

Implementation Barriers in Green Supply Chain In the Medium Scale Manufacturing Enterprises

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Abstract

In recent years the natural environment becomes a major global issue. Due to increasing human and industrial impacts on the environment, environmental issues become more intense and widespread. Increasing awareness about environmental protection in India and world, the green trend of conserving the earth's resources and protecting the environment is overwhelming, thereby exerting pressure on industries in India and worldwide. Many manufacturing supply chain enterprises considered or initiated some green supply chain management practices such as investment recovery, eco-design and internal environmental management. However, investment recovery and development of recycled material markets in India have not received much attention. Due to globalization, supply chains have grown more lengthy and complex. Thus, it is highly imperative to conduct an empirical research on the green supply chain management and its implication towards sustainable supply chain performance. Therefore, this research looks to find answers to the implementing barriers of the green supply chain management in the medium scale manufacturing enterprises. A total number of 3014 medium scale manufacturing enterprises were found to be functioning in these select districts as on 31.01.2016. Of these units, 712 units in Chennai district, 159 units in Kanchipuram district and 112 units in Thiruvalluvar district were implemented green supply chain practices in their operations. By adopting simple random sampling, 246 medium scale manufacturing enterprises i.e. 25 per cent of the population were selected for this study. The primary data were collected from 246 medium scale manufacturing enterprises with the help of questionnaire. The secondary data are mainly congregated from published and unpublished works on the related topics. In order to analyze the data, student t test, analysis of one-way variance, analysis of co-efficient of variation, factor analysis, multiple regression analysis and percentage analysis have been employed. The results veiled that human and technology barriers, financial barriers, government barriers, management barriers and suppliers-related barriers are affecting the implementation of green supply chain management practices in the select medium scale manufacturing enterprises. The researchers suggest various measures to improve the effectiveness of green supply chain management of the select enterprises.

Keywords: Green supply chain, environmental supply chain management, sustainable supply chain management, environmental sustainability, etc.

Introduction

In recent years the natural environment becomes a major global issue. Due to increasing human and industrial impacts on the environment, environmental issues become more intense and widespread. Natural resources including mineral ores and fossil fuels, agricultural productivity, and the self-purification capacity of the natural environment all have their own limits. Today, environmental pollution is the main problem which has the potential to lead to the extinction of mankind on earth if not addressed at this moment. It requires immediate action by business organizations, governments, and society to achieve a balanced growth that tries to achieve economic and social objectives without scarifying the environment. With environmental problems such as global warming, ozone depletion, solid waste and air pollution, business organizations are considered to be the source of most of the environmental problems. Besides, more people are aware of the world's environmental problems such as global warming, toxic substance usage, and decrease in non-replenish resources. Increasing awareness about environmental protection in India and world, the green trend of conserving the earth's resources and protecting the environment is overwhelming, thereby exerting pressure on industries in India and worldwide. This calls for considering the issues of sustainable development in business operations. Recent environmental regulations initiated by governments and other third party organizations in many parts of the world have directed companies to produce strategic environmental plan on implementing green supply chain management practices. The number of organizations contemplating the integration of environmental practices into their strategic plans and operations is continuously increasing. Though, in the past, supply chain management only focuses on the efficient and responsive system of production and delivery from raw material stage to final consumer but

currently environmental issues in supply chain are significantly growing partly due to wider debate on how industry meets the challenges of sustainability.

Green Supply Chain Management

Environmentally sustainable supply chain management has emerged as an important organizational philosophy to achieve corporate profit and market share objectives by reducing environmental risks and impacts while improving ecological efficiency of these organizations and their partners. An environmentally conscious supply chain, also called a green supply chain, is a new concept appearing in recent literatures. Green supply refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment. Green supply chain management, also known as environmental supply chain management or sustainable supply chain management, combines green procurement, green manufacturing/materials management, eco accounting, green distribution/marketing and reverse logistics. Green supply chain management is an approach to improve performance of the process and products according to the requirements of the environmental regulations. It is a kind of sustainable strategic development for enterprises in today's competitive workplace, which has emerged as a new innovative approach to achieve both financial and environmental benefits simultaneously, by reducing environmental risk and impact. With the more environmental concern during the past years the issue of environmental toxic waste incidental to industrial growth should be addressed together with supply chain management as the most important part in production chain, therefore contributing to initiatives of green supply chain management.

