Environmental Practices in the Indian Pharmaceutical SMEs: An Assessment

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ABSTRACT

This paper empirically investigates the environmental practices followed by the small and medium enterprises in the pharmaceutical industry in India and explores the relationship between these practices and implementation of any formal environmental management system by the enterprises. A survey response from 71 firms shows that the firms are exploring various environment management practices and have the potential to develop proactive environmental strategies. This result counters the traditional assumption that SMEs lack long term sustainability focus. However, the results also show the wide array of environmental strategies being followed by them indicating lack of clarity, and highlighting the need for specific knowledge and awareness based interventions. The results are discussed under the Resource Based View theory.

Keywords: environmental practices; small and medium enterprises; India; environmental strategies

1. INTRODUCTION

The growth in technology and the resulting development over the last two centuries has contributed heavily in damaging the world's natural system through the release of various hazardous pollutants. Acid rain, desertification, ozone layer depletion, green house effect, climate changes and destruction of species are some of the examples of the system changes due to release of pollution in the environment. In order to combat the effects of pollutant emission levels, every country has formulated their own environmental laws and regulations.

India has also implemented detailed guidelines for all industries. For example, the Good Laboratory Practices Guidelines (2002), the National Environment Policy (2006), and the National Pharmacy Pricing Policy (2011) provide the prevention and conservation based regulations to the pharmaceutical industry. Several regulatory bodies oversee these laws, the main ones being the Central Drugs and Standards Control organization (CDSCO), the Drug Controller General of India (DGCI) and the Ministry of Chemical and Fertilizers.

Though the regulations are in place, their implementation and maintenance is a challenge for the industries, especially the small and medium scale enterprises (Campos, 2012; Gurtoo and Antony 2009). Pollution control expenditures can get as high as 137% of the revenue for the manufacturing companies (Porter, 1991). Rearrangement of

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production processes from pollution bearing technologies to efficient technologies leads to productivity slow down and higher production costs as well (Porter, 1991).

Small and medium enterprises (SMEs) are unable to bear this magnitude of expenditure. Lack of access to large credit and low cash reserves due to small scale of operations compel SMEs to continue using outdated and highly polluting technologies (Gurtoo and Antony, 2009; Frijns and Vliet, 1997; Keshab, 2008). Moreover, this sector operates with low margins and high capital to cost ratio (Dasgupta, 2000). Thus, introduction of cleaner technologies, waste management techniques and other changes in processes are not just a question of access to technology and information for the SMEs. Lack of resources and low borrowing capacity is a significant barrier (Gurtoo and Antony, 2009; Frijns and Vliet, 1997). Regulatory pressures, as well as heightened societal awareness about environmental degradation, however, are leading SMEs to take abatement steps.

In this paper we investigate the various environment management practices followed by the SMEs to deal with the environmental regulations and standards. Specifically the paper looks at the Indian pharmaceutical industry, through a primary questionnaire based survey administered across India. Response by 71 pharmaceutical SMEs across India gives us a wide array of practices. We investigate these practices within two research objectives, namely,

- Identify the environmental management practices followed by the pharmaceutical SME
- Understand the relationship between these practices and implementation of any formal environmental management system by the enterprises.

The survey highlights two main formal systems being implemented to management environmental issues: implementation of ISO 14001 and establishing a department. The 4th census report on Indian SMEs (DCSME 2009) and the recent ISO survey (ISO Survey 2011) document the rise in the ISO 14001 certification and establishing of separate environment department by the Indian SMEs. Studies by Joshi (2003) and Afsah and Wheeler (1996) found many factories complying with environmental regulations with EMS and separate departments, even when the enforcement was weak. The same came up in our results. The EMS typically follows after adoption of an environmental policy by an organization and the formation of a department or environment management may be a precursor to implementing an ISO 14001 (Campos, 2012).

While a general agreement exists that small firms in India are adapting to the environmental regulations in order to survive, not many studies illustrate the various practices followed and its outcomes (Kathuria and Sterner, 2006; Khanna and Brouhle, 2013). Little is known whether uptake of formal practices like ISO14001 among Indian firms leads to tangible environment improvements (Singh, Brueckner and Padhy, 2014). There are difficulties in obtaining data from SMEs as well (Singh and Bagchi, 2013). However, Indian SMEs produce as much as 70% of the industrial pollution in India (Singh, Brueckner and Padhy, 2014), and there is growing evidence of increased pollution from this sector (Kathuria and Sterner, 2006) and thus a need to assess the compliance initiatives.

