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Antecedents and Enablers of Green Supply Chain Practices

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1. Introduction

It has been observed that firm's focus on generic strategies (Porter, 1980) and on their core competencies (Prahalad & Hamel, 1990) by outsourcing their non-core activities and production of low value and low-technological parts and sub-assemblies to lower cost providers. Around 75 percent of the content of products are sourced from outside the original equipment manufacture (Trent, 2004) hence supply chain is considered as the vital part of contemporary organization (Miles and Snow, 2007). Manufacturers also compete on cost (Hayes & Wheelwright, 1984). This outsourcing has lead to manufacturers transferring production to low-cost economies.

By outsourcing production firms reduce costs. However this creates other challenges. One of these is high cost due to the need to transport these outsourced goods, the environmental impact becomes greater (Green et al, 1996). Legislative and regulatory compliance requires organisations to become greener and reduce environment impact. Thus firms are focusing on green supply chain practices (GSCP).

The companies concentrate on customer-supplier relationship and sometimes green supply chain issues are ignored. There is a focus on customer-supplier relationships in which close long-term co-operation simultaneously increases the value produced by the demand chain and decreases the overall cost of the chain (Lambert et al., 1996; Cooper et al., 1997; Bensaou, 1999). However this decrease in overall cost of chain can affect the green supply chain practices.

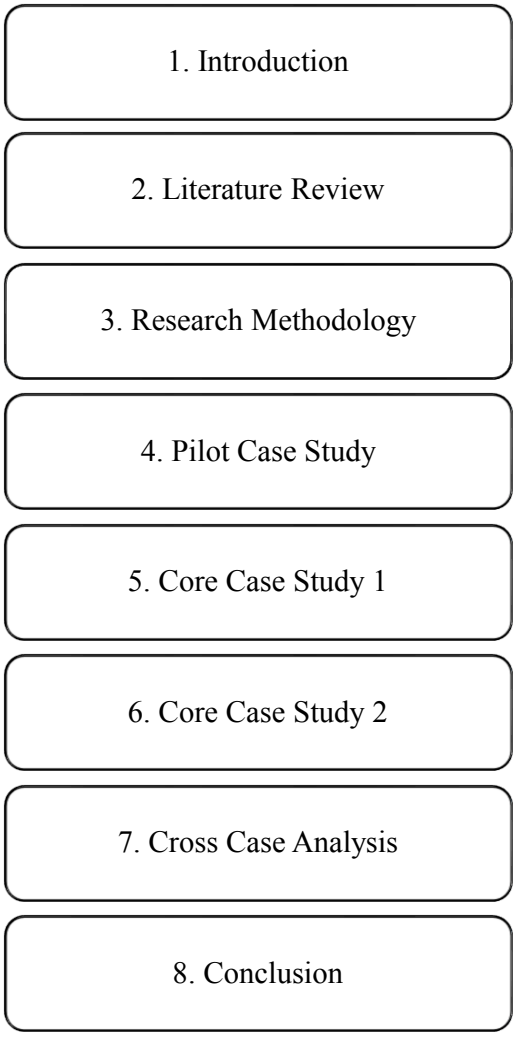
At the supply chain level, organizations that involve suppliers and third parties in the greening process early and well in advance of competitors start a development path that may provide a *sustained* competitive advantage that lasts well into the future (Simpson & Samson, 2008). Hence it is very important for the organizations to involve the vendors, supplier and third parties in their greening process.

There is immense pressure on the manufacturing organizations to go greener and reduce the impact on environment. Organizations are continuously monitoring their practises by implementing environmental collaboration with customers and suppliers and also by using environmental technologies (Vachon, 2010).

There is wide range of literature available on different aspects and issues of green supply chain practices; green design (Zhang *et al*. 1997), green manufacturing and product recovery (Guide *et al*. 1996; Gungor and Gupta 1999), reverse logistics (Carter and Ellram 1998; Fleischmann *et al*. 1997), production planning and control for remanufacturing (Bras and McIntosh 1999; Guide 2000) and logistics networks redesign (Jayaraman *et al*. 2003). However, not much work has been done on the antecedents and enablers of green supply chain practices. It is the emerging issue and hence this research examines and focuses on the antecedents and enablers of green supply chain practices.

