The Role of Environmental Awareness and Green Technological Usage to Foster Sustainable Green Practices in Bangladeshi Manufacturing SMEs

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Abstract

The aim of this study is to examine the impact of environmental awareness, green technology usage towards sustainable green practices on the manufacturing SMEs in Bangladesh. Developing countries are more reactive regarding the adaptation of green practices into their businesses than developing countries, mainly due to technical, financial and social reasons. Bangladesh is no exception. The major constraints for adopting those practices are costly green technology and the lack of sound knowledge about ecological footprints. But adopting green technologies can be an effective solution. 220 manufacturing SMEs are surveyed through using a structured questionnaire. The data were analyzed using Smart PLS 3.0. The findings reveal that environmental awareness and environmental technological usages has positive association with sustainable green practices. This study has been inspired the SME manufacturer to foster the environmental sustainable practices.
Keywords: *environment sustainable practices, environment friendly materials, small and medium enterprise, green technology, awareness, Bangladesh*

1. Introduction

Lin and Ho (2011) found that, for perusing sustainable development, environmental problems have turned into very critical impendence. Therefore, protecting the environment is highly needed all over the world. Kashiwagi (1996) evaluated that the damage of environment could occur in three different ways, namely, decrement of energy, changing of global temperature, and contamination due to the removal of poisonous waste. Such a type of environmental damage is a common thing which is directly or indirectly caused by almost all business industries. Therefore, corporate sustainability and corporate social responsibility, which indicate protection of environment have become the primary concern of operators under the wave of global sustainable development promoted by the United Nations. Sustainability and social responsibility mean that when a company is developing, it must not only meet its current needs, but also protect the environment and also the needs of future generations. The initiatives hope for volunteering and awareness of sustainability and social responsibility. In other words, enterprises actively perform their social responsibilities during the process of economic development and are expected to maintain or expand the productive use and completeness of resources. There is coordination between the economy and the environment, for example, global warming issues. Since the ozone hole is a worldwide environmental challenge, combined efforts are needed in order to tackle climate change in all countries of the world. Currently, industry management should not blindly look for profit. In order to keep global Greenhouse gas emissions are at their expected level, all countries need to be refined and strengthened pledge.

Therefore, due to the harmful effect on the environment, various product manufacturing industries have gained the attention of researchers and industrialists during the last few decades. Existing surveys confirm that manufacturing SMEs are the most environmental pollution contributor. Previous study by Hoogendoorn et al., (2015) and Johnson (2015) identify that 70 percent of manufacturing pollution is instigated by SMEs. Quintás et al., (2018) estimates that SMEs produces 60 percent of carbon emissions.

Besides lot of constraints like lack of financial and human resource, lack of time, organizational culture and structure; a large proportion of SMEs are unaware about their negative contribution on environmental sustainability (Pil and Rothenberg, 2003). Another important aspect of differentiating between SMEs and large companies not only the size of the company but also some other

characteristics that makes the SMEs unique; for example, an informal management style, owner-manager domination in all decision-making and strong community ties. But, their combined impact on environment is significantly higher than big companies (Dey et al., 2019).

Green technology can be a solution for this environmental issue. It can effectually modify waste pattern and production in an eco-friendly way that causes less harm to the environment. (Soni, 2017) brings several the possible areas related to this green initiative include green energy, organic agriculture, environment-friendly textiles, green building constructions, and manufacturing eco-friendly products and materials. Due to the newness to the industry, it is also anticipated to create an appeal to new customers. Besides other forms of green technology the usage of solar power and fossil fuel can be effective as they have no adverse effect on the earth and it won't replenish. So upcoming generation can be beneficial from them without impairing the planet.

Implementing any new ideas, initiative in any industry requires a coordinated effort and communication from all stakeholders. The management should be proactive about the environmental initiative but for that, awareness, education is important. There have some studies on measuring level of awareness on environmental issues and green technology usages but in the context of Bangladesh which is scare. This study aims to fill up the gap by examining the impact of environmental awareness and green technological usage on sustainable green practices in the   manufacturing SMEs of Bangladesh.

