Research Paper

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ISO 14001 Certification – A Step Ahead Towards Implementation of Green Supply Chain Management Practices in Chemical Industries

Management

KEYWORDS : Green Supply Chain Management Practices (GSCM), ISO 14001, Environment Management System (EMS), Chemical.

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ABSTRACT

Environment has become increasingly important concern to the various stakeholders of industries around the world. Therefore, genuine efforts should be made to combine the industries economic benefits, environmental protection; resource utilization and biological balance, and try to implement GSCM to promote the sustainable development of the Industries. In order to promote and drive the implementation of GSCM in the Industries, ISO 14001 certification can act as a roadway. The objective of this study is to explore the implications of ISO 14001 and Environment Management Systems (EMS) on the adoption and implementation of green initiatives within supply chains. The study reveals that there is an association between the state of GSCM process ISO 14000 certification and EMS adoption achieved by an organization. The stages of GSCM activities differ. When effectively applied, an EMS can act as an initiative that can promote integration of environment consciousness in entire SCM strategy of the firm.

1. Introduction

Since the Earth Summit in 1992, the environment has become increasingly important to the various stakeholders of the corporate and industries. They have been continuously pressured into analyzing what impact their operations, are having on the environment and how that impact can be reduced. Industries are facing many environmental related problems, such as exhaustion of resources, rising environment pollution levels, pressure due to global warming, etc. Thus, the development of industry is in a dilemma. The issue that all business houses and industries are worried about is how to use the limited resources to make the industries benefits as much as possible in a way that it least affects the environment. Therefore, the genuine efforts should be made to combine the industries economic benefits, environmental protection, resource utilization and try to implement GSCM to promote the sustainable development of the enterprises and the society. The concept of GSCM has emerged in last few years which integrate environmental consciousness into the supply chain management. The idea covers every stage of product life cycle, i.e. from product design to product recycle or product disposal. It is increasingly accepted and practiced by the many industries (Zhu and Sarkis 2004). GSCM is a method to design and/or redesign the supply chain that incorporates recycling and remanufacturing into the entire production process. The concept of GSCM provides new opportunities for organizations that are seeking to implement an infallible environmental management system. This involves in minimization of firm's total environmental impact from start to finish of the supply chain and also from beginning to end of the product life cycle. The method considers both strategic and operational issues, including inventory control and purchasing policies due to the uncertain timing, quality and quantity of recyclable material, disassembly planning for material recovery and the number and location of collection facilities, collection procedures and customer incentives (Gupta et al., 1994). Many of these initiatives involve compromises between various logistics functions and environmental consideration in order to improve the environmental performance of an organization (Wu and Dunn, 1995).

Sustainability and need of sustainability issues are yet to come in widespread manner in Indian industries in general and chemical industry in particular. Isolated instances are present in some specific industries, but not mainstreamed. GSCM is rising as a promising approach for Indian Industries to improve performance in various dimensions such financial performance, environmental and operational performance. Companies have to realize its benefit commercially due to these new initiatives. Industries and firms appear to have a variety of drivers or motivators to implement GSCM practices. One of them is the Environment Management System of the firm with push these firms and makes it easier for them to implement or start with the GSCM Activities (Arimura et al, 2011; Chan et al., 2010; Deif, 2011). ISO 14001certfication registration for the industries facilitates the adaptation of environmental activities at customer and a supplier both organizations. ISO 14001 leads to closer relationships with suppliers which are seen as beneficial for both the successful outcomes of projects and as a catalyst for environmental management process. It also leads to sharing of environment initiatives between a customer and a supplier. This in turn can motivate and enable the supplier and the company to integrate their supply chain with environment management and develop their GSCM strategy. ISO 14001certification can be considered to be a step ahead towards the implementation of GSCM Practices in Industries.

