Green Supply Chain Initiatives In Turkish Automotive Main Industry*

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Abstract
In recent years, the concept of natural environment has become one of the essential subjects that organizations should consider together with the increase of environmental protection consciousness. In particular, this concept is effective throughout the supply chain. In this case, Green Supply Chain Management (GSCM) is at the forefront. GSCM has emerged as an important organizational philosophy and proactive approach to reducing environmental risks. The impact of this approach is huge in the automotive sector. Reasons such as solidification of legislations, increased partnerships and consumer pressures have led to the review and implementation of GSCM practices. In this study, interviews were conducted with the managers of 11 companies that produce in automotive main industry in Turkey and the points of view on GSCM applications were examined. These companies' GSCM initiatives and barriers were focused. In particular, the reduction of vehicle engine emission rates, plans against climate change, and green initiatives on recycling draw attention. In addition, the presence of vehicles with a high emission rate in traffic is of interest among GSCM barriers.

1. Introduction
In the 1990s, GSCM applications became more and more keen on researchers' concerns about environmental and climate change issues (Walker, et al., 2008: 69). GSCM has emerged as an important philosophy to achieve organizational profit and market share goals by reducing environmental risks and impacts while increasing the ecological efficiency of organizations. For a variety of reasons, such as resource constraints, legislation consolidation, and consumer pressures increasing, it has become imperative for manufacturers to effectively integrate environmental considerations into their strategic planning programs in order to minimize environmental impact, gain competitive advantage, and sustain. In addition, the adoption of GSCM has reduced the impact of pressures and has increased the tendency of organizations to implement green supply chains (Zhu, et al., 2008: 2). Many of the accepted green approaches continue to remain as traditional command and control or "pipe end" solutions, particularly in the developing world, seeking to remove or reduce adverse environmental effects created by the establishment, rather than pursue a proactive approach to reducing

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waste or pollution sources (Zhu & Sarkis, 2007: 4333). The traditional "pipe end" approach only converts nature polluting substances from one form to another and does not remove them from the surface. The GSCM concept assumes responsibility for products and services, as opposed to the traditional environmental management approach, from the purchase of raw materials to the final use and disposal (Eltayeb, et al., 2011, 495).

Green initiatives implemented within the framework of GSCM have had to be carried out very effectively in the automotive sector due to various reasons. Efforts to comply with European Emission Standards of engine emission rates to make more environmentally friendly vehicles are particularly effective. From the literary perspective, the work of GSCM on the automotive sector is remarkable. Luthra, et al. (2011) aimed to identify the obstacles encountered while performing the GSCM in the Indian automobile industry. The relationship between these barriers has been reviewed and classified. Diabat, et al. (2013) investigated the relationship between green supply chain practices (initiatives) and performance outcomes at an automobile plant in their study. As a result, environmental design, cooperation with customers and reverse logistics has emerged as the three main factors that are most important in their performance. Demirci, (2014) has carried out an empirical study on 5 main industries in Turkish Automotive Industry. The questions posed are that the GSCM is not fully implemented and that the concepts of green design and green procurement for Turkish producers are quite new concepts. Jain & Sharma (2012) have highlighted the literacy of GSCM practices in their study and have examined how much of these practices in the literature have taken place in India. They compiled their data from the survey of 10 firms. According to the survey results, some applications were found to be at an early stage. Drohomeretski, et al. (2014) have identified the motivating factors and challenges in the Brazilian automotive sector. Three cases were reviewed and 13 interviews were conducted. As a result, this study guides the companies in the automotive sector to adopt GSCM applications and shows that the internal actions of automobiles can be transferred throughout the supply chain. Vanalle & Santos (2014) defined the most valuable aspects of sustainability as well as factors related to environmental, financial and operational performance in the process of supplier selection and development to the Brazilian automotive supply chain members. They interviewed 20 companies. One of the most valued applications by companies is to remove or reduce the use of hazardous materials. Operational performance has been among the most valued by companies with emphasized applications, including the amount of products delivered on time, commitment to quality management, delivery time and order compliance. Sanghavi et al. (2015) presented GSCM applications in the highly competitive automotive industry. They mainly focused on automotive companies’ green design, green business practices and obstacles they encountered. They said that the supply chain's greening will occur when marketing performance and environmental problems are balanced.

