ANTECEDENTS AND OUTCOME OF SUSTAINABLE ENVIRONMENTAL MANUFACTURING PRACTICES: A CONCEPTUAL DISCOURSE

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Abstract

The increasing awareness of environmental impacts of manufacturing industry has made sustainable environmental manufacturing practices an important issue among practitioners and researchers. However, the link between environmental manufacturing practices and firm performance remain inconsistent and inconclusive. This study aims at proposing an integrated and comprehensive framework to resolve the inconsistent conclusion on the antecedents and outcomes of SEMP. It provides several important benefits to the academicians and practitioners in manufacturing industry by contributing to literatures on sustainable environmental manufacturing practices. This study identifies the antecedents and outcomes (firm performance) of SEMP and further incorporates the environmental regulation and perceived benefits as moderators on the link between SEMP and firm performance, and thus serves as a basis on which future empirical researches can embark.

Keywords**:** sustainable environmental manufacturing practices; antecedents of SEMP; firm performance; framework.

1. Introduction

The revolution in the manufacturing industry since the middle of eighteenth century has increased the momentum and automation gained in labour productivity by forcing mechanical thinking on manufacturers which is supported with the idea of substituting human by machine (Gandhi, Selladurai & Santhi, 2006). This revolutionary process has succeeded in shifting the economy from rural and agrarian to an urban and industrial economy, thereby increasing consumption through mass production techniques as goods are supplied to the market at cheaper price (Baskhar, 2000; Gandhi et al. 2006). The effect of this industrial revolution on the economy has been both positive and negative (Al-Amin, Siwar, Huda & Hamid, 2009). These effects include the increment in demand for goods, thereby increasing production coupled with environmental degradation and depletion of natural resources which has made sustainable environmental practices the concern of various industrial sectors.

According to international environmental agency [IEA], (2007), manufacturing industries are significantly responsible for the consumption of a huge amount of resources and waste generation throughout the world. This is evidenced in the obvious increase of 61 percent in the consumption of energy by manufacturing industries between 1972 and 2004. Manufacturing sectors is also responsible for about a third of the world's global usage of energy and emission of 36 percent of carbon dioxide ($C0_2$) in the world (OECD, 2009). For example, manufacturing has brought about a noticeable increase in energy consumption in Malaysia (Al-Amin et al, 2009). Energy supply in Malaysia in 1991 was 20,611 Ktoe (Kilo tons of oil equivalent) which increased to 50,658 Ktoe in year 2000. The value of energy recorded in 2000 increased to 54,194 Ktoe in 2003. This is also evidenced in the actual demand of 14,560 ktoe and 29,960 ktoe of energy in 1991 and 2000 respectively which jumped to 34,586ktoe in 2003. Another negative impact of manufacturing industry in Malaysia is in the aspect of waste generation. According to the statistics of the department of environment (DOE, 1996), waste generated rose from 420,000 tons in 1994 to 630,000 tons in 1996. This has continued to rise till present, since the rebounds of Malaysia from the economic crisis. However, irrespective of the negative contribution of manufacturing, it is evidenced in the statistics of Malaysian economy that manufacturing contribute positively to the development of the nation, making it highly important in the national economic development.

As a result of the above mentioned environmental impact of manufacturing industries on the natural resources and the environments, a renewed focus of the manufacturing industries' stakeholders such as the regulatory policy makers, shareholders, customers and employees on the manufacturing organizations has been shifted to demanding from the companies to be more responsible to the environments with respect to the products and the process (Rusinko, 2007; Hart, 1995; Naffzinger, Ahmed & Montagno 2003; Galdeano-Gomez, 2008). This demand is due to various factors driving sustainable environmental practices, such as: environmental regulation compliance, stakeholder pressure, public concern and perceived benefits of the organizations from being environmentally sustainable (Rusinko, 2007; Adebambo 2013). Thus, sustainable environmental practices have been seen as a primary source of better firm performance of many manufacturing companies in many countries of the world including the Asia-pacific region, UK and the USA (Anis &Nurul, 2010; Seidel, Shahbazpour & Sidel, 2007).

