



The Assessment of the Impact of Sustainable Supply Chain Management on the Performance of Manufacturing Firms in Ghana

Johnson Nsowah^{a*}, George Agyenim-Boateng^a and Augustine Anane^b

^a *Department of Procurement and Supply Chain Management, Sunyani Technical University, Ghana.*
^b *Procurement Unit, Sunyani Technical University, Ghana.*

Authors' contributions

This work was carried out in collaboration among all authors. Author JN wrote the protocol and wrote the first draft of the manuscript. Authors JN, GAB and AA performed the statistical analysis. Authors GAB and AA managed the literature review. All the authors designed the study. All authors read and approved the final manuscript.

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ABSTRACT

The study assessed the impact of Sustainable Supply Chain Management (SSCM) on the performance of manufacturing firms in Ghana. The study employed a mixed method approach. Three hundred and twenty manufacturing firms were used for the study. Closed and open-ended questionnaires were used. The Structural Equation Model (SEM) was used to analyse the data on the impact of SSCM on the performance of manufacturing firms in Ghana. The statistics generated were organised in tables using IBM SPSS 26 and AMOS 25. The study revealed that the mean of the responses to the statements on environmental performance ranged from 4.422 to 4.574, which indicated that participants agreed that SSCM strongly impacted the environmental performance of

*Corresponding author: E-mail: nsowahkojo@gmail.com;

manufacturing firms in Ghana. The mean of the responses to the statements on economic performance ranged from 4.469 to 4.594, which indicated that participants agreed that SSCM had a strong impact on the economic performance of manufacturing firms in Ghana. The mean of the responses to the statements on social performance ranged from 4.495 to 4.587, which indicated that participants agreed that SSCM strongly impacted the social performance of manufacturing firms in Ghana.

Keywords: Economic performance; environmental performance; social performance; sustainable supply chain management.

1. INTRODUCTION

In 1987, the Brundtland Commission issued the report entitled *Our Common Future* to reconcile environmental stability and economic development concerns. By so doing, the report explained sustainable development as “development that meets the needs of the present generation without jeopardising the rights of generations to come” [1]. This view of sustainable development intends to maintain economic progress and development while protecting long-term environmental value. Therefore, it provides a framework for the incorporation of development strategies and environmental policies [1].

Ensuring environmental protection when carrying out business activities should occur at a single firm level and other firms in the supply chain. Thus, because of the increasing environmental concern, firms are supposed to practice sustainable supply chain management (SSCM). This involves all supply chain activities and members ensuring the environmental tolerability of their goods from raw material to production, from production to retail and then lastly to the end-user (consumer) [2]. It is believed that policies to protect the environment can also enhance innovation and lead to profit. This suggests that sustainable production and the supply chain must ensure a balance when achieving economic, environmental, and social goals [3,4], which may be possible by following SSCM as a key strategy for improving the general performance of a business [5].

Scholars have contended that the introduction of socially and environmentally responsible initiatives like SSCM in a firm can lead to extra costs for community development, employee training and setting up environmentally friendly policies, for example [6], which might prevent it from maintaining a competitive advantage. However, research has also shown that considering the environment and society can

help a firm in that green practices improve customer goodwill, employee morale and relations with shareholders, such as (i) investors who put more into the company; and (ii) government organisations that decrease regulatory costs [7,8].

In et al. [6,9] and Orlitzky et al. [10] maintain that SSCM practices, which integrate environmental, social and economic responsiveness, would enhance a firm's reputation and brand image in the eyes of shareholders, customers and the public, thereby beating the competition in terms of financial performance. Lieberman et al. [11] and [12] argue that effective and efficient planning, strategising, decision-making, production and pricing contribute to a firm's competitive edge.

When companies offer products of the same quality and value as their rivals' products to clients at a reduced price, they enjoy a cost advantage [11]. However, a company can also beat the competition by selling products that differ from those of its rivals but are superior, whereby it has a differential advantage. In addition, a company can maintain a competitive edge by producing an item at a lower cost than its rivals, thereby having a comparative advantage. However, a company can have a competitive advantage whereby it does not rely on price to maintain its superiority over its rival and might have other advantages, such as greater customer satisfaction or a product with unique features [11,13].