2. Literature Review

Ratnasingam and Karl (2009) studied green manufacturing practices among the furniture industry in Malaysia and conducted a survey to find out the status of Malaysia wooden furniture manufacturers to follow environment sustainability. From his study, 54% of wooden manufacturer industries adopt green manufacturing practices. Another study by Fatoki (2018) on environment sustainability practices among SME of South Africa whereas claim that SMEs involvement in environment-friendly products and environmental management policy is inadequate. Moreover, Trandafilovic et al. (2017) mentioned that environmental education has positive correlation with environmental awareness that inspires people to recycle and use energy and water more efficiently and protect the environment. Furthermore, several review study on green entrepreneurial sustainability in SME found a comprehensive overview of the recent condition of sustainable development and focused on few more trends/gaps, which could be practically addressed in future research. Therefore, the role of Corporate Social Responsibility (CSR) in promoting sustainability is one of these gaps. Hasan (2016) conducted a study on social responsibility of SMEs in Bangladesh. Although his research reconfirms the existence of the so called "attitude-behaviour" gap but in terms of adopting socially responsible business practices by Bangladeshi manufacturing SMEs, the size and type of the business, educational qualification of owner-managers do not influence significantly. Moreover, Rashid et al. (2019), Nguyen et al. (2018), Tang et al. (2018), Stuwig et al. (2017) and Salimzadeh (2016) also conducted their study on environmental sustainability to identify the status and factors that influence the adoption of environmental sustainability in different industries. During the last decade, the SME industry has faced huge challenge and witnessed radical change in response to global competition. The growth of agro-based processing and essential consumer goods products are the major driving force in SME promotion in Bangladesh (Alauddin and Chowdhury, 2015).

However, advanced technologies have not been utilized properly for the development of SME sector which has been found from majority of the respondents. The following Waste minimizing and process improvement initiatives are considered as critical to success: total quality management (TQM), business process reengineering (BPR), supply chain management (SCM) and lean manufacturing (LM) by Ratnasingam (2006). Current status of SME has been analyzed by Zaman and Islam (2011), who found that 98 percent of establishments were micro units having less than 10 workers. Only 13 percent were in manufacturing, while remaining 87 percent were involved in trade and services. Moreover, SMEs employ 1.3 million people, constituting 44 percent of the total 10+ units' employment (Zaman and Islam, 2011).

Environment sustainable green practices

Since SMEs' adopting sustainable green practices is considered very crucial for the attainment of national environmental goals, therefore; they must be reinvigorated to go beyond the usual eco-efficiency practices (Nulkar, 2019). In addition, Handfield et al. (1997) and Gonzales-Benito and Gonzales-Benito (2008) proposed market-driven eco-friendly practices while adopting sustainable green practices in order to be effective. Environmental sustainability practices are a strategic construct in which businesses are intentionally engaging in environmental protective activities consists of recycling, waste reduction, energy efficiency, use of eco- friendly products, reduction of carbon emission and environmental management policy (Viviers, 2009). Now-a-days, large firms increasingly putting pressure to implement environmental management systems on their supplies as supply chains contributes unswervingly for ensuring sustainability in all aspects of the business. Correspondingly, the most important vendor qualification criteria for manufacturing SMEs is the environmental management certifications. Currently, banks and leading financial institutions of some developed countries ask for environmental risk assessment from their loan applicants. Furthermore, environmental risky SMEs are charged higher premium by the insurance companies.

