Innovation Propensity and Collaborations of firms in the Wood and Furniture Clusters in Kampala, Uganda

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ABSTRACT
99% of the businesses in Uganda fall in the SME category, however, their growth, performance and contribution to the Uganda's GDP is limited most especially those in the manufacturing sector.

The importance of collaboration and business linkages has been identified in innovation studies as a key determinant of productivity and growth of SMES. The aim of this study was to understand the level and types of linkages and cooperation of technology sources with SMEs in the wood and furniture industry in Kampala and the factors affecting the linkages.

The study revealed that SME firms have very low innovation propensies, have strong linkages with suppliers and customers but have weak linkages with large firms, government, academia and financial institutions. Strategies for sector upgrading ought not to be solely based on creation of innovation system linkages/networks but should rather be based on collaborations that address the specific underlying weaknesses/challenges that firms are currently facing.

Key words: Clusters, Collaborations, Furniture, Innovation propensity, Linkages, Productivity, SME.

1.0 INTRODUCTION

99% of the business in Uganda fall in the SME category, but their growth, performance and contribution to the Uganda's GDP most especially those in the manufacturing sector (7% of businesses in Uganda) is still low (UBOS, 2011, Gauthier, 2001). Most of the SMEs have low levels of productivity; produce poor quality products which are supplied to only small localized markets. Many of the SME businesses are not formalized which limits their access to credit, subcontracting and business linkages (EAC, 2010).

Ugandan SMEs need to be supported to grow from micro to small, small to medium and from medium to large firms (UIA, 2008) and some of the key drivers for upgrading and increased competiveness of SMEs is through business linkages and collaboration (Enterprise Uganda, 2008; Machikita & Ueki, 2011). Business linkages stimulate innovation, they are a key determinant of productivity and growth, and they are the engine that moves the economy, reshapes industries, firms and markets (Carvalho, 2005).

The wood and furniture industry has several constraints that have curtailed its growth and some of these include the limited cooperation of SME firms with research institutions/university, government, financial institutions and most importantly with large wood working firms in the industry. This has created a sector disparity with large firms serving high end customers and the cluster firms serving the low and middle class with very small profit margins. The SME firms are also limited in terms of technological, human, financial and management resources which contribute to high levels of wastage, inefficiencies and poor quality products (Inshengoma & Kappel, 2008). The furniture produced by

these firms is also regarded inferior to the imported and that produced by the large firms (Yoshida, 2008).

The aim of this study was to understand the level and types of linkages and cooperation of technology sources (large firms, industry, government parastatals and academia) and SMEs in the wood and furniture industry and the factors affecting the linkages. This research specifically focused on the wood and furniture cluster firms in Kampala district agglomerated in areas of Kubiri-Makerere/Bwaise, Nsambya and Natete-Nalukolongo areas. This was because Kampala district has about 35% of the total number of furniture workshops in the country (UBOS 2010; Seremba et al., 2011). Figure 1.1 below shows some of the firm product innovations in the study.

Figure 1.1: A special set of unique furniture only found with specific firms in Nsambya, Kampala

2.1 The cluster concept
For the purpose of this research, the clusters in developing countries are defined as geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in similar or related economic activities that compete but also cooperate, government and associated institutions (e.g., standards agencies, trade associations, financial, universities) which provide specialized training, research and technical support(Porter, 2001; Porter, 2000; ECEIDG, 2013).

Firms in developing countries are now under intensive pressure to improve their performance and increase their competitiveness (Humphrey and Schmitz, 2002). Good quality furniture is now a luxury to the ordinary Ugandan, which has resulted into the increased import of cheap furniture into the country and thus highly intensive competition in the industry (Muleme, 2010; Seremba et al., 2002). Literature on competiveness indicates that the most viable option for firms is to upgrade. Upgrading is defined as the capacity of a firm to innovate and increase the value added of its products and processes. 2.3 Innovation

2.2 Innovation Propensity
Popular definitions of innovation focus on new combinations of productive resources to increase profit (Schumpeter, 1961); newness related questions 'what is new, how new, and new to whom' (Johannessen et al., 2001); the importance, improvement of existing technologies and market success of inventions (Corre & Michke, 2005). The definition context for developing countries also includes miniature improvements in quality and product designs; changes in production organization, process, techniques and knowledge management; creative marketing; introduction of new maintenance routines and process innovations with new purchase of equipment and through technology licensing and subcontracting relationships (Patarapong, 2007). The creation of ties with established large firms, government institutions, universities and research institutions creates a significant impact in the innovation activities of cluster firms (Nganga et al., 2003; Baum et al., 2000).

