

Identifying the Barriers of Implementing Sustainable Supply Chain Management: A Case Study on a Sugar Mill

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ABSTRACT

Over the years, Sustainable Supply Chain Management (SSCM) has brought more focus in the industrial structure of Bangladesh almost in all the sectors mainly due to the high increase of EPI scores within the country, and there is a need for this to be practiced. Given the clear necessity of SSCM, there are still a number of limitations that prevent its full-scale application in many sectors. This paper seeks to examine the factors that hinder SSCM in a Sugar Mill and categorize them according to their importance relative to one another. Data were collected through interviews and questionnaires involving the mill's authorities and officials, hence the need to analyze current issues. To facilitate identification of the most important barriers, barriers were classified using the Henry Garret Ranking Model. The study's outcomes show that firstly, stakeholders' lack of awareness is identified as the major hindrance to the use of SSCM, and the other issues also are resources, technological factors as well as politics. These conclusions highlight the importance of raising the understanding, and the provision of resources, for the need of SSCM. Moreover hereto, this case study aids in the ongoing debate on sustainability practices in the industrial sectors of Bangladesh, by laying down a useful basis for policy makers, business practitioners and researchers interested in development and operations of SSCM in other sectors as well.

Keywords: Sugar mill, Bangladesh, Barriers, Sustainable Supply Chain Management.



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1. Introduction

The conventional Supply Chain Management (SCM), especially as it applies to industries, lays more emphasis on the effectiveness and agility of the supply chain in converting raw materials and carrying out the productive processes of a company to avail finished goods to its fortune customers [1]. Nevertheless, for a short time now, the climate has been recognized as a concern at a whole employing chiefly the advancement in humanity and the rapid rate of industries which causes global warming and depletion of the earth's resources and extinction of species [2–4]. The changing environmental dynamics makes it even more difficult for the SCM to ignore the sustainability of the entire chain of supply. The motion can be explained by the high technologic advancement in production and consumption, inflating pollution levels, and over utilizing the natural environment for the profits of one's economy. On the other hand, the transformation why not has its roots also in more or less uncompromisingly implemented ecological policy, including consumer pressure on regulators and on businesses in the sector [5].

In simple terms, the term sustainability can be defined as the development and utilization of resources in such a way so as to satisfy the present needs without putting at risk the potential for the future generations to meet their wants [6]. This notion has advanced through [7]. The Bottom Line Approach looks at quite a number of indicators, measures and performances of the organization's success and in addition to the environment, it includes the society and the economy too [8]. Adapt and merge this approach with TBL so as to enhance performance for a longer term and enable organizations to

create a competitive advantage over other players in the industry and realization of the benefits over the years to come [7, 9]. In addition to that, there is significant proof that an enterprise can grow its revenues through adopting and even encouraging social and environmental practices in the firm, due to how these practices function, especially, on the consumers [10]. Looking at the current state of affairs where businesses have to minimize their adverse environmental impact, there is need for the formulation and application of sustainability practices in their supply chains. For this change to take place successfully, these organizations will have to reconfigure their supply chains by using ones available in different ways, such as sourcing or producing any product involving recyclable, reusable or recycled materials [11, 12]. Nonetheless, during the turning of traditional SCM to, some barriers or hindrances are to be expected [12, 13].

Several contingent factors such as size, culture, geography, and supply chain relationships of an organization, for instance can enable or deter some common practices [14]. It is important, as noted by Sarkis et al., to recognize the obstacles to the most sustainable production and development practices [15]. Consequently, organizations should analyze those barriers and prioritize the most significant ones while recognizing their relationship with others to assist the decision-makers in coming up with measures to deal with such barriers during their implementation. [13, 16].

This study seeks to explore and rank the barriers in order to better the understanding of the sugarcane processing industry and subsequently the ability to execute successfully within it. The methodology employed in pursuing this goal is

the identification of various barriers so as to select appropriate ones for the purpose of ranking them.