Level of Awareness

The environmental performance of an SME is exceedingly reliant on the owner's environmental awareness alongside with relevant stakeholders proactiveness. Education develop the level of awareness and concern. There are numerous studies find that education and training help to increase awareness and knowledge of practicing sustainability in SMEs (Trandafilović et al., 2017, Tilbury, Adams, & Keogh, 2005; Katos & Nathan, 2004; Yacob & Moorthy, 2012). Likely, creating awareness among SMEs will help to make competitive position in the global. The majority of the SMEs have limited knowledge about environmental sustainability (Sudath Weerasiri, Zhang Zhengang, 2012), and they think their ecological impact is insignificant. Due to this ignorance, level of awareness of SMEs is very low. Nulkar (2019) find that 98% respondents agreed that owner's awareness on SMEs needs to be enhanced. On the other hand, 95% agreed that they don't have adequate knowledge on green benefits.

The main focus of SMEs is sustaining today. As a result, they fail to realize the intangible long-term benefits of environmental management. Unfortunately, the lack of proper waste emission daily data, less pressure from stakeholders, preference of informal communication (del Brío, J.Á. and B. Junquera, 2003) and insufficient resources (Yadav et al, 2018) are responsible for SMEs apathy. Policy makers, trade associations, environmentalists and chambers of commerce have responsibility to bring the changes in the ecosystem. Strenuous efforts to diffuse environmental awareness among SMEs are obligatory. When all these stakeholders plan aligned with the similar goal, it will be accelerated (Nulkar, 2019). The results of (Yacoob et al, 2019) reveal that the managers' environmental concern have indirect influence on green initiatives and sustainable green practices. Thus, we hypothesize that:

> H1: Level of Awareness has significant relationship on green practices

Green Technology Usage

The field of "green technology" is a board area which is known as sustainable technology using to protect the environment. Green technology can be used as environmental friendly technology that reduces environmental damages created by the products of traditional technologies. These are technologies that retain and sustain development. It is believed that the use of Green technology can help in environmental healing making lives comparatively better. As the world is moving forward towards a greener economy, industries are implementing policies that strive towards sustainable goal. Bangladesh is falling in line with these policies and adopting green principles for multiple industries. One of the main tools towards attaining this goal is by adopting green technology. The definition of green technology was provided as the set of

technologies integrating the practices and equipment used in product design, production and distribution, which boost efficiency, reduce energy and water waste, and mitigate environmental problems (Chan, E.S.W. et al., 2018; Nath, P.; Ramanathan, R., 2016). Another explanation on the adoption and use of green technologies was provided by (Soni, 2015) as involving the use of environmental technologies for monitoring and assessment, pollution prevention and control, and remediation and restoration. Adopting green technology refers to the investment in physical assets such as buildings, machineries and equipment which increase the amortisation period. Green technology has long- and short-term effect on environment. The use of green technology reduces the pollution and waste of production. There are various green technologies can be used in order to condense pollution and the use of toxic and hazardous resources in the product/service production process. Thus, green technology reduces the consumption of materials, saves energy and time as well as, improve equipment efficiency and layout eco-friendly processes which helps to make the existing process more environmentally sustainable (Seidel, S. et al., 2013; Hottenrott, H. et. al., 2016; Ozusaglam et. al., 2018). The findings of (Foroozanfaret al., 2017) show the importance of a series of factors influencing sustainable technology adoption. Martin Woertera et al., (2017) found that policies essentially promote the adoption of technologies. Thus, we hypothesize that:

H2: Green technology usages has significant relationship on sustainable green practices
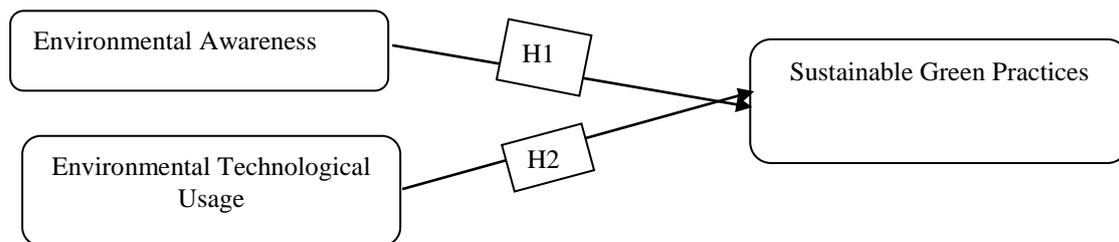
3. Conceptual Framework