The aim of this study is to examine the perspectives of GSCM applications by interviewing the managers of 11 companies that produce in the automotive main industry in Turkey. These companies have focused on examples of GSCM initiatives and the barriers they face during these initiatives.
2. Green Supply Chain Management

In recent years, many researches and studies on GSCM concept have been made in the literature. The greening history of the supply chain was inspired by reverse logistics research in the 1990s (McKinnon, et al., 2010: 20). The GSCM idea first appeared in 1996 in the study entitled "Perceptive Production" by Michigan State University (Wang & Luo, 2010: 12). Van Hoek (1999) then noticed the relationship between logistics environmental work and reverse logistics, and this relationship was extended to whole chain (McKinnon, 2010: 20). Hsu & Hu (2008) defined GSCM as a used approach to improve the performance of processes and products according to the requirements of environmental regulations. Hervani et al. (2005) stated that GSCM is the sum of Green Purchasing, Green Production / Material Management, Green Distribution / Marketing and Reverse Logistics. In short, GSCM includes traditional supply chain management practices that combine environmental criteria (Gilbert, 2000: 18). Although the GSCM concept was introduced in the 1990s, it is still a new application in countries such as China, Turkey and India which are underdeveloped or developing. For this reason, it is important to analyze the GSCM practices in these countries and see how well these countries have used GSCM in their main industries.

GSCM initiatives; Green Design, Green Purchasing, Green Production, Green Storage, Green Transportation and Green Recycling (Rostamzadeh, et al., 2015: 191-192). This classification is given in Figure 1. Today, the green design is of increasing importance. This is just one of the many environmental issues that producers and producers are expected to target. The reason why producers force for green design is government environmental legislation, company image, public pressure and consumer demand and increasing waste disposal costs (Dowie, 1994: 34).

Green purchasing or environmentally sensitive purchasing is very important in the purchasing activities nowadays (Igarashi, et al., 2013: 249). This green initiative is an environmentally sensitive purchasing practice that encourages the recycling and recovery of purchased materials without adversely affecting the performance requirements of waste reduction materials (Min & Galle, 2001: 1222).

Green production or environmentally sensitive production is a production path that minimizes waste and pollution. In green production, all environmental effects are assessed at every stage of production. It is a kind of modern production mode that has the least environmental impact during the product life cycle. (Li, et al., 2010: 149).

Green storage or environmentally sensitive storage is an attempt to have a critical prescription to save energy and cost. Today, the number of green deposits is increasing. Companies are avoiding high starting costs and high investments. However, increasing social responsibilities will lead to a reduction in costs and carbon footprint, and an increase in green deposits (Rostamzadeh, et al., 2015: 192).

Green transport is one of the least important and least studied subjects, although it has a significant impact on the environment. Firms can not ignore the danger of transport-related carbon dioxide emissions (Rostamzadeh, et al., 2015: 192).
As environmental concerns have increased lately, reuse or recycling of products has become important. Green recycling or reverse logistics means reusing products and supplies in green (Chaves & Alcantara, 2006: 3).

**Figure 1:** Classification of Green Initiatives (Rostamzadeh, et al., 2015)

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3. Automotive Sector in Turkey

Automobile production, which is a contemporary history of the automotive industry in Turkey, started in 1966 with a fiberglass car "Anadol", which is powered by a foreign-made motord. But before that, in 1959 Otosan factory was established to produce under-licensed Ford Motor Company models in Turkey. In 1961, the first domestic design Turkish car "Revolution" was produced in Eskisehir. The 30 Customs Union treaties between Turkey and the EU were signed at the end of 1995 and a free trade area was established between the EU and Turkey. This advantage has accelerated the shift of production facilities to Turkey by many automotive manufacturers (Yılmaz & Ustaoğlu, 2013: 11).