Khan et al. [14] view SSCM as a strategy for realising a business's economic, social and environmental objectives by systematically managing crucial corporate processes that integrate the social, environmental and economic pillars of sustainability. These processes involve a firm's organisation's internal practices, which include process design and sustainable production, and external practices, such as the collaboration between a provider and a

consumer, which ensure the sustainability of the supply chain [15]. However, there is limited evidence that SSCM impacts firms' performance. Therefore, the study assessed the impact of SSCM on the performance of selected Ghanaian manufacturing companies using mixed-methods methodology, which combined interviews and surveys questionnaires to gather qualitative and quantitative data of the Ghanaian manufacturing firms in the Greater Accra, the Ashanti, the Western and the Bono Regions of Ghana.

2. LITERATURE REVIEW

2.1 Sustainable Supply Chain Management (SSCM) Performance

As the performance of Sustainable Supply Chain Management (SSCM) is grounded in the Triple Bottom Line (TBL) approach, it is defined in environmental, social and economic terms. Lee et al. [16] maintain that inter-organisation collaboration and linkage result in environmental improvement. In particular, according to [17], relationships with suppliers help develop and adopt innovative environmental technologies. SSCM "can ultimately lead to improved financial performance, thereby contributing to the economy through employment creation [18]. Nonetheless, [19] point out that the financial performance and profitability of SSCM practices are not realised in the short term.

Incorporating environmentally-friendly initiatives into the Supply Chain leads to benefits, such as minimising pollution, gaining the marketing edge by promoting brands, products, ideas and services, which do not harm the environment, reducing costs, enhancing a company's reputation and corporate image [14,20,21,22]. In addition, including stakeholders in a participative decision-making process when implementing environmentally sustainable strategies and addressing Corporate Social Responsibility (CSR) will ensure the success of SSCM [23].

The benefits of SSCM were summarised by [24] as decreasing disposal costs; enhancing product quality; reducing the workforce and turnover costs owing to safer transport and warehousing; decreasing safety and health costs, and reducing packaging through recycling. According to [25], certain social and environmental initiatives improve relationships with clients, especially those that support environmental activities in the community and involve giving donations for local environmental projects

2.2 Resource Dependence Theory

Davis et al. [26] RDT holds that external resources affect organisational behaviour and that firms must engage with other businesses in their environment to obtain resources. Thus, the Resource Dependence Theory (RDT) provides a framework for understanding the relationship between a company and the environment [27]. The RDT proposes "that firms are not self-sufficient and depend on the environment and its resources for survival and the accomplishment of long-term objectives [28,29]. Furthermore, firms find important resources by looking outside their boundaries [30,31].

Interdependence on required resources produces inter-organisational power that drives "organisational behaviour and supplier-buyer relations [32]. Businesses with a power advantage gain a dominant position in the network, which leads to a competitive advantage [30,33]. In addition, the ability to affect the activities of other members of the network determines the extent of the partnership between suppliers and buyers in networks [34]; Kahkonen, 2014), and businesses use different" approaches to obtain the resources required for different coordination levels [31].

The RDT proposes that a business is in charge of the internal power distribution within its SC, the inter-firm external power distribution (Parastuty et al., 2015; [29]. However, the problems encountered by a business and a lack of self-sufficiency generate resource dependence, uncertainty and control by external powers (Vecchiato, 2015; Parastuty et al., 2015; [29].

Tachizawa et al. [34] mention that power relations "are intrinsic to global supply networks. Innovation and competition are no longer just between single businesses but between SC networks, and this interdependence makes inter-organisational relationships problematic [31]. Dependence on suppliers for crucial resources directly influences socially and environmentally responsible practices [34,35]." Businesses constantly pay for resources, such as example distribution channels, material resources, technologies, procedures and standards, and are thus dependent on the external environment, although businesses in the network might have different objectives and strategies [36,31].