Additionally, the regulatory pressures in India are not high and awareness programs are low as well (Chakraborti and Mitra, 2005). Keshab (2008) and Singh,

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Brueckner and Padhy (2014) highlight high pollution generating production work being taken by SMEs from large companies trying to avoid environmental protection costs. Another case in point is the Larsson, Pedro and Paxeus (2007) study that found water pollution levels from the pharmaceutical SMEs in the state of Andhra Pradesh to be 150 times higher than the accepted levels. Despite strict orders by the Andhra Pollution Control board (APPCB) in 2008 and 2009 to use pollution control measures and adhere to permissible limits, a 2009 repeat study (Larsson and Fick, 2009) of the same place found no change in the water contamination.

Given this context, we investigate the environmental practices through a primary survey of SMEs. The next section highlights the features of the Indian pharmaceutical industry, followed by a review of the environmental practices followed by small and mediums scale industries. Section 4.0 details the methodology, the sample and the data analysis conducted. Section 5.0 provides the results followed by the discussion using the resource based view of the firm. The paper concludes with listing the agenda for future research.

1.1 The Indian pharmaceutical industry

The Indian pharmaceutical industry is a significant player in the global market. As the world's fourth largest pharmaceutical industry in terms of volume, the industry controls about 1% of the world market (Haley and Haley, 2012). Generic drugs form the bulk of the manufacturing. The industry supplies to over 65 countries and derives 50% of their revenue from exports (KPMG International 2006). McKinsey & Company (2010) predicts the Indian pharmaceuticals market to grow to US$55 billion by 2020. Table 1 provides some more details of the Indian Pharmaceutical industry.

Table 1: The Indian Pharmaceutical Industry

Theme	Figures
Compounded annual growth 2011-12	16%
Predicted compounded annual growth rate between 2013 to 2016	14-17%
Share in world pharmaceutical sales (in value)	1.4%
Share in world pharmaceutical sales (in volume)	10%
Total value of the domestic market (2012-13)	18 billion USD
Total value of exports (2012-13)	14.6 billion USD
Estimated growth in exports by 2020	45 billion USD
Domestic market (in value)	12.26 billion USD
FDI in the sector (in 2013)	11 million USD

Sources: Brand India Equity Foundation Report, 2011; Pricewaterhouse Coopers Report, 2010; McKinsey and Co., 2010; Department of Industrial Policy and Promotion (DIPP), 2013; Annual Report 2012-13, Ministry of Micro, Small and Medium Enterprises, 2013.

The existence of small and medium enterprises (SMEs) is a salient component of the Indian pharmaceutical industry. The sector has more than 24,000 registered units, with an estimated 9456 units (about one third) in the SME segment, producing several thousand formulations of 350 different bulk drugs (Vijay, 2012). According to the Annual Reports 2012-13 and 2011-12 of the Department of Micro, Small, Medium Enterprises, Government of India, pharmaceutical SMEs account for 87% of the production in volume, employ over 345 thousand workers, and contribute 35-40 per

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cent to the industry in terms of production value, with a turnover of about INR 35,000 crores. Cost competitiveness is one of their major strengths. Production costs are estimated to be almost 50 percent lower while research and development (R&D) costs are about one-eighth as compared to Western countries (KPMG 2006; Greene, 2007).

The Pharmaceutical industry generates a variety of wastes during the manufacturing, maintenance and housekeeping operations. The past decade has witnessed growing attention towards the potential adverse effects of these pharmaceuticals wastes on the environment. Several regulations and standards at various levels have been developed by the Indian government to address these concerns and protect the eco-system from the effects of pollution, namely, the Guidelines for Good Laboratory Practices (2008), the National Environment Policy (2006), and the National Pharmacy Pricing Policy (2011). However, disposal costs, liabilities associated with hazardous waste management, and compliance to environmental regulation standards becomes a real challenge for this sector in the present competitive domestic and international markets. This is especially so for the small and medium scale enterprises.

1.2 SMEs and the environment management practices

SMEs produce around 70 percent of the total global pollution (Smith and Kemp 1998), 60 percent of the total carbon emissions, and the sum total of SMEs' environmental impacts outweighs the combined environmental impact of large firms (Hillary 2000). In India SMEs account for over 40 percent of the hazardous waste, as compared to 13percent generated by the large scale industry (Frijns and Vliet 1999).

Recent report (DCSME, ISO Survey, 2011) document the rise in the initiatives for environmental management by the Indian SMEs. Incentive for implementing EMS comes from several factors. Firms regard EMS as a useful tool for the improvement of their environmental performance, despite obstacles like weak regulatory support and lack of transparency in India (Singh, Brueckner and Padhy, 2014; Singh and Bagchi, 2013). Adaptive management systems, like EMS and environment management departments successfully address the unpredictable interactions faced by the Indian SMEs with the regulators, society and international customers (Ryu, 2012). Studies conducted on the implementation and impacts of EMS and establishment of environment management departments show organizational improvement in environmental performance and a positive relationship with regulatory authorities (Jabbour et al., 2012). Lack of EMS leaves firms unsure on how to deal with the obstacles introduced by environmentally responsible manufacturing and dealing with increasing market complexity (Gopakumar and Santosh, 2013).