Figure 1: Conceptual Framework of the study

4. Methodology

A survey of the SME manufacturers in Bangladesh among three divisions, namely, Dhaka, Chittagong and Rajshahi was conducted using a self-administrated structured-questionnaire. These three districts were chosen because these three districts: Dhaka (38%), Rajshahi (18%), Chittagong (15%) encompass 71% SMEs of Bangladesh (Economic Census, 2013). The questionnaire was adopted from existing literature as well as consultations with industrial experts. Data were collected from SMEs according to the categories provided by SME Foundation, Bangladesh. Small SME considered where maximum 30 employees are working and medium consists of maximum 300 employees. In terms of taking appointment, we contacted with the respondents over phone. The total number of questionnaires was 250 distributed to SME owner-managers. But 225 out 250 distributed questionnaires have been returned therefore; 5 questionnaires were eliminated from the sample due to incompletely filled parts and taken into account 90% response rate. In addition, the remaining number of valid questionnaires, a total of 220, was used for actual analysis. The questionnaire was pilot tested with ten manufacturers and corrected accordingly prior to the actual survey. We have tested the validity and reliability on all questionnaires before using scales for further hypothesis testing. The content validity was examined before data collection by presenting the scale items to five academicians, who checked the scale items, and all necessary changes were made. To test internal consistency, Cronbach's alpha has been used. The results showed the reliability of 0.89, 0.88, 0.87 for awareness regarding environmental issues, green technological usage and sustainable green practices. These values are acceptable, being above 0.7 (Hair et al., 2010) for all scales. Smart PLS 3.0 was used to get the study outcomes.

Measurement

The questionnaire was divided into four parts: (a) demographics profile; (b) environmental awareness; (c) technological usages and (d) sustainable green practices. The questionnaire had a total of 13 items and the respondents, who were owner and managers, had to mark the answers that reflected their company's position for each of the statements as they have the dept knowledge, consciousness about sustainability practices within organization rather than bottom line employee. Five likert scale was used.

Environmental Awareness: Aware of clean and green manufacturing**,** aware of sustainable green manufacturing**,** familiar about Triple bottom line (Millar and Russell, 2011)**,** conscious about environmental footprint (Emiel L. Eijdenberg et al., 2019).

Environmental Technological Usage: Certification of green building (LEED), certification of environmental management (ISO family), energy efficiency equipment, eco-friendly materials usage (Reza et al., 2017).

Sustainable green practices: Sustainable green practices are the popular approach to the manufacturers. Sustainable green practices are economically viable, socially responsible and environmentally friendly which has minimal negative impact and practice on the environment. Through sustainable green practices; products are designed in a way that minimize the adverse impact on the environment, assessment of the environmental impact of the product using Life Cycle Analysis, fulfillment of supplying raw materials meeting certain environmental criteria before sourcing, environmental audits at regular intervals and finally, adopting environmentally sound policies (Yacoob et al., 2017)

5. Results and Discussion

Table 1 below shows the respondent's demographic profile of the study. A total of 250 questionnaires were sent out to owner-managers of manufacturing SMEs in Bangladesh among three divisions (Dhaka, Chittagong and Rajshahi) of the 220 valid responses.