Malatesta et al. [31] emphasise that the RDT is used by managers to guide organisations "in short-term survival and long-term growth and is

included in studies on contemporary organisations and, particularly, in research on SC relationships [34]. Wry et al. [37] claim that the unique insights of the RDT on the complexity of an organisation's external environment" provide solutions to the problem of a firm's contemporary relevance. Furthermore, researchers have used the RDT in the field of SCM, such as Paulraj and Chen (2007), who designed an SCM strategy "based on environmental uncertainty and concluded that the relationship between SCM strategy and environmental uncertainty supports the RDT."

Wolf et al. [38] applied the RDT to an SSCM context, thereby extending the range of theories currently applied in the area. [27] employed the RDT to investigate the relationship between SSCM practices and organisational performance. Ramanathan et al. [39] carried out a holistic analysis taking into consideration a variety of stakeholder pressures in a single framework and extended the use of the RDT."

Those who disagree with the RDT contend that although it is difficult to disagree with the theory, it has not been extensively tested and needs extension and improvement [31]. Examining inter-organisational relationships in explaining the RDT is not enough, whereas integrating the theory with other theoretical frameworks, such as the real options theory, stakeholder theory and the RBV, might provide more insights into the relationship relation between an organisation and its environment [40].

Hillman et al. [40] mention that incorporating the Resource-based View (RBV) into the RDT would improve understanding of organisational resources, and incorporating the RDT into the stakeholder theory might lead to insights into managing dependencies [40]. Therefore, comparing and incorporating the RDT into competing or complementary theories might result in a better comprehension of environmental uncertainty, interdependence, the drivers of sustainability initiatives and how businesses can benefit from the external and internal factors influencing SSCM [41].

3. RESEARCH METHODOLOGY

3.1 Study Site

Quantitative research approach and explanatory design was employed for this study. The study

was conducted in the manufacturing sector of Ghana, the second-largest economy in West Africa and, in 2019, was identified as one of the world's fastest-growing economies in the world by IMF, 2020. The country has 16 regions, each carrying out particular economic activities. However, the manufacturing sector is dominated by the Ashanti, Greater Accra, Bono and Western regions. In each of these regions, manufacturing is carried out in their regional capitals: Kumasi, Accra/Tema, Sunyani and Takoradi, respectively, where the study was conducted.

3.2 Target Population

The study population comprised staff of selected manufacturing firms in four dominant manufacturing regions in Ghana. In ascending order, the topmost five manufacturing subsectors in Ghana are shearing and forming (3%), joining (4%), machining (6%), casting and moulding (7%), textiles (9%); non-metallic products (9%); chemicals and chemical products (13%); paper and paper products (19%); food and beverages (30%). In Ghana, the last time an industrial survey was carried out was 2003, when 27,000 manufacturing firms employed 244,000 individuals. Only 4% of the manufacturing firms were large enterprises employing more than 100 people. The number of manufacturing firms in the study area is 1900 [42,43].

3.3 Sampling and Sample Size

The study made use of purposive sampling, also called subjective, selective or judgemental sampling is a form of non-probability sampling whereby researchers depend on their judgement to choose respondents from a population to participate in a study.

At first, the purposive sampling method was used to select firms with an annual turnover of not less than one million dollars (\$1,000,000) within the study area. Moreover, the selected firms' staff (particularly procurement officers) were purposively selected. Therefore, not every firm or staff member within the study area was selected.