Successful adoption of EMS by Indian SMEs, as demonstrated by Sethuraman and Ahmed (1992) and Dasgupta (2000), is often led by the personal commitment of founder/owner and top management. Some of the steps followed in this form include voluntarily identification of hazards involved in the manufacturing process, analyzing methods such as material substitution, exploring innovative R&D, and recruiting policy analysts. Extending awards in the form of incentives and motivations for employees also plays an important role (Jabbour et al., 2012).

Dasgupta (1996) highlights two socio-economic reasons characterizing the lack of environmental compliance. One, most SMEs have a low capital output ratio compared

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to larger units (Sandesara, 1991). The investment surplus is limited, constraining the standard business argument of improved technologies will lead to better business in the long run. Secondly, with heavy emphasis on daily production, limited awareness of environmental technologies and better processes, the environmental decision making is severely constrained (Sethuraman and Ahmed, 1992). Consequently, a complex amalgamation of availability of finance, raw material sources, and adequate knowledge of the owner becomes significant in order for the SMEs to implement environmental management practices.

Additional complexities characterize the SMEs in developing countries. They serve a socio-economic role in the economy by providing employment to low skilled labour (Dasgupta 1998). The sector has low entry barriers and generates livelihood for those with limited education and skills. The sector is also instrumental in providing low cost essential drugs to millions of poor in the country. The Indian SMEs have been historically encouraged by the government with incentives and subsidies, as the argument for protection of SMEs is more social than economic (Little, Mazumder, and Page, 1987). The consequent articulation of capital, labour and technology for SMEs under these conditions is different from large scale manufacturing firms.

2. METHODOLOGY, SAMPLE AND DATA ANALYSIS

2.1 Methodology

An online primary survey was administered to investigate the environment management practices followed by small and medium scale firms in the pharmaceutical industry. This section was designed for response on a scale of 1 to 5, where 1 is definitely followed and 5 is not followed at all. The questionnaire also included demographics on age of the firm, location / region, environmental management certification, availability of separate environmental department and level of product mix.

Table 2 lists the set of environment management practices included in this survey. The total items were finalized from a set of original items through a two-step content analysis procedure. As step one, individual meetings were conducted with experts from enforcement, industry and academia where a list of items were debated and identified as relevant for the pharmaceutical industry. As step two, a group meeting was organized with some of the experts to validate these items.

The survey was administered online with the help of US based Survey console.com. Registration to this site kept for 5 months for getting the responses from all over India. All the 430 SMEs listed in the directories of The Pharmaceutical Export Promotion Council of India, Ministry of Commerce and Industry, (http://www.pharmexcil.com/members) and the Confederation of Indian Industries (CII) were contacted.

2.2 Sample

The survey response rate was very low. Out of the 430 firms contacted 112 firms (26%) opened the questionnaire website, and 54 completed the survey.

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Table 2: Survey dimensions

Original List of Item	Final List of Items
• Identify the hazards involved in the manufacturing process • Compare current pollutant levels with the environmental standards • Develop alternate solutions to comply with the standards • Conduct analysis of competitors strategy • Conduct internal safety and environmental audit • Develop on and off site emergency plans to Analyze the national and international environmental policy • Formulate policy statement focusing on sustainable development • Shift plant production location from more stringent to less regulated area • Create network of companies for sharing information on regulatory issues • Obtain incentives and financial help from the Government • Recruit policy analysts/planners and environmental lawyers minimize hazards • Utilize technical knowhow from the enforcement organizations • Plan for newer abatement technology (Cleaner technology) • Explore innovative R&D in product and process to control pollution • Give training to all concerned on environmental regulatory issues • Introduce green manufacturing and end of life cycle concept in all activities • Outsource waste reclamation and disposal • Initiate step to follow good manufacturing practices (GMP) • .Ensure emission reduction/pollution control by end-of- pipe technology • Ensure emission reduction/pollution control by changing the product mix • Ensure emission reduction/pollution control by raw material substitution • Reformulation of final product to reduce the environmental impact • Reduce the generation of the wastes at the source by in process recycling • Redesign process for cleaner/pollutant free product control and certification • Keep the level of pollution to the minimum possible • Set the limits of Market share (National and International) • Incorporate energy and water conservation as part of regulation • Motivate employees by incorporating eco-friendly changes • Corrective action plan based on environmental impact assessment • Develop environmental friendly image through labeling and statement on products • Stakeholder participation while designing environmental policy • Do routine environmental reporting • Certify with environmental management systems providers • Be up to date about the changes/ amendments of environmental regulations • Make available the industrial regulatory standards to all concerned • Compare the existing situation with the standards and identify the challenges ahead • Conduct mock drills to plan for emergency preparedness • Do pollution level measuring and reporting.	• Identify environmental issues involved in the process • Incorporate solutions in the process for meeting environmental standards • Formulate policy statement focusing on sustainable development • Shift plant location from more regulated to less regulated area • Create network of industries for sharing information on regulatory issues • Take technical & financial help from government organizations • Recruit policy analysts or planners and environmental lawyers • Explore innovative R&D in product and process to control pollution • Give training to all employees on environmental regulatory issues and technology • Initiate step to follow current good manufacturing practices (cGMP) • Outsource waste reclamation and disposal functions • Make available the industrial regulatory standards to all concerned • Set market share limits (National and International) to plan process changes • Motivate employees by incorporating eco-friendly changes in the process • Corrective action plan based on environmental impact assessment • Eco- labeling and pollution statements on products • Stakeholder participation while designing environmental policy • Certifying with environmental management systems providers • Ensure emission reduction/pollution control by using end-of- pipe technology • Reformulation of final product to reduce the environmental impact • Timely control and certification of all components of supply chain • Do pollution level measuring and reporting at regular intervals