Table 1: Respondent's Demographic Profile

Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage
Gender			*Education*		
Male	129	58.6	Diploma	20	9.09
Female	91	41.4	Bachelor	159	72.27
Age			Masters	37	16.82
29-34 Years	15	6.80	PhD	4	1.82
35-40 Years	62	28.16	*Experience*		
41-46 Years	79	35.92	1-2 Years	145	65.91
47-52 Years	64	29.13	3-4 Years	50	22.73
			More than 5 Years	25	11.36
Marital Status			*Monthly Income (US Dollar)*		
Single	29	13.18	100-500	61	27.73
Married	191	86.82	501-900	52	23.64
Divorced			901-1300	70	31.82
			More than 1300	37	16.82
Total-220					

Among them, 58.6% (129) were male and 41.4% (91) were female. The respondents' age ranges from 29 to 52 years old, where 35.92% of the respondents were between 41- 46 years, 29.13% were between 47-52 years and only 6.80% were 29-34 years old. 86.82% were married and 13.18% were single. The majority of respondents 72.27% held Bachelor's degrees, while 16.82% possessed Master

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degrees. Meanwhile, 22.73% of respondents had 3-4 years and 11.36% had more than 5 years of work experience in their current position, while approximately 65.91% had 1-2-year work experience. 27.73% of respondents earn 100-500 USD, 23.64% earn 501-900 USD, 31.82% earn 901-1300 USD, and 16.82% earn More than 1300 USD monthly.

Table 2 below shows the measurement of model assessment where the AVE value of every variable is above 0.50 and the value of CR and Cronbach's Alpha is above 0.70 and the value of factor loadings is above 0.60 which are the suggested or accepted range. However, R^2 indicates the values of the variances of the endogenous variable(s). Here, Sustainable Green Practices is demonstrated by a large effect (0.818 or 81.8 %) with independent variables.

Table 2: Measurement of Model Assessment

Constructs	Items	Loading	AVE	CR	Alpha	R-Square
Environmental Awareness (EA)	EA1	0.853	0.694	0.919	0.89	
	EA2	0.814				
	EA3	0.819				
	EA4	0.824				
	EA5	0.853				
Environmental Technological Usage (ETU)	ETU6	0.827	0.692	0.918	0.889	
	ETU7	0.834				
	ETU8	0.826				
	ETU9	0.881				
	ETU10	0.790				
Sustainable Green Practices (SGP)	SGP11	0.784	0.671	0.911	0.877	0.818
	SGP12	0.816				
	SGP13	0.800				
	SGP14	0.823				
	SGP15	0.870				

Table 3 below shows the discriminate validity of the study. To evaluate the discriminate validity for assessing the model, Fornell-Larcker criterion was applied. Moreover, the square root of the AVE (in bold) of all variables describes the highest within a range of 0.819-0.833. In this way, it is well comprehensible that discriminant validity is sustained between variables and accredited for this estimated model of the study.

Table 3: Values of correlations between the LV and square roots of the AVE values in the main diagonal in the SEM

		1	2	3
1	Environmental Awareness	**0.833**		
2	Environmental Technological Usage	0.811	**0.832**	
3	Sustainable Green Practices	0.785	0.828	**0.819**

*The diagonal are the square root of the AVE (in bold) of the latent variables and indicates the highest in any column or raw

