ENVIRONMENTAL MANAGEMENT SYSTEMS (EMSS) IN WASTE MINIMIZATION IN SMALL AND MEDIUM-SIZED ENTERPRISES IN DELHI AND NOIDA, INDIA

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ABSTRACT

This is a multi-disciplinary research study guided by the theories of Entrepreneurship and Operations management. The operations management literature is focused on type of organizational practices that reduces environmental impacts, pollution reduction or importing environmental technologies. Many researchers have established relationship between ISO 14001 certification and lean manufacturing, suggesting that lean manufacturing helps improve environmental management and in turn improves operational performance. This study investigates the challenges small and medium-sized enterprises (SMEs) face in India with regards to their generally poor environmental management track record. The descriptive/diagnostic study aimed to propose a research agenda for EMS in the Indian SME context, inspired by the thus far seemingly limited response within this sector to the growing significance of EMS uptake and implementation for both environmental and commercial reasons. To this end, the thesis is organised to answer two research questions (RQ).

RQ1: Does EMS-ISO14001status lead to Waste minimization in Indian SMEs?

RQ2: Is the waste minimization more in ISO 14001 certified SMEs than that of uncertified SMEs?

To answer RQ1, the 1st objective aims to evaluate the relationship between ISO 14001 certification and degree of waste minimization in SMEs in Delhi and Noida. To answer RQ2, the 2nd objective aims to compare degree of waste minimization both in certified and non-certified SMEs in Delhi and Noida

The study proposed a pre-conceptual framework for empirical studies that encapsulates research gaps found in most relevant and prominent studies for testing it

in a developing country (Indian) context. We have conducted a baseline study on secondary data to find out the contextual factors that influences the decision of adopting ISO 14001 certification thus may influence the relationship between ISO 14001 certification status and waste minimisation.

Based on literature survey and a baseline study on ISO 14001 certified companies, we proposed a pre-conceptual model. The study allows pre-planned design for analysis with self-structured questionnaires for data collection. 400 SMEs were selected randomly, and questionnaires were sent off (by mail and/or personal delivery) to be completed either by senior management, key environment officers or resource allocators. There were two e-mail follow-ups for all 400 SMEs following the survey mail-out.63 valid responses were recorded and included for analysis in the study.

The model is tested for a model-fit, and restructured into a post-conceptual model after removing one highly correlated predictor variable. Hypotheses are tested through regression coefficient (β) scores to determine the influence of ISO 14001 on the degree of waste minimisation among certified and non-certified companies.

The data reveal that ISO 14001 certification alone helped account for a 25% increase in waste minimisation in certified companies. The study helped to reduce the problem of time and resource requirements in conducting waste audits or getting access to the audit results. The analytical tools described in this paper lend themselves to be applied to similar research problems in future studies. The study provides baseline data for further research into ISO 14001 effectiveness in the Indian SME context - a field with still only limited research insights - and offers policy prompts for targeted environmental management improvements in Indian firms.

APPROVAL PAGE

I certify that I have supervised / read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in quality and scope, as a thesis for the fulfilment of the requirements for the degree of Doctor of Philosophy.

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DECLARATION

I hereby declare that the thesis submitted in fulfilment of the PhD degree is my own work and that all contributions from any other persons or sources are properly and duly cited. I further declare that the material has not been submitted either in whole or in part, for a degree at this or any other university. In making this declaration, I understand and acknowledge any breaches in this declaration constitute academic misconduct, which may result in my expulsion from the programme and/or exclusion from the award of the degree.