The innovation construct includes taxonomy of types/categories: process, product, organizational and market innovations (Schumpeter, 1961; OECD, 2005; Bonen, 2007, Johannessen et al., 2001).

2.3 Study Objective
Assess the level of innovation propensity as affected by linkages and collaborations between the wood and furniture actors (clusters, clients, large firms, government and academia) in Kampala district

Hypothesis: Linkages and collaborations of SMEs in the wood and furniture clusters with different partners has a~~a~~ no significant impact on innovation propensity

3.0 RESEARCH METHODOLOGY
3.1 Research approach
A quantitative approach was used for the study which enabled us to obtain numerical data from the survey interviews with use of structured questionnaires about the number of innovations, levels of linkage/collaborations of cluster and the variables that affect them, number of staff at different education levels, firm age, new staff training period and enumeration of the specific areas of collaboration with large firms, government, academic, financial institutions. It also enabled us obtain the main constraints/obstacles to firm innovation activities thus leading to the current low level of competiveness.

3.2 Sample population and sampling
The target interviewees were the workshop managers/owners and managers. 42 firms provided a representative sample in this study and a simple random sampling method was used. The sampling frame was the official and non-officially enumerated, agglomerated firms in Kubiri-Makerere, Nsambya and Natete-Rubaga areas.

The author established the number of firms engaged by physically counting the firms engaged in production of wood and furniture products as he walked through the area. A total population of 148 firms was counted in an estimated area of 7 square kilometers. The sample size was determined using the Equation 3.1 (Watson, 2001):

$$n = \frac{\frac{P(1-P)}{\frac{A^2}{Z^2} + \frac{P(1-P)}{N}}}{R} \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\text{equation 3.1}$$

Where:
- The estimated total number of enterprises in the selected areas of the wood and furniture sector is 148 as per the calculations indicated in this sub-section i.e. N = 148.
- The estimated variance for this population was 0.3 i.e. P = 0.3 (Watson, 2001)
- The desired margin of error was 10% i.e. A = 0.1
- A confidence level of 90% was chosen i.e. Z =1.6449
- The estimated response rate was 95% i.e. R = 0.95
- $\Rightarrow n = \frac{\frac{0.3(1-0.3)}{\frac{0.1^2}{1.6449^2} + \frac{0.3(1-0.3)}{148}}}{0.95} \approx 43$ Firms $\dots\dots\dots\dots\dots\dots\dots\dots\dots$equation 3.2

A total of 43 firms were interviewed, however only 42 interviews provided complete information that would be used for the statistical evaluations.

3.3 Measurements
To determine the importance of external knowledge to firms innovation propensity, the level of collaborations/linkages over the last 3 years with Suppliers, Customers, Universities/Research institutions, Large Firms/competitors, Government, and Financial institutions was analyzed on a 5 point likert scale where the value of 1 signified no collaboration, 2 indicated 1-2 interactions, 3 indicated 3-5 meetings/interaction, 4 indicated 6-8 interactions and 5 indicated 9 and more interactions (an average of 3 or more per year).

Innovation propensity was analyzed in form of count data that was obtained by summing the different innovations as per the Innovation categories of product, process, procurement, organization and market innovation. The total innovation was used to analyze the innovation propensity quartile/level of innovation propensity.

To obtain the innovation propensity quartile, the ratio of the total number of firm innovations to total number of possible innovations (80 in total) as per this research model was obtained. The innovation propensity quartile ranged from (0-0.24 for low level; 0.25-0.49 for medium level; 0.5-0.74 for high level and 0.75 to 1 for very high level).

The data collected was entered into Epidata version 3.1, and later exported to STATA for descriptive and multiple regression analysis.

4.0 RESULTS

4.1 Total number of innovations

The minimum number of innovations was 2 and the maximum from the firms was 26 out of a possible total of 80 innovations

Table 4.1 shows that the minimum number of Product innovations, Product process innovations (PPI), Market Innovations (MI), Organizational Innovations (OI), and Procurement Innovations are 0,0,1,0 and 0 respectively. The maximum number of Product innovations, Product process innovations (PPI), Market Innovations (MI), Organizational Innovations (OI), and procurement Innovations are 10, 5, 14, 3 and 4 respectively.