The structure of thesis is illustrated in figure 1.1. Thesis involves, one pilot case study, two core cases and cross case analysis. The thesis starts with introduction and literature review and progress on to research methodology in chapter 3.

Figure 1.1: Structure of thesis



2. Literature Review

2.1 Introduction

This chapter presents the key definition of supply chain, sustainability, sustainable supply chain, green supply chain and a thorough literature on them.

2.2 Supply Chain

2.2.1 Definition

There are multitudes of definitions; some of them even don't use the term supply chain. Whilst there are some subtle differences between the competing definitions, the core concepts are the same. Supply chain is mostly linked from the raw material to the end customers.

Saunders (1995) suggested that supply chain is the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers.

Mentzer *et* al (2001, p4) defines supply chain as:

"It is a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer".

These three entities are raw material suppliers, manufacturing organization and distributor. However they didn't discuss about the control and feedback system in supply chain. Recycle of the used products and remanufacture issues were also not touched, which can add to some more entities in the supply chain. There are different angles from which the supply chain discipline can be explored. It has been explored from the perspectives of Logistics (Christopher, 1992; Harrison and Van Hoek, 2002), Close loop supply chain (Beamon, 1999; Seuring, 2004).

Firm survival in the modern business environment is no longer an issue of one firm competing against another firm but has, instead, become an issue of one supply chain competing against another supply chain (Fine, 1998). Hence academicians and practitioners explored new issues in supply chain, for example, supply chain risks (Chopra and Sodhi, 2004), resilience (Sheffi and Rice, 2005), and business continuity planning (Zsidisin *et* al., 2005). Hence supply chain is expanding and new issues are emerging. Supply chain has gained increased attention from scholars from a variety of academic disciplines adding to the breadth and depth of knowledge and theory development within the field (Cousins *et* al., 2006). Supply chain as an academic discipline and supply chain design are discussed in the next section.

2.2.2 Supply Chain as an Academic Discipline

Supply chain, as a separate discipline is not very old, it can be traced back to just before the 1960s. Increased study of the field began in the 1980s, with a dramatic increase in the publication rate since 1990 (Huan *et* al., 2004) and incorporation in business school educational programs (Ballou, 2007).

It has now been at least two decades since Supply chain began to receive serious attention, with scholars arguing that purchasing, as it was then known, be regarded as a key area of academic study and practitioner focus (Burt DNS, 1985; Fearon, 1989). Kraljic (1983) shifted the debate from practical issues of purchasing to strategic issues and introduced concepts and strategies, such as category management, leveraging and relationship management, into common business parlance. The introduction of lean manufacturing (Womack *et al*., 1990) helped shift the focus, considering not only how the production process could be optimised, but also how this was constrained by supply chain activities. Lean supply techniques were introduced including supplier tiers, collaboration, joint design and development, and supplier associations (Lamming, 1993; Rich and Hines, 1997).

Research in supply chain consists of operational issues, design issues (Tan, 2002; Huan *et al*., 2004) and strategic decision issues (Lambert and Cooper, 2000). Operational issues concerns with the daily operation of facilities such as inventory management, production, planning, and scheduling (Lederer and Li, 1997). These operational issues play a vital role in day-to-day operation and can improve the

operational efficiency. Different approaches and techniques are available for inventory management, production, planning and scheduling activities.

Supply chain disruption and risk are also emerging area of supply chain. Supply chain disruptions are unplanned and unanticipated events that disrupt the normal flow of goods and materials within a supply chain (Stevensson, 2000; Hendricks & Singhal, 2003; Kleindorfer & Saad, 2005). Hence supply chain is emerging as interdisciplinary disciple, and its boundaries are stretching.

2.2.3 Supply Chain Design and Methods

Recently, there has been increasing attention placed on the design and analysis of the supply chain as a whole. This attention is largely a result of the rising costs of manufacturing, the shrinking resources of manufacturing bases, shortened product life cycles, and the globalization of market economies (Beamon, 1998).