The beginning of the new millennium witnessed an increased urge for sustainable environmental practices among manufacturing companies (Seidel et al., 2007; Millar & Russel, 2011; Anis & Nurul, 2012) as corporate organizations responded to the environmental issues due to their concerns for the drivers of sustainable environmental manufacturing practices (Bansal & Roth, 2000) or what they perceive to benefit from the implementation of sustainable environmental practices (Al-Shourah, 2007). The question to ask here is how companies perceive environmental practices and the effect of their perception on the performance of their companies. The above originated the practices of sustainability among manufacturing companies which has now become a concern of various organizational sectors as there is increase in the issues of sustainability around the world (Bajracharya & Too, 2009; UNEP, 2011). Presently, sustainability issues are now receiving noticeable attentions globally and have become a critical and major factor of competition and firm performance (UNEP, 2011) among manufacturers thereby compelling many manufacturing firms both at the international and local level to include sustainable environmental practices in their strategies and activities (Amrina & Yusof, 2011).

Literatures show that firms are not only concerned about their environmental values but also about the economic success and performance of their organizations (Henri & Journeault, 2008). Thus, the implementation of sustainable environmental manufacturing practices in industries could be as a result of different factors motivating the implementation of the initiative and influenced by regulation and benefits anticipated by the firms from implementing the initiatives (Bansal & Roth, 2000; Al-Shourah & Ibrahim 2007). However, the conclusion of practitioners about the impact of SEMP on what drives/motivates firms into implementing sustainable environmental practices and in-turn, the effects of the practices on firm performances remains inconsistent (Schoenherr & Talluri, 2012; Arafat et al. 2012; Gonzalez-Benito & Gonzalez-Benito 2005). The reason for this could be as a result of the failure of the past empirical researchers to integrate the antecedents, SEMP and the outcomes in a single comprehensive framework (Gonzalez-Benito & Gonzalez-Benito, 2005).

Practitioners have often view the implementation of environmental practices is in two different ways: (Choi & Zhang, 2011): Some group of practitioners assert that sustainable environmental manufacturing practices is integral to the performance of manufacturing companies as it provides a long-term economic gain to companies (Ahmed et al 1998; Ahmed et al 2003; Hartmut & Kara (2006); and Hart (1995) however, the other groups view environmental sustainable practices as a mere investment on a practices that add more to the cost of manufacturing companies as firms incur more cost while implementing this practices (Judge & Krishman 1994; Walley & Whitehead, 1994, Freeman, 1994).

In addition, the preliminary investigation of this study shows that the motives of firms in implementing sustainable environmental practices is either to avoid sanctions and punishments in form of penalties, fines or withdrawal of license as a result of non-compliance with environmental regulations (Lai & Wong, 2012; Davidson & Worrel, 2001; Bansal & Roth, 2000), in this case, firms implement environmental initiative just to satisfy the requirement of the regulation. On the other hand, firms implement sustainable environmental practices as a corporate social responsibility by going beyond the basic environmental requirements and regulations in order to contribute to the success of the firms (Omar & Samuel, 2011). Therefore, to clarify the inconclusive assertions on the relationship between the antecedents and outcomes of SEMP, a comprehensive framework integrates the antecedents, SEMP and its outcome via the moderating influence of perceived benefits and environmental regulation is needed.

2. Sustainable environmental manufacturing practices (SEMP)

Sustainable manufacturing is a sub-section of the concept of sustainable development which started in the 80s as an answer to the call for increasing the awareness and the concern over the effect of the environment on the economic growth and global expansion on business (Leahu- Aluas, 2010). Sustainable development regards to the ability of the present generation to meet their needs without compromising the ability of the future generation to meet their own needs as well (WCED, 1987). Sustainable environmental manufacturing practices (SEMP) is a technique, policy and the procedures taken by firms with specific aim of monitoring and controlling the effects of the operations of the firm on the natural environment (Schoenherr & Talluri, 2012). Sustainable manufacturing practices aim at minimizing the negative effect on the environment, minimize energy use and natural resources, provides safe environment for the employees and the consumers (Mani, Lyons & Sriran, 2011). It is commonly perceived as recycling of materials, sourcing renewable energy and emission reduction (Mani, Lyon & Sriran, 2011) however, it also entails the other practices that spread the environmental perspectives to the public and stakeholders, such activities include research and design, employees training and customer awareness (Rusinko, 2007).

Previous researches have highlighted the identification of the importance of the antecedents and outcome of SEMP for firms to successfully implement SEMP. Thus, this study has identified top management commitment, stakeholder pressure and public pressure as the antecedents of SEMP while firm performance is identified as the outcome. Previous literatures identified a relationship between the antecedents, sustainable environmental practices and parameters of performance in firms (Lai & Wong, 2011; Schoenherr & Talluri, 2012; Lopez-Gamero et al., 2009). Therefore, this study will postulate a positive relationship between the antecedents, sustainable environmental manufacturing practices and firm performance.

