhanced absorptive capacity of knowledge-spillovers that may trickle back into the MSEs. According to Knight (2001), participants in the National Innovation System (government, firms and the other members) invest in R&D for the creation of new products, technologies and knowledge a scenario that is emerging in Kisumu as firms collaborate with KIRDI, technical institutions and universities to access skills and special machinery as is the case between KIRDI Kisumu and products manufacturers.

The activities partnered in were sought and the results are shown in figure 2.

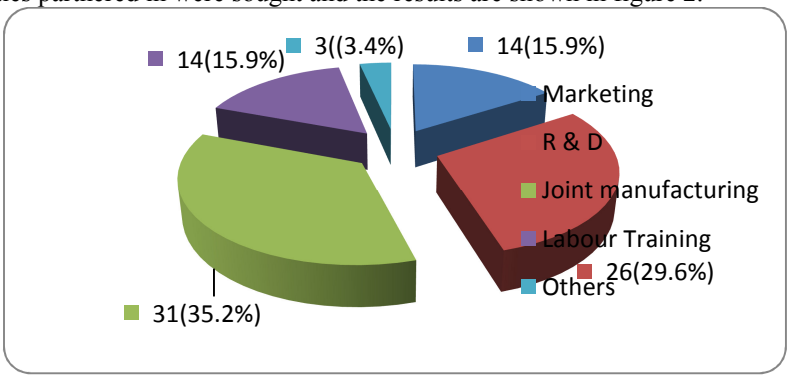

Figure 2: Partner Firms Collaboration Activities

The results indicated that 14 (15.9%) of firms collaborated in marketing, 14 (15.9%) labour training, 25 (29.6%) R & D, 31 (35.2%) Joint manufacturing and 3 (2.8%) others. Waits (2000) has argued that the industry cluster concept has proved to be a powerful framework for firms to collaborate, and work with other institutions to meet their needs and their interests. Within the cluster, firms 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 who have specific kinds of resources and know-how (Moyi & Njiraini, 2005).

Nonetheless, Gemunden et al, (1996) posit that the entire set of collaborative activities established then becomes a network. All collaborations differ in importance and intensity, and firms build up and maintain only those relationships which are valuable to them Branzei and Vertinsky (2006) aver that innovative firms actively scan external sources of knowledge, seek diverse partnerships and learn. This external idea sourcing may prove particularly critical in situations where relevant skills tend to be dispensed among highly specialized players (Rodriguez, Fernandez, & Martins, 2007).

4.3 Hypotheses Testing

Variance inflation factor (VIF) was used to examine multicollinearity with no value going beyond the critical level of 5 and none of the tolerance approached zero, implying no multicollinearity problem (Hair *et al.,* 2010). The results are shown in Table 2.

Table 2: Regression coefficients Results of Knowledge Transfer & Knowledge Spillover on Product Innovativeness

Variables	B	S.E. of B	*β*	t	*P*	Tolerance	VIF
(Constant)	17.375	2.637		6.590	.000		
Skills from competitors	-.070	.399	-.016	-.175	.862	.901	1.110
Role models	-.026	.416	-.006	-.062	.950	.865	1.156
Attend conferences	-.746	.369	-.178	-2.021	.045	.945	1.058
After sales services	.594	.381	.138	1.559	.122	.931	1.074
Adequate knowledge	1.091	.399	.245	2.736	.007	.914	1.094
Benchmarking	-.208	.395	-.048	-.528	.598	.875	1.143

R =.361; R2 = .131; R2adj =..087; p ≤ 0.05

The results of the regression indicated the predictors explained 13.1% of the variance (R^2= .131, Adj R^2 = .087), F (6, 119) = 2.981, p < .05; t = 6.590.

H1: It was found that knowledge transfer through attending conferences significantly predicted PI (**B** =-.746, *p*< .05) t=.-2.021 as did having adequate knowledge (**B** =.1.091, *p* < .05) t=2.73 6, supporting Hypothec 1 thus confirming earlier results as reported in figure 2.