The questionnaire was also administered face to face, and 27 responses collected from this method. The face to face meetings lasted for almost one hour followed by a plant visit to observe the systems practiced. The repeated follow up and visits were carried out

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

for almost 6 months. The survey link and all the related communication was directed to the heads of the organization in each case.

The sample size and the nature of data create some restrictions for statistical analysis. For example, factor analysis (exploratory or confirmatory) was not possible. Two main conditions for running a factor analysis, namely, sample size and sample to variable ratio, are not met with our sample. Typically a sample size of 200 or greater is suggested for factor analysis (Hair et al., 2009), though it is debated. Guadagnoli and Velicer (1998) suggested solutions with correlation coefficients >0.80 can run on smaller sample sizes like 80 or 100 as well. However our sample size of 71 does not meet this requirement as well. Factor analysis also demands a certain the sample to variable ratio (often denoted as N: p ratio where N refers to the number of participants and p refers to the number of variables). The ratio is recommended to be in the range anywhere from 3:1, 6:1, or higher. Our data shows 22 practices being followed by the 71 firms, making the N: p ratio to be barely 3:1.

2.3 Data Analysis

The survey gives us an array of practices. The data was first subject to simple frequency analysis and then categorized using Cronbach Alpha test of reliability. As factor analysis was not possible due to sample size limitations (Williams, Brown, and Onsman, (2010), an attempt at categorizing these practices was undertaken, taking help from Chronbach's Alpha.

The relationship between environmental practices followed and formal environment management systems is analysed using Kruskal Wallis Analysis of Variance and the Binary Logistic Regression. The Kruskal Wallis Analysis of Variance is used to test the difference between three groups, namely firms with ISO 14001 certification, firms with a separate department for environmental management and firms with none of these or any other formal environment systems. This test is a non-parametric test, an equivalent of the one way analysis of variance (ANOVA). It provides statistical test of whether or not the means of the several groups are equal. Since it is a non-parametric test it does not assume a normal distribution. Moreover it supports nominal scale data.

The Binary Logistic Regression (BLR) is used to see the impact of formal systems on the practices followed by the SMEs. BLR is a special type of regression which allows for using a binary response variable as a dependent variable, which can be related to a set of explanatory variables. As our data on "presence of a formal environmental system" has a binary response of YES or NO, this regression model was considered the appropriate choice.

Moreover, for this model the predicted independent variable is a function of the probability that a particular factor will be in one of the categories. This makes more sense for our data set as environmental management systems are a mix of several other factors like access to bank loans, economic health of the firms etc. Hence we model the probability of the response variable as a function of explanatory variables (6 explanatory variables in our case as detailed in Table 5). The basic rule of 10:1 (sample size: predictor variable) ratio was largely followed in using this probability model. As we had 50 firms with a formal management system, 5 predictor factors in the regression model would be ideal. We have taken the six main factors emerging with acceptance Cronbach alpha test of reliability in the regression model.

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3. RESULTS

The seventy one respondent firms were from different parts of the country. The 39 percent firms are from the states of Kerala and Karnataka. These areas are known for production of traditional medicine and emphasis on natural cure. 37 percent firms are from the states of Maharashtra and Gujarat. These areas have high concentration of large pharmaceutical manufacturing firms. 24 percent firms are from states of Delhi and Haryana which has the oldest manufacturing base for SMEs in general. Figure 1 marks the locations.

All the respondent firms produce more than 20 products, and have been established post economic liberalization. 66 percent of the firms have some form of a formal environment system in place. Out of these 32 percent have a separate environment management department and 34 percent have applied for and taken up ISO14001 certification. Table 3 illustrates the sample characteristics.