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LIST OF ABBREVIATIONS

EMS	:	Environmental Management System
SME	:	Small and Medium Enterprises
WM	:	Waste Minimisation
MSME	:	Micro Small and Medium Enterprises
MOEF	:	Ministry of Environment and Forests
MSE	:	Medium Size Enterprises
DMRC	:	Delhi Metro Rail Corporation
ISO	:	International Standardisation Organisation
DCMSME	:	Development Commissioner, M/O Micro & Small Enterprises Cluster Development Programme
HACCP	:	Hazard Analysis and Critical Control Points
CPCCC	:	Communist Party of China Central Committee
CPPCC	:	Chinese People's Political Consultative Conference
CSR	:	Corporate Social Responsibility
EU	:	European Union
SSI & ARI	:	Small Scale Industries Agro and Rural Industries
FDI	:	Foreign Direct Investment
SMBDCI	:	Small & Medium Business Development Chamber of India
APPCB	:	Andhra Pradesh Pollution Control Board
EPA	:	Environment Protection Act
VEP	:	Voluntary Environmental Program

CHAPTER 1.0 INTRODUCTION

1.1 Background

Industrial waste is the cause of rising pollution both in soil and ground water. This is because in India appropriate waste disposal and treatment facilities for hazardous wastes are not adequate, mostly produced by the manufacturing industries. Illegal waste dumping and other wrong practices have made this problem even bigger. This problem resulted in not only threat to human health but also a concern for Indian small to medium sized enterprises (SMEs) (Singh, Brueckner and Padhy, 2015; Hindustantimes, 2012; Wath et al., 2011; Saxena and Bhattacharyya, 2010; Gupta and Goldar, 2005; Moturi et al., 2004). Solid waste samples from five small-scale industrial sets in the area of National Capital Region, Delhi (covers NOIDA), that represents the regional spread of the industrial belt in Delhi, were collected and studied by Moturi et al. (2003). The result of this study shows high mean levels of toxic metals in all industrial area wastes. This is due to the presence of metal processing small scale industries. This is posing potential risk to the people living downstream with contaminated and poor quality water. Similarly, the study of Saxena and Bhattachayya (2010), confirmed very high levels of copper, nickel, chromium, iron and manganese in River Yamuna at Wazirpur industrial area. Soil and water at Okhla industrial area is also contaminated with the presence of high level of metal ions that are a major threat to both human and environmental health (Ahmad et al., 2011). Similarly Wath et al. (2011) has investigated the persistent alarming e-waste problem. Recently the National Green Tribunal issued warning of a very high level of air pollution in Capital Delhi.

The SMEs in India are crucial for the economy and a successful SME sector in future will determine the path of our future development. However, industrial pollution load is higher now with the surge in number of SMEs. SMEs, with high pollution loads, are blamed

to be responsible for contributing to the total pollution load of India. Significant loss of environmental resources can be seen in pursuit of economic growth in India for many years now. Many governments lead the country but could not contribute towards the improvement. Moreover, the environmental quality has deteriorated in the last few decades. Also, biodiversity losses, depleting ecosystem services causing growing shortages of critical natural resources (Singh and Bagchi, 2013). Today, when the air, water pollution and resource degradation parameters are judged, India is found to be the country with many of the world's most polluted cities (Sims, 2003).As reported by the Ministry of Environment and Forests (2009), overuse of capital resources such as water and timber is leading to worrying forecasts of environmental problems in India. There is a doubt over future resource availability. According to Taylor and Rahman (1996), it is also a concern that the costs related to human health rise due to environmental issues.

ISO 14001 is the most commonly adopted standard for environmental management systems globally (Montiel, Husted and Christmann, 2012; Bracke and Albrecht, 2007; Székely and Knirsch, 2005). By certifying to the standard, cleaner, healthier and safer products and workplaces can be achieved. It also leads to economic benefits and improved environmental outcomes (Tarí et al, 2012; Melynk et al., 2003; Lesourd and Schilizzi, 2001). So, ISO 14001 can be a better and popular option for waste minimization in SMEs in India. However, the efficacy of this certification is mixed when investigated empirically. Also, in developing countries, the efficacy of certified environmental management systems (EMS) has not been fully explored yet. In particular, information is limited regarding the efficacy of the ISO 14001 certification in IndianS MEs also. (Singh, Brueckner and Padhy, 2014; Potoski and Prakash, 2013; Prajogo et al., 2012).