2. Literature Review

2.1 Sustainable Supply Chain Management

In the academic exploration of the concepts, there exist a plethora of definitions. Ahi and Searcy [7] provide a conceptualization emphasizing the engagement of economic, environmental and social issues for the purposes of establishing and coordinating supply chain network structures. Such portrayal, describes this complex inter-organization system, which primarily focuses on the management of materials, information and monetary flows in regard to sourcing, production and delivery of goods services. Additionally, the fully satisfied stakeholder needs correspond with increasing the organization's profitability, market standing and stability over the short as well as the long term. For the purposes of this study, we have chosen to focus on the definition summarized by Lin and Tseng [17] and Reefke and Sundaram [18], which states that is making information and material, capital and cooperation flows between the participants of the whole supply chain, taking into account the economic, social and environmental needs of the stakeholders and the end customers.

It has attracted more of global attention with time in most parts owing to regulations by authorities, pressing for sustainable products by consumers, market trends, rising levels of concern and awareness among the public as well as the benefits that accrue from competition [19-21].

Several practices in the industrialized world have demonstrated global tendencies which have environmental effects and have contributed to the negative quality of life [19]. This negative trend in environmental effects, among others, has concerned different parties, such as politicians and environmentalists, who have sought for the government to put enforceable measures and guidelines [22 - 24]. In this respect, governments have availed tougher measures and guidelines that have made it compulsory for these institutions to embrace more environmentally friendly practices [25]. Consequently, there has been an increased organizational concern about the environmental, economic, and social dimensions of their operations, and a consequent desire to achieve sustainability [26]. The search for sustainability has started to redefine competition – forcing organizations and supply chains to rethink their processes, technologies, and products. Most organizations, even with a firm grasp of present-day market realities, continue with operations that are unsustainable. Nevertheless, there are clear signs of a rising tide regarding incorporating sustainability into their supply chains and operations. [27, 28]. It is the implementation of sustainable innovation practices that enable chains to achieve sustainability. [29, 30]. Sustainable innovation can be termed as a process that involves the application of new ideas or methods in existing production processes with the aim of mitigating the negative impact on the environment. [29]. these practices help organizations deal with sustainability challenges [31, 32] with regard to the TBL principle [33, 34]. Such concepts are concerned with, being linked to, or related to the ideas of Sustainable planning design, production system for remanufacturing, energy management, reverse logistics, inventory control, product reclamation, waste management, and emissions controls [35].

2.2 Sustainable Supply Chain Management Barriers

Hsin-Hung Wu et al. investigated the barriers of implementing SSCM and found that organizational involvement is the top most dimensions in order to implement SSCM effectively [36]. Farhana et al. did a case study on impacts of SSCM in RMG sector of Bangladesh and found that it is highly positive impact for environment sustainability [37]. Rayhan et al. studied and analyzed find barriers of implementing SSCM in Footwear industries in Bangladesh and ranks them by Delphi Method. It finds out that the major problem is Regulation and awareness [38]. Shaif et al. analyzed the barriers of implementing SSCM in Leather industries by AHP and ELECTRE-1 [39]. It indicates technology and finance is the top of the barriers list. Towfique et al. investigated in barriers of SSCM in Plastic Industries of Bangladesh applying Fuzzy-VIKOR method and point out that top barrier is inadequate knowledge and support. Insufficient technology and infrastructure are the second top barrier to implement SSCM [36]. Apart from these, Mahmudur et al. works on implementing SSCM in Bangladesh Perspective. They work in general and for this they came out with a potential barriers list for Bangladesh perspective [41]. The list is given below in Table 1.