Design of the supply chain focuses on the location of decision spots and the objectives of the chain (Mourits and Evers, 1995). The main concern is to optimize the whole supply chain and stochastic analytical models (Lee *et* al., 1993), economic models (Christy and Grout, 1994), and simulation models (Towill, 1991) are used for this purpose.

Strategic decisions are made by business managers, which require understanding the dynamics of a supply chain and development of objectives for the whole chain (Gopal, 1992). This also includes critical evaluation of alternative supply chain configurations and partnerships and also look for the opportunities to enhance the competitiveness of the firm.

Many analytical and numerical models, stemming from conventional business and engineering principles, have been proposed to handle supply chain operational and design issues (Chopra and Meindl, 2004). However, to deal with strategic decision issues the models are scare because they need to address in entire supply chain (Huang *et* al., 2004).

Later, researchers introduced the terms Planning and control of material (Jones and Riley, 1997; Ellram, 1991) and discussed upstream, downstream linkage and services (Christopher, 1992; Harland, 1994). The control came in to the picture due to cost efficiency. Organizations were focusing on controlling the flow of products. However, the control was not clear in terms of inside the organization or in the complete supply chain.

Supply chain has been explained; we have now supply chain management as supply chain's need to be managed.

2.3 Supply Chain Management (SCM)

2.3.1 Definition

Supply chain management is much more problematic to define. Indicative of the field's immature nature, the discipline lacks 'consensual definition' clearly evidenced in a recent literature review by Burgess, Singh & Koroglu (2006) who found that only a quarter of the authors used existing definitions, and within this subgroup there was no clear convergence on a single definition. Some authors termed it as integrative philosophy, synchronization with customers (Stevens, 1989), while others linked it with the management of upstream and downstream relationship with suppliers and customers as stated below:

- 'Supply chain management is an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user' (Cooper *et* al., 1997, p2)

- 'The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole' (Mentzer *et* al., 2001, p4)

- 'The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole' (Christopher, 2005, p5)

- ‘Supply chain management is a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide costs while satisfying service level requirements’ (Levi *et* al., 2009, p7)

The different approaches and ideas in supply chain management make it difficult to have a standard definition. It is often depicted as a series of characteristics
In all the above definitions, the Key features identified are shown in Table 2.1:

Table 2.1: Key features in supply chain management

Authors / Source	**Key Features**				
	Integrative Philosophy	Strategic coordination	Upstream, Downstream management	Customers Satisfaction	Synchronize with customers
Stevens (1989)	✓			✓	✓
Cooper *et* al. (1997)	✓		✓		
Mentzer *et* al. (2001)		✓	✓		
Christopher (2005)			✓	✓	
Levi *et* al. (2009)	✓			✓	✓

In addition to these seminal works as discussed in Table 2.1, there have been many attempts at defining the supply chain management. Whilst there are some subtle differences between the competing definitions, the core concepts are the same. Indeed there is greater consensus in defining the supply chain management, which consist of managing upstream and downstream management. Customer satisfaction is another aspect, which is echoed by most of the authors.

2.3.2 Rationale for SCM

Supply chain management looks across the entire channel, rather than just at the next level (Chopra and Meindl, 2004). So the supply chain management involves the management of flows between and among stages. The main reasons for supply chain management were to reduce the inventory investment and to increase customer service (Cooper and Ellram, 1993).

The impact of supply chain management extends beyond reducing costs (Lambert and Cooper, 2000; Ellram and Liu, 2002). It has been suggested that excellence in managing supply chains is directly linked to superior organizational performance (Ellram *et* al., 2002; Christopher, 2005; Johnson and Templar, 2009).

In the late 90's the focus was on supply chain management as integrative approach and on networks (Cooper *et* al., 1997; Lee and Ng, 1997; Handfield and Nichols, 1999). The focus was more on optimization of networks and to find the optimum path for logistics and transportation. The last decade saw the emergence of the customer focused approach and supply chain was focused on service level and cost minimization (Ayers, 2001).