Against the above detailed background, our study investigates whether ISO 14001 certification has any impact or not on actions by Indian SMEs to reduce waste, and thus influence their total environmental standing. This study is interdisciplinary guided by theories of Entrepreneurship and Operations management. On one hand, this study includes past entrepreneural research on enterprises' internal structure, decision making process, available environmental options, key drivers and barriers to adopt EMS based on regional circumstances (Comoglio and Botta, 2012; Burke and Gaughran, 2006; Malynk, Sroufe and Calantone, 2003; Iloomaki and Melanen, 2001) and on the otherhand, it evaluates if lean production/manufacturing due to EMS adoption improves operational performance (Jabbour et al., 2013; King and Lenox, 2001).

1.2 Problem statement of the study

According to reports of DCMSME (2009) businesses, especially micro, small and medium enterprises (MSMEs) are implicated for India's environmental problems. MSME sector is essential for India'seconomic performance, with approximately 60 million employees and contributes towards 35% of India's exports. However, MSMEs are also known to be the main contributor towards the most concerning environmental impacts. India's MSME sector is the fastest growing sector in the Indian economy and contributes 90% of all businesses existing in India.However this sector isthe most poorly organized, in frequently monitored and controlled (Rao, 2008). As per the reports of DCSME (2009) and Ministry of Environment and Forests (2009), the MSME sector therefore, unsurprisingly contributes highly i.e., around 70% of the nation's industrial pollution load. Mixed results have been seen as an initiative of the regulatory efforts. As advocated by Dasgupta (2000), there exists clear gap between policy making for MSME sector and its integration into the operations of the MSMEs. As stated above, the regulatory pursuit is poorly enforcemed and

compliance is low. This issue probably can be addressed by making a shift from command-and-control policies towards a market-oriented solution i.e., voluntary adoption of EMS-ISO 14001 as a measure to raise waste minimisation and thus increasing environmental performance of the SMEs. Our claim finds support from the study of Gupta and Goldar (2005) which finds that weak environmental performance of businesses results in negative abnormal returns of upto 30 %. The case of India is considered for this study. In India, where the monitoring and enforcement is weak (Qadir and Gorman 2008; Gupta and Goldar 2005; Murthy and Prasad 1999; Pargal et al. 1996) despite strong legal framework, these findings stress the financial loss of firms due to their poor environmental performance and so, the firms may voluntarily focus on environmental management. It is, thus, necessary to attend to the environmental issues faced by the SME sector and investigate how EMS can play a role in this context. However, the literature review reveals ais lack of empirical evidence to establish a stronger link between environmental performance and the certification (in this case, waste minimization).

1.3 Aim of the study

This thesis has focused on the question of whether a variation to the degree of waste reduction occurs among ISO 14001 certifying and non-certifying SMEs and if so, what factors contribute to it. The research is also aimed to provide valuable inputs to strengthen Government's environmental policy making efforts i.e., whether a changed strategy from a poorly monitored command-and-control to market-based (adoption of EMS-ISO 14001) will be useful in raising environmental performance of SMEs in terms of a measurable/tangible indicator i.e., waste minimisation. The aim of this research is also to develop a set of research parameters that can be replicated by other researchers in developing countries and also the rest of world while evaluating the relationship between EMS-ISO14001 and waste

minimisation. This will allow country-wide comparative studies.

1.4 Research questions/objectives of the study

Globally, ISO 14001 is most frequently used and the most widely recognised standard for environmental management systems (EMSs) (Montiel, Husted and Christmann, 2012; Bracke and Albrecht 2007; Székely and Knirsch, 2005). There are only a small number of empirical results available to support a correlation between EMS and improved environmental achievement. The discussion to date is mostly based on the theoretical assumptions and opinions (Steven et al., 2012). Many studies (mostly qualitative and other empirical studies) on the correlation between EMS-ISO14001 and environmental standing found a positive correlation between the two, however many of them are based on studies on certified SMEs instead of including both certified and non-certified SMEs in population and sample. Study of Potoski & Prakash (2013) and Nguyen and Hens (2015) from their empirical data analysis established a positive link between EMS-ISO 14001 and forms of air pollution. However, various studies have doubted the proposed disparities in environmental achievement when comparing ISO 14001 certified and non-certified firms (Zobel, 2013; Hertin et al., 2008; Barla, 2007). Studies on effectiveness of EMS have overall resulted in heterogeneous outcomes. This may be due to ineffective and insufficient empirical evaluation of EMS effectiveness (Ferenhof et al., 2014; Strasser, 2011). To provide more robust links between ISO 14001 adoption and certification with that of overall environmental achievement and waste reduction especially, further empirical research is required.