The number of respondents was selected based on the guidelines of [44], according to whom a sample size should be determined using the following formula:

$$S = X^2NP(1-P) \div d^2(N - 1) + X^2P(1 - P)$$

Where:

s = required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = the population size

P = the population proportion (assumed to be 0.50) since this would provide the maximum sample size

d = the degree of accuracy expressed as a proportion (0.05)

Therefore, based on the formula, the sample size from an estimated population of 1900 was determined as follows:

$$\begin{aligned} s &= X^2NP(1-P)/d^2(N-1)+X^2P(1-P) \\ s &= 3.841 * 1900 * 0.50(1-0.50)/0.05^2(1900-1) + \\ &3.841*0.50(1-0.50) \\ s &= 3648.95(0.50)/0.0025(1899) + 1.92(0.50) \\ s &= 1824.46/4.75 + 0.96 \\ s &= 1824.46/5.70 \\ s &= 320 \end{aligned}$$

3.4 Quantitative Data Collection

Quantitative data were collected from procurement officers, accountants and chief executive officers of the firms under study through a survey using a questionnaire comprising closed-ended questions as the data collection instrument. Creswell et al. [45] emphasise that in quantitative research, the investigator develops knowledge from a postpositive perspective through measurement, observation, cause and effect thinking, reducing data to specific variables, hypotheses, questions and the testing of theories.

3.5 Data Collection Instrument

A survey questionnaire was employed as the data collection instrument in the study because it gathers data from many participants. Only closed-ended questions were included in the questionnaire to enable easy analysis. Closed-ended questions suggest answers to research questions, which makes it simple for respondents to choose an answer. Closed-ended questions enable a researcher to compare the responses provided by participants [46].

The questionnaire consisted of Likert-scale questions. The answers to the questions were measured according to a five-point Likert scale whereby respondents had to choose from the

following statements to indicate their response to the questions: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA). Three hundred and twenty (320) questionnaires were distributed, although 303 (94.9%) were returned.

3.6 Validity and Reliability of Data Collection

To do the test of reliability, test-retest reliability method was used, where the questions in the questionnaire were asked in a twisted way but asking the same questions twice to establish whether the questionnaire elicit the same response. Furthermore, very simple languages in designing the questionnaire were used to ensure valid and reliable data. Simple constructed questionnaires were adopted to eschew ambiguity and make sure that the questions were understood by the respondents.

3.7 Measurement Model

The questions on the impact of SSCM practices were grouped into three sections representing. These were environmental performance, economic performance and social performance (Table 1).

3.8 Data Analysis

The SEM was used to analyse the data on the impact of SSCM on the performance of manufacturing firms in Ghana. The statistics generated were organised in tables using IBM SPSS 26 and AMOS 25.

4. RESULTS AND DISCUSSION

4.1 The Impact of SSCM on the Performance of Manufacturing Firms in Ghana

Table 2 below presents the descriptive statistics (means and standard deviations) generated by the analysis of the data gathered from the participants' responses to the items on the impact of SSCM practices on the performance of manufacturing firms in Ghana. The economic, environmental and social performance indicators to which the participants had to agree or disagree in varying degrees are clearly indicated in the table with the means and standard deviations of the responses.

Table 1. Questionnaire model

Variables	Number of questionnaire items	Literature source
Environmental performance (EP)	6	Zhu and Sarkis (2004), Zhu et al. (2013).
Economic performance (EcP)	7	Bowen et al. (2001), Zhu et al. (2008), Ameer and Othman (2012)
Social performance (SP)	7	Testa and Iraldo (2010), Xie and Breen (2012)

Table 2. Impact of SSCM on the performance of manufacturing firms in Ghana

Item	Mean	Std. Deviation
Environmental performance		
Improvement of a firm’s environmental situation	4.574	0.655
Waste reduction	4.538	0.643
Air pollution reduction	4.479	0.717
Reduction of consumption for toxic/harmful materials	4.495	0.744
Reduction of environmental accidents frequency	4.558	0.686
Reduction in natural resources use	4.422	0.812
Economic performance		
Cost reduction of purchased materials	4.469	0.698
Cost reduction of energy use	4.482	0.693
Fee reduction for waste discharge	4.512	0.669
Improvement in earnings per share	4.492	0.698
Improvement in return on investment	4.528	0.649
Growth of sales	4.594	0.642
Growth of profits	4.568	0.661
Social performance		
Customer satisfaction improvement	4.564	0.651
Improvement of firm’s image in the customers eyes	4.587	0.664
Investments improvement on social projects (e.g., sports, culture and education)	4.495	0.664
Improvement in relations with community stakeholders, e.g., community activists and NGOs	4.515	0.644
Improvement in employee education and training	4.512	0.649
Improvement in employees’ occupational safety and health	4.564	0.661
Improvement in stakeholder betterment or welfare	4.518	0.703