In the second quarter of 2016, Turkey produced 441,366 passenger and 284,111 commercial vehicles, ranking as the 5th largest producer in Europe and the 14th largest producer in the world (OICA Production Statistics, 2017). As can be seen from these statistics, it is clear that the automotive industry contributes to employment and plays an important role in the economic growth of Turkey. However, contrary to this positive effect, gasoline prices and heavy taxes on automotives caused unemployment in the Turkish automotive industry. Achieving a sustainable environment cannot be solved by lowering gasoline prices. It will, therefore, be provided through the use of alternative energy sources to create a green supply chain for the automotive industry.
4. Application

This study was carried out in order to examine the point of view of the Automotive Main Industry in Turkey. For this reason, 11 main industrial companies operating in the sector were visited and 40 employees were employed in managerial positions and data were collected in the face-to-face interviews. As can be seen in Table 1, 4 of the 11 firms participating in the this study invested 5.1% -10% of the their income in the last 5 years, 5 of them invested the their income of between 10.1% and 30% and 2 of them invested the their income of more than 30% to green initiatives projects. In the next 5 years, 5 of them are planning to invest the their income of between 5.1% and 10% and 6 of them are planning to invest the their income of 10.1% and 30% % to green initiatives projects.

| Table 1: Investments of companies participating in this study on green projects |
|-----------------------------------|-------------------------------|-------------------------------|
|                                   | %5.1-%10                      | %10.1-%30                     | Over 30% |
| Last 5 years                      | 4 company                     | 5 company                     | 2 company |
| Next 5 years                      | 5 company                     | 6 company                     | -         |

Furthermore, 3 of them are related to green and environmental issues between 5 to 10 years, and 8 of them are related to green and environmental issues over 10 years.

50% of executives interviewed in this study stated that green initiatives are much more important in the automotive sector than other sectors, 30% is stated more important and 20% stated is of equal importance.

Figure 2: Importance of the companies participating in the research in green initiatives

As shown in Figure 2, executives who participated in this study were asked about their green initiatives. According to this, 30% of them attach importance to green production, 25% of them attach importance to green purchasing, 20% of them attach importance to green recycling, 12.5% of them attach importance to green transportation, 7.5% of them attach importance to green design, 5% of them attach importance to green storage.
4.1. Examples of GSCM Initiatives in the Automotive Sector

All over the world, green initiatives in industries like automotive are important factors in determining technological performance and competitive advantages. Especially after the Kyoto Protocol, the automotive industry has been aiming to release less CO\textsubscript{2} emissions and as a result the need for new engine and vehicle technologies has grown. In parallel, green initiative spending on environmentally friendly technologies has increased. Examples of GSCM initiatives implemented in the automotive main industry in line with the information obtained during the interviews with 40 executives working in the companies involved in the research are summarized as follows:

- Vehicle production efforts with low fuel consumption and emission rate (close to the Euro 7 emission level, meeting the Euro 6 emission level).
- Work on capturing the low emissions standard in diesel engines.
- Electric alternative fuel vehicle development studies.
- Green production (environmentally friendly production) with the understanding of the environment in the production stage of vehicles to minimize the effort to work.
- Suppliers and other stakeholders to raise awareness about the environment.
- Work to control the suppliers more strictly.
- Printing for suppliers to have environmental certificates.
- Making action plans against climate change.
- The inclusion of environmental targets into individual business goals with score card application.
- Renewable energy investment studies (solar energy to electrical energy conversion).
- In-house glass ceiling applications: maximum benefit from sunlight.
- Use of green information technologies.
- Conversion in factory lighting fixtures: Replacement with LED systems.
- Lighter vehicle production efforts: Reducing the amount of raw materials used in production so as not to raise vehicle safety, thus more efficient use of resources and less waste.
- Recycling of idle energy: Flow regulating magnetic clamping on natural gas lines.
- Wastewater recovery studies.
- Green packaging concept: Use of metal case instead of wooden case.
- Reducing road transport to make marine and rail transport more secure and environmentally friendly.
• Milk-run applications.
• Intermodal transport studies.
• Installation of treatment plant.
• Avoidance of raw material intake (lead, tin, etc.) which is considered to be hazardous for environmental, legal or ethical use.
• Educate customers to encourage eco-driving practices.
• Studies on the use of all the wastes generated in the production processes as raw material and energy source in the cement sector.
• Providing technical training support (grants of things such as vehicles, equipment, etc.).
• Greenhouse effect low climate gas usage studies.