Table 3: Sample Characteristics

Characteristics		**% responses** *(rounded to nearest integer)*
Clusters	1- Kerala, Karnataka	39
	2- Maharashtra, Gujarat	37
	3- Delhi, Haryana	24
Age of the firm	7-10 years	9
	10-20 years	28
	21-30 years	38
	30 + years	25
Designation	CEO/Chairman/ Managing Director/ Director/ President/Vice President (VP)/Senior VP	55
	Senior General Manager/ General Manager	45
Product Mix	0-20	0
	21-30	24
	31-40	39
	41 and above	37
Environment Management System	Environmental Management Department	32
	ISO14001 Certification	34
	No formal EMS implemented	34

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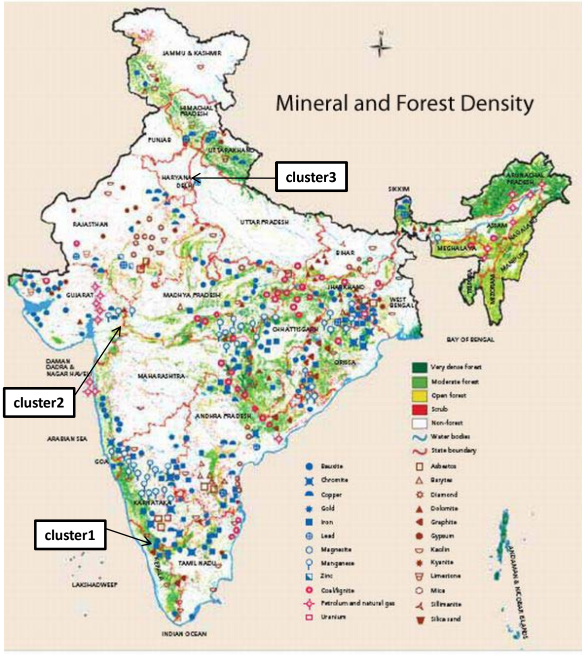

Figure 1: Location of the sampled SMEs

3.1 Environmental management practices followed by the SMEs

Frequency analysis to study the environmental practices followed by the SMEs shows 5 practices followed by more than 50% of the firms, namely, initiating steps to follow current good manufacturing (CGMP) practices (84.5%), pollution level measuring and reporting at regular intervals (69%), providing training to all employees on environmental regulatory issues and technology (54.9%), identifying environmental issues involved in the process (53.5%), and incorporating solutions in the process for meetings environmental standards (50.7%). Table 4 summarizes these results.

Table 4: Summary of the management practices followed

No.	Environmental management practices	No. of firms	% of firms
1	Identify environmental issues involved in the manufacturing process	38	53.5
2	Incorporate solutions in the process for meetings environmental standards	36	50.7
3	Formulate policy statement focusing on sustainable development	25	35.2
4	Shift plant location from more regulated to less regulated area	1	1.4
5	Create network of industries for sharing information on regulatory issues	3	4.2
6	Take technical & financial help from government organizations	12	16.9
7	Recruit policy analysts or planners and environmental lawyers	2	2.8
8	Explore innovative R&D in product and process to control pollution	15	21.1
9	Provide training to all employees on regulatory issues and technology	39	54.9
10	Initiate step to follow current good manufacturing practices (cGMP)	60	84.5
11	Outsource waste reclamation and disposal functions	2	2.8

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

12	Make available the industrial regulatory standards to all concerned	7	9.9
13	Set market share limits (National and International) to plan process changes	5	7.0
14	Motivate employees to incorporate eco-friendly changes in process	26	36.6
15	Corrective action plan based on environmental impact assessment	12	16.9
16	Eco- labeling and pollution statements on products	5	7.0
17	Stakeholder participation while designing environmental policy	14	19.7
18	Certifying with environmental management systems providers	28	39.4
19	Ensure emission reduction/pollution control by end-of- pipe technology	17	23.9
20	Reformulation of final product to reduce the environmental impact	10	14.1
21	Timely control and certification of all components of supply chain	11	15.5
22	Do pollution level measuring and reporting at regular intervals	49	69.0

The overall results reflect the heavy emphasis on aligning the production processes to the environmental compliance regulations. Most commonly followed strategies by the firms are; identifying environmental issues involved in the process (48 of the 71 firms), initiate steps to follow current good manufacturing practices (60 of the 71 firms); incorporate solutions in the process for meetings environmental standards (67 of the 71 firms); and corrective action plan based on environmental impact assessment (51 of the 71 firms). Other steps include doing pollution level measuring and reporting at regular intervals (49 out of 71 firms) and certifying (34 out of 71 firms) with EMS providers, as part of the pollution prevention strategies mandated by the law.

