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# Barriers and Drivers of Green Supply Chain Management: a Case Study of Ukraine

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**Abstract** – Any change in a system requires a thorough preparation, especially when third parties are concerned. Introduction of green supply chain management (GSCM) is not an exemption. Various factors, like barriers and drivers, are able both to accelerate and inhibit the process of GSCM introduction. Thus, the importance of prior knowledge of such factors is difficult to underestimate. There has been a number of studies relates to barriers and drivers affecting GSCM introduction in various countries and industries. As soon as there were few GSCM-related researches in Ukraine, a country with powerful manufacturing and processing industries, this study is aimed to determine factors influencing GSCM introduction in manufacturing companies of the country.

Based on results of filled-in and returned questionnaire distributed among 2000 Ukrainian manufacturing companies, 16 barriers and 22 drivers for GSCM introduction were identified. The statistical analysis showed that most important barriers are cost of implementation, lack of demand from customers, market competition, lack of government support and suppliers readiness to GSCM. Among most significant drivers are issues related to export, market and competitors, customers, costs reduction and financial benefits and liability and penalties imposed on environment legislation breaking entities.

The results of this study can be applied both by scientists and environment / sustainability management professionals for further researches with the purpose of defining drivers and barriers and developing recommendations on GSCM introduction in certain country, industry or entity. Findings of the study together with further researches can be useful for governmental authorities for defining GSC-driving policies and regulations.

**Key words** – *Green supply chain management, Barriers, Drivers, Environment management, Sustainability management.*

## 1. Introduction

Supply chain constitutes a network of entities and/or departments (in terms of a closed production system of an entity) which are directly or indirectly connected to each other. Without any link of this production chain, the end product would not be able to get to targeted customers at the desirable location, time and price [1].

At the same time, when an entity makes supply chain decision as to which outsource supplier to buy from or what method of distribution to use, the company actually accepts the waste stream generated due to such managerial decision [2]. Since except for the direct waste and pollution impact generated by the storage, transportation, processing, use or disposal of the product, there's also an indirect pollution impact of the product caused by outsource entities constituting the supply chain thereof [3]. Understanding of this environmental impact has significantly increased the complexity of the process of purchasing. Today buyers have to purchase goods and services from those suppliers which are able not only to produce them at the lowest costs, highest quality and within the shortest time, but which are also environmentally responsible in managing the processes related to production of such goods and services [3].

From past decade, in order to fulfill the due part in environmental sustainability, business around the globe have been adopting, implementing and exercising the process of green supply chain management (GSCM) [4].

In simply expressions, green supply chain management can be defined as the relationship of buyer and vendor of green products [5]. Except for minimization of impact on environment, the adoption of GSCM practices improves economic performance and, as a consequence, enhances operational and organizational performance of a production company [6].

While green production of a product is the issue of human, material and financial resources of an entity, the development of environmentally friendly processes, products, and services in a supply chain requires a unified effort by all members of the supply chain. Like any other process, the introduction of GSCM has its own barriers and drivers directly or indirectly affecting the speed and quality of GSCM implementation in an organization [7].

In past decades, GSCM has been rapidly developing in academia and industry, and the number of investigations

all over the world has grown dramatically [8]. There has been a number of studies relates to barriers and drivers affecting GSCM introduction in various countries and industries. Most of the researches related to barriers or drivers only, four of them covered both types of factors [7], [9]-[11]. The studies also differed from each other by the number of barriers/drivers: from 3 factors [12] to 47 factors [13]. Number of GSCM barriers and drivers in previous researches is given in Table 1.

**Table 1.** Number of GSCM barriers and drivers in previous researches

Study	Barriers	Drivers
Zhu and Sarkis (2006)	-	19
Lee, 2008	-	3
Hu and Chia-Wei, 2010	-	20
Luthra et al., 2011	11	-
Diabat and Govindan, 2011	-	11
Balasubramanian, 2012	12	-
Dashore and Sohani, 2013a	20	16
Kamalakanta and Akhilesh, 2013	4	-
Bhool and Narwal, 2013	-	15

Dashore and Sohani, 2013b	14	-
Dube and Gawande, 2014	20	-
Govindan et al., 2014	47	-
Manikanda Prasath et al., 2014	10	-
Dheeraj and Choudhary, 2014	16	-
Mathiyazhagan et al., 2015	-	15
Kamolkitiwong and Phruksaphanrat, 2015	-	10
Shibin et al., 2015	8	10
Niemannet al., 2016	8	4
Dhull and Narwal, 2016	27	41
Sarker et al., 2018	22	-
Rashid et al., 2018	-	13
Khoo Terh Jing et al., 2019	-	12
Saeed and Kersten, 2019	-	40

Main barriers covered by the previous studies are given in Table 2.