Table 1 Potential barriers

Barriers	References
Lack of government support	[42]-[51]
Lack of regulation and legislation	[44], [50], [52], [53]
Corruption	[44]
Competition and uncertainty	[45], [46]-[51], [53]
Lack of demand and public awareness	[42], [43]-[45], [46]-[50]
Supplier's flexibility	[42], [43], [45]-[53]
Lack of source of materials	[44], [53]
Poor organizational culture	[42], [44], [45], [48]
Cost of implementation for SSCM	[42], [43], [54], [46]-[51], [53]
Lack of CSR	[45], [46], [52], [53]
Lack of commitment	[45], [46], [49]-[53]
Lack of management initiatives	[42], [46], [48], [50]
Lack of Organization Encouragement	[46], [47]
Lack of knowledge and experience	[42], [44], [46], [48]-[50], [52], [53]
Lack of skilled HR	[42], [43], [45]-[49]
Lack of training in SSCM	[44], [45], [48]-[50]
Lack of acceptance of advancement in new technology	[42], [44], [45], [47]-[50], [53]
Lack of energy and waste management policy	[42], [48], [49], [51], [53]
Lack of internal sustainability audits	[49], [51]
Lack of integration of IT system	[45], [47]-[49], [53]
Lack of rules and regulations	[60], [62]-[64]
Customer interest toward SSCM	[54]-[58]
Customer interest	[62]
Society's awareness	[62]
Financial constraints	[13]-[14],[18]-[23]
Interest In investment	[62]
Nature of raw materials	[62]
Poor supplier commitment	[54]-[55], [61], [63]
Lack of global value chain integration	[62]
Buyers' outsourcing strategy	[62]

3. Research Methodology

To conduct this case study, statistical assessment and analysis were used. At first literature was reviewed to get an idea about the potential barriers of implementing SSCM. Then a questionnaire was developed and survey was conducted among the supply chain professionals. The survey questionnaire was developed to find out the potential barriers and required variables. All the collected data were evaluated by using Henry Garret Ranking Model to create a ranking table by prioritizing the barriers.

4. Data Collection and Result Analysis

Data were collected through face to face interview with the 17 professionals including from the sugar mill and academia. Here we choose 17 professionals because it almost cove the full population in the relevant area of this case. All the collected data were evaluated by using Henry Garret Model to create a ranking table by prioritizing the barriers.

To investigate preference and the conversion of constraint and advantage orders into numerical scores, the Henry Garret Ranking method was used. This technique's main advantage over a simple frequency distribution is that, from the respondents' perspective, the constraints are arranged according to their severity. Though other ranking methods are available, those are little bit more technical which was not easy to understand as most of the officials of that sugar mill was from general background. Hence we use Henry Garret Ranking method in this case.

4.1 Data Collection

From the survey it was found 7 categorized vital barriers for implementing SSCM as shown in Table 2. From these 7 categorized factors it needed to determine which factors are the most potential by ranking them Henry Garret ranking method.

The number of respondents are N= 17

Table 2 Categorized factors

Notation	Factors Name
F1	Lack of Awareness
F2	Lack of Technology
F3	Cost of SSCM
F4	Knowledge and Expertise
F5	Government Support and Policies
F6	Product and Materials
F7	Miscellaneous Factors

Among the 7 factors our respondents ranked the factor in their perspectives. Table 3 is showing the count how many respondents have given 1st to 7th rank for each factor.

Table 3 Collected data

Factors	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th
F1	4	5	2	3	2	1	0
F2	3	2	4	3	1	2	1
F3	5	4	2	2	2	1	1
F4	3	4	3	3	1	2	1
F5	1	1	3	2	6	3	1
F6	1	0	2	2	3	5	4
F7	0	0	1	2	2	3	9

4.2 Data Analysis

For the data analysis there's need to calculate percent position for Henry Garret Ranking.

Here,

For Rth rank the basic formula of percent position is,

$$\text{Percent position} = 100(R_{ij} - 0.5/N)$$

$$R_{ij} = \text{Henry Garret Rank} = 1^{\text{st}}, 2^{\text{nd}}, 3^{\text{rd}}, 4^{\text{th}} \dots \dots 9^{\text{th}}, 10^{\text{th}}$$

$$N = \text{Total Ranks given by our respondents} = 7$$

Now, for each rank the percent position is as shown in Table 4.

Table 4 Percent position for each Henry Garret rank

Rank	100 (R _{ij} - 0.5)/ N	Percent Position
01	100(1 - 0.5)/7	7.14
02	100(2 - 0.5)/7	21.42
03	100(3 - 0.5)/7	35.71
04	100(4 - 0.5)/7	50
05	100(5 - 0.5)/7	64.28
06	100(6 - 0.5)/7	78.57
07	100(7 - 0.5)/7	92.85

After determining the percent position Garret value was determined from Garret value chart for each percent position as shown in Table 5.