2. Literature Review

2.1. GSCM (GSCM)

Literature review reveals that there are several researches that involved GSCM issues including GSCM definitions, GSCM Drivers, GSCM practices and decision framework (e.g. Sarkis, 2003; Zhu & Sarkis, 2004; Hervani, Helm and Sarkis, 2005). Organizations appear to have a variety of drivers or motivators to implement GSCM practices. Several research studies have identified a wide range of drivers that can persuade an organization to extend environmental management criteria and practices to its supply chain. GSCM drivers could be both internal and external to the organization. The initial motivation to adopt Green practices was by the Public Pressure and Regulatory Pressures to avoid environmental issues negatively affecting environment. With the increasing of environmental pressure and resource restriction, many developed countries have issued some environmental protection policies and International Environmental Agreements like Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) and others which act as the motivation for export oriented Industries to adopt and implement GSCM. REACH is a European Union regulation dated 18 December 2006, adopted to improve the protection of human health and the environment from the risks that can be caused by chemicals, while enhancing the competitiveness of the European Union chemicals industry. Another driver is the higher awareness of environmental problems from the consumer perspective, which leads to more demand for Organizations to balance business performance with environmental issues (Basu & Wright, 2008). Commitment from top-level managers will also be necessary for development of GSCM practice (Zhu, Sarkis, Geng, 2005**).** Although the top management team had strong motivation there are other organizational factors also like employee's environmental values, organizational capabilities, etc that drives organizations to implement GSCM (Lee, 2009). With all mentioned drivers one of the most important drivers for implementation of GSCM is ISO 14001 and other Environment Management Systems in the Industries. The ISO 14001 certification of

these industries acts as a roadway for GSCM implementation in these industries and facilitates them to integrate the sustainability strategy with their supply chain strategy.

2.2. ISO 14001

ISO 14001 is an international environmental standard establishment of an efficient environmental management system. In this study we show that ISO 14001 has the potential to improve sustainability across the supply chain when used under the right circumstances. In other words, it is a tool for sustainability. It can be applied across firms so as to tap into the synergies associated with the greening of a supply chain, i.e. better understanding of environmental processes, lower waste, pollution prevention and improved performance. Industries that see ISO 14001 certification as an opportunity to improve their EMS and supply chain integration of environmental standards will be part of a more sustainable supply chain. Industries with ISO 14001 are more likely to evaluate their suppliers' environmental performance and more likely to ask their suppliers undertake specific environmental practices. Government program of encouraging EMS adoption indirectly influences ISO 14001 adopters to implement GSCM practices. When effectively applied, an EMS can help integrate environmental considerations within an organization's overall management system. Findings have been reported that environment management system implementation, according to the ISO 14001 requirements, has more or less positively influenced the environmental performance of industrial companies within different countries and in various industrial sectors (Andrews et al., 2003; Dahlström et al., 2003; Morrow and Rondinelli, 2002; Nishitani, 2009). ISO 14001 enables firms to inform stakeholders about the application of Environmental Management System (EMS).

2.3. ISO 14001 and GSCM

In industry the most important factor is ISO 14001 certification, in which the industry is certified to environmental system, so the customers can also trust the industry and it also reduces cost of waste management and distributors cost and it also reduce the consumption of energy and materials (Hsu & Hu, 2008). Corbett and Cutler (2000) suggested that having a Environment Management System in place does facilitate the development of an GSCM. In a study on Indian Manufacturing industries, ISO 14001 certification, Environmental compliance and auditing programs, Training personnel about environmental issues have been identified as strong drivers of the GSCM Implementation (Chandraker et, al., 2013). In another multinational study, Rao (2002) found that 77 percent of the surveyed companies agreed or strongly agreed with the implementation of ISO 14001 system benefits recycling. Klassen (2000) found that investment in recycling is strongly associated with investment in quality-related organizational systems

In a study done on Indian automotive sector ISO 14001 identified using Analytical Hierarchical Process (AHP) approach, certification standards like the ISO 14001 for environmental management are used in SSCM. Again, companies may use their own "Codes of Conduct" to translate specific needs and values into detailed applicable practices (Miemczyk *et al.*, 2012).According to Boiral (2007), ISO 14001 represents an internal management tool to gain organization's legitimacy. Although voluntary ISO 14001 certification does not guarantee a specific level of improvement in environmental performance. But is still the most important driver was found to be for GSCM adoption. China has encouraged (pressured) GSCM practice adoption to help spur economic development. For example, by encouraging the adoption and certification of the global environmental system standard ISO 14001, the Chinese government has contributed to organizational GSCM practices adoption such as integrating environmental considerations into supplier selection. (Zhu et al, 2005). A research conducted in a ISO 14001: 2004 certified biscuits firm to seek out the interrelations between GSCM and ISO 14001: 2004. In the findings, it is found that ISO 14001: 2004 is supporting for the improvements in GSCM for its all five GSCM activity areas. (Panditha, 2011).

