Chapter 1
INTRODUCTION

Supply Chain Management (SCM) has become vital in the business environment today. In its early years, SCM was narrowly conceived as the larger view of inventory management or operating cost reduction. In the 1990s, organizations and some specific industry segments began to recognize the much greater role and impact of SCM on their business operations. Recent work indicates a new evolution in SCM due to the diminishing boundaries between the internal and external organizations. This has proved especially important to manufacturing firms as it can help improve efficiency and provide better overall value to the customer.

Manufacturing industry is a driving force of many economies in the world. India has a vision for manufacturing to grow by 25% of Gross Domestic Product (GDP) by 2022. That is for manufacturing to grow 2-4% faster than the overall envisioned GDP (CII-BCG Report, 2012). India being one of the top ten manufacturing economies of the world (Sedani & Lakhe, 2011) and with promising advantages to become the ‘Germany of the East’, manufacturing practices should be built on solid foundations towards sustainability.

The two major paradigms that have made inroads into the sustainable supply chain are Lean and Green SCM practices. Hence it is the right time to dissect the implementation of these practices, their causal relationship and the impact of these practices on organisational performance.

1.1 Lean Supply Chain Management (LSCM)

Toyota production system forms the foundation for the principle of Lean which has been widely used as a core business strategy to create competitive advantage by big global corporations. Lean involves a fundamental paradigm shift from conventional “batch and queue” mass
production to product-aligned “one-piece flow” pull production. This shift requires highly controlled processes operated in a well maintained, ordered, and clean environment that includes principles of employee-involvement, systems and continual improvement. Common methods used in lean manufacturing include: Kaizen, 5S, Total Productive Maintenance (TPM), Cellular Manufacturing, Just-in-Time Production, Six Sigma, Pre-Production Planning (3P) and Lean Enterprise Supplier Networks.

Most manufacturing firms in the world have adopted some type of Lean initiative (Liker & Morgan, 2006) and the adoption level are accelerating in a fast pace to compete in the globalised economy (Gurumurthy and Kodali 2009; Upadhyay et al., 2010; APICS, 2004).

Lean thinking when extended to supply chain focuses on optimising the entire processes of the supply chain, searching for simplification, reducing waste and reducing activities that do not add value (Machado & Duarte, 2010). Lean SCM process comprises: i) identifying value; ii) determining the best sequence of value-creating steps, eliminating wastes; iii) performing activities without interruption when a customer requests them; and iv) improving the process continually (Venkat & Wakeland, 2006). Some of the identified Lean SCM practices are Demand management, Value addition, Process standardization, Industry standardization, Lean culture and Cross enterprise collaboration (Manrodt & Vitasek, 2008).

Recently globalization makes this concept highly significant to Indian manufacturers as the majority of the world’s manufacturing will be carried out in Asia, making India an integrated part of the Global supply chain (US-AEP, 1999). But this tremendous growth opportunity to the country also brings equal environmental challenges (Rao, 2002). Cost efficiency and environmental responsibility are not mutually exclusive, and with conscious implementation can be mutually enforcing (Duarte et al., 2011).
Developing a systems approach to understand how firms can best manage these paradigms to optimise the sustainable supply chain as a whole is important (Juin, 2011). Lean provides an excellent platform for broadening firms’ definition of waste to begin addressing environmental waste as well. Trade-offs between emissions and profitability may lead firms to explore new kinds of supply relationships, including the transfer of best practices to supply chain partners. The compatibility between Lean and Green paradigms represents a new way of thinking in the context of SCM.

This forces firms to understand that the value they provide to their customers is the sum of all the ‘value added’ along the supply chain. Organizations realize that they not only have to identify, understand, and manage issues within their organization, but also co-operate with other organizations in the supply chain to ensure that the issues are successfully managed throughout the supply chain. This new challenge and view on SCM has made lean and green paradigms interesting in making new management strategies, identifying new research agendas, and exploring a new knowledge domain.

Having established the importance of “green” thinking in a lean supply chain, it is essential to understand the concept of Green SCM.