3. The Antecedents of SEMP

Researchers concerned with ecological responsiveness and the natural environment investigated the rationale behind the response of firms to environmental issues and reveal that firms response to environmental issues are in two folds (Bansal & Roth, 2000): Firstly, organization will respond to the environmental issues in order to comply with the legislation requirement and pressure from the environment and stakeholders (Bansal & Roth, 2000; Harmut & Sami, 2006; Chien & Shih, 2007) while some organizations respond to environmental initiatives as a result of the potential benefits they foresee as outcome of the implementation of such practices (Chien & Shih, 2007).

The notion of SEMP resonates from the preliminary investigation conducted in this study, while it is believed that several factors motivate the implementation of SEMP in firms. Previous researches on the motives of the implementation of SEMP have identified different motives for firms' implementation of the environmental initiatives. Lawrence & Morell (1995); Chien & Shih (2007), Harmut & Kara (2006) identified the reasons that drive organizations to adopt environmental practices, such reasons are: Stakeholders pressure (Chien & Shih, 2007, Henriques & Sharma, 2005; Darmal et al., 2010) top management commitment and public concern (Carter et al., 2009; Chien & Shih, 2007). Though these drivers are of widespread interest among organizations but their ability to predict the response of organizations in implementing sustainable environmental practices is limited (Bansal & Roth, 2000).

Stakeholder pressure is described as the influence (normative or coercive) exerted by individuals groups on companies (Henriques & Sadorsky, 1999). Researches have proven that the pressure of the stakeholders is significantly related to the implementation of environmental practices (Henrique & Sadorsky, 1999; Chien & Shih; 2007; Darmal et al., 2010). Stakeholders may exert pressure on firms to get their claims from the firms, thus initiating the implementation of SEMP in firms. Following the empirical investigation of the past researchers, it is established that there tend to be a positive relationship between the stakeholder pressure and implementation of SEMP (Cespedes-Lorente et al., 2003; Chien & Shih, 2007). Bansal & Roth (2000) found a relationship between stakeholder pressure and corporate ecological response. Gonzalez-Benito & Gonzalez-Benito (2005) highlight a positive relationship between perceived stakeholder environmental pressure and environmental logistic practices. Cespedes-Lorente (2003) found a positive relationship between stakeholders' pressure and the adoption of environmental practices in firms. Henrique & Sadorsky (1999) found that pressure from stakeholders drive firm to implement environmental management practices. As a result, stakeholder pressure is hypothesized to positively influence the implementation of SEMP in firms.

Top management commitment refers to the involvement and the support received from the top management of organizations towards adding value and shaping the environmental manufacturing practices implemented by the firm (Drumwright, 1994). Top management of an organization shows their commitment to the implementation of environmental practices by directly involved in the environmental issues of the firm (Carter et al, 2009). This commitment is shown by appointing senior managers to oversee the environmental issues of the firm (Banerjee et al. 1998). Top management must understand the implementation of the environmental initiatives and make provision for the necessary resources for the successful implementation of environmental practices (Yen & Yen, 2012). According to Banerjee (2003), he asserts that the commitment of the top management directly influences the implementation of corporate environmentalism. The empirical investigation of Al-Shourah & Ibrahim (2007) also confirms that top management positively support and influences the implementation of environmental practices. Thus, top management commitment is posited in this study as an antecedent of SEMP in firm.

Public concern is the certain level of expectation a firm is expected to meet by the public. It is partly a force driving the implementation of environmental manufacturing practices. That is, the higher the concern of the public will result into higher implementation of SEMP. Firms are concerned about how they are perceived by the public, thus having a tendency of influencing their environmental manufacturing practices. Firms may intend to maintain their reputation through their responsiveness to sustainable environmental manufacturing practices, and as well implement environmental manufacturing practices to stay in market competition (Banerjee et al. 2003). The empirical investigation of Carter et al. (2009) and Banerjee et al. (2003) conclude that public concern drives the implementation of proactive environmental practices. As such, it is posited in this as an antecedent of SEMP.