Thus, the thesis is organised to answer the following two research questions (RQ)

RQ1: DoesEMS-ISO14001status lead to waste minimization in Indian SMEs?

RQ2: Is waste minimization greater in ISO 14001 certified SMEs than that of uncertified SMEs?

Research Objective1: To answer RQ1, the 1st objective aims to evaluate the correlation between ISO 14001 certification and degree of waste minimization in SMEs in Delhi and Noida.

Research Objective2: To answer RQ2, the 2nd objective aims to compare the degree of waste minimization both in certifying and non-certifying SMEs in Delhi and Noida.

1.5 Approaches to the study

The purpose of this descriptive/diagnostic study is to propose a research agenda for EMS in the Indian SME context, inspired by the thus far seemingly limited response within this sector to the growing significance of EMS uptake and implementation for both environmental and commercial reasons. To this end, a review of the key literature on EMS in India is used to formulate a set of research hypotheses targeting existing knowledge gaps in the field (analysed through a gap analysis with the international EMS experience) and the development of a research framework to provide a platform for progress of this study in this area. The study allows pre-planned design for analysis with structured questionnaires for data collection. It needs to be recognized, however, that the SME sector is not homogenous. As noted by Hillary (2004, 568) research into SMEs often results in "*comparing not just apples and pears, but the whole fruit bowl."* For this reason, the focus here will be limited to "small and medium-sized enterprises" (SMEs) in Delhi and Noida with an annual turnover of over 1million rupees.

The above mentioned objectives are integrated into the conceptual research model that has also specifically considered the contextual factors.

1.6 Significance of the study

Industrial waste dumping and poor waste handling practices in India are problematic and contributing towards soil and groundwater pollution. This problem together with the

hazardous industrial wastes generated by the manufacturing industry is becoming a pressing issue that needs urgent attention. The pollution not only is causing human health problems but also leads to increasing concerns for Indian SMEs (see Hindustantimes, 2012; Wath et al., 2011; Saxena and Bhattacharyya, 2010; Gupta and Goldar, 2005; Moturi et al., 2004). Solid waste samples from five small-scale industrial sets in the area of National Capital Region, Delhi (covers NOIDA), that represents the regional spread of the industrial belt in Delhi, were collected and studied by Moturi et al., 2003. The result of this study shows high mean levels of toxic metals in all industrial area wastes. This is due to the presence of metal processing small scale industries. This is posing potential risk to the people living downstream with contaminated and poor quality water. Similarly, the study of Saxena and Bhattachayya (2010), confirmed very high levels of copper, nickel, chromium, iron and manganese in River Yamuna at Wazirpur industrial area. Soil and water at Okhla industrial area is also contaminated with the presence of high levels of metal ions that poses a major threat to the environment and human health (Ahmad et al., 2011). Similarly Wath et al., 2011 has investigated the persistent alarming e-waste problem.

The honorable Supreme Court of India said “we are sitting on a plastic time bomb.” Delhi alone produces 689.5 tonnes of plastic wastes per day out of which 40% are not recycled (Mahapatra, 2013). A study (Assocham study) warned that Delhi NCR will generate 50000 metric tons of waste per annum by 2015 (Sinha, 2013).Recently the National Green Tribunal issued a warning of a very high level of air pollution in Capital Delhi. Due to fast economic growth, waste in developing Asia is a problem and rising due to changed consumption patterns and social linkages whereas, initiatives to tackle this problem are not satisfactory (Ray, 2008).

From the growth and development point of view MSME has two controversial characteristics;

- They are the backbone of the Indian economy with their significant contribution to the Country's total GDP.
- They are the largest polluters (Chakrabarti and Mitra, 2005).