1.2 Green Supply Chain Management (GSCM)

The increasing scarcity of resources, growing awareness among consumers, stringent laws that are more environment conscious and the natural impact on the environment are posing real challenges to firms today (Vachon & Klassen, 2006; Srivastava, 2007). Environmental management is implemented across the world by many firms (Krut & Karasin, 1999; Rao, 2002; GEMI, 2004) and has gained increasing attention among researchers and managers (Linton et al., 2007) and has been. This is termed as Green Supply Chain Management.
Adding the green component to supply chain management involves addressing the influence and relationships of supply chain management to the natural environment. According to Sarkis (1999), Ninlawan et al., (2010), GSCM = Green purchasing + Green manufacturing / materials management + Green Distribution / marketing + Reverse logistics. ‘Greening’ here refers to everything that is ecologically thought and it is considered as a process of integration of the environmental values into the supply chain (Mudgal et al., 2009; Svensson, 2007).

Green supply chains consider the environmental effects of all processes of a supply chain from the extraction of raw materials to the final disposal of goods. Within the Green supply chain each player motivates other players to go Green and provides the necessary information, support, and guidance. With this integration, Green Supply Chains will strive to achieve what any individual organization on their own could not achieve: minimized waste, minimized environmental impact while assuring maximized consumer satisfaction, and healthy profits (Efron, 2009; Hu & Hsu, 2010; Cervera & Flores, 2012).

In Indian scenario, organizations are taking steps to become environment friendly and going green (Bhateja, 2011). It has resulted in a growing need for integrating environmentally sound choices into the supply chain management practices. Indian manufacturers are concerned about the environmental issues under legislation and directives from the export market. Aside this many consumers, shareholders, and businesses are also becoming more attuned to and involved in the growing green movement.

A global survey conducted by Boston Consulting Group in 2009 among consumers quote that customers prefer firms to have good environmental records and are willing to pay a premium of 5 percent or more for green products. This shows that consumer demand for environmentally friendly
products has changed the attitude of the market (Srikanta, 2009). With customer loyalty shifting towards environmentally friendly products, businesses are increasingly trying to make their supply chains greener by introducing sustainability strategies.

Government policies in the country are also prohibiting products made from environmentally destructive materials and polluting processes. Foreseeing these paradigm changes, several supply chains have already developed systems of green supply chain management that may be many years ahead of or perhaps entirely out of reach for other supply chains (Juin, 2011). Organizations that involve suppliers and third parties in the greening process early than competitors gain a sustained competitive advantage that lasts into the future.

Some organizations have been able to convert public interest in Green issues into increased profits. A number of researches have shown that there is a clear link between improved environmental performance and financial gains (Hu & Hsu, 2010; Ninlawan et al., 2010; Zhu et al., 2007). Organizations that have looked to their supply chain have discovered areas where operational and environmental improvements can produce profits. For example, General Motors was reported to reduce disposal costs by $12 million by establishing a reusable container program with their suppliers (Darnall et al., 2008; Zhu et al., 2008; Toke et al., 2010). This envisages need to understand the impact of Green SCM practices on organizational, environmental and financial performance. Green is profitable, but more than that it is the right thing to do. This could be implemented effectively through sustainable supply chains.

Implementing Lean and Green sustainable supply chain improves profitability and enriches the social responsibility of the firm. But these practices are still in fragments across the industry and are considered
nascent. An in-depth study to understand the practices and their synergies for driving efficiency is of paramount importance.

1.3 **Integration of Lean and Green SCM practices towards sustainability**

Sustainability can be defined as: “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). The concept of sustainable development is made up of three areas: economic, social and environmental sustainability. In this research, Lean SCM and Green SCM practices in manufacturing firms have been given priorities as it can foster sustainability.

The Green paradigm has opened the gate for revisiting various established strategies of supply chain management with a new lens of sustainability. The concept of “lean manufacturing” is also widening to the new concepts of the “lean enterprise” in order to optimise performance and improve competitive advantage. Lean and Green are generally considered alone or in isolation within the supply chain. However, in recent years, a more complex strategy of ‘eco-efficiency’ or ‘lean-and-green’ approach to SCM has evolved (Juin, 2011). This type of strategy derives benefits beyond mere regulatory compliance and helps members of the supply chain meet better efficiency and profits.