The increasing competition and importance of supply chain management has forced the organizations to move their supply chain to low cost economies which result in to longer transportation time and increase in emission. This increasing emission has adverse affect on environment, which lead the organization to focus on sustainability. Sustainability is critically discussed in the next section.

2.4 Sustainability

2.4.1 Definition: Sustainability

Sustainability practices find its roots in the ancient cultures. Recent attention to environmental issues and sustainability can be found in the works of many economist and philosophers and they said that we are locked in a system of 'fouling our own nest' by dumping chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air (Harding, 1968). Moreover sustainability was always an emerging concern to the policy makers and in last decade, there was an enormous amount of concern towards sustainability issues, in the Brundtland report (UN, 1987).

More recently a steady increase can be seen in both public and private sector recognition of the need to conserve and protect the environment as a societal issue (Ball, 2004; Corey, 2005; and Bodansky *et* al., 2004). The main focus is to safeguard the interest of future generations to come. Many researchers echo the three pillars of sustainability (social, environmental and economic) as first mentioned in the Brundtland report. The key sustainability definitions are summarised in Table 2.2.

Table 2.2: Key sustainability definitions

Source / Author	**Key features in sustainability definition**
Brundtland Report (1987)	Using resources to meet the needs of the present without compromising the ability of future generations to meet their own needs
Sikdar (2003)	A wise balance among economic development, environmental stewardship, and social equity
Elkington (2004)	A macro-viewpoint on supply chains and balance between the environmental, social and economic dimensions
Carter and Rogers (2008)	An integration of social, environmental, and economic issues

2.4.2 Synthesis

Sustainability as discussed above in Table 2, is consist of three pillars (social, environmental and economic). The Brundtland report (1987) forms the basis of the most popular definition of sustainability and focuses on the well being of future generation to come. The main idea of three dimension of sustainability is considered as most prevalent (Elkington, 2004 and Carter & Rogers, 2008).

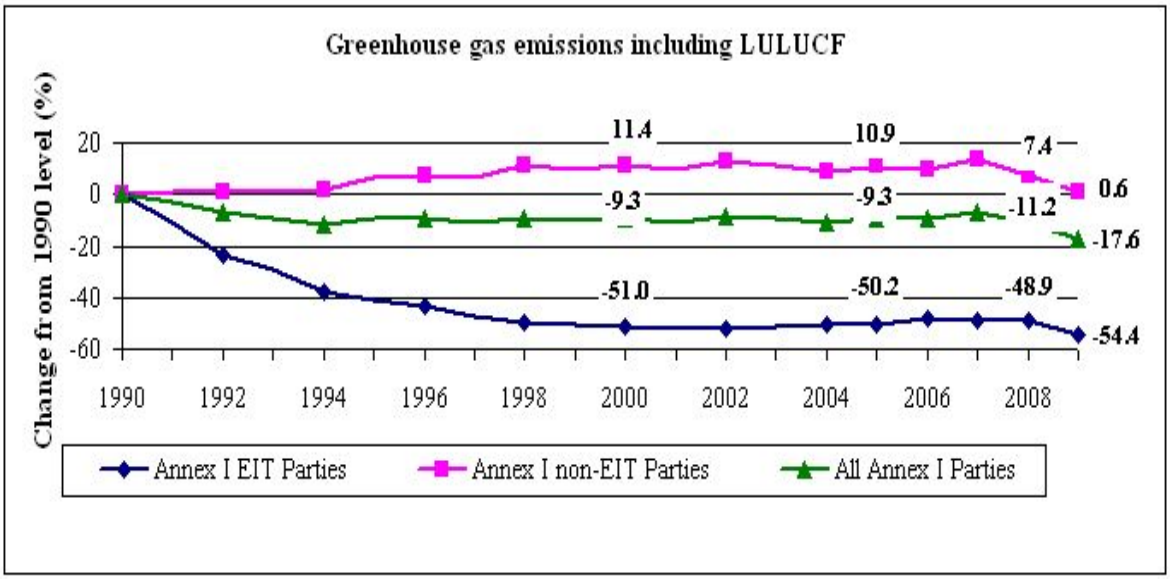
The new initiatives being proposed or adopted by both the public and private sectors, such as Cisco system's value recovery program and Wal-Mart's sustainability program to create zero waste and to sell products that sustain the environment (Hoek and Johnson, 2010). So, organizations in many sectors are working to inculcate the sustainability practices in their operations and which may lead them to gain competitive advantage (Porter and van der Linde (1995a,b).