Source: Field survey (2022)

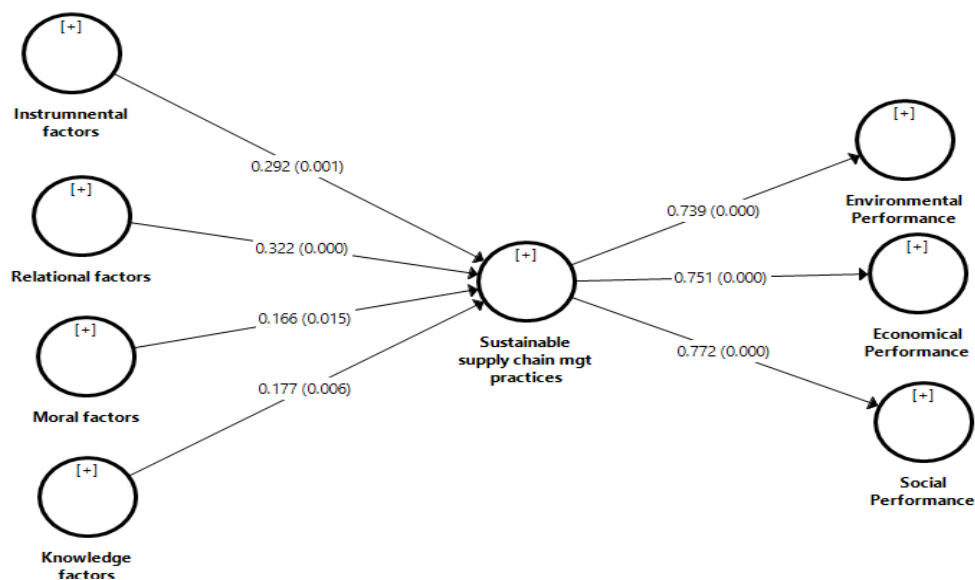


Fig. 1. Main model of the study showing parameter estimates and significant values

Source: Field survey (2022)

It was revealed that sustainable supply chain management practices had a significant positive effect on economic performance (H5) ($\beta = 0.751$, STDEV = 0.081, t-statistic = 9.244) with a p-value of 0.000. The prediction was further validated by the confidence level of 95% at the lower and upper boundaries of 0.603 and 0.865, respectively. The unidimensionality of the confidence interval values indicated that the predictions were valid and not spurious.”

Sustainable “supply chain management practices have a significant positive effect on environment performance (H6) ($\beta = 0.739$, STDEV = 0.065, t-statistic = 11.432) at a p-value of 0.000. The prediction is further validated by the confidence level of 95% at the lower and upper boundaries of 0.628 and 0.838, respectively. The unidimensionality of the confidence interval values indicated that the predictions were valid and significant.”

Sustainable supply chain management practices significantly positively affected social performance (H7) ($\beta = 0.772$, STDEV = 0.072, t-statistic = 10.696) at the p-value of 0.000. The prediction was further validated by the confidence level of 95% at the lower and upper boundaries of 0.636 and 0.872, respectively. The unidimensionality of the confidence interval values indicated that the predictions were valid and not assumed.

The study as shown in Table 2 revealed that the mean of the responses to the statements on environmental performance ranged from 4.422 to 4.574, which indicated that participants agreed that SSCM had a strong impact on the environmental performance of manufacturing firms in Ghana. The results of the inferential statistical analysis of the quantitative data revealed that “a firm’s SSCM practices positively and significantly influence its environmental performance, which means that the hypothesis is accepted. This outcome is consistent with the results of the studies conducted by [47] and [48]. According to [49], a firm must embrace environmentally friendly technology and practices to achieve outstanding environmental performance. Using a conceptual model, [50] in their study of Chinese firms found that SSCM practices significantly impacted environmental performance. In the measurement model, environmental performance was identified as the improvement to a firm’s environmental situation; waste and air pollution reduction, the reduction of the consumption of toxic/harmful materials; the

reduction of environmental accidents; and the reduction of the use of natural resources.