Table 4.1:

Innovation	Observations	Mean	Std. Dev.	Min	Max
Product	42	6.2381	2.18431	0	10
Product process	42	0.5	1.21475	0	5
Marketing	42	5.45238	3.20976	1	14
Organization	42	0.19048	0.5942	0	3
Procurement	42	0.33333	0.8165	0	4

4.2 Level Innovation propensity/ innovation

Table 4.2 shows that 83.33% of the firms have their innovation propensity belonging to the first 1st quartile and 16.67% belong to the 2nd quartile. There are no firms with innovation propensity in the 3rd and 4th quartiles.

Table 4.2 Innovation Indice/Quartile

Innovations indice		Freq.	Percent	**Cum.**
0- 0.24	1st quartile	35	83.33	83.33
0.25-0.49	2nd quartile	7	16.67	100
Total		42	100	

4.3 Sources of knowledge for innovation and linkages

Figure 4.2 shows the knowledge sources based means of level of linkages/interactions/collaborations SMEs with stakeholders in the innovation system**.**
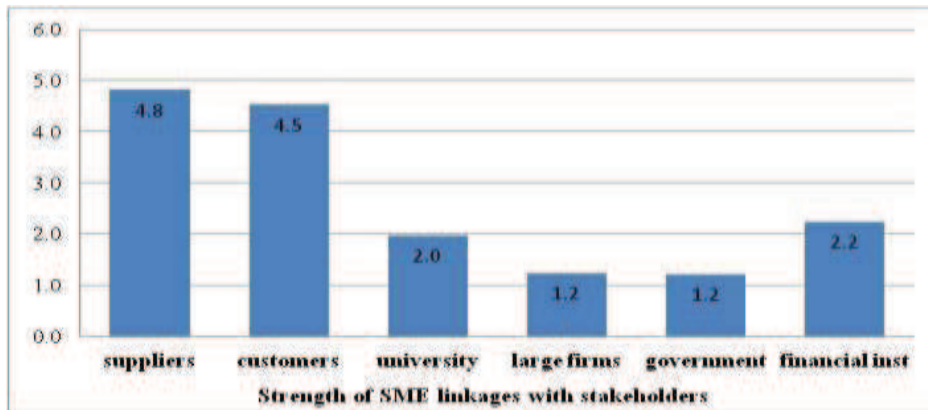

Figure 4.2: Strength of SME linkages with with suppliers, customers, university, large firms, government and financial institutions

Figure 4.2 shows that firms have very high levels of interaction with suppliers (4.8) and customers (4.5), weak collaborations with universities/research institutions (1.97) and financial institutions (2.2) and no collaborations with large firms (1.2) and governments (1.2) basing on the likert scale of 1-5. The linkages/collaborations with customers was the strongest as highlighted above with levels of 4.8 and 4.5 basing on the likert scale of 1-5.

4.4 Firm absorptive capacity
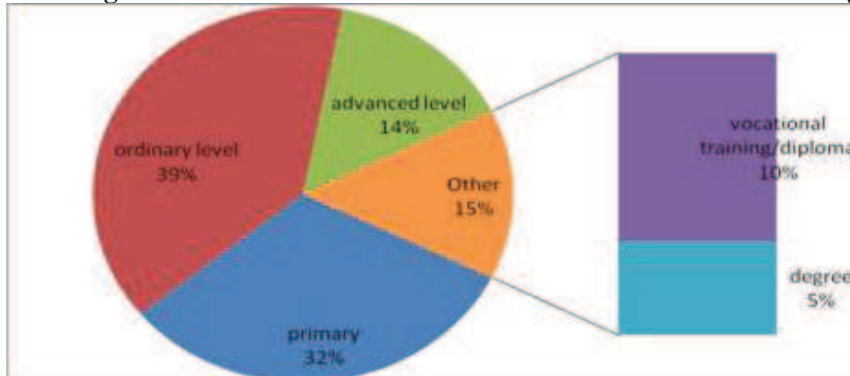**4.4.1 Highest attained education of the Owner/CEO/Director/Manager**

 Figure 4.3: Highest attained education of CEOs

Figure 4.3 shows that only 5% of the CEOs have attained a degree education, 10% have obtained a highest education of a diploma or vocational training, 14% have obtained advanced level training, 39% have obtained a highest education of ordinary level and 32% have attained only primary level education. This clearly shows that the firms have low absorptive capacities due to the low level of CEO education.

