

**OPTIMISING ENVIRONMENTAL AND OPERATIONAL PERFORMANCE THROUGH INNOVATIVE GREEN SUPPLY CHAIN MANAGEMENT****Mr. Adarsha K**

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Department of Business Administration  
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Supply chain management has become a crucial issue with the major stakeholders associated with the industry, including governments, national and international. Already the world is paying the penalty for ignoring it – in the form of the severe damage inflicted and still being inflicted by the industry on the fragile environment. Green supply chain management continues to pose a challenge to entities into business and their major stakeholders, namely the community of suppliers. Hence the entities or companies into business and their suppliers have to necessarily work in tandem to counter the challenge lest they should attract criticism from various quarters. Given the high level of environmental consciousness one finds in the present-day world, it is necessary for the two categories of stakeholders to devise innovative measures to manage the supply chain and resource risk effectively. Obviously this has to be done at the level of the business / company concerned and at the level of the suppliers too. The business / company concerned has to rope in the suppliers in the endeavour. The investigation taken up by the researcher reveals that the company / business concerned should ensure that responsible sourcing policies are embedded internally or at the company level. The former should recast the procurement policy to ensure changed supplier behaviour and set them targets for supply chain carbon reductions. Further, the company / business concerned should allow the suppliers to access the company's internal innovation platform so they can suggest improvements to the supply chain. Companies had better realise that some of their suppliers may possess superior capabilities in the GSCM space – superior to what the companies themselves possess!

*Key words: Green supply chain management; innovation platform resource risk; sourcing policies*

### **1.1 Theoretical background of the topic**

Supply chain management has become a crucial issue with the major stakeholders associated with the industry, including governments, national and international and the people across the globe. This is not surprising given the implications of supply chain management for the environment. Already the world is paying the penalty for ignoring it – in the form of the severe damage inflicted and still being inflicted by the industry on the fragile environment. Not surprisingly, these days, the phrase green supply chain management (GSCM) is talked about much more than mere supply chain management. Green supply chain management conveys how innovations in supply chain management and industrial purchasing may be considered in the context of the environment.

### **1.2 Statement of the problem**

Green supply chain management continues to pose a challenge to entities into business and their major stakeholders, namely the community of suppliers. Hence the entities or companies into business and their suppliers have to necessarily work in tandem to counter the challenge lest they should attract criticism from various quarters. Given the high level of environmental consciousness one finds in the present-day world, it is necessary for the two categories of stakeholders to devise innovative measures to manage the supply chain and resource risk effectively. Obviously this has to be done at the level of the business / company concerned and at the level of the suppliers too. The business / company concerned has to rope in the suppliers in the endeavour. It is this problem that the present study seeks to address.

### **1.3 Review of literature**

1. As managers become more adept at addressing recurrent risks, they pay less attention to designing supply chains that mitigate the impact of disruptive risks, argues the researcher, citing the article “Three Strategies to Safeguard Your Global Supply Chain” contributed by Sunil Chopra and ManMohan S. Sodhi and published by Industry Week (University Alliance, 2016) . The latter maintain that the potential for labour strikes, political unrest, regulatory shifts and natural disasters could have severe and lasting repercussions on operations. According to them, the manufacturers would do well to devise strategies that alleviate this risk. The challenge for manufacturers, they add, is to prepare for disruptive risks while maintaining the gains made to improve supply chain efficiency.
2. The exposure of companies to turbulence, uncertainty, and vulnerability in their supply chain leads to supply chain disruption, reminds the researcher (Jonathan, 2015). He estimates that each supply chain disruption costs USD 10 million. The following three main themes emerged from his research:
  - ✓ supply chain design, planning, and forecasting
  - ✓ flexible and multiple supplier base;
  - ✓ Resource allocation and demand management.

The implications for positive social change include the potential of reducing supply chain risk. Such a reduction could lead to lower prices of products for consumers, increased stakeholder satisfaction, and a higher standard of living, concludes the researcher.

### **1.4 Research gap**

The researchers are right in remarking that managers tend to focus less on mitigating the impact of disruptive risks even as they become more confident of addressing recurrent risks. The resultant cost of supply chain disruption is prohibitive indeed. In this backdrop it is worth exploring innovative ways of dealing with the problem. It is this gap the present study seeks to bridge.