2.4.3 Background

After the Brundtland report in 1987, the next big treaty and protocol adapted in 1997 was the Kyoto protocol. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing Greenhouse Gas (GHG) emissions. Under the treaty, industrialised countries signed up to reduce their emissions of greenhouse gases by at least 5% from 1990 levels during the period 2008- 2012 (UNFCCC, 2011) **(Appendix 1).**

Figure 2.1, illustrates key Greenhouse gas emission trends for Annexure 1 (Industrialised) countries based on the latest UNFCCC publication.

Figure 2.1: Greenhouse gas emission Trends



- From 1990 to 2009, total aggregate GHG emissions including LULUCF decreased by 17.6 per cent, from 17,673.8 to 14,560.5 Tg (Tetragram) CO2 equivalent. One teragram (Tg) equals one million tonnes.
- For Annex I Parties with economies in transition (Annex I EIT Parties), GHG emissions including LULUCF decreased by 54.4 per cent. From 2000 to 2009.
- For Annex I non-EIT Parties, GHG emissions increased by 0.6 per cent including LULUCF from 1990 to 2009.

In figure1, EIT means Economies in Transition and LULUCF means land use, land-use change and forestry (LULUCF) activities. These affect changes in carbon stocks between the carbon pools of the terrestrial ecosystem and between the terrestrial ecosystem and the atmosphere. The figure is for Annex 1 parties, which include the European Union countries and countries with economies in transition.

In accordance with Climate Change Convention, and the relevant decisions of the Conference of the Parties, countries that are Parties to the Convention submit national greenhouse gas (GHG) inventories to the Climate Change secretariat. These submissions are made in accordance with the reporting requirements adopted under the Convention, such as The UNFCCC Reporting Guidelines.

2.4.4 Sustainable Development

Man made carbon emissions have grown dramatically since the dawn of the industrial age, increasing from 200 million tons of annual CO_2 emissions in 1850, to over 30 billion annual tons by 2008 (Centre for climate and energy solutions, 2010). Driven by concerns with the impact of industrial activity on climate change, there has been considerable activity in the past decade directed towards measuring and limiting man-made emissions of the primary greenhouse gases (GHG), CO_2, Methane and N_2O. For example, Mark and Spencer (M&S) launched 'Plan A' in 2007 to become world's most sustainable retailer by 2015. According to Marks and Spencer (M&S) corporate:

"Plan A is about systematically making every aspect of our business, our supply chain and customer use and disposal of our products more sustainable" (Marksandspencer, 2010, p 6).

Marks and Spencer consider supply chain as an important constituent of their business and their 'Plan A' has the target to make logistics and warehousing 35% more efficient and reducing refrigeration carbon footprints by 50 %.

Supply chain is an important part of any organization's operations and it constitutes a major portion of overall operations hence sustainable supply chain practices are the major focus for the organizations. In the following section, I will discuss sustainable supply chain management.

2.5 Sustainable Supply Chain Management

Sustainable Supply Chain Management (SSCM) is linked with supply chain management and environment management. SSCM integrates environment thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life (Srivastava, 2007). Hence it involves sustainability in the entire supply chain starting from raw material sourcing to the final consumption. The awareness and the government regulations are also big factors in prompting the organizations to take necessary steps towards sustainability and supply chain is a major department in the same direction (Ashford, 2002; UNEP, 2002).

The interaction between sustainability and supply chains is the critical next step from recent examinations of operations and the environment (Corbett and Kleindorfer, 2003) and operations and sustainability (Kleindorfer *et* al., 2005).