Figure 2 below shows the structural model assessment of the study. Using the bootstrapping process with a resample 500 was also implemented to figure out the t-values and R square.
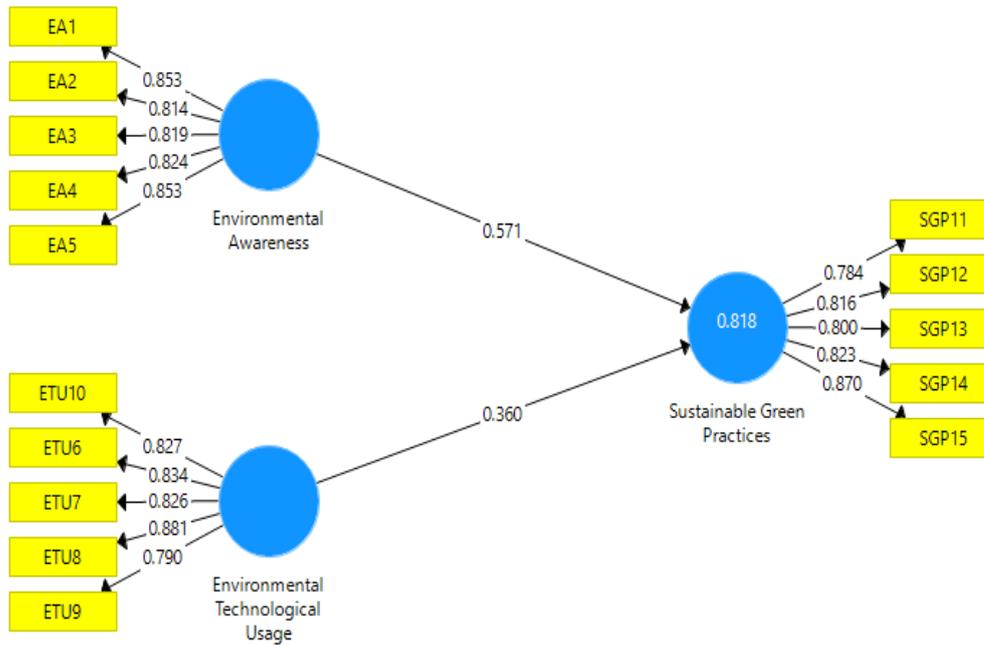
Figure 2: Standardized results of SEM calculations

Table 4: Result of Direct Effect Hypotheses

Hypothesis	Relationship	Std Beta	Std Error	t-value	p-value	Decision
H1	Environmental Awareness → Sustainable Green Practices	0.559	0.104	5.471	0.000***	Supported
H2	Environmental Technological Usage → Sustainable Green Practices	0.373	0.124	2.912	0.004**	Supported

Table 4 shows the result of direct effect hypotheses. Firstly, we hypothesize that level of awareness has significant relationship on green practices. As found in Table 4, a positive and significant relationship is found between environmental awareness and sustainable green practices (β=0.559, t=5.471, p<0.001). In this way, hypothesis 1 is supported. So, environmental awareness significantly influences on the adoption of green practices. Such awareness includes only an awareness to recognize the costs and benefits associated with environmental issues. This result is consistent with the findings of Gadenne et al. (2009) as they also found a positive relationship between environmental awareness and environmental conservative practices for SME owner/managers.

Secondly, we hypothesize that Green technology usages has significant relationship on sustainable green practices. As found in Table 4, a positive and significant relationship is found between environmental technological usage and sustainable green practices (β=0.373, t=2.912, p<0.01). In this way, hypothesis 2 is supported. So, green technological usage significantly influences on the environmental green practices. This result supports the findings of Wang, Y. et al. (2015) & Ozusaglam et al. (2018) as they found positive relationship with technological adoption in environmental performance.

6. Conclusion

The term of sustainability and green business has received vast attention in business, research and in economics. The aim of this study was to find out the practical implications of green business practices. In the notion of performance, one probable implication is that practitioners (e.g. trainers, consultants, and policymakers) should concentrate on how the awareness can be carry through to the next stage – that is, more advanced environmental practices, such as using green high-end technology and materials. The low awareness and indifferent attitudes of SME owner's need to improve.

The adoption of green manufacturing practices within the Bangladesh SME industry is limited, mainly due to the lack of financial support and knowledge regarding environmental issues. Moreover, no strict pressure has been imposed by the Government. The utilization of certified SME resources, environment-friendly mechanisms, minimization of environmental waste and utilizing proper environment-friendly technologies, must be practiced, which will solve environmental sustainability-related problems faced by Bangladeshi SMEs.

This study only focuses on the SMEs within three districts. Further studies could be possible by extending the scope of the study. At the end, this study concerns the availability of the data which is comparatively difficult to obtain due to the active involvement of respondents with small medium enterprises activities.

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