### **1.5 Scope of the present study**

The study confines itself to industrialists and consultants based in and around Bangalore urban and rural districts with exposure to GSCM practices. The study covers 30 industrialists and 30 consultants.

### **1.6 Objective of the study**

The objectives of the study are to:

1. Explore the innovative strategies available at the company level to manage supply chain and resource risk.
2. Explore the innovative strategies available at the level of suppliers to manage supply chain and resource risk.

### **1.7 Hypothesis proposed to be tested**

The study proposes to test the following hypothesis:

1. Recasting the procurement policy at the company level to ensure changed supplier behaviour will help manage innovatively the supply chain and resource risk at the level of the company
2. Permitting the suppliers to find solutions to sustainability challenges will lead to emergence of innovation and creativity

### **1.8 Research methodology**

This is a descriptive study, involving investigations and adequate interpretation. It is a fact-finding study. Data has been collected from authoritative sources like the central government departments and the financial press of the country

### **1.9 Sources of data**

Data required for the study has been collected from primary as well as secondary sources. Primary data was collected from the respondents, viz, industrialists and consultants with exposure to GSCM practices. Secondary data was downloaded from the web sites of reputed financial dailies and the departments of the government of India.

### **1.10 Sampling plan**

Industrialists and consultants represent the sampling universe.

*Industrialists:* Given the rather limited number of industries with exposure to GSCM practices operating in the area, purposive or judgement sampling under the non-probability method has been deployed to select the industrialists. Applying exposure to GSCM practices as the criterion, the Researcher selected 30 industrialists who have been in business for a period of at least ten years. This criterion, according to the researcher, is the most appropriate one for the present study. What is important is the typicality and the relevance of the sampling units to the study and not the overall representativeness to the population. Thus it guarantees inclusion of the relevant elements in the sample. Probability sampling plans cannot give such a guarantee.

*Consultants:* Given the rather limited number of consultants with exposure to GSCM practices operating in the area covered by the study, purposive or judgement sampling under the non-probability method has been deployed. Applying their exposure to GSCM practices as the criterion, the researcher selected 30 consultants with an exposure of at least 10 years to bank finance. This criterion, according to the researcher, is the most appropriate one for the present study. What is important is the typicality and the relevance of the sampling units to the study and not the overall representativeness to the

population. Thus it guarantees inclusion of the relevant elements in the sample. Probability sampling plans cannot give such a guarantee.

### 1.11 Data collection instruments

Structured interview schedules were drafted and administered to the respondents for collection of primary data. The interview schedules featured open questions and closed questions. Open questions were incorporated to identify opinions, ascertain the level of exposure to the topic and seek suggestions.

### 1.12 Data processing and analysis plan

Non-parametric statistical units were used to test the association between qualitative characters. Conclusions were arrived at on the basis of formation of  $H_0$  and  $H_1$ . To be specific, chi-square test was applied to test the association.

### 1.13 Limitations of the study

Primary data has at times been inferred through frequent topic-oriented discussions with the respondents. This may have influenced the findings of the study. The researcher is however convinced that such influence is too insignificant to affect the accuracy of the findings of the study.

### 1.14 Data Analysis – Industrialists

#### 1.14.1 Measures to manage supply chain and resource risk innovatively at the level of the company

The only thing that is constant is change, stated a Greek philosopher. Nowhere could this statement be truer than in the green supply chain management space. The green supply chain management space is still evolving and hence innovation on the part of all the stakeholders associated with the industry is called for in this space. Hence the researcher sought to know from the respondents the measures required to innovatively manage the supply chain and resource risk at the level of the company. Their replies to the query appear in the following Table.

**Table-1**

**Measures to manage supply chain and resource risk innovatively at the level of the company**

Measures	Number of respondents
Ensure that responsible sourcing policies are embedded internally at the company	28
Recast the procurement policy at the company level to ensure changed supplier behaviour	27
Set targets for supply chain carbon reductions	26
Allow the suppliers to access the company's internal innovation platform so they can suggest improvements to the supply chain	23

The company should ensure that responsible sourcing policies are embedded internally or at the company level, according to 28 respondents. According to 27 respondents, the company should recast the procurement policy to ensure changed supplier behaviour. According to 26 respondents, the company should set targets for supply chain carbon reductions. 23 respondents want the company to allow the suppliers to access the company's internal innovation platform so they can suggest improvements to the supply chain.