A focus on supply chains is a step towards the broader adoption and development of sustainable supply chain, since the supply chain considers the product from initial processing of raw materials to delivery to the customer (Linton *et* al., 2007). Supply chain is crucial from the first stage (raw material processing) to the delivery of end customer and now to recollection, recycle and remanufacturing of the product. However, sustainable supply chain should also focus on the issues, which are beyond the normal supply chain management: product design, manufacturing by-products, by-products produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life.

Lee and Rhee (2007) developed four types of environmental strategies; reactive, focused, opportunistic, and proactive. Reactive strategies are applied for low levels of environmental responsiveness, focused strategies are applied for high levels of environmental management opportunistic strategies are applied for a medium level and proactive strategies are applied to the latest environmental practices.

Research showed that organizations could achieve their business goals and also reduces environmental impact (Melnyk *et* al., 2003). However, there is no guarantee

that all the investment in sustainable practices will bring cost savings and ultimately generate profit. This becomes a major issue when the investment in sustainable supply chain practice is proactive, and then it may not pay off for decades (Wu and Pagell, 2011). However, there are some organizations, which take bold sustainable supply chain action at the expense of the financial health of the organization. But it is a risky proposition, sometimes it pays off in the future and sometimes it does not. I argue that it depends upon the mission and vision of the organization; what does an organization want to achieve in long run? Moreover, sometimes organizations change their decisions mid-way depending upon various internal and external factors and these organizations operate in a dynamic and complex setting (Devinney, 2009).

There is a wide range of literature available on different aspects and issues of sustainable supply chain management. These include green design (Zhang *et* al., 1997), green manufacturing and product recovery (Guide *et* al., 1996; Gungor and Gupta 1999), reverse logistics (Carter and Ellram 1998; Fleischmann *et* al., 1997), production planning and control for remanufacturing (Bras and McIntosh 1999; Guide, 2000) and logistics networks redesign (Jayaraman *et* al., 2003). These aspects and issues come together and form sustainable supply chain practices, which can be used in alignment with other practices. In the following section I will explore more about sustainable supply chain practices.

2.5.1 Sustainable Supply Chain Practices

To reduce environmental impact there are sustainable supply chain practices which affect the organization in the short-term and also in long-term. It has been suggested that life cycle assessment are used to design a product to minimize the environmental impact over it's life and afterwards (Pennington *et* al., 2004). This is a step towards sustainable supply chain practices. Sustainability is also an emerging issue, which is linked with supplier selection (Upadhyay, 2012); Buyers are looking for sustainable suppliers and prefer suppliers who match with their sustainable practices. Innovative suppliers must continue to try to align their practices with the buyer's sustainable practices (Upadhyay et al., 2012).

Sustainable supply chains require awareness about sustainable practices like ethical sourcing (Roberts, 2003), green purchasing (Rao and Holt, 2005), environmental

purchasing (Min and Galle, 1997), and logistics social responsibility (Carter and Jennings, 2002). Different sustainable practices cover the specific area in supply chain. Moreover, it also defines the boundaries for every unique practice and it's effect on the whole supply chain. I argue here that it's not possible and appropriate to implement all the sustainable supply chain practices in an organization. These practices are sometimes specific-to-specific domain areas.

At the supply chain level, organizations that involve suppliers and third parties in the sustainable process early—and well in advance of competitors—start a development path that may provide a sustained competitive advantage that lasts well into the future (Simpson and Samson, 2008). Hence it is very important for the organizations to involve the vendors, supplier and third parties in their sustainability process. There is immense pressure on the manufacturing organizations to go greener and reduce the impact on the environment. Organizations are continuously monitoring their practises by implementing environmental collaboration with customers and suppliers and also by using environmental technologies (Vachon, 2010). These include certification of their suppliers and evaluating the new supplier's on the basis of their contribution towards the organization's sustainability goal. Remanufacturing and recycling of used products is also a major concern for organizations. There are various practices, which are used for green supply chain management. In the following section, green supply chain management is discussed.

