

**Antecedents of Environmentally Friendly Manufacturing Practices among SMEs in Africa:
Evidence from Uganda**

by

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Abstract

Environmental management is increasingly becoming an important topic of discussion in the business world today. Stakeholders as well as policymakers are demanding more accountability from companies in relation to their effects on the environment. In fact, putting the environment at the heart of a company's marketing drive has become a popular strategy as companies search for ways to achieve competitive advantage in the currently dynamic global business landscape. This paper addresses these issues in a rarely studied context. Specifically, it documents empirical evidence on the nature of SMEs adopting environmentally friendly manufacturing practices in a developing-country context where firms have a weak resource base and operate in a poor regulatory regime. By focusing on the SMEs as opposed to the conventional focus on large corporations, as well as, utilizing a developing-country context, this paper attempts to contribute to the extant literature by uncovering additional facets on the current topic with potential significant implications for business practice and public policy.

Key words: Environmental Management, Recycling, Waste disposal, SMEs

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Introduction

Environmental management is increasingly becoming an important topic of discussion in the business world today (Gadenne, Kennedy, & McKeiver, 2008; Lefebvre, Lefebvre, & Talbot, 2003; Williamson, Lynch-Wood, & Ramsay, 2006). Stakeholders as well as policymakers demand more accountability from companies in relation to their effects on the environment (Gadenne, Kennedy, & McKeiver, 2008; Williamson, Lynch-Wood, & Ramsay, 2006). Putting the environment at the heart of a company's marketing drive has even become a popular strategy as companies strive to achieve and sustain competitive advantage in the highly dynamic global business landscape (Simpson, Taylor, & Barker, 2004; Brammer, Hojmosse, & Marchant, 2012) McKeiver et al, 2005). In the conceptual domain, advances have been made to illustrate the importance of incorporating environmental issues in the company's strategy. For instance, according to Hamdouch (2012) a company can obtain good market evaluation following its attempts to address the current environmental challenges in the production process. In some circles, a company's environmental attitude has been linked to financial performance. For instance, the Global Environmental management Initiative (GEMI) has argued that the prowess of a company to innovate in its products while putting the environment into consideration can enhance the firm's profitability in terms of ROE, ROS and strong brand recognition. Beyond the financial benefits, Organization for Economic Co-operation and Development (OECD) (2007) and the United Nations Conference on Environment and development (1992) also anticipate the benefit of reputation that may arise from developing a business strategy with the goal of reducing the firm's effects on the environment.

But not withstanding the conceptual propositions made in this area, there is only a dearth of empirical research addressing the importance of building an environmentally responsive business especially from the context of SMEs (Coad & Tamvada, 2008). The scant empirical research ascertaining the progress of companies in building environmentally sustainable business has majorly focused on developed countries (Coad & Tamvada, 2008). Empirical research focusing on developing countries especially from the SME perspective in Africa is virtually non-existent. In line with the existing concerns on the relevance of the findings developed in the context of developed countries to inform managerial practice in developing countries, this study seeks to

explore the nature of environmental management practices among SMEs and the associated factors drawing on the context of Uganda.

Uganda is one of the countries in Africa that has registered tremendous progress in the arena of business development (Donat, 2010; UBOS, 2007; UIA, 2008; Weesasiri & Zhang, 2012). It is currently one of the leading entrepreneurial economies on the continent (Donat, 2010). Moreover, the government has established a number of regulations to enhance the SMEs response to the current environmental challenges in the country (e.g., National Environmental Action Plan of 1994, National Environment Act of 2006 and National Environmental Management Authority).

In addition, firms in the Uganda operate under a highly competitive environment of limited or no government protection (Whitehouse, Rider, Speir, & Thompson, 2005). The liberal economic environment as well as the preference of the government to open external competition has created a business milieu of numerous actors in the market including local and foreign firms (Donat, 2010; UIA, 2008; Whitehouse, Rider, Speir, & Thompson, 2005). In this environment finding means to conserve resources has become a necessary practice for the SMEs if they are to survive the local competitive landscape (Walker, Rednond, Sheridan, Wang, & Goeft, 2008). Focusing on Uganda, can therefore offer some valuable insights into how local firms in a unique setting of Africa are responding to the general call around the world to integrate environmental sustainability in their business operations. In the same view, the study promises to contribute towards our understanding of the creative ways through which SMEs are positively responding to the current environmental concerns drawing on the context of least-developed but highly dynamic local economy in Africa.