H2: The four predictors representing knowledge spillover exhibited insignificant effects on PI: acquiring skills from competitors (**B** =-.070, p=.862) t= -.175; learning from colleague-role models (**B** =-.026, p=-.950) t= .062; offering after sales services (**B** =.594, p=.122) t=1.559 and learning from benchmarking products (**B** =.-.208, p=.598) t=-.528. Hypothesis 2 was rejected.

5. Discussion

Interaction creates new knowledge when actors bring their knowledge to a shared platform. MSEs acquire explicit knowledge from participating in conferences/seminars/workshops, sharing of product ideas/ information/ knowledge and training. These results indicate that explicit knowledge creation and knowledge transfer are spiraling processes of interaction fusing explicit and tacit knowledge (Nonaka & Konno, 1998). Gao *et al.,* (2008) opine that university/research institutions play a lead role in product 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. All these will contribute positively to innovation and product innovativeness of MSEs. The findings would appear to be consistent with other research views that external knowledge is an essential determinant in new product innovation (Un et al. 2010). . Researchers are of the view that such interactions provides firms with some of the necessary conditions required for innovativeness, namely, product idea or information transfer (Walsh *et al.*, 2009), learning and coordination of production and product development activities (Walsh *et al.*, 2011).

Likewise, knowledge spillover, even though insignificant, do facilitate access to tacit knowledge through acquisition of skills from competitors, learning from colleagues (role models), benchmarking products, and customers through offering after sales services. This may derive from the fact that a firm's absorptive capacity is crucial when it is exposed to an opportunity to assimilate innovative product technology/ knowledge from outside sources.

Further the relatively insignificant impacts of knowledge spillover on PI may imply that MSEs use University and industrial research institutes technology, that is less product-specific thereby resulting in less effect on the development of near market products (Tidd *et al.,* 1997). Arora and Gambardella (1994) argue that the university linkage appears to be more important as a source of scientific information and capabilities, rather than as a source of new innovations. The nature of the product-specific project lies in producing a successful new product that requires various technologies covering a complete set of product commercialization knowledge, such as pre-development assessment, design and development manufacturing and marketing.

The insignificant relationship between knowledge spillover and PI may suggest that a firm can have access to complementary knowledge through collaborators but may not have adequate ability to absorb such knowledge. It may also imply that firms with higher absorptive capacity are likely to codify collaborators' product knowledge that can then be assimilated and distributed within (Shu, 2003).

5.1 Conclusions

This study investigated the effect of knowledge transfer and knowledge spillover on product innovativeness of manufacturing MSEs in Kisumu Town with a view to generating appropriate mix of knowledge creation and knowledge transfer strategies for the improvement of their product innovativeness. This was in relation to MSEs

lack of continual improvement and enhancement of their product innovativeness.The study established that knowledge transfer significantly enhance PI.

5.2 Recommendations

Despite its limitations, this study contributes substantially to academic knowledge and practice, in addition to highlighting key areas warranting future investigation. At the national context, the study generates appropriate mix of learning and knowledge transfer strategies and contribute to policy efforts towards enhancing the manufacturing MSEs' product innovativeness and hence competitiveness.

The researcher recommends the setting up of MSEs Knowledge transfer policies that promote inter-firm interaction and alliances with university/research institutions for purposes of sharing information/ accessing the diverse knowledge base on new product design, development and production. Such alliances and the direct contact with entrepreneurs in the same field will reduce risks and durations of the innovation process because of direct or informal information transfer between firms and university/ research institutions, hence enhanced product innovativeness.

5.3 Areas for Further Research

Future studies replicating this study across multiple industries and sectors using a larger sample would increase the understanding of MSE Knowledge transfer and spillover concept. The study did not investigate firm-specific factors influencing product innovativeness in relation to knowledge spillover, such as absorptive capacity or similar firm-specific factors that may influence firm ability to translate information into innovative products. Therefore, this is a line of investigation that future research should embrace.

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