**Table 2.** Barriers investigated in previous researches

1. Lack of government support policies	[7], [9]-[11], [13]-[18]
2. Lack of government regulation and legislation	[10], [17], [19], [20]
3. Corruption	[10]
4. Market competition and uncertainty	[11], [13]-[18], [20]
5. Lack of demand and public awareness	[7], [9]-[11], [13]-[17]
6. Supplier's flexibility to change towards GSCM	[7], [9], [11], [13]-[20]
7. Lack of green architects, consultants, green developers, contractors in the region	[7], [9], [15], [19]
8. Lack of source of eco-friendly materials	[10], [20]
9. Poor organizational culture in GSCM	[7], [10], [11], [15], [16], [18], [20]
10. Cost of implementation for GSCM	[7], [9], [10], [13]-[18], [20]
11. Lack of corporate social responsibility	[11], [13], [19], [20]
12. Lack of top management commitment	[11], [13], [16]-[20]
13. Lack of management initiatives for transport and logistics	[7], [13], [15], [17], [20]
14. Lack of Organization Encouragement	[13], [14]

15.	Lack of knowledge and experience	[7], [10], [13], [15]-[17], [19], [20]
16.	Lack of skilled human resource in implementation of GSCM	[7], [9], [11], [13]-[16], [18], [20]
17.	Lack of training in GSCM	[10], [11], [13], [15]-[18], [20]
18.	Lack of acceptance of advancement in new technology	[7], [10], [11], [14-18], [20]
19.	Lack of energy management and waste management of the organization	[7], [15], [16], [18], [20]
20.	Lack of internal sustainability audits within the organization	[16], [18]
21.	Lack of integration of IT system	[7], [11], [14]-[16], [20]

Main drivers researched by the previous studies are given in Table 3

**Table 3.** Drivers investigated in previous researches

1. Regulations	[7], [11], [21]-[27]
2. Regional regulations	[11], [21], [24], [26]
3. International regulations	[11], [21], [24], [26]
4. Products potentially conflict with laws	[11], [21]
5. Government Supports / Encouragement	[11]
6. Liability and penalties	[11], [21], [24]
7. Global	[26]
8. Resource depletion	[24], [26]
9. Market / Competitors	[11], [21], [25]-[27]
10. Export	[11], [21], [24]
11. Suppliers	[7], [9], [11], [12], [21]-[23], [26], [28]
12. Customers	[7], [11], [12], [21], [22], [25]-[27]
13. Community	[10], [11], [26], [27]
14. NGO	[11], [24], [26]
15. Media/Press	[11], [24], [26]
16. Shareholders'/investors' pressure	[11], [23], [24], [26], [27]
17. Costs	[7], [11], [21], [23], [24], [26], [27]
18. Operational/economic performance	[7], [11], [22], [26]
19. Health and safety	[26]
20. Corporate commitment	[9]-[11], [23], [26]-[28]
21. Employees	[11], [26], [28]
22. Standards/Certification	[7], [11], [22], [23], [25], [26]
23. Social responsibility	[10], [11], [24], [26], [27]

24. Organisational policies & culture	[9], [10], [21], [23], [25], [26], [28]
25. Financial benefits	[9], [11], [23], [26], [27]
26. Competitive advantage	[11], [27]
27. Innovativeness	[9], [25], [26]
28. Green Design	[7], [9], [22], [28]
29. Company's image	[7], [11], [21], [24], [26], [27]
30. Reverse Logistics	[7], [9], [22], [23]
31. Reducing energy consumption and confining wastes	[7], [23], [24]
32. Reusing and recycling materials and packaging	[7], [23]

According to the Readiness for the Future of Production Report 2018 issued by The World Economic Forum, Ukraine possesses 51<sup>st</sup> place in the world in terms of manufacturing value added in economy (12.3% of GDP) and 55<sup>th</sup> place by manufacturing value added (15,62 million USD). Thousands of Ukrainian entities produce computers, pharmaceutical products, electronic equipment, machinery, vehicles, chemicals, metallurgic products, charred coal, gas, oil and oil refinery products, rubber and plastic items and other non-metal mineral products. Agriculture and processing industries including production of food, drinks and tobacco production is also well-developed in Ukraine, as well as textile production, manufacturing of clothes, leather, timber and paper production, furniture and lots of other products [29].