Literature review

A rich body of research exists providing insights into a number of issues firms face in the adoption of environmentally friendly manufacturing practices (Brammer, Hojmosse, & Marchant, 2012; Seidel, Seidel, Tedford, Cross, Wait, & Hämmerle, 2009; Gutowski, et al., 2005). A key concern in this literature has been the barriers in terms of lack of information about manufacturing best practices (Seidel, Seidel, Tedford, Cross, & Wait, 2008; Okello-Obura,

Minishi-Majanja, Cloete, & Ikoja-Odongo, 2007; Herren & Hadley, 2010), limitations of firms to ask the necessary questions vital to adoption of environmentally friendly manufacturing practices (Walker, Rednond, Sheridan, Wang, & Goeft, 2008; Herren & Hadley, 2010) as well as limited technical competence to incorporate environmentally friendly manufacturing practices (Seidel, Seidel, Tedford, Cross, Wait, & Hämmerle, 2009; Iraldo, Testa, & Frey, 2010). From the strategic perspective, a debate has arisen regarding whether or not the adoption of environmentally friendly manufacturing is a core activity to competitive advantage of the firms (Herren & Hadley, 2010; Whitehouse, Rider, Speir, & Thompson, 2005). While some researchers have held the view that investment in such activities may constrain firms to adequately execute their core activities (Oba & Fodio, 2012; Whitehouse, Rider, Speir, & Thompson, 2005), in more recent works, firm managers are encouraged to increase their investment in environmentally friendly manufacturing practices as a means to attain such strategic advantages as reduction in raw material efficiency, cost reduction and savings, regulatory compliancy, improved company image among local community and stakeholders, higher employee commitment, improved product quality and improved public relations (Gadenne et al, 2008; Simpson et al, 2004; Biondi, 2010; Burgos-Jime´nez, 2012).

Furthermore, previous research has also made vital advances in relation to the process of successful implementation of the environmentally friendly manufacturing practices (Starkey, Welford, Young, Brophy, Rikhardsson, & Johnson, 1998; Webster, Walker, & Schaper, 2003). Specifically work in this area, while recognizing the role of government regulations (Hoevenagel, Brummelkamp, & Peytcheva, 2007; Oba & Fodio, 2012, Weesasiri & Zhang, 2012), have highlighted the importance of firm characteristics and their associated effect on transformation of business practices, investment in research and development, access to finance and relevant information as critical factors in the successful implementation of environmentally friendly manufacturing practices. On the whole these previous advances in the literature have enriched our knowledge on environmental management at firm level especially in relation to factors that lead or impede environmental management among firms (Weesasiri & Zhang, 2012; Coad & Tamvada, 2008; Berry & Randinelli, 1998). Nonetheless, given that majority of this research draws on the developed country context and its major attention has been on large firms (Uwalomwa & Uadiale, 2011; Coad & Tamvada, 2008; Weesasiri & Zhang, 2012), there is still

room for contribution especially in relation to how SMEs in developing countries adopt environmentally friendly manufacturing practices (Donat, 2010). This knowledge is critical and with potential to enrich the current advances in the literature given that adoption of environmentally friendly manufacturing practices in the context of developing countries takes place within legacies of weak legal and regulatory framework (Akello, 2007; Herren & Hadley, 2010), lack of resources and information and lack of demanding and sophisticated customers (Morgenstern, Pizer, & Shih, 1998; Seidel, Seidel, Tedford, Cross, Wait, & Hämmerle, 2009).

In the sections that follow, we now draw on the extant literature to explain the likely relationships between the organization characteristics of interest and adoption of environmentally friendly manufacturing practices as we seek to empirically establish how these characteristics may explain the environmental management of SMEs in a developing country context.