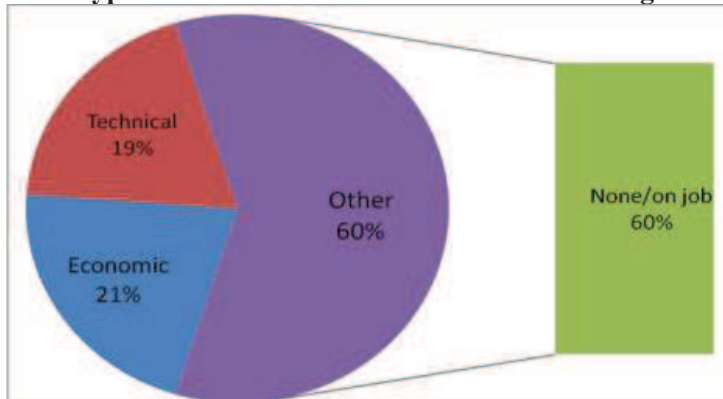### 4.4.2 Type of CEO/Owner/Director/Business manager's education

Figure 4.4: Type of CEO/owner/manager's education

Figure 4.4 shows that 60% of the business owners/directors/CEOs have obtained their skills by learning on the job. Only 19% have received some form of technical training and 21% have received economic/business training. This result implies that firms' absorptive capacity is low.

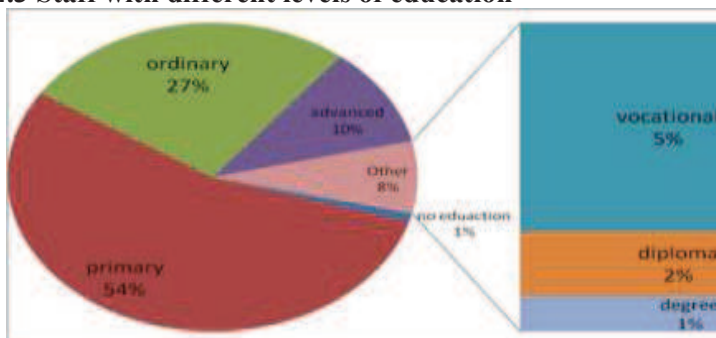### 4.4.3 Staff with different levels of education

Figure 4.5: The highest level of education attained by the staff

Figure 4.5 shows that 54% of the firm's employees have highest education of primary level. 27% of staff have ordinary level education in addition to the primary education, 10% have advanced level education in addition to primary and ordinary level education, 5% have vocational education in addition to ordinary education or advanced education. 1% have no education at all, only 2% have a diploma and only 1% have highest of degree education. The high number of staff with primary education and the lack of sufficient staff with a diploma or degree shows the low absorptive capacity of the firms.

4.4.4 Firm size

The minimum firm size is 2 staff and 20 staff is the largest firm size. The mean firm size is 8 staff each firm has an average of 4(four) permanent employees, 3(three) temporary employees and 1(one) apprentice

4.5 Hypothesis testing

4.5.1 Hypothesis

Null hypothesis: Linkages and collaborations of SMEs in the wood and furniture clusters with different partners has a no significant impact on innovation propensity

The hypothesis was evaluated through the following regression analysis as obtained in the stata output. Table 4.4 below shows the values of the coefficients of the significant variables, as key extracts from the regression analysis.

Table 4.4: Impact of Impact Of linkages and collaborations of SMEs in the wood and furniture clusters with different partners on firm innovation propensity

Dependent Variable	Innovation propensity/ Y_{innov}
University/Research Institutions	2.2253**
Constant	4.375***

Notes: All non significant variables (Gov't, large firms, suppliers, customers and financial institutions) obtained from the stata output were omitted.

R^2= 0.32, Adjusted R^2=0.29

**$P < 0.05$, ***$P<0.01$

From the regressions results highlighted in Table 4.4, the following regression model was developed.

$Y_{innov}=$ 4.38 + 0.03 (suppliers)^3 + 0.01(customers)^3 + 2.23 university/research + 0.87 1/(largefirm^3) - 3.19 1/(government^3) + 11.09 1/(finance institutions^3)

The above model was significant since its P value of 0.0262 was less than 0.05 level of significance. The R-squared (R^2) indicates that 32.17% of Innovation propensity is being predicted by the variables under consideration of this model.

This model above was further checked to find out which variables were statistically significant to the model through a stepwise regression. As a result the most insignificant variables at 95% level of confidence were eliminated from the model one by one and the final regression analysis output has only one variable (university/research institution collaboration) out of the 6 variables.

Table 4.5 shows the output of the impact of collaborations on Innovation propensity after a stepwise regression.

Table 4.5: Impact Of linkages and collaborations of SMEs in the wood and furniture clusters with different partners on firm innovation propensity after as step wise regression

Dependent Variable	Innovation propensity/ Y_{innov}
University/Research Institutions	2.6043***
Constant	7.567****

R^2= 0.23, Adjusted R^2=0.21

***$P<0.01$, ****$P<0.0001$

From the regression outputs highlighted in Table 4.4 above, the following model was obtained as final model for hypothesis 1.