### 1.14.2 Measures to manage supply chain and resource risk innovatively at the level of the suppliers and / or in association with the suppliers

The only thing that is constant is change, stated a Greek philosopher. Nowhere could this statement be truer than in the green supply chain management space. The green supply chain management space is still evolving and hence innovation on the part of all the stakeholders associated with the industry is called for in this space. Hence the researcher sought to know from the respondents the measures required to innovatively manage the supply chain and resource risk at the level of the suppliers and / or in association with the suppliers. Their replies to the query appear in the following Table.

**Table-2**

#### Measures to manage supply chain and resource risk innovatively at the level of the suppliers and / or in association with the suppliers

Measures	Number of respondents
Hold risk management meetings with core suppliers to design innovative greener products and materials	26
Bind the suppliers to minimise waste and emissions from the supply chain	25
Permit the suppliers to find solutions to sustainability challenges so innovation and creativity can emerge	24

According to 26 respondents, the company should hold risk management meetings with core suppliers to design innovative greener products and materials. According to 25 respondents, the company should bind the suppliers to minimise waste and emissions from the supply chain. The company should permit the suppliers to find solutions to sustainability challenges so innovation and creativity can emerge, aver 24 respondents.

### 1.15 Data Analysis – Consultants

#### 1.15.1 Measures to manage supply chain and resource risk innovatively at the level of the company

The only thing that is constant is change, stated a Greek philosopher. Nowhere could this statement be truer than in the green supply chain management space. The green supply chain management space is still evolving and hence innovation on the part of all the stakeholders associated with the industry is called for in this space. Hence the researcher sought to know from the respondents the measures required to innovatively manage the supply chain and resource risk at the level of the company. Their replies to the query appear in the following Table.

**Table-3**

#### Measures to manage supply chain and resource risk innovatively at the level of the company

Measures	Number of respondents
Ensure that responsible sourcing policies are embedded internally at the company	29
Recast the procurement policy at the company level to ensure changed supplier behaviour	29
Allow the suppliers to access the company's internal innovation platform so they can suggest improvements to the supply chain	25
Set targets for supply chain carbon reductions	23

The company should ensure that responsible sourcing policies are embedded internally or at the company level, according to 29 respondents. According to 29 respondents, the company should recast the procurement policy to ensure changed supplier behaviour. 25 respondents want the company to allow the suppliers to access the company's internal innovation platform so they can suggest improvements to the supply chain. According to 23 respondents, the company should set targets for supply chain carbon reductions.

### 1.15.2 Measures to manage supply chain and resource risk innovatively at the level of the suppliers and / or in association with the suppliers

The only thing that is constant is change, stated a Greek philosopher. Nowhere could this statement be truer than in the green supply chain management space. The green supply chain management space is still evolving and hence innovation on the part of all the stakeholders associated with the industry is called for in this space. Hence the researcher sought to know from the respondents the measures required to innovatively manage the supply chain and resource risk at the level of the suppliers and / or in association with the suppliers. Their replies to the query appear in the following Table.

**Table-4**  
**Measures to manage supply chain and resource risk innovatively at the level of the suppliers and / or in association with the suppliers**

Measures	Number of respondents
Bind the suppliers to minimise waste and emissions from the supply chain	29
Hold risk management meetings with core suppliers to design innovative greener products and materials	28
Permit the suppliers to find solutions to sustainability challenges so innovation and creativity can emerge	27

According to 29 respondents, the company should bind the suppliers to minimise waste and emissions from the supply chain. According to 28 respondents, the company should hold risk management meetings with core suppliers to design innovative greener products and materials. The company should permit the suppliers to find solutions to sustainability challenges so innovation and creativity can emerge, aver 27 respondents.

### 1.16 Conclusions

Conclusions are inferences / generalisations drawn from the findings. They relate to the hypotheses. They are answers to the research questions or the statements of acceptance or rejection of hypotheses.

#### *Hypothesis-1*

As already explained, the following is the first of the two hypotheses to be tested:

“Recasting the procurement policy at the company level to ensure changed supplier behaviour will help manage innovatively the supply chain and resource risk at the level of the company.”