4. Outcome of SEMP

There is a growing interest of sustainable environmental manufacturing practices and firm performance. Performance is a critical concern which is usually pursued by corporation (Lin & Fang, 2006). It is an integrated concept that reveals the outcome of the operations of firm. Thus, effectiveness and efficiency are the elements that contribute to the performance of an organization. Performance originated in 1900 as a result of the demand of government to evaluate the outcome of its operations (Johnson & Kaplain, 1987) therefore, it has ultimately been used as an indicator of the extent to which an organization moves closer to the achievement of its objectives and goals of the business (Kassen and Moursi, 1971). Organizational performance is regarded by Robbins & Coulter (2002) as the building up of the organizations' operations and outcomes therefore; the link between organizational strategy and performance is regarded as the core of strategic management.

It is generally believed that a trade-off exists between environmental proactiveness and firm's productivity (Porter & Van der Linde, 1995). The pursuit of environmental goals is usually associated with increased cost at the beginning of the implementation of SEMP; however, it results into benefits such as cost savings and better financial performance in the long run (King & Lenox, 2000). The concept of SEMP is directed towards eco-efficiency and pollution prevention practices such as reduction of energy consumption, carbon emission reduction and waste minimization which lessen environmental degradation caused by manufacturing industry. Thus, this study posits that the implementation of SEMP will positively improve environmental performance. In a similar vein, pollution prevention activities such products life cycle analysis, collection and use of the reusable parts and components of products is tended towards reducing environmental degradation and creates avenue for the identification of the areas that requires improvement in the quality of products of firms which can reduce damages due to waste disposal and cost of manufacturing operations (Lai & Wang, 2012) as rework is avoided and quality is ensured from the beginning of operations. As such it is posited that implementation of SEMP positively increases operational performance.

The outcomes of sustainable environmental manufacturing practices such as financial performance, environmental performance and operating performance have been previously examined (Ameer & Othman, 2011; Lopez-Gomez et al., 2009; Chien & Shih, 2007; Wagner, 2005 and Zhu & Sarkis, 2004). Ameer & Othman (2011) and Chien & Shih (2007) found a positive relationship between environmental practices and financial performance of firms. Lopez-Gomez et al. (2009) on the relationship between environmental variables and firm performance affirmed that proactive environmental practice is significantly related to firm performance. Chin & Shih (2007) in their investigation on green manufacturing practices among the Chinese industries established that green manufacturing practices is positively related to the environmental and financial performance. Zhu & Sarkis (2004) affirmed that there is a direct positive relationship between internal environmental management practices and environmental performance. Furthermore, Hart & Ahuja (1996) confirmed that a significant relationship exists between reducing emission and operating and financial performance. Schoenherr & Talluri (2012) found a positive relationship between sustainable environmental practices and plant efficiency while Lai & Wong (2012) affirmed a positive relationship between environmental management and operational performance in green logistics. As a result, this study posited a positive relationship between the implementation of SEMP and firm performance.

5. Perceived Benefits

Perceived benefit is a set of favourable outcomes anticipated by organizations as benefits from the implementation of environmental practices (Al-Shourah & Ibrahim, 2007). Perceived benefit is conceptualized in this study as a moderator between sustainable environmental manufacturing practices and firm performance. It is a set of favourable outcomes anticipated by firms as benefits from the implementation of SEMP (Al-Shourah & Ibrahim, 2007). The implementation of sustainable environmental practices is regarded by firms in two ways: as either a threat or opportunities (Garcia-Ayerbe et al. 2012; Choi & Zhang, 2007). In this regards, the case analysis study of Sharma et al. (1999) assert that the implementation of environmental practices should be seen as benefits not as a threat. The implementation of SEMP will be more proactive when firm perceive the initiatives as a potential benefits and reactive when they feel that environmental initiative is a threat (Sharma et al. 1999). This was empirically tested in the study of Sharma (2000) using a sample of 99 Canadian oil and gas firm in which it was concluded that the greater a firm interprets environmental practices as opportunities the more likelihood they implement the initiative.

Al-Shourah & Ibrahim (2007) on the relationship between environmental management practices and the performance of five-star hotels in Malaysia indicate that benefits perceived by the companies moderate the relationship between the environmental management practices and hotel performance. In line with this argument, Bansal & Roth (2000); Porter & Van der Linde, (1995); Gonzalez-Benito & Gonzalez-Benito (2005, 2006), Claver et al. (2007) assert that company will implement environmental practices if they perceive some benefits either by drastically reducing costs of operations, cost reduction, greater product efficiency, enhanced product image as potential benefits, they will implement sustainable environmental practice. As a result of the aforementioned discussion, perceived benefit is posited as a moderator between SEMP and its outcome.