SMEs are under pressure to produce low environmenmental impact goods and services with changed operational strategies. The pressure comes from various stakeholders such as community, importers of their goods and services, governments (both national and international), NGOs and others. Key challenges faced by SMEs outlined in this study are;

Changes to entry-level strategies for potential growth in worldwide markets; absence of improved waste treatment and disposal techniques and facilities; pressure for legal compliance; problems in self-monitoring of operations or continuous improvement due to lack of resources (Singh et al., 2012).

In the wake of the waste problem in India and challenges faced by SMEs, this thesis investigates the role of environmental management systems in waste reduction.

This study is significant in understanding the state of EMS-ISO 14001 in Indian SMEs. The data presented here confirms the role of EMS-ISO 14001 certification in waste minimization in Indian SMEs thus setting an environmental agenda in the SME sector.

1.7 Operational definitions

We have defined the terms used in this study under this section.

1.7.1 Small and medium enterprises (SMEs)

Indian businesses are classified depending on the degree of investment in plant, machinery and equipment. Medium-sized enterprises are those who hold plant and machinery worth US$1.25 million to US$2.5 million and investment in equipment valued at US$0.5

million to US$1.5 million. Small enterprises comprise businesses with investment in plant and machinery of US$62 500 to US$1.25 million and investment in equipment of US$25 000 to US$0.5 million. Firms holding investment of plant and machinery of less than US$62 500 and of equipment up to US$25 000 are classified as micro enterprises (SMBDCI, 2012).

1.7.2 Definition of waste and waste minimization

Waste may be defined as a material that is non-useable use. It can be found in solid, liquid or gaseous form. However, according to About WMC (2015) the concept has evolved to "a resource at a wrong place".

WMC (2015) described waste minimisation (WM) as a creative strategy of thinking about products and processes that makes them continuous application of these strategies help reduce the wastes generation and emissions.

Natu (1999) proposed a waste audit (an internal examination of waste generation, storage, handling and disposal) rather than an environmental audit. Seiffert (2008) revealed some general practices having far-reaching environmental impacts. The project DESIRE (Van Barkel, 2004), based on the model PRISMA project in the Netherlands is the first project to examine applicability of WM for developing nations (Van Barkel, 1996). The audit methodology in the context of small sizedenterprises in India is based on eight practices including, input material review, good housekeeping, better process controls, equipment modification, technological improvement, on-site recovery and reuse, generation of useable by-products and product modifications (Van Berkel, 2004).

Waste minimisation has been chosen as an environmental measure to evaluate environmental performance of SMEs. This study, in line with Seiffert (2008, 1455) considers environmental components and related aspects to measure waste minimisation. The OECD definition of waste minimisation differs from that of waste prevention which includes

prevention, reduction at source and reuse of the products. Yet, the term includes waste prevention as well as *quality improvements* (such as reducing the hazardous waste) and *recycling* (EEA, 2002; OECD workshop, 1996).

Based on DEMING Cycle i.e., on the principles of Plan-Do-Check-Act, all the waste minimization methodologies work *(*About WMC, 2015).

1.7.3 Definition of environmental management system (EMS)

EMSs are to be understood as voluntary management systems for identifying, controlling and monitoring the potential environmental impacts of a company's activities. An EMS provides a company with a framework for setting and reaching environmental goals and targets consistent with its environmental policy. EMS uptake aims at delivering efficiency gains and a reduction in firms' overall environmental impacts by way of integrating responsibilities and practices into an overall management system. EMSs provide an ongoing process aimed at driving continuous improvements in company practices through the use of the PDCA (Plan, Do, Check, Act) model, a universal improvement methodology, aimed at constant improvement and learning. Ongoing monitoring and review of company practices are meant to ensure that learning occurs and that performance improvements are realised (Rondinelli & Vastag, 2000).

SMEs in our study are categorised into 3 types according to their EMS status as stated below and mainly categorised to subgroups ; 1. *SMEs certified to ISO 14001* and 2. *SMEs not certified to ISO 14001*.

SMEs with Formal/Certified EMS: Formal EMS certified to ISO 14001

SMEs with Formal EMS/Not Certified: Formal EMS integrated to company policy but not yet ISO 14001 certified