3. Aims and Objectives

It was found that very little research has been done in area of GSCM practices in chemical industries in India. The objectives of the study are:-

- To study the current scenario of GSCM in Chemical industries and to find out the awareness of GSCM practices in chemical industries in Gujarat Region.
- To measure the current status perception, practices and future direction of "green or Sustainable development" activities within the supply chain of the chemical Industries in Gujarat and to identify the inadequacies.
- The primary objective of this study is to explore the implications of ISO 14001 and EMS on the adoption and implementation of these green initiatives within supply chains.

4. Research Methodology

The study used exploratory research design to study the macro environment of chemical industries for the GSCM implementation followed by the descriptive research. The non-probability convenience sampling method was used for data collection. All three segments namely, basic chemicals, Specialty Chemicals and Knowledge Chemicals of Chemical Industries are selected for the primary research and data collection. The data has been collected from the all major Chemical Clusters in Gujarat. The appropriate person from which the required data could be obtained should ideally have knowledge about both aspects. Managers of Environment Management Systems (EMS) departments or managers of Environment, Health and Safety (EHS) departments at various Chemical Industries were considered as sample universe for sampling procedure. Sample size calculation performed with consideration of Finite Population correction factor with N = 2052, n = 384, p = 0.5, q = 0.5, Confidence level = 95%, α = + or - 5% gives n = 324 as sample size.

A total of 1000 Chemical Industries in Gujarat were approached for the survey and were administered with the research questionnaire, and only 350 respondents have responded. Out of which 331 were usable thus is a 35 per cent response rate but the data included for the analysis is of 331 respondents. For the analysis of data statistical methods are applied with the aid of SPSS (Statistical Package for Social Science) software, version 16.0 and excel. The table 2 shows the distribution of respondent Chemical Industries in Sample. Table 1 shows the distribution of respondent Chemical Industries in terms of Size, ISO Certifications and organization types.

Table 1 Distribution of survey respondent Chemical Industries

Particulars	Total	Percentage (%)
Ownership Category (Total)	331	100
ISO 14001	331	100
Certified	215	64.95
Not Certified	116	35.04
EMS	331	100
Having EMS	204	61.63
Not having EMS	127	38.37

5. Hypothesis

H_{01}: There is no association between the state of GSCM process and ISO 14001 certification achieved by an organization.

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H_{11}: There is an association between the state of GSCM process and ISO 14001 certification achieved by an organization.

H_{02}: There is no association between the state of GSCM process and adoption of Environmental Management System.

H_{22}: There is an association between the state of GSCM process and adoption of Environmental Management System.

6. Data Analysis and Discussion

6.1 Cross Tabulation of Stage of GSCM Activities and Supply Chain Activities

To study the level of Green Supply Chain Activities among the Chemical Industries in Gujarat, the Stage of activities data of the Chemical Firms are cross tabulated against the phases of green activities implementation specifically in Procurement/Purchasing, Manufacturing and Marketing in Table No. 2 given below. The data shows that most of the Chemical industries surveyed are at the Beginning Stage of GSCM Activities followed by the few large scale Chemical Industries which are at Intermediate stage of Green Activities Implementation. It is found that only very few players are implementing Green activities entirely along the every activity and are at Advanced Stage of green activities implementation and there are almost practically no medium sized and large scaled chemical industries without green activities strategy. It is very much evident the almost every firm has realized the need to be green but the level of implementation differ due to the other influencing variables.

Table 2 Stage of Green practices and Supply Chain Activities

Stage of Activities	Procurement	Manufacturing	Marketing	Total
No Green Strategy	0	4	0	4
Early	34	76	0	110
Beginning	140	162	78	380
Intermediate	52	73	55	180
Advanced	9	9	9	27
Total	235	324	142	701

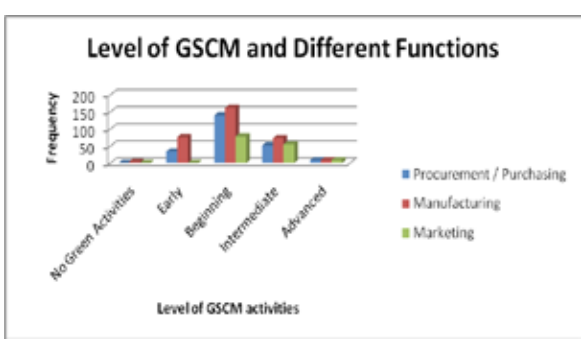

Figure 1 Level of GSCM

6.2. Association of GSCM Activities with their ISO Certifications

To study the association of GSCM Activities among the Chemical Industries in Gujarat with their ISO Certifications the Hypothesis was set and to find the association. The hypothesis is tested with the help of chi square test (Goodness for fit test). Cross tabulation of the ISO 14001 certified and not ISO 14001 certified firms are cross tabulated against the GSCM is also performed in the Table 3.