6. Environmental Regulation

Environmental regulation refers to the law, policy, rules, standards and international agreements enacted by the regulatory bodies prompting organizations to become conscious of its activities on the environment (Sarkis, 2003; Lai & Wong, 2012). Environmental regulations are enacted to control the environmental damages caused by the operations of firms therefore, manufacturing firms are mandated to operate under the requirements of the regulation (Lai & Wong, 2012). Results of the past researches have shown that environmental regulations that are focused on the manufacturing sectors have a set of implications on operations and the performances of the manufacturing firms (Lai & Wong, 2012; Chin & Shih, 2007; Henriques & Sadorsky, 1999). In the presence of an increased public concern, stakeholder pressure, top management commitment and the growth of a more stringent environmental regulation, a sustainable environmental manufacturing practice is a proactive approach and a more sustainable way to develop a friendly environment to enhance firm performance. Environmental regulation strengthens the implementation of SEMP in manufacturing firms by providing standards and requirements on environmental conformances. Therefore, there is a need for environmental regulation compliances to strengthen the dedication of the manufacturing firm to the implementation of SEMP.

In the same vein, polluting firms are punished by paying penalties and fines for not complying with environmental standards and regulations (Davidson & Worrel, 2001). Manufacturers are in so many cases pressurized to be proactive in order to achieve performance and benefits. This pressure indicates the essence for the manufacturing firms to improve their environmental manufacturing practices (Lai & Wong, 2012). Environmental regulation provides the need for firms to implement SEMP while the requirements of regulation guide the practices of manufacturing firms to preserve the environment. In order for firm to gain more competence in an environment with stringent environmental regulation, SEMP is required to offset the unproductive cost of non-compliance. In view of a stringent environmental regulations and requirements, SEMP is required to boost the financial, environmental and operational performance of manufacturing firms. This assertion was supported in the empirical findings of Lai and Wong, (2012) which found environmental performance as a moderator on the relationship between environmental practices in green Logistic and firm performance.

7. The proposed conceptual framework

The literature review above has shown a clear need for a framework that integrates the top management commitment, stakeholder pressure, public concern, SEMP and its outcome via the moderating role of environmental regulation and perceived benefits in a single study. In this study, firm performance is the outcome of SEMP and it's the dependent variable while the independent variables are the antecedents of SEMP (stakeholder pressure, top management commitment and public concerns), they are also regarded as the drivers of the implementation of SEMP. Perceived benefits and environmental regulation are moderators on the relationship between SEMP and its outcome. It is a general belief and regarded in environmental practices literatures that only when the factors that drive the implementation of environmental practices in firms have been identified that the firm can have a successful implementation of sustainable environmental practices. The proposed framework for this study is presented in figure 1 below.