Table 5 Determining Garret value

Rank	Percent Position	Garret Value
1	07.14	79
2	21.42	66
3	35.71	57
4	50.00	50
5	64.28	43
6	78.57	35
7	92.85	22

Determined garret value was multiplied with each rank with their respective garret value and summed them all for each factor as shown in Table 6.

Table 6 Multiplication of each rank with their respective garret value

Factor	1 st *79	2 nd *66	3 rd *57	4 th *50	5 th *43	6 th *35	7 th *22	Sum
F1	316	330	114	150	86	35	0	1031
F2	237	132	228	150	43	70	22	882
F3	395	264	114	100	86	35	22	1016
F4	237	264	171	150	43	70	22	957
F5	79	66	171	100	258	105	22	801
F6	79	0	114	100	129	175	88	685
F7	0	0	57	100	86	105	198	546

To calculate average score all summed value was divided by the total number of respondents as shown in Table 7. Highest average score is the most potential.

$$\text{Avg. Score} = \text{summed value/No. of Respondents}$$

Table 7 Determination of average score

Factors	Factors Name	Score	Rank
F1	Lack of Awareness	60.64	1
F2	Lack of Technology	51.88	4
F3	Cost of SSCM	59.76	2
F4	Knowledge and Expertise	56.29	3
F5	Government Support and Policies	47.11	5
F6	Product and Materials	40.29	6
F7	Others	32.11	7

4.3 Result Analysis

After Rewrite we got the final ranking table as shown in Table 8.

Table 8 Final ranking of the factors

Factors Rank	Factors Name
1 st	Lack of Awareness
2 nd	Cost of SSCM
3 rd	Knowledge and Expertise
4 th	Lack of Technology
5 th	Government Support and Policies
6 th	Product and Materials
7 th	Others

The analyze sums up that the top barrier of implementing SSCM in a sugar mill is Lack of Awareness. Also, the second top position is the financial impact of SSCM. Also, knowledge and expertise and Technology barriers came respectively in the priority list. Products and Materials comes 6th in the priority list and shows less impact on implementing SSCM. Some others factor also came in the list. It may help for the authorities to implement SSCM in the sugar mill.

4.4 Discussion

SSCM is an effective strategy for meeting ecological standards in the advancement of procurement practices. It also helps in the enhancement of efficiency, product attributes, and profitability, thus improving overall company performance. Identifying significant obstacles to implementing SSCM has been a difficult task due to the various properties of the barriers. In this research work we discussed and analyzed different barriers which are the most influential when introducing SSCM in the sugar mill. We collect various opinions from the Sugar Mill and other external experts and analyze the collected data by Henry Garret Ranking Model.

But only identifying the barriers is not enough, we need to identify the mitigation strategies also. Some of them are being proposed from our end as following:

- Building stakeholder awareness via focused workshops and training can enhance the awareness of the SSCM benefits.
- The government's sanction and relevant political action will provide incentives for the adoption of these sustainable measures.
- Added investments into advanced technologies and infrastructure may tackle gaps associated with technology while allocating funds to reduce the cost-related challenges.
- Collaboration with academia and industry encourages knowledge sharing, as well as expertise development.
- Engaging the suppliers aligns them with sustainable objectives and conducting periodic audits complemented by great IT integration reinforces monitoring and continuing improvement efforts.

5. Conclusion

The research offers the sugar mill with an important way to identify major obstacles and potential paths for implementing SSCM. To adopt SSCM in the sugar mill every possible barrier should be considered with adequate importance. Though the company can first think about the awareness of SSCM which is the top barrier in the priority

list. Then, consider the rest barriers for proper implementation of SSCM. Sustainable activities help to conserve resources and protect the environment. Adoption of Sustainable practices and Sustainable technology in production plans also ensures profitability.

The authors conducted the study in a small scale and only collects data from the specific sugar mill. The authors recommends that this work can be studied in a larger scale by collecting plenty of data. This work also be conducted in others sector. From Methodological perspective this work is analyzed by Henry Garret Ranking Model. Although the method is good enough to rank the barriers, this can be analyzed by other Methodologies. In the current economic and social state more work in this field is clearly needed.

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