$Y_{innov}=$ 7.567 +2.60 university/research institution

The above model as a whole was significant since its P value of 0.0014 was less than 0.01 level of significance. This is slightly lower than the R^2 in the first model (0.33), attributable to the fact that the final model was obtained with only one variable. In addition, the adjusted R^2 of this new model is 0.21, which is also lower than 0.29 of the first model.

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The final model for the hypothesis, clearly shows that of all the external linkages, only the collaborations with universities/research institutions have an impact on firm innovation. Thus, the null hypothesis was rejected and an alternate hypothesis of "**Only University/research institution linkages significantly positively impact firm innovation propensity**".

5. DISCUSSION OF RESULTS

In this chapter, the findings presented in chapter four are discussed.

5.1 Total innovations

In light of the low level of innovation propensity, the Table 4.1 shows that current innovations pursued by the firms are mainly in the area of Product and Market innovations and firms hardly engage in Organisational, Process and Procurement innovations. This perspective is contrary to Thai firms which have more process than product innovations (Intarakamnerd, et. al., 2002).

The high level of product and market innovations shows that firms are only concentrating on improving product image with inspirations from magazines, imported furniture and other SME firms so as to attract more customers and to increase sales. Thus no efforts are put on improving efficiency and productivity through process, procurement and organisational innovations, and yet these are key aspects of sustaining firm competiveness.

5.2 Level of Innovation propensity and collaborations

Table 4.2 shows that 83.33% of the firms belong to the first 1st quartile and 16.67% belong to the 2nd quartile. There are no firms with innovation propensity in the 3rd and 4th quartiles. This clearly shows that generally firms are not highly innovative since most of them only belonged to the first quartile. Figure 4.2 shows that firms have very high levels of interaction with suppliers (4.8) and customers (4.5), weak collaborations with universities (1.97) and financial institutions (2.2) and no collaborations with large firms (1.2) and governments (1.2) basing on the likert scale of 1-5.

The firms depend on suppliers for the wood and furniture since the firms do not own any forests. Firms also depend on customers who purchase their products, for they must have a market. Without the customers, the firms would not be in business. Further, the customers are good sources for new product innovations and the suppliers make sure that they help the firm execute their product innovations through raw material supplies. This explains the very high collaborations firms have with the suppliers and customers for the businesses thrive on these two collaborations with or without innovation, their business' survival depends on them.

5.3 Discussions of the hypothesis results

The null hypothesis in hypothesis was rejected and an alternate hypothesis of "**Only University/research institution linkages significantly positively impact firm innovation propensity**" was adopted. The final model is shown below;

$$Y_{innov} = 7.567 + 2.60 \text{ university/research institution}$$

The model above implies that the creation of linkages/collaborations between SME firms with government institutions, large firms and financial institutions, customers and suppliers shall not guarantee an increase in innovation propensity of the firms. This result is contrary to several scholars who have documented that creation of linkages between SMEs with large firms, universities, research institutions, financial institutions, customers and suppliers increases the firm's innovation propensity (Temell et al., 2013; Baum et al., 2003; Basil, 2012).

The lack of impact on collaborations on Innovation propensity may be attributed to the weak collaborations with academic/research institutions, financial institutions, large firms and government institutions at levels of 1.97, 2.2, 1.2 and 1.2 respectively on a likert scale of 1-5. Due to the low collaborations, this affects any opportunity of having a significant impact on innovation propensity.

6.0 CONCLUSION
In general the SME firms in this industry have very low innovation propensity and they have weak linkages with large firms, government, academia and financial institutions. All firms also have very strong collaborations with suppliers and customers with whom they engage on a daily basis. The low firm absorptive capacity explains their limited ability to develop and sustain collaborations, hence the lack of collaborations with government institutions & large firms and the weak collaborations with universities & financial institutions.

Study showed that the creation of linkages/collaborations between SME firms with government institutions, large firms and financial institutions, customers and suppliers does not necessarily guarantee an increase in innovation propensity of the firms. This implies that, the strategies for sector upgrading ought not to be solely based on creation of innovation system linkages/networks but should rather be based on raising the firms' absorptive capacities so as to raise the innovation propensities in mainly process and organizational innovations.

7.0 FURTHER RESEARCH
An in depth study is needed so as to evaluate all the actors that have linkages to the wood and furniture industry so to effectively correlate the views of the firms with those of the different actors and thus develop more a comprehensive strategy.

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