Statement of the Problem

Today's highlighted agenda is to raise environmentally responsible consumption and production to recover environmental quality, reduce poverty and bring about economic growth, with resultant improvements in health, working conditions, and sustainability. The growing importance of green supply chain management is driven mainly by the escalating deterioration of the environment, e.g. diminishing raw material resources, overflowing waste sites and increasing levels of pollution. However, it is not just about being environment friendly; it is about good business sense and higher profits. Therefore, it's important for firms to understand all the elements of green supply chain so as to ensure that they implement them comprehensively. Enterprises have established global networks of suppliers to take advantage of various characteristics to build their competitive advantage. This poses a major challenge to the supply chain managers to balance at low costs and innovate to substantiate both environmental and economic sustainability. Environmental practices in supply chain management pose inherent complexity due to multiple stakeholders, uncertain implications and international presence and have been a challenging field. The rapid and continuous growth of Indian industry population has brought great challenges to India energy resource security. The large transportation system in India is based on gasoline and diesel fuels, which would dramatically increase India's dependence on oil imports. Indian manufacturing companies have experienced increasing environmental pressure while simultaneously.

In India, the diversity in the adoption rates has seen some manufacturing supply chain companies proactively implementing environmental strategies such as green purchasing and eco-design. Many manufacturing supply chain enterprises considered or initiated some green supply chain management practices such as investment recovery, eco-design and internal environmental management. However, investment recovery and development of recycled material markets in India have not received much attention. Due to globalization, supply chains have grown more lengthy and complex. It has become harder for companies to maintain the same oversight and control that they traditionally had. A side effect of globalization has been for some companies that operations were shifted to locations with weaker environmental protection. In some cases, this has resulted in costly product recalls of contaminated goods, damage to workers' health and pollution of public drinking water. Increasing pressures from a variety of directions have caused the supply chain managers to consider and initiate implementation of green supply chain management practices to improve both their economic and environmental performance. Thus, it is highly imperative to conduct an empirical research on the green supply chain management and its implication towards sustainable supply chain performance. Therefore, this research looks to find answers to the implementing barriers of the green supply chain management in the medium scale manufacturing enterprises.

Objectives of the Study

The study has the following objectives:

1. To analyze the implementation barriers of the green supply chain management in the select medium scale manufacturing enterprises in Tamilnadu.
2. To suggest suitable measures for the effective green supply chain management in the select medium scale manufacturing enterprises in Tamilnadu based on findings of the study.

Testing of Hypothesis

The study is based on the formulation null hypothesis: H_{01} : There is no significant relationship among the acceptance levels of the medium enterprises belonging to different institutional variables towards implementation barriers of the green supply chain management.

Sampling Design

There are 32 districts in Tamilnadu as on 31.1.2016. Chennai, Kanchipuram and Thiruvallur are the top three districts of Tamilnadu in terms of having more number of medium scale manufacturing enterprises. A total number of 3014 medium scale manufacturing enterprises were found to be functioning in these select districts as on 31.01.2016. Of these units, 712 units in Chennai district, 159 units in Kanchipuram district and 112 units in Thiruvalluvar district were implemented green supply chain practices in their operations. By adopting simple random sampling, 246 medium scale manufacturing enterprises i.e. 25 per cent of the population were selected for this study. The following table shows the sampling distribution of the present study.

TABLE 1
Sampling Distribution

District	No. of Medium Scale Manufacturing Enterprises		No. of Samples
	In Operation	Practicing Green Supply Chain	
Chennai	2034	712	178
Kanchipuram	531	159	40
Thiruvallur	449	112	28
Total	3014	983	246

Methodology

The study is confined only to medium scale manufacturing enterprises located in Chennai, Kanchipuram and Thiruvallur districts of Tamilnadu. The present study considers only the implementation barriers of the green supply chain management. The study is empirical in character based on survey method. To enhance the quality of data, the researcher employed multiple data sources for the study: primary and secondary data. The secondary data are mainly congregated from published and unpublished works on the related topics. The Directorate of Industries, Directorate of Economics and Statistics, DIC, etc. were also a major source for secondary information. As an essential part of the study, the primary data were collected from 246 medium scale manufacturing enterprises with the help of questionnaire. In order to analyze the data, student t test, analysis of one-way variance, analysis of co-efficient of variation, factor analysis, multiple regression analysis and percentage analysis have been employed.