Lean manufacturing and green supply chain management have at times been complementary and have some potential conflict. For example lean strategies that require just-in-time delivery of small lot sizes require increased transportation, packaging, and handling that may contradict a green approach (Mulich, 2012). Simultaneously, Value stream Mapping,
with the traditional definition of lean was considered to include environmental wastes.

While higher levels of environmental performance can be achieved through the green practices, lean will result in lower material and labour cost and greater production revenues, which leads to a profitable organisation. In spite of these contradictions and similarities, lean and green initiatives in supply chain can enable organisations to develop a sustainable supply chain. This research work addresses Lean supply chain management and its concurrence with Green supply chain management. The research is also an attempt to prove empirically that these practices have the potential to improve significantly the firm’s environmental and financial performance.

The research tries to identify key drivers or motivators to green supply chain initiatives in the Indian context. It is about coordinating Lean with Green Supply chain management and in turn fostering the culture of continuous improvement in organizations so as to encourage people to improve overall performance and lead organizations towards sustainability.

1.4 Need for the Study

The research aims to validate the relationship between Lean and Green in supply chain management and their contribution to the organisational performance. Discussions and investigation are very limited in the literature on Lean Adoption, ISO 14001 certification, Green drivers, Lean and Green SCM practices across industries in the Indian context. It is still a wide area to be explored. Further the performance outcome in terms of environmental and financial performance has not been thoroughly examined. There is a need for an empirical research in this context.
Four potential gaps in the literature attempted to be addressed are;

1. The focus on Lean and Green SCM practices has been in isolated context and very minimal work on the combination of both is attempted.

2. Very little studies on Lean and Green SCM practice and their impact on organisational performance has been done in Indian context.

3. There has been hardly any comprehensive research on building and validating models on Lean and Green SCM practices and their impact on organizational performance.

4. Metrics to measure the Lean and Green SCM practices varied across researchers and most of them were based on individual firms.

The purpose of the research was to address the above gaps. Investigation of the relationship between Lean adoption, ISO 14001 certification, Lean SCM practices, Green drivers, Green support practices, Green SCM practices and Organisational performance has been carried out at the firm level unit of analysis to address the gaps.

The goal is to maximize the conscious implementation of lean and green by raising the awareness of the linkage between lean and green on the organisational performance. The researcher asserts that the potential benefit of linking Lean and Green is an efficiency driven strategy for organizations towards sustainability.

The research is of importance as the proposed framework is expected to uncover many neglected relationships that are of interest to managers. This could further encourage managers to implement these practices and improve the organization’s sustainability.
1.5 Objective

To fill the research gaps and derive at a model integrating Lean and Green SCM practices the objectives of the research are:

1. To assess whether the relationship between Lean adoption with Lean SCM practices, Green drivers, Green support practices, Green SCM practices and Organizational performance is explained by ISO 14001 certification.

2. To develop a model of Causal relationship between Green drivers, Green support practice, Green SCM practices, Lean SCM practices and Organizational performance.

1.6 Organization of the Thesis

To substantiate the above objective the research work was carried out and presented as follows,

1. Chapter 1, introduces the background information identifying the research gap, research objectives and its contribution to knowledge.

2. Chapter 2, presents the relevant review that best describes Lean adoption, Lean SCM practices, Green drivers, Green SCM practices, and organizational performance.

3. Chapter 3, indicates the constructs, the conceptual model and the hypotheses. It describes the methodology used to empirically validate the conceptual model and test the hypotheses: development of the research instrument, test for validity and reliability, selection of participants, data collection methods and statistical tool used for data analysis.
4. Chapter 4, reports the results of the preliminary data analysis, the statistical hypotheses testing with interpretations of the results derived from the model.

5. Chapter 5, the conclusion highlights the findings and discussion, contribution and implications, limitations and suggestions for future research.