2.6 Green Supply Chain Management (GSCM)

Green Supply Chain Management (GSCM) is a broad term which covers activities such as green design, green sourcing/procurement, green operations or green manufacturing', 'green distribution, logistics'/marketing' and 'reverse logistics' (Srivastava, 2007). However, the green supply chain management concept also covers all phases of a product's life cycle, from the extraction of raw materials through the design, production, and distribution phases, to the use of the product by consumers and its disposal at the end of the product's life cycle (Walker *et* al., 2008; Hervani *et* al., 2005). Innovation is also linked with the green supply chain management (Green *et* al., 1996) linked innovation in supply chain management and industrial purchasing in context of the environment. Hence industrial purchasing also come in to the picture and also play an important role in environmental context (Narasimhan and Carter,

1998). The main concepts and key definitions of green supply chain management are shown in Table 2.3.

Table 2.3: Key definitions of green supply chain management.

Source / Author	Key Features
Green *et* al. (1996)	Innovations in supply chain management and industrial purchasing in the context of the environment
Godfrey (1998)	Monitoring and improving environmental performance in the supply chain
Narasimhan and Carter (1998)	Involvement of Purchasing function in reduction, recycling, reuse and the substitution of material activities

Each view emphasizes improving environmental performance in the supply chain. All embrace involvement of purchasing in the context of improving the environmental condition.

Improvement of environmental performance is only possible after it is monitored. The concept of monitoring and improving of environmental performance in supply chain was echoed by Godfrey (1998). The main focus in green supply chain management is on the improvement of environmental performance and how to improve the environmental performance is major concern. Environmental performance can .be improved by following some internal and external practices.

Zhu and Sarkis (2004) discussed the broad perspective of Green supply chain management and include internal and external practices that play a vital role in greening the supply chain and they developed four categories for Green supply chain practices; internal environment management, external green supply chain management practice, investment recovery and eco-design as shown in Table 2.4.

Table 2.4: Categories of green supply chain management from literature (Zhu and Sarkis, 2004)

Categories	**Key Features**
Internal environmental management	• Commitment of GSCM by senior managers • Support for GSCM by mid-level managers • Cross-functional cooperation for environmental improvements • Total quality environmental management • Environmental compliance and auditing programs ISO 14001 certification • Environmental management systems
External green supply chain management (GSCM) practices	• Providing design specification to suppliers that include environmental requirements for purchased item • Cooperation with suppliers for environmental objectives • Environmental audit for suppliers' internal management Suppliers' ISO14000 certification • Second-tier supplier environmentally friendly practice evaluation • Cooperation with customer for eco-design • Cooperation with customers for green packaging
Investment recovery	• Investment recovery (sale) of excess inventories / materials • Sale of scrap and used materials • Sale of excess capital equipment
Eco-design	• Design of products for reduced consumption of material/energy • Design of products for reuse, recycle, recovery of material, component parts • To avoid or reduce use of hazardous Products

As in Table 2.4, the main features of internal environmental management consist of commitment and cooperation from management, ISO 14000 certification and environmental management system. The main features of external green supply chain management are guidelines and check for suppliers and customers. These help the customers and suppliers to become more environmental friendly. Investment recovery deals with the sale of excess inventories and eco-design focus on reducing the consumption of energy. The next step in green supply chain management is green supply chain practices, which are followed in next section.

2.7 Green Supply Chain Practices (GSCP)

2.7.1 Definition

Several papers discuss environmental issues in the supply chain (Bowen *et* al., 2001; Zhu and Sarkis, 2004). However, a clear and widely accepted definition of green supply chain practices is lacking (Klassen and Johnson, 2004). There is no such specific definition for green supply chain practices hence different authors give the common characteristics of green supply chain practices.

Lately, the internalization / externalization framework from the international management literature (Buckley and Casson, 1976) was proposed as a theoretical foundation to categorize environmental management in the supply chain (Vachon and Klassen, 2006a). The framework, which was also used recently to characterize supplier development activities (Krause *et* al., 2000) and corporate social responsibility (Husted, 2003), suggests that organizations can either conduct activities through markets (externalizing) or by incorporating those activities within the organization hierarchy (internalizing). Using a similar premise, Vachon and Klassen, (2006a) put forward the concept of green supply chain practices, which comprise two sets of related yet independent environmental activities: Environmental collaboration and environmental monitoring. Hence, an organization's green supply chain practices imply:

1. Internalizing by integrating its environmental management activities with other organizations in the supply chain or

2. Externalizing environmental management in the supply chain by employing market-based mechanisms. The former is termed environmental collaboration while the latter is environmental monitoring (Vachon and Klassen, 2006a).