Findings

1. There is no significant relationship among the acceptance level of the sample units belonging to varied years of existence groups, investment groups, nature of businesses and ISO certification towards implementation barriers of green supply chain in the medium scale enterprises in n Tamilnadu. However, There is no significant relationship among the acceptance level of the sample units belonging different ownership patterns and districts towards implementation barriers of green supply chain in Tamilnadu

2. Table 2 shows the consistency in the acceptance level of the enterprises towards implementation barriers of green supply chain management. It is inferred that there is consistency in the acceptance level of the units having existence above 20 years, units having investment in the range of Rs. 8.76 -10 crore, Sole proprietorship firms, units engaged in general engineering towards, ISO certified enterprises and enterprises belongs to Thiruvallur district towards implementation barriers of green supply chain in Tamilnadu.

TABLE 2

Consistency in the Respondents’ Opinion towards Service Quality Dimensions

Enterprises	No. of Respondents	Mean Score	Standard Deviation	Co-variation
Above 20 years of existence	56	92.21	24.47	26.54
Rs.8.76 -10 crore investment	49	95.10	24.92	26.20
Sole proprietorship	57	99.21	24.23	24.42
General engineering	42	95.21	22.61	23.75
ISO Certified	139	93.99	24.49	26.06
Located in Thiruvallur district	40	116.85	7.90	6.76

3. The factor analysis is applied to find out the underlying dimensions in the set of statements relating to the implementation barriers of green supply chain. The variables in the data were reduced to 5 factor model. The factors are human and technology barriers, financial barriers, government barriers, management barriers and suppliers-related barriers. The 28 variables in the data were reduced to 5 factor model and each factor may be identified with the corresponding variables as follows:

TABLE 3

Factors of Implementation Barriers

Statements	Factor Name
Lack of skilled human resources	Human and technology barriers
Lack of supporting technology	
Difficult to repair and recycle or remanufacture	
Lack of encouragement	
Lack of customers’ awareness towards green supply chain management	
Resistance to technology adoption	
Lack of reverse flow or logistics	
Poor organizational culture in green supply chain management	
Cost implications	Financial barriers
Fear of success	
Market competition and uncertainty	
Lack of knowledge regarding national legislations on being green	
Less return on investment	

Lack of financial incentives from green supply chain buyers	
Lack of energy management and waste management system	
Extended green investment payback	
Pressure of lower prices	
Limited access to finance	
Weak legal structure	Government barriers
Lack of government support and initiatives	
Lack of appropriate company’s policies towards green initiatives	Management barriers
Lack of top management commitment	
Lack of performance metrics and audit	
Lack of awareness about environmental issues	Suppliers barriers
Lack of green architects, consultants, green developers, contractors in the study area	
Lack of a green supplier and supply chain network	
Complexity in designing supplier’s flexibility to change towards green supply chain	
Supplier reluctance to change towards green supply chain management	

4. Table 4 shows the enterprises acceptance towards management barriers for implementation of green supply chain management practices.

TABLE 4
Respondents’ Level of Acceptance Implementation Barriers

Barriers	Level of Acceptance					Total	Mean Score
	Strongly agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree		
Human and technology barriers	86 (34.96)	48 (19.51)	32 (13.01)	34 (13.82)	46 (18.70)	246 (100.00)	3.38
Financial barriers	71 (28.86)	63 (25.61)	32 (13.01)	29 (11.79)	51 (20.73)	246 (100.00)	3.30
Government barriers	72 (29.27)	60 (24.39)	49 (19.92)	29 (11.79)	36 (14.63)	246 (100.00)	3.42
Management barriers	71 (28.86)	71 (28.86)	38 (15.45)	25 (10.16)	41 (16.67)	246 (100.00)	3.43
Suppliers-related barriers	70 (28.46)	65 (26.42)	33 (13.41)	33 (13.41)	45 (18.29)	246 (100.00)	3.33

5. Out of 246 enterprises, majority of the enterprises reveal that they strongly agree (34.96%) with the human and technology barriers in the implementation of green supply chain management,

followed closely by agree (19.51%) and strongly disagree (18.70%). 13.01% and 13.82% of the enterprises neither agree nor disagree and disagree respectively towards human and technology barriers in the implementation of supply chain management.