As shown in Table 2 above, the mean of the responses to the statements on economic performance ranged from 4.469 to 4.594, which indicated that participants agreed that SSCM had a strong impact on the economic performance of manufacturing firms in Ghana. The results of the inferential statistical analysis of the quantitative data revealed that a firm’s SSCM practices positively and significantly influence its economic performance, which means that the hypothesis is accepted. This outcome is consistent with the results of the studies conducted by [48,50,51] and [47]. The measurement model identified economic performance as the cost reduction of purchased materials and energy use, fee reduction “for waste discharge, improvement in earnings per share, return on investment and” growth of sales and profit. These elements of economic performance reflect the business knowledge and capabilities that [51] assert are part of economic performance due to SSCM practices that are appropriately controlled. Kaufmann et al. [48] in their study, found that firms that promote sustainability do better in their overall economic performance. Khan et al. [14] posit that firms strategically undertaking SSCM practices will perform better economically than firms that do not pursue the TBL.

The mean of the responses to the statements on social performance ranged from 4.495 to 4.587, which indicated that participants agreed that SSCM strongly impacted the social performance of manufacturing firms in Ghana. The results of the inferential statistical analysis of the quantitative data revealed that a firm’s SSCM practices positively and significantly influence its social, which means that the hypothesis is accepted. This result is in line with those of [48,50], and [49]. Kaufmann et al. [48] study found that social and environmental sustainability drives the long-term profitability of firms in developing countries, which motivates companies to focus on social and environmental concerns. Golini et al. [49] study found that SSCM practices have a considerable effect on the social “performance of manufacturing firms. Wang et al. [52] also found a link between SSCM practices and the social performance of Chinese firms and a significant relationship between social and economic” performance. In the measurement model, social performance was customer satisfaction improvement; the improvement of a company’s image and

reputation in the eyes of customers; increased investment in social projects; the improvement of relations with community stakeholders, e.g., community activists and NGOs; better employee education and training; improved employee health and safety; and attention to stakeholder betterment and welfare.

5. CONCLUSIONS

The study found that SSCM has a significant impact on manufacturing firms' performance in achieving environmental sustainability goals by: using environmentally friendly materials in product design, standardising product design to facilitate reuse, manufacturing environmentally-friendly products, evaluating existing processes to minimise their impact on the environment, and formalising environmentally-friendly processes. Others are by teaming up with their clients and suppliers to attain sustainability goals, carrying out mutual planning with their suppliers and customers to anticipate and solve sustainability problems, and collaborating with clients to provide services and/or products that comply with sustainability objectives. The remaining includes reducing waste and air pollution, minimising the use of toxic/harmful materials, preventing environmental accidents, and reducing the use of natural resources.

The study further found that SSCM has a significant impact on manufacturing firms' performance in achieving social responsibility goals by: forming relationships with community stakeholders, e.g., community activists and NGOs, employee education and training, employees' occupational safety and health, and stakeholder betterment and welfare.

Lastly, the study found that SSCM has a significant impact on manufacturing firms' performance in achieving financial goals by: reducing the cost of materials by recycling, reducing energy use, minimising the cost of waste discharge by using bio gradable materials, and improving customer satisfaction, thereby increasing sales, profits and return on investments, and improving a firm's image and reputation, thereby increasing earnings per share.

6. RECOMMENDATIONS FOR FUTURE RESEARCH

Future research could expand on the methods used in the study by following a quantitative or

qualitative approach instead of the mixed-methods approach adopted by the current study. Future studies could investigate SSCM practices in other industrial sectors in Ghana or other developing countries. Nevertheless, they could keep the focus on SSCM in manufacturing sectors but in developing countries other than Ghana. Using a longitudinal survey technique in future studies on the subject may provide a more complete picture of SSCM over time.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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