Table 3 Cross tabulation of ISO-14000 certified firms &Stage of Green Activities

		ISO-14000 Certification		Total
		Yes	No	
Green Activities Stage	No Green	4	3	7
	Early	6	70	76
	Beg.	138	28	166
	Inter.	64	9	73
	Adv.	3	6	9
Total		215	116	331

Table 3 (A) Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	153.488[a]	4	.000
Likelihood Ratio	160.622	4	.000
Linear-by-Linear Association	62.996	1	.000
N of Valid Cases	331		
a.0 cells (00.0%) have expected count less than 5. The minimum expected count is 12.45.			

The results in Table 3 (A) show that the Chi-square value is 153.488 with significance level of 0.000. So, null hypothesis (H_0) is rejected and alternate hypothesis (H_0) is accepted that there is an association between the state of GSCM process ISO 14000 certification achieved by an organization. The stages of GSCM activities differ among organizations having ISO 14000 certification and not having ISO 14000 certification.

6.3. Association of GSCM Activities with their EMS Adoption

To study the association of GSCM Activities among the Chemical Industries in Gujarat with their adoption of Environmental Management Systems by the firm, Hypothesis was set and to find the association. The hypothesis is tested with the help of chi square test (Goodness for fit test). Cross tabulation of the Environmental Management System enabled and not enabled Chemical Firms of Gujarat against the GSCM Practices is done in the Table 4.

Table 4 Cross tabulation of Adoption of (EMS) and Stage of GSCM

		EMS		Total
		Yes	No	
Green Activities Stage	No Green	4	3	7
	Early	22	54	76
	Beg.	117	49	166
	Inter.	58	15	73
	Adv.	3	6	9
Total		204	127	331

Table 4 (A) Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	52.743[a]	4	.000
Likelihood Ratio	52.726	4	.000
Linear-by-Linear Association	22.060	1	.000
N of Valid Cases	331		
0 cells (00.0%) have expected count less than 5. The minimum expected count is 20.69.			

The results in Table 4 (A) show that the Chi-square value is

57.743 with significance level of 0.000. So, null hypothesis (H_0) is rejected and alternate hypothesis (H_0) is accepted that there is an association between the state of GSCM process and adoption of Environmental Management System. The stages of GSCM activities differ among organizations having adopted EMS and not adopted EMS.

7. Findings & Discussions

The major findings of the primary surveys are as follows:

The study and the data collected revealed that the awareness of GSCM practices is very much present in the medium and the large sized chemical industries in Gujarat but only a small proportion of them are unaware about the GSCM concept. From the initial survey done and the pilot study it was found that the small and micro chemical industries are not aware of the concept. (Bhateja et al, 2011)

The data shows that most of the Chemical industries surveyed are at the Beginning Stage of Green Supply Chain Activities followed by the few large scale Chemical Industries which are at Intermediate stage of Green Activities Implementation. It is found that only very few players are implementing Green activities entirely along the every activity and are at Advanced Stage of green activities implementation and there are almost practically no medium sized and large scaled chemical industries without green activities strategy. (Kumar and Chandrakar, 2012)

It also shows that there is an association between the state of GSCM process ISO 14000 certification achieved by an organization. The stages of green management activities differ among organizations having ISO 14000 certification and not having ISO 14000 certification. (Arimura et al, 2011; Chan et al., 2010; Deif 2011; Heidrich and Tiwary, 2013)

There is also an association between the state of GSCM process and adoption of Environmental Management System. The stages of green management activities differ among organizations having adopted EMS and not adopted EMS. (Arimura et al, (2008); Arimura et al, 2011)

8. Conclusion

In this study we analyze the Mid-Size and Large Chemical Industries in Gujarat to study their current position and state of GSCM implementation among the ISO 14001 certified and non-certified industrial units. The study finds the impact of or association if ISO 14001 certification on GSCM implementation. The finding reveals that that industrial facilities which are ISO 14001 certified are more likely to implement GSCM in an integrated manner along the supply chain. Thus, ISO 14001 certification can be use for promoting the more advanced environment management techniques which can in turn help this industries to perform on the various parameters including the environment performance.

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