6. The majority of the sample enterprises reveal that they strongly agree (28.86%), followed closely by agree (25.61%) and strongly disagree (20.73%). 13.01% and 11.79% of the enterprises neither agree nor disagree and disagree in that order towards financial barriers for implementation of green supply chain management.
7. The majority of the sample enterprises indicate that they strongly agree (29.27%) towards government barriers for implementation of green supply chain management practices, followed closely by agree (24.39%) and neither agree nor disagree (19.92%). 11.79% and 14.63% of the enterprises disagree and strongly disagree correspondingly towards government barriers for implementation of green supply chain management practices.
8. Out of 246 enterprises, majority of the enterprises reveal that they strongly agree and agree (28.66%) with the management barriers for implementation of green supply chain management practices, followed closely by strongly disagree (16.67%). 15.45% and 10.16% of the enterprises neither agree nor disagree and disagree in that order towards management barriers for implementation of green supply chain management practices.
9. 28.46% of the enterprises strongly agree towards suppliers barriers for implementation of green supply chain management practices, followed closely by agree (26.42%) and strongly disagree (18.29%). 13.41% and 13.41% of the enterprises neither agree nor disagree and strongly disagree correspondingly towards suppliers barriers for implementation of green supply chain management practices.
10. There has been a low correlation (0.106) between the acceptance levels towards implementation barriers of green supply chain and the selected institutional variables. The R square indicates that 1.10 per cent of variation in the acceptance level is explained by all personal variables taken together. The F value indicates that the multiple correlation coefficients are not significant. Years of existence, investment, ownership pattern and nature of business have no significant effect on their acceptance towards implementation barriers of green supply chain.

Suggestions

1. Initiating green procurement practices has to be a continuous process, which needs to be incorporated as part of the strategic plans of the select medium enterprises. The select medium can implement global green supply chain management best practices through ensuring that they include environmental criteria when sourcing for goods to ensure that they only procure from environmentally certified suppliers. In addition, policies need to be designed to ensure that environmentally friendly products are procured.
2. This is an emerging green concept which has to be looked at as one whose benefits are long-term. Green design can take the form of structural designs or product designs; therefore the select medium enterprises can enforce these practices through the use of biodegradable raw material and inputs in the design of buildings and continuously upgrade their product offering to conform with environmental requirements.
3. The key inputs any manufacturing set up is energy and water. Therefore the select manufacturing enterprises should strive at achieving sustainability through recycling, reuse and reverse logistics. This will enhance their competitiveness through enhancing efficiency and synergy among business partners, helps to enhance environmental performance and reduces waste to achieve cost savings.
4. The select medium enterprises can effectively practice green manufacturing practices through the use of solar energy and recycling of water and utilize biodegradable energy sources in their manufacturing operations. Green manufacturing leads to lower raw material costs, production efficiency gains, reduced environmental and occupational safety expenses, and improved corporate image.

Conclusion

In a rapidly changing market economy where globalization of markets are intensified the competition, manufacturing enterprises should certainly play an important role to take ecological India is one of the most climate change vulnerable countries in the world. Results of this study show that

green supply chain management is now gaining momentum in India. Acceptance of green supply chain management practices vary depending on the firm's products and services. Basically, companies involved in green purchasing and implementing green practices internal as their efforts to support the greening of the supply chain. In addition, some companies do logistics, reverse eco design and work with their chain partners in maintaining green business strategy. Therefore, the select medium scale enterprises should adopt effective green supply chain by considering it a strategic imperative. Hence, possible policy measures, regulatory framework and initiatives to promote green supply chain management have become the need of the hour. If the study provokes the authorities to take some positive measures, the researchers will feel amply rewarded.

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