The survey gives us an array of practices followed in this sector. As factor analysis was not possible due to sample size limitations, an attempt at categorizing these practices was undertaken, taking help from Cronbach Alpha test of reliability. The Cronbach Alpha test gives six environment goals followed by the SMEs, namely, long term sustainability, long term process improvements, tangible process improvements, stakeholder involvement, meeting regulations and standards, and pollution control. Table 5 details these results.

Categorizing the practices gives a clearer picture of the environmental practices in the pharmaceutical industry. The impact of implementation of CGMP standards by the government for the pharmaceutical industries is clearly visible. The current regulations mandate adoption of abatement technologies to minimize pollution and improve waste management. The revised CGMP standards have been implemented in 2010 under the "Schedule M" of the law on Drugs and Cosmetics Rules 1945. The Schedule M outlines the conditions (practices and requirements of premises, plant and machinery) under which a license can be given to manufacture drugs. The conditions cover all aspects including disposal of waste, requirements for sterile products manufacturing areas, health clothing and sanitation for workers, equipment standards (including recommended equipment for all product forms), need for testing laboratory, ingredient quality and specifications, and use of additives or aids. All pharmaceutical companies are been monitored on these guidelines, which is leading to active process changes initiated by the SMEs.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 5: A framework for the identified environment management practices

Environmental Goal	Environmental management practices	Cronbach Alpha test of reliability
Long term sustainability	• Create network of industries for sharing information on regulatory issues’ • Formulate policy statement focusing on sustainable development • Shift plant location from more regulated to less regulated area • Take technical & financial help from government organizations • Recruit policy analysts or planners and environmental lawyers	0.834
Long term process improvements	• Incorporate solutions in the process for meetings environmental standards • Explore innovative R&D in product and process to control pollution • Make available the industrial regulatory standards to all concerned	0.711
Tangible process improvements	• Reformulation of final product to reduce the environmental impact • Outsource waste reclamation and disposal functions • Corrective action plan based on environmental impact assessment	0.887
Stakeholder involvement	• Provide training to all employees on regulatory issues and technology • Stakeholder participation while designing environmental policy • Motivate employees to incorporate eco-friendly changes in process	0.690
Meeting regulations and standards	• Identify environmental issues involved in the manufacturing process • Initiate step to follow current good manufacturing practices (cGMP) • Certifying with environmental management systems providers	0.622
Pollution control	• Ensure emission reduction/pollution control by end-of- pipe technology • Do pollution level measuring and reporting at regular intervals • Timely control and certification of all components of supply chain	0.695
- **	• Set market share limits (National and International) to plan process changes • Eco- labelling and pollution statements on products.	---

***** These practices do not find high correlation with any other variables and hence have been kept separate.***

3.2 Differences in practices based on firm size, location and implementation of EMS

The analysis brings forth some interesting and some unusual results. First, significantly, the location or age of the organization is not a predictor of environment management strategies (Table 6).Literature argues that age of the firm and failure has an inverted U relationship. Liability of newness argument suggests that selection process favors old organizations as they are more reliable (Hannan and Freeman, 1984). Contrary wise, the liability of obsolescence argues that old firms have high inertia and become increasingly mis-aligned with the external environment (Barron, West and Hannan, 1994). However, we do not find either of these as significant (as part of internal capabilities and resources) with respect to the environment.

Kruskal Wallis test of significant differences between firms based on implementation of formal environmental management systems gives interesting insights.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Two formal systems are common to Indian SMEs namely, implementation of ISO14001 certification and establishment of a formal environmental management department (Campos 2012). The survey also found these two systems as implemented by some of the SMEs, and is the basis of our investigation in this section. Table 6 summarizes the test results.

Some practices are common to all firms irrespective of a formal environmental management system implemented in the organization. All the surveyed firms follow one or more of the basic set of technical standards required, namely incorporating solutions in the process for meetings environmental standards, exploring innovative R&D in product and process to control pollution, taking steps to follow current good manufacturing practices (cGMP), reformulation of final product to reduce the environmental impact, and measuring and reporting pollution level at regular intervals.

The firms that have certified for ISO14001 have implemented further technical changes. The significant practices are corrective action plan based on environmental impact assessment (1.92) and timely control and certification of all components of supply chain (1.96). However these firms have not marked long term sustainability practices as significantly followed, for example creating network of industries for sharing information on regulatory issues (2.69), eco-labeling and pollution statements on products (3.15), and stakeholder participation while designing environmental policy (2.73).

The recent attempts by state governments to actively support EMS by sharing some of the financial burden of firms transiting towards cleaner production has had a positive impact. Promotion of the certification fee reimbursement programme to incentivize technological up-gradation and improved waste management has seen a surge in environmental compliance effort by the SMEs (DCSME 2009). In some states up to 75% of the expenditures associated with obtaining certification has been reimbursed (Singh, Brueckner and Padhy 2014) and a positive impact of these initiatives is evident in the sector.