The role of firm Age

Researchers have observed that with time firms discover what they are good at and learn to be more efficient (Loderer & Waelchli, 2010; Majumdar, 1997). They specialize and find ways to standardize, coordinate and speed up their production processes as well as to reduce costs and improve quality (Majumdar, 1997; Vlachvei & Notta, 2008). But it is also argued in other circles that older firms are prone to inertia, and often constrained by the bureaucracy (Simpson, Taylor, & Barker, 2004; Mitchel, O'dowd, Dimache, Imache, & Roche, 2011). Mature firms may therefore fail to make rapid adjustments to changing circumstances and are likely to lose out in the performance stakes to younger and more responsive firms (Biondi, Frey, & Iraldo, 1997). In comparing young and old firms it is common for the researchers to observe that young firms undertake radical green innovations, more often exploit technological or commercial opportunities and more easily challenge the business models of existing firms than older firms (Majumdar, 1997). We speculate that a similar logic may hold in the case of adoption of environmentally friendly manufacturing practices among SMEs in a developing country context.

The role of owner's education

In addition to age of the firm, personal demographic factors such as age and education of the owner have a considerable impact on entrepreneurial intentions and/or decisions that can either

hinder or promote the adoption of environmentally friendly manufacturing practices (Parker, Redmond, & Simpson, 2009; Schaper, 2002; Amran, 2011). This is especially more likely among SMEs where ownership and management are concentrated in the same hands (Perez-Sanchez, Barton, & Bower, 2001). In these firms, the personal preference of the owner will dominate in any decision about investments, allocation of funds and the development of business strategies (Hoevenagel et al, 2007). Education is presumably related to knowledge and skills, motivation, self confidence, problem solving ability, commitment and discipline (Papadaki & Chami, 2002). As such, higher education level of the owner is expected to increase the ability of the owner to cope with problems and seize opportunities that are important to the adoption of environmentally friendly manufacturing practices of the SME (Papadaki & Chami, 2002; Schaper, 2002). Highly qualified managers are more likely to be innovative; they appear more likely to adopt strategies, introducing new higher quality products and improving the quality of existing products, while less qualified managers are less likely to be engaged in increasing the efficiency of the production of existing products and processes (Papadaki & Chami, 2002; (Schaper, 2002). All these are important aspects of the advancing of environmental management within the company. We also anticipate a similar logic may hold in the case of adoption of environmentally friendly manufacturing practices among SMNEs in a developing country context.

The role of owner's age

Similar to the owner's education, the owner's age may be linked positively to innovation (Amran, 2011). Thus if we view adoption of environmentally friendly manufacturing practices as a form of innovation, we expect that age would negatively affect innovation. This is because mature people within innovation literature are noted to be more risk averse, while younger people change faster and are more inclined to change (Papadaki & Chami, 2002). Indirectly, these trends lessen the chances for adoption of environmentally friendly manufacturing practices in firms (Amran, 2011). Besides, younger individuals tend to be more environmentally concerned than older persons (Schaper, 2002). Moreover, there is a clear relationship between environmental concerns and age with concern rising in individuals up until the 30-39 year age

bracket and declining thereafter (Schaper, 2002). Despite the alternative view, that highly experienced managers are more likely to develop better production processes leading to adoption of environmentally friendly manufacturing practices, in the developing country context we speculate that the relationship will potentially be negative.

Methodology

Research design and study setting

The study explores environmentally friendly practices by SMEs in the manufacturing sector in the unique context of Africa. In addition, it establishes the firm characteristics associated with those practices. The study is based on a survey of Ugandan SMEs drawn from Mukono district during the period between December 2013 and January 2014. Mukono district is located 21kms from the capital city of Uganda: Kampala city. Mukono's proximity to the main economic hub of the country has made the district attractive for SMEs. Locating in Mukono district would potentially imply easy access to the country's finest business development services including financial support that are available in the capital city. Yet at the same time avoiding the high location costs of the city center. In addition, Mukono's location near lake Victoria and proximity to the Kenyan border, which represents a major transit for road imports and exports of the country, gives the district relatively easier access to the outside world. As a result, Mukono is now one of the fastest growing business hub for SMEs in Uganda (CME consult group, 2013; Ntayi et al. 2012). Mukono district is therefore an interesting location to study in the context of Uganda. While we acknowledge that the SMEs in Mukono may have some unique contextual qualities from the SMEs located elsewhere in Uganda, we believe that given the highly dynamic environment in Mukono, SMEs in this district offer valuable insights in relation to the current research effort.