At the same time, the significant increase in industrial and agricultural production adversely affects existing natural resources and ecosystems in many areas of the country. Despite comprehensive environmental legislation Ukraine faces serious problems related to environmental degradation [30]. Thus, the application of a wide range of environment protection policies and practices including GSCM is of current interest.

As soon as there were few GSCM-related researches in Ukraine, investigation of green supply management issues in the country is of great importance. The aim of this study is to determine factors influencing GSCM introduction at Ukrainian manufacturing companies. This research is sought to resolve the following tasks:

- determine the number of companies which introduced or are introducing GSCM in operation;
- determine and rank barriers affecting GSCM introduction;

- determine and rank drivers influencing GSCM introduction.

## 2. Methods

For the purposes of this study, statistical assessment, grouping, analysis and correlation-regression method were used.

2000 Ukrainian manufacturers with supply chains were selected from various industries using Ukraine Today online catalogue. Out of 2000 questionnaires distributed via e-mail and post only 803 were filled-in and returned. 9 questionnaires were disregarded due to improper or partial filling-in. Thus, the empirical base of the research was the data of surveys involving 794 manufacturing companies with full-scope supply chains. The survey was conducted in 2018-2019 (Table 4).

**Table 4.** Types of manufacturing companies in the sample

Size	Number of companies	% of the sample
Large	10	1,30%
Medium	249	31,40%
Small	534	67,30%
Total	794	100%

For the purposes of the study, a questionnaire was developed, which contained barriers and drivers influencing actual or potential GSCM introduction. The list of 16 barriers was based on previous researches [7],

[9]-[11], [13]-[20]. The list of 22 drivers was developed according to previous studies which investigated such factors [7], [9], [11], [12], [21]-[28].

The survey contained the following questions:

“1. Have your company implemented / is currently implementing GSCM?

2. When introducing GSCM in your company, which of the following barriers were affecting / would affect this process (please rate each barrier using a four-point scale: not important, somewhat important, important and very important (*list of barriers*)).

3. When introducing GSCM in your company, which of the following drivers were facilitating / would facilitate this process (please rate each driver using a four-point scale: not important, somewhat important, important and very important (*list of drivers*))”

The ratings of each barrier/driver were recalculated as relative importance index (RII) by way of dividing total rating score from all respondent companies by four times sample size. After that all the factors were ranked according to the relevant RII of each of them.

### 3. Results

According to answers of the respondents to the first question of the survey, 249 (31%) out of 794 manufacturers introduced or were in course of GSCM introduction: 5 large manufacturers (1% of sample and 48% of large companies), 86 medium-sized manufacturers (11% of sample and 34% of medium-sized companies) and 158 small companies (20% of sample and 30% of small manufacturers).

According to the survey, the barriers for GSCM introduction were ranked as follows (Table 5)

**Table 5.** Barriers affecting GSCM introduction

Barrier	RII	Rank
Cost of implementation for GSCM	0,96	1
Lack of demand from customers and public awareness	0,94	2
Market competition and uncertainty	0,94	3
Lack of government support	0,93	4
Supplier's unreadiness to change towards GSCM	0,92	5
Lack of top management commitment	0,90	6
Lack of knowledge and experience	0,90	7
Lack of source of eco-friendly materials	0,87	8
Lack of corporate social responsibility	0,85	9
Lack of skilled human resource in implementation of GSCM	0,82	10
Lack of government regulation and legislation	0,80	11
Lack of training in GSCM	0,80	12
Corruption	0,79	13
Lack of acceptance of advancement in new technology	0,68	14
Lack of internal sustainability audits within the organization	0,65	15
Lack of integration of IT system	0,54	16

Table 5 shows that the strongest barriers among manufacturers are cost of GSCM implementation, lack of demand from customers, market competition and uncertainty, lack of government support and suppliers

readiness to GSCM. On the other hand, such factors as lack of training in GSCM, corruption, lack of acceptance of advancement in new technology, lack of internal sustainability audits within the organization and lack of

integration of IT system were reported as the least affecting.