Review of studies exploring the motivations for ISO14001 certification identifies improved technical performance as the key driver for certification (Comogolio and Botta 2012), especially in pharmaceutical firms where hazardous waste and toxic emissions are more common (Mitra and Kannan, 2007). Additionally, Qadir and Gorman (2008) and Joshi (2003) find improved relationship with the government as significant as well. Internal drivers like improved corporate image, marketing advantages and improved relationship with stakeholders are more evident in large firms (Zorpas, 2010). Our results also confirm the same.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM)

Table 6: Significant differences between firms based on location, age and EMS followed

	Location	Age	EMS			
			ISO4001 Implemented	Separate Department	No EMS	
	ANOVA F Value	ANOVA F value	Mean	Mean	Mean	ANOVA F value
Identify environmental issues involved in the process	1.13	1.01	1.23	1.50	2.08	3.95*
Incorporate solutions in the process for meetings environmental standards	0.24	0.13	1.84	1.66	1.79	0.22
Formulate policy statement focusing on sustainable development	1.27	0.07	1.53	1.66	2.16	3.69*
Shift plant location from more regulated to less regulated area	0.79	1.4	3.88	4.16	4.12	0.25
Create network of industries for sharing information on regulatory issues	0.71	0.62	2.69	1.66	2.87	2.84**
Take technical & financial help from government organizations	0.85	0.69	2.00	3.66	3.33	1.49
Recruit policy analysts or planners and environmental lawyers	0.55	1.07	3.46	3.33	3.25	0.43
Explore innovative R&D in product and process to control pollution	0.22	1.41	1.84	1.66	2.08	1.12
Give training to all on environmental regulatory issues and technology	1.03	1.98**	2.42	1.50	2.50	3.16**
Initiate step to follow current good manufacturing practices (cGMP)	0.71	0.11	1.19	1.00	1.16	0.49
Outsource waste reclamation and disposal functions	0.69	0.73	2.88	3.33	3.08	0.79
Make available the industrial regulatory standards to all concerned	1.04	0.66	2.23	2.00	2.33	0.85
Set market share limits (National and International) to plan process changes	0.64	0.14	2.69	2.83	2.66	0.69
Motivate employees by incorporating eco-friendly changes in process	0.67	0.21	1.65	1.00	1.66	2.83**
Corrective action plan based on environmental impact assessment	1.08	0.44	1.92	2.66	2.83	4.85*
Eco- labeling and pollution statements on products	1.08	1.89**	3.15	3.16	3.12	0.22
Stakeholder participation while designing environmental policy	0.58	0.28	2.73	3.66	3.12	1.13
Certifying with environmental management systems providers	0.70	0.19	1.69	2.33	2.20	12.95*
Ensure emission reduction/pollution control by end-of- pipe technology	0.27	0.72	1.76	1.66	2.70	3.89*
Reformulation of final product to reduce the environmental impact	0.61	0.60	2.07	2.16	2.12	0.30
Timely control and certification of all components of supply chain	0.85	1.10	1.96	1.16	2.08	5.42*
Do pollution level measuring and reporting at regular intervals	1.16	0.89	1.23	1.66	1.37	1.93

*****p<0.05,*p<0.01***

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The firms with a separate department for environment management reflect a higher stakeholders and long term sustainability focus in their environmental management practices. These firms are seen to engage with others, for example, creation of network of industries for sharing information (1.66), training employees on environmental regulatory issues (1.50) and motivating employees to incorporate eco-friendly changes in process (1.00).

3.3 Relationship between formal environmental management system and practices followed

Binary logistic regression model results show ISO 14001certification has a significant positive relationship with meeting regulations standards (*.000*) and pollution control (*.024*). The Cox and Shell R^2 is 0.703. The dependent variable of Separate Department for Environment Management has a significant positive relationship with long term sustainability (*.058)*, stakeholder involvement (*.056*) and pollution control (*.098*).

Table 7: Impacts of EMS on management practices: binary logistic regression results

	Dependent Variables	
	ISO 14001 Certification	Separate Department for Environment Management
	Cox and Shell $R^{2:}$ 0.703	*Cox and Shell $R^{2:}$ 0.449*
Factors	Standardized Beta Coefficients	Standardized Beta Coefficients
longterm_sustainability	.767 *(.381)*	3.642 *(.058)*
longterm_process_improvement	-.421 *(.516)*	.632 *(.427)*
tangible_process_improvement	.057 *(.812)*	2.046 *(.153)*
stakeholder_involvement	2.209 *(.137)*	3.577 *(.056)*
meeting_regulations_standards	13.144 *(.000)*	.080 *(.778)*
pollution_control	1.877 *(.024)*	2.735 *(.098)*
Constant	2.222	4.380

Evidently, firms using ISO 140001 demonstrate more proactive behaviour towards the environment. Zorpas (2010) categorizes the benefits from an ISO 140001 into three categories, organizational, financial and people. Organizational benefits like operational improvements and efficiency accrue directly, and quality improvement in products and management are spin offs from this indirectly. The desire to reduce cost gets fulfilled via EMS as waste processing and reduction is an integral part of EMS with the focus to reduce costs (Walker et al., 2002). Consequently, entrepreneurs

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move towards other benefits like loans, carbon credits, green points and export markets (Jaffe and Palmer 1997; Greene 2007).