Hence  $H_0$  and  $H_1$  are as follows:

$H_0$ : Recasting the procurement policy at the company level to ensure changed supplier behaviour will not help manage innovatively the supply chain and resource risk at the level of the company

H<sub>1</sub>: Recasting the procurement policy at the company level to ensure changed supplier behaviour will help manage innovatively the supply chain and resource risk at the level of the company

On the basis of the primary data collected from the respondents, vide Tables: 1 and 3, a chi-square test was applied to ascertain the association, if any, between the two variables. The following Table reveals the computation made using MS-Excel:

<i>Observed Values</i>			
<i>Category</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Industrialists	27	3	30
Consultants	29	1	30
<i>Total</i>	56	4	60
<i>Expected Values</i>			
<i>Category</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Industrialists	28.00	2.00	30.00
Consultants	28.00	2.00	30.00
<i>Total</i>	56.00	4.00	60.00
	<i>Yes</i>	<i>No</i>	
o-e	-1	1	
	1	-1	
(o-e) <sup>2</sup>	1	1	
	1	1	
((o-e) <sup>2</sup> )/e	0.035714	0.5	
	0.035714	0.5	
CV	0.071429	1	1.071429
TV			3.841459
p			0.300623

The calculated value of  $\chi^2$  is 1.071429, lower than the table value of 3.841459149 for an alpha of 0.05 at one degree of freedom. Hence the null hypothesis is accepted.

*Hypothesis-2*

As already explained, the following is the second of the two hypotheses to be tested:

“Permitting the suppliers to find solutions to sustainability challenges will lead to emergence of innovation and creativity.”

Hence  $H_0$  and  $H_1$  are as follows:

$H_0$ : Permitting the suppliers to find solutions to sustainability challenges will not lead to emergence of innovation and creativity

$H_1$ : Permitting the suppliers to find solutions to sustainability challenges will lead to emergence of innovation and creativity

On the basis of the primary data collected from the respondents, vide Tables: 1 and 3, a chi-square test was applied to ascertain the association, if any, between the two variables. The following Table reveals the computation made using MS-Excel:

<i>Observed Values</i>			
<i>Category</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Industrialists	24	6	30
Consultants	27	3	30
<i>Total</i>	<i>51</i>	<i>9</i>	<i>60</i>
<i>Expected Values</i>			
<i>Category</i>	<i>Yes</i>	<i>No</i>	<i>Total</i>
Industrialists	25.50	4.50	30.00
Consultants	25.50	4.50	30.00
<i>Total</i>	<i>51.00</i>	<i>9.00</i>	<i>60.00</i>
	<i>Yes</i>	<i>No</i>	
o-e	-1.5	1.5	
	1.5	-1.5	
(o-e) <sup>2</sup>	1	1	
	1	1	
((o-e) <sup>2</sup> )/e	0.039216	0.222222	
	0.039216	0.222222	
CV	0.078431	0.444444	0.522876
TV			3.841459
p			0.278076



The calculated value of  $\chi^2$  is 0.522876, lower than the table value of 3.841459 for an alpha of 0.05 at one degree of freedom. Hence the null hypothesis is accepted.

### 1.17 Researcher's recommendations

The following are the researcher's recommendations:

1. The company concerned should put in place responsible sourcing policies. These policies should be embedded internally to rule out deviation from the policy in future, whatever the provocation. After all, the company / manufacturer should lead by example – the example had better be an ideal example that the suppliers have to follow willy-nilly.
2. The company's procurement policy too should be compatible with its avowed pursuit of GSCM practices. The supplier concerned had better realise that if it is not as sensitive to GSCM practices as the company, the company will not be interested in sourcing supplies from it any more. It is as simple as that. Such a cut-and-dried approach to the issue on the part of the company will discipline the errant suppliers, if any.
3. On its part, the company should set a target for the purpose. It should set a target date for supply chain carbon reductions and in conjunction with the community of suppliers, it should achieve the target.
4. The company should utilize the knowhow and expertise the suppliers may possess on the subject. For example, the company can allow the suppliers to access its internal innovation platform so the latter can suggest valuable and feasible improvements to the supply chain.
5. When more and more of companies set targets for their supply chains, they will increasingly become less tolerant of suppliers that do not comply with the prescribed GSCM practices.
6. Companies had better realise that some of their suppliers may possess superior capabilities in the GSCM space – superior to what the companies possess! Hence companies would do well to listen to what the suppliers say on GSCM best practices. After all, emission reductions will significantly improve the bottom line of companies! Suppliers, for all the companies know, may be as good as or even better than the companies when it comes to innovating in the GSCM practices space!

### 1.18 References

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