Study sample

The sample was drawn from a number of manufacturing sectors including carpentry, steelworks, handcrafts and agro-processing. The focus was on the firms located in Mukono town and Seeta industrial areas. In this setting as also observed elsewhere in developing countries, local managers are afraid of losing their trade secrets and are skeptical of answering questionnaires for

fear of leaking information to their competitors as well as fear of the information reaching the authorities. Under such an environment, it was not possible to follow the procedures of random sampling. Instead convenience sample was sought for. Drawing on convenience sample in developing countries is a common phenomenon given the lack of well established database of firms to collect the sample, the reluctance of executives to answer academic questionnaires and lack of accurate information of firm location (Sekaran, 2003; Czinkota et al. 2011). In line with the common practice, we worked with the local leadership of the two industrial areas and obtained a convenience sample of 122 SMEs. In terms of distribution across the two areas, 42 firms in the study were obtained from Seeta industrial park and 80 firms came from Mukono town industrial park. Table 1 below gives the characteristics of the study sample.

Table 1: Sample characteristics

Variable	Category	Frequency	Percentage
Number of employees	1-5	59	59
	>5	41	41
Age of the firm	0-5	81	81
	6-10	19	19
Owner's education level	O-Level and below	26	26
	A-Level	29	29
	Diploma	20	20
	Degree	25	25
Owner's age bracket	18-34	56	56
	35-54	36	36
	>55	8	8

N=122 .The sample includes firms from both Seeta and Mukono town industrial areas

Data collection

The data was collected using questionnaires. The second author personally delivered and picked the questionnaires from the respondents. She explained the study and made clarification that were necessary as the respondents received the questionnaires. Given that the topic required a well established understanding of the firm's activities, we ensured that the questionnaire is

received and answered by well knowledgeable person about the activities of the firm. Specifically the respondents were mainly owners and managers of the SME establishments.

Validity of the study responses

In employing a survey data collection methodology several issues arise that may compromise the validity of the study responses. Specifically, when a survey design is used the findings of the study may be undermined by the problems of selection bias, non-response bias and common methods variance among others. In relation to non-response bias, it was not possible to conduct a post hoc examination given that there was no publicly available data to conduct a comparison test of the firms that did not participate in the study and those that did. Moreover, the questionnaires were collected in person therefore it was not possible to statistically ascertain the non-response basis by comparing early and late respondents. In order to reduce the occurrence of the informant selection bias, the questionnaires were personally administered by the second author. She ensured that the questionnaires are received and answered by the person who had the knowledge necessary regarding the company.

In addition, the goal of the study rests on the validity of the behavioral construct of adoption of environmentally friendly manufacturing practices. A factor analysis with varimax rotation procedure was conducted to establish the validity of the measures. Two dimensions were revealed that were labeled recycling and nature of waste disposal. For each of these dimensions a reasonable loading of the variables retained is observed (see Table 2 below). In the case of the other study variables, the questions required objective data namely the age of the firm, the owner's level of education as well as owner's age. A detailed discussion of the variable measures is presented in the section below.

Study measures

Dependent variable. The dependent variable was environmental friendly practices adopted by the SMEs in the manufacturing sector. The study emphasized two dimensions namely recycling, and proper waste disposal. Highlighting these two dimensions help one to distinguish between adoption with immediate short term financial value to the firm and that which is long-term and its value is majorly none-financial.

Recycling was measured using a five point likert scale consisting of three items. These items included (a) the extent to which the firm uses its scraps and damaged products with other raw materials in the production process, (b) the extent to which the firm's final products are made up of reused materials, and (c) the extent to which a firm's policy is to collect back used products from its customers for use. These items were adapted from Eltayeb and Zailani (2009). The Cronbach alpha coefficient for this scale was 0.77. The principle component for this scale revealed one factor with Eigen value of 2.09. The factor accounted for about 70 per cent of the variance. The individual factor loadings for the item were between 0.73 and 0.88 (see Table 2 below).