EMS firms with a separate department for environment management (not implanted ISO 140001) demonstrate higher desire for stakeholder interactions (Table 5). Limited technical help and support from enforcing agencies (1.66) and limited interaction between firms and regulatory authorities (1.66) are marked as significant. These firms have also marked limited market monitoring practices among officials, shortage of skilled manpower for new abatement technology, and need for intensive employee training and development as higher concerns than the rest of the firms (Table 5). Larger stakeholder focus and long termism is evident here. Authors Campos (2012) and Zorpas (2010) highlight formation of a separate cell for compliance as demonstrating a commitment to reduce waste, reduce energy and resource use, sets objectives and targets, and reviews a company's environmental performance. With dedicated manpower, entrepreneurs with full knowledge of the legal and statutory requirements of doing business worldwide, can focus more on important issues like energy use, hazardous waste produced, and possible cost savings (Dean and Brown 1994). This is reflected in their desire to engage with the government over these issues.

4. DISCUSSION

The results empirically show that SMEs are exploring various environment management practices and have the potential to develop proactive environmental strategies. This also reinforces the fact of their desire to survive and deal with international and national competition. Specifically we find that there is significantly positive relationship between implementing an EMS systems and dealing with the environmental concerns. Firms with EMS deal better with their technical performance and managing stakeholder dynamics. The firms' desire for waste processing and reduction, and benefits like loans, green points and export markets are evident from the results. The results empirically support the idea that that dynamics proactivity of these firms may positively impact their export intensity as well. This in turn reflects a long term sustainability focus.

These findings corroborate with the resource based view of the firm (Hart, 1995), supporting the importance of proactive environmental proactivity in generating positive implications for the SMEs. The resource based view of the firm says that competitive advantage of a firm likes primarily in its ability to apply its valuable tangible and intangible resources (Wernerfelt, 1995; Rumelt, 1984; Penrose, 1959).

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The resource enables the firm to employ it in a value creating strategy (Peteraf, 1993; Barney, 1991). Relevant here is to know that the costs associated with the investment in the resources cannot be higher than the future rents that will flow out of this resource and associated value creating strategy (Mahoney and Pandian, 1992; Peteraf, 1993). Therefore, if the firms are investing in EMS, it is a proactive action for long term sustainability and growth.

The resource based view of the firm further states that if the resource is non-substitutable then the future rents are more secure (Barney, 1991; Dierickx and Cool, 1989). For example, if the resource is able to counter competition, add unique value to the firm which is valued by the market or creates a strategy which is non-substitutable, then these result in economic profits and long term sustainability of the firm. EMS and other environmental practices are a deterministic condition for the SMEs to have a long term future and adequate profits. Our results highlight that SMEs understand the relevance of EMS and other environmental practices, and are proactively applying the same. Within the framework of the resource-based view, environmental concerns are the weakest link for the SMEs. The firms are, hence, displaying characteristics for sustainability by proactively dealing with this weakest link. .

Our results counter the traditional assumption that SMEs lack long term sustainability focus. However, the results also show the wide array of environmental strategies being followed by them indicating lack of clarity, and highlighting the importance of specific knowledge and awareness based interventions. The SMEs lack financial and human resource strength is a much researched fact. In such circumstances regulatory support in the form of incentives and guarantees becomes critical for the long term survival of these firms.

4.1 Limitations and agenda for future research

This study is not without limitations. The research only examines the practices followed and its link to formal environmental management practices. It would be beneficial to examine the impact of the practices on the firm's financial and export performance as well. Further, a longitudinal analysis will empirically reinforce the theoretical logic in this paper.

Moreover, the data analyzed is from a single industry and single country. Generalization of these results too widely, therefore, needs a caution. We could not get a larger sample size from the pharmaceutical industry despite several attempts, for more than 6 months. This also puts a limit to wide generalization of the result.

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Inclusion of other variables like export data, innovation, capability analysis, or entrepreneurial interview may have brought a more robust and generalizable findings. This could have countered the small sample size. However the firms were not open to further questioning and that limits our study.

Despite these limitations, this study makes important contributions to the understanding of the environmental practices followed by Indian SMEs and of the relationship between different environmental strategies and likelihood of potential actions. The finding that SMEs are proactively trying to deal with environmental issues and grappling with them highlights the importance to provide incentives for firms' environmental performance by the government and regulatory authorities.

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