4.2. Barriers Encountered in GSCM Initiatives in the Automotive Sector

As experienced in every sector, companies face various obstacles in exchange. The automotive sector is also heavily influenced by these changes. In the interviews conducted with the 40 executives who participated in the research, the barriers that the automotive sector faced against the GSCM initiatives were summarized as follows:

Implementation costs:

Due to the high cost of green purchasing, producers avoid investing in this area. Costs are one of the most difficult obstacles encountered in automotive main industry in GSCM. In the interviews conducted, it was observed that the green work which was to be done especially in the production was delayed due to the cost. However, it has been stated that green investments which are to be made in the legislative period will be inevitable.

Lack of information:

Some green initiatives require specific knowledge. For this reason, managers, engineers, workers should be given to employees who do not know the necessary training. Training costs should not be avoided when necessary.

Not having enough environmental awareness:

It should be known that it is a duty of the state and citizen to improve the environment, to protect the environment and to prevent the pollution of the environment. Under these circumstances, trainings should be given to customers on driving techniques and employees should make efforts to increase environmental awareness within the factory.

Vehicles with high emission rates in traffic:

In particular, Euro 2 and Euro 3 cause environmental pollution due to increased CO2 emissions due to the fact that motor vehicles are in traffic. In addition, as long as these vehicles are in traffic, the trend of green will decrease. For this reason, necessary sanctions should be applied to prevent environmental pollution.
Densities of fugitives in old equipment:
In order to save energy, equipment should be checked and leaks detected.
The technological and understanding behind the country is:
Efforts to green initiatives will not be evident if AR-GE work and university-
industry cooperation are of equal importance.
Deficiencies in government policies and regulations:
The required policies are published at certain times. The companies that follow
them are minimizing the problems they will experience during GSCM initiatives. In
addition, necessary sanctions should be applied to companies that do not follow. It
is published periodically

5. Results
In this study, automotive main industry in Turkey has been considered as an
aspect of GSCM. For this, 11 companies were visited and 40 managers in these
companies were interviewed. The automotive main industry has shown great
importance to GSCM but has not been fully implemented. The results show that the
cost factor is a huge barrier for firms to fully implement and maintain GSCM.
An integrated structure should be established in the automotive main industry in
order to make sustainable GSCM. This can be done from the basic 5 items as shown
in Figure 3. These items consist of the government’s point of view and policies,
strategic consciousness environment, production planning and management, use
of information technology and environmental engineering.

Figure 3: Integrated Green Supply Chain
For an efficient green supply chain management in the automotive main industry, the government’s perspective must be examined first and policies should be established. When necessary, producers should be supported by tax or development incentives. A strategic awareness should be established for producers and customers about GSCM, emphasizing the importance of producing environmentally sensitive products or purchasing products. Importance should be given to production planning and management, and care must be taken in arrangements made before and after. The use of information technology is important in GSCM. It provides strong communication and time saving as well as sensitivity to the environment. Finally, environmental engineering is one of the most important issues to be exploited at every stage of the product life cycle. When these five elements are used all-in-one effectively, GSCM will be fully realized.

In this study, the automotive main industry is considered. In the following studies, different main industries’ viewpoints from GSCM can be examined and evaluated.

References


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