Waste disposal measure consisted of 3 items measured on a five point likert measure. The items consisting this scale include the extent to which the firm (a) collects the company's waste to be taken by the municipal council, (b) clearly labels separate containers for hazardous waste and (c) has acquired containers for waste separation with clear labels and signs. The Cronbach Alpha coefficient for this scale was 0.70. The factor accounted for 72% of the total variance with factor loadings for individual items between 0.66 and 0.86.

Table 2: Factor analysis with Varimax rotation

Items/measures for adoption of environmentally friendly manufacturing practices	Factors	
	F1	F2
We collect our waste to be taken by municipal council		0.66
We have clearly labelled separate containers for hazardous waste		0.87
We have containers for different waste separate with clear labels and signs		0.82
Our products have recycled materials	0.73	
Scraps are reused or sold for reuse	0.87	

We collect back used materials and incorporate them in our production process	0.88	
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NB: The underlying dimensions identified are two factors where F1 is recycling and F2 is waste disposal. The value for items that did load highly for each of the two factors are excluded. These results are based on factor analysis with Varimax rotation procedure conducted in SPSS version 17.0.

Independent variables. The independent variables in the study included the following firm characteristics: age of the firm, academic qualification and age of the owner.

Results

The results of the study are based on means and standard deviations as well as analysis of variance (ANOVA). The analysis was conducted using SPSS version 17.0. The cross-sectional nature of the data does not allow us to conclude on causality as such the results are descriptive and only reveal associations. Table 3 shows the observed differences among SMEs' level of adoption of environmentally friendly manufacturing practices along the dimension of SME's age, owner's education and age.

Table 3: The relationship between recycling, waste disposal, age of SME as well as owner's age and education

Characteristic		Recycling		Waste disposal	
		Mean	Standard deviation	Mean	Standard deviation
Age of the SME	0-5	3.75**	1.07	2.20	0.78
	6-10	2.89	1.32	2.00	0.69
Age of the owner	18-34	4.03***	0.76	2.20	0.78
	35-54	3.09	1.36	2.21	0.76
	55-64	2.75	1.17	2.16	0.77
Education level of the owner	O-level	3.89	1.050	2.04	0.75
	A-level	3.65	1.136	2.23	0.92
	Diploma	3.52	1.249	2.13	0.74
	Degree	3.23	1.208	2.21	0.77

F significant at $P < 0.01$, *F significant at $P < 0.001$.

Recycling, age of the SME, owner's age and education

The results in this case reveal that recycling, which is the dimension of adoption of environmentally friendly manufacturing practices emphasizing immediate short term financial value to the firm, may potentially be predicted by age of owner and years of existence of the SME (see Table 3 above). With respect to the age of the owner, the data reveal that recycling activities among SMEs are on average higher among SMEs that are younger than those that are older. A similar trend is also observed for the relationship between recycling and age of the owner. On average, the level of recycling is noted to decrease with an increase in the owner's age. Drawing on ANOVA, both these observations are found to be significant at $P < 0.01$ and $P < 0.00$ respectively. While we observe a clear pattern of decline in the average level of adoption by the education level of the owner, this association is not found to be statistically significant. This means that this observation in the data may be out of chance. We were also interested in establishing which of these factors, age of the owner and years of existence, is potentially more likely to predict the level of recycling among SMEs in our study context. Based on ANOVA, the

results indicate that it is owner's age that is more likely to be associate with the level of recycling in our study context (e.g., age of the SME estimate is $F(1, 107) = 3.20$, $p = 0.008$ while the age of owner is $F(1, 107) = 12.46$, $p = 0.001$). These results are presented in Table 4 below.

Table 4: Relationship between Recycling and Organizational characteristics

Variable	Type III sum of squares	df	Mean square	F	Sign
Corrected Model	2.19	5	5.84	5.128	001
Intercept	684.74	1	684.74	600.53	001
Age of SME	3.64	1	3.64	3.20	0.08
Owner's Education	0.51	3	0.168	0.148	0.931
Owner's age	14.12	1	14.19	12.46	0.01
Error	107.00	94	1.138		
Total	1425.00	100			
Corrected total	136.19	99			

a) Computed using $\alpha=0.05$, b) R square=0.214 (Adjusted Square=0.173).