**Table 6.** Drivers facilitating GSCM introduction

Driver	RII	Rank
Export	0,97	1
Market and competitors	0,95	2
Customers	0,95	3
Costs reduction and financial benefits	0,94	4
Liability and penalties	0,91	5
Government support	0,89	6
Operational and economic performance	0,85	7
Corporate commitment	0,85	8
Standards and certification	0,79	9
Regulations	0,76	10
Suppliers	0,75	11
Competitive advantage	0,74	12
Community	0,74	13
NGO	0,72	14
Pressure from shareholders / investors	0,69	15
Green design	0,69	16
Reducing energy consumption and confining wastes	0,65	17
Health and safety	0,62	18
Social responsibility	0,62	19
Image of the company	0,60	20
Mass Media	0,59	21
Resource depletion	0,57	22

According to Table 6, export, market and competitors, customers, costs reduction and financial benefits and liability and penalties were or would be most driving factors for respondents, while health and safety, social responsibility, image of the company,

Mass Media and resource depletion were or would be the least influential drivers.

#### 4. Discussion

In 2014, Ukraine has signed the Association Agreement

with the EU and obliged to correspond to the EU technical regulations and standards, systems of accreditation and to adhere to the principles and practices specified by the EU relevant decisions and regulations [31]. The Association Agreement also opened one of the world's biggest markets to Ukrainian entities, products of which go in line with EU standards including those related to environmentally friendly goods and services. It shall be noted that the EU used to apply both import and transit barriers based on environmental standards [32]. At the same time this research showed that only 249 (31%)

manufacturers introduced or were implementing GSCM at the time of survey, among which the introduction of GSCM was detected at bigger number of small manufacturers (158) followed by medium-sized (86) and large companies (5). This can be explained by more flexibility of small and medium-sized companies than large ones. Besides that small and medium-scale companies are more customer-oriented and have better access to eco-friendly materials. Large manufacturers, on the contrary, due to big volumes of production and raw materials required do not usually have a wide range of green suppliers to build an effective GSCM system.

Manufacturers occurred to be more concerned with cost-related issues when deciding on introduction of GSCM. At the same time they carefully look at the market, and if there's no demand from customers or threat from competitors, they prefer to change nothing in their supply chain. Absence of governmental support for GSCM introduction was reported as another one strong barrier.

Barriers investigated in this research basically go in line with the previous studies. As to top five barriers, it is also consistent with previous researches: cost of GSCM implementation [10], [11], [17], [20], [33] lack of demand from customers [9], [10], [20], [38] market competition [7], [14], [16], [18], [37] lack of government support [13] and suppliers readiness to GSCM [9].

The majority of manufacturers, irrespective of size, occurred to be export oriented. At the same time they tend to be quite attentive to market situation, customers' demands and activities of competitors. Cost reduction is also important in terms of GSCM introduction. Although the legislation of the country on environmental protection is quite comprehensive, the enforcement thereof due to bureaucracy and corruption is weak. This allows manufacturers to avoid complying with environment-related laws. Though, in situation of due control and penalties, companies tend to comply with law and implement GSCM as well.

5 most important GSCM drivers were also confirmed by previous studies: export [21], [24], [36] market and competitors [23], [27], [35] customers [23], costs reduction and financial benefits [11], [26] and liability and penalties [11], [23], [34].

## 5. Conclusion

Any change in a system requires a thorough preparation, especially when third parties are concerned. Therefore it is vitally important to understand beforehand all issues that can arise in course of changing such system. Introduction of green supply chain is not an exemption.

Various factors are able both to accelerate and inhibit the process of GSCM introduction. The importance of prior knowledge of such factors (barriers and drivers) is difficult to underestimate.

This study determined and ranked 16 barriers and 22 drivers for GSCM introduction among Ukrainian manufacturers with various scales of business. It was determined that most important barriers are cost of implementation, lack of demand from customers, market competition, lack of government support and suppliers readiness to GSCM. Among most significant drivers are issues related to export, market and competitors, customers, costs reduction and financial benefits and liability and penalties imposed on environment legislation breaking entities.

The results of this study can be applied both by scientists and environment / sustainability management professionals for further researches both in Ukraine and internationally, including industry-based investigations with the purpose of defining barriers and drivers and developing of recommendations on GSCM introduction in certain country, industry, entity. Findings of the study together with further researches can be used by governmental authorities when defining GSC-driving policies and regulations.

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