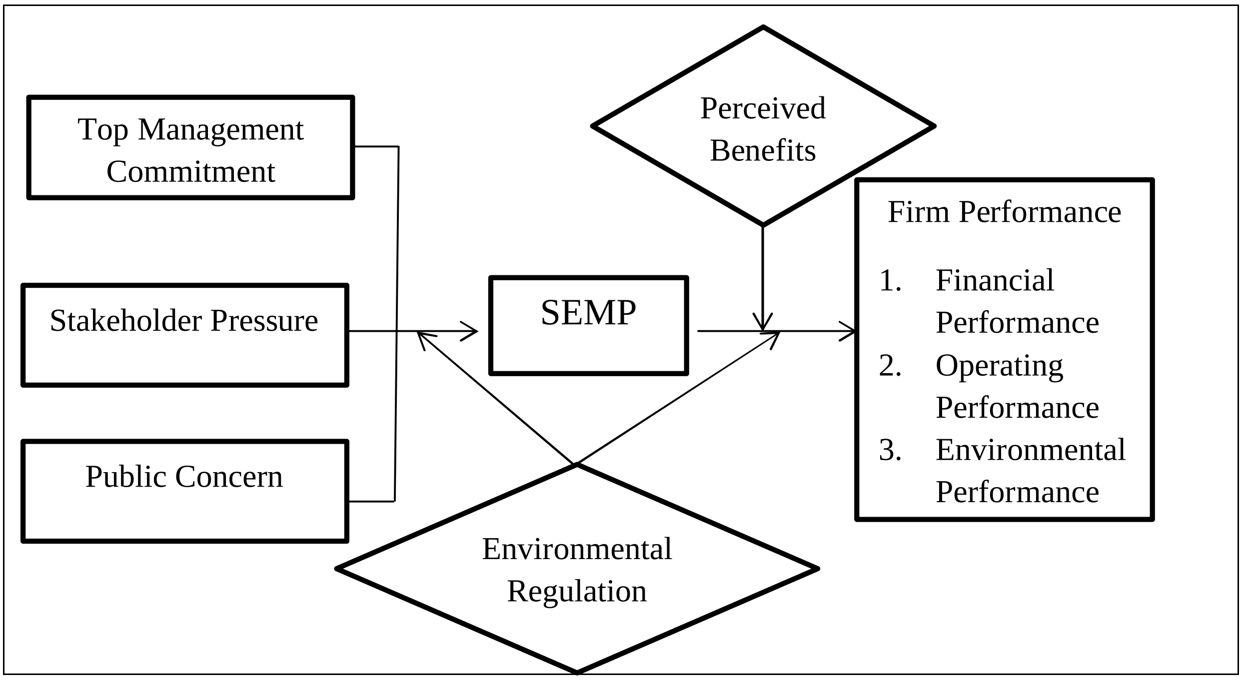

Figure 1: Conceptual Framework

8. Theoretical Support

The theoretical approach used in examining firms' natural resources and performance in this study is the resource-based view of firm. The resource based view provides manufacturing firms with the opportunity of classifying their resources and enhance comparison towards strategic measurement of the firms' resources. The tenets of RBV states that the resources of firms must have value, must be rare, must not be imitated and not be perfectly substituted by either current and potential competitors (Barney, 1991). Therefore, the sustainable environmental manufacturing practices implemented by manufacturing firms provide value as it has tendency of attracting more customers to the companies and improves its reputation, firms stand the chance of being the mover of a market through the implementation of SEMP, training provided to the employees of a firm prevents the firm from being perfectly substituted by the competitors though, firms competitors who may only duplicate the performance outcome of SEMP but will find it impossible to imitate the skilled and trained staff implementing SEMP of the firm. Thus, this study identified SEMP as the resources of firm to achieve sustainable performance and outperform its competitors..

Viewing the above framework from the perspective of a stakeholder theory, it is important that firm manages its relationship with the stakeholders. Stakeholder theory is important in developing a way in which different groups who have influence on organization are managed and their relationship which results into organizational strategic management, hence performance achievement (Fontaine, 2006). According to Freeman (1984) stakeholder approach to strategic management must reveal that managers must implement processes that take all those groups of the organization into consideration. Pressures from the stakeholders of firms have a high tendency of committing firms to better implement SEMP which resulting into better firm performance. The major concern of stakeholder theory is on the continuous and effective management of the environment within which a firm operates the management of the relationship of the firms' stakeholders and promoting the shared interest of both the stakeholder and the firms to achieve better performance level.

Furthermore, the explanation provided by Hart (1995) using RBV of firm on why companies engage in social responsibilities posits that cooperate social responsibility is a tool through which firm can achieve competitive advantage thus, better firm performance. The environmental responsibility initiatives in the framework of Hart (1995) include the pollution prevention, product stewardship and sustainable development indicating the strands of SEMP. This aligns with the concept of CSR which is concerned with environmental issues to embed economic development, environmental protection and social balance. Therefore the RBV of firm induct that all the CSR activities of firms should be able to establish resources that serve as source of competitive advantage and a better performance for firms.

9. Conclusion

This study has been able to highlight the positive impacts of manufacturing industry on the economic development of a nation. It has also been able to show that manufacturing industry negatively impacts the natural environment which gave rise to the increasing awareness on environmental sustainability issues in manufacturing industry. Also, it was shown that the concerns of firms about their environmental issues are not only about the environmental values of the firms but also about their economic success and firm performance.

This literature also highlighted the possible reasons for the inconsistency in the link between sustainable environmental manufacturing practices and firm performance and therefore presents a framework that integrates the drivers, SEMP, perceived benefits, environmental regulations and firm performance in a single framework to resolve the issues of inconsistency. This research is one among the others that considers the effect of environmental regulation and perceived benefits of SEMP on the relationship between SEMP and firm performance. This proposed framework is developed through a thorough review of literature to provide a deep understanding to academicians and practitioners on the antecedents and outcome of SEMP and the moderating effect of environmental regulation on the link between SEMP and firm performance to enable policy maker enhance performance of firms through environmental regulation.

This study is limited to the environmental aspect of sustainable practices therefore, future researchers are charged to investigate the social and economic aspects of sustainable practices and also endeavor to empirically validate the proposed framework in this study.

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