Waste disposal, age of the SME, owner's age and education

While we found strong association between recycling and the three factors of our interest in the study, similar findings were not established for the case of waste disposal practices among SMEs in our context. None of the three SME characteristic (age of the owner, age of the firm and owner's education) was found to have a clear pattern of variation with the mean level of waste disposal management. It is therefore not surprising that the test of association for all the variables were found not significant. We discuss this finding in the next section and provide some insights into this observation.

Discussion and conclusion

Based on the findings of the study it appears that SMEs put emphasis on immediate financial value when deciding whether or not to adopt environmentally friendly manufacturing practices. For instance, in the study, none of the firm characteristic evaluated was found to be related with proper waste disposal practices: a dimension of environmental management which does not give obvious and immediate financial benefit. On the other hand, age of the firm and age of management (captured with owner's age) were found to be closely related to the adoption of environmentally friendly manufacturing practices. This finding is not surprising given that the legacies of weak regulatory framework would not encourage the already resource poor SMEs to incur an extra cost on particular forms of environmental management that they consider not to be core to adding value to the organization. This finding also support the view that given the SME resource constraint, there is need for governments in developing countries to address the regulatory machinery for SMEs in these countries to make the necessary investment to safeguard the environment (Herren & Hadley, 2010; Hoevenagel, Brummelkamp, & Peytcheva, 2007). In our study, we offer an even richer guideline for government action. For instance, we find that there is already inherent motivation for SMEs to adopt certain environmentally friendly manufacturing practices with immediate financial value to the organization. We also identify the profile of these SMEs. With this revelation, governments in developing countries can save resources by specifically targeting those areas where SMEs are reluctant to adopt proper environmental management. We also highlight some of these areas in the study to guide government decision (e.g., this is in the area waste disposal management).

Also interesting in the study is that the relatively young SMEs and those whose management is young were found to appreciate the value of recycling. This finding is consistent with earlier discussions in the literature that predict the negative relationship between age of the firm as well age structure of management and adoption of environmental management (Simpson, Taylor, & Barker, 2004; Labonne, 2006; Vlachvei & Notta, 2008). While we recognize that there is a reverse argument in the literature, we establish the former argument in this research as the most likely to hold for the case of SMEs in a developing country context (Gadenne, Kennedy, & McKeiver, 2008). It was however surprising to find that the relationship between education differences among owners was not correlated with adoption of even those practices that would bring immediate financial value to the organizations such as recycling. This is specifically

surprising because one would expect education differences to be associated with the level of awareness about environmentally friendly manufacturing practices and appreciation for the need to be environmentally friendly. This anomaly in our finding represents an interesting area for future research.

However, in interpreting the finding of this study scholars need to be aware of the following limitations. The study is only descriptive and does not provide causal explanations. The study is based on non-random sample and it therefore not possible to make appropriate inference on the population. Moreover, it is based on few organization characteristics and therefore addresses a limited area of the phenomenon. Notwithstanding, these limitations, the study adds interesting insights in the literature on adoption of environmentally friendly manufacturing practices with potential to guide future research aiming at giving deeper insight into the current topic in the context of the developing countries. In addition, the study offers some interesting guidelines for policymakers and firm managers to understand the nature of SMEs in the context of a developing country that are more likely to adopt to environmentally friendly manufacturing practices.

In conclusion, while this paper is a theoretic in nature, it contributes to our understanding on how certain key characteristics of an SME are associated with whether or not it will embrace environmentally friendly manufacturing practices in the context of a developing country. By distinguishing between manufacturing practices with immediate financial value to the firm and those that are not, the study gives a clear picture on how government and firm managers within the legacies of weak legal and regulatory framework and firms with limited resources can effectively target their efforts in the area of enhancing adoption of environmentally friendly manufacturing practices at firm level. In line with the focus of the study therefore rather than test or extend existing theory, we offer valuable insights to guide business practice and public policy.

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