2.7.2 Types of Green Supply Chain Practices

The most comprehensive set of green supply chain practices comprises environmental collaboration (internalizing by integrating its environmental management activities with other organizations in the supply chain) and environmental monitoring (externalizing environmental management in the supply chain by employing market-based mechanisms) as suggested by Vachon and Klassen (2006). However, its still not clear that which activities an organization should internalize or externalize with other organizations in supply chain.

For supply chain management, boundary spanning environmental practices remains particularly challenging, as two or more organizations actively work to coordinate and integrate their management and technological systems are called green supply chain practices (Klassen and Johnson, 2006) as shown below.

1. Environmental certification
2. Pollution prevention
3. Life cycle assessment (LCA)
4. Design for the environment
5. Reverse logistics

Here the important thing is that two or more organizations come together to work on environmental issues and coordinate and integrate their systems. Mostly one organization is supplier and other organization is customer. Hence their internal and external environmental issues are linked with each other. Internal environmental issues are commitment and cooperation from management, certification and internal environmental system. These internal issues can be shared with the other organizations to get help and feedback.

To implement green supply chain practices properly the customers and suppliers should align their environmental practices and integrate their system. There are

different views on classifying the green supply chain practices and Zhu and Sarkis (2005) classified the green supply chain practices in five different ways shown below.

1. Internal environmental management
2. Green Purchasing
3. Cooperation with customer including environment requirement
4. Investment recovery
5. Eco-design practices

2.7.3 Total Green Supply Chain Practices

These include the four factors, which were earlier discussed by Zhu and Sarkis. Green purchasing is new addition to the green supply chain practices. Industrial purchasing is taking centre stage due to innovation in supply chain (Green *et* al., 1996) and is playing a vital role in green supply chain management. To get the more clear idea of green supply chain practices, significant green supply chain practices are put together. In total there are ten green supply chain practices as mentioned by Klassen and Johnson (2006) and Zhu and Sarkis (2005) and these are shown below.

1. Environmental certification
2. Pollution prevention
3. Life cycle assessment (LCA)
4. Design for the environment
5. Reverse logistics
6. Internal environmental management
7. Green Purchasing
8. Cooperation with customer including environment requirement
9. Investment recovery
10. Eco-design practices

GSCM has emerged as an effective management tool and philosophy for proactive and leading manufacturing organizations. The scope of GSCM practices implementation ranges from green purchasing (GP) to integrated life-cycle management supply chains flowing from supplier, through to manufacturer, customer, and closing the loop with reverse logistics. Similar to the concept of supply chain

management, the boundary of GSCM is dependent on goals and the problems at hand, e.g., should it be just the procurement stage or the full logistics channel that is to be investigated (Lai *et* al., 2004)?

In the following sections, the individual green supply chain practices are discussed.

2.7.3.1 Environmental Certification

There are increasing array of voluntary standards, certification protocols and codes of practice have emerged to ensure that management is addressing environmental consideration and improving environmental performance. These certifications can take on various forms, ranging from product specific eco-labels, which may rely on a comparative environmental Life Cycle Assessment (LCA), to management-based practices that employ third-party audits (International Institute for Sustainable Development, 2001). This can be used to position products and services with customers, as well as select preferred suppliers. The standard have been developed for the management systems that underlie effective environmental management rather than individual products. ISO 14001 is from International Organization for Standardization and now it has expanded to become a family of over twenty standards that cover aspects of any strong environmental management system (i.e. 14001), including auditing (14011), labelling (14021), performance evaluation (14031), and LCA (14040). In many ways, ISO 14000 parallels the ISO 9000 quality standard (Puri, 1996). As a result, ISO 14000 has encouraged the application of continuous improvement models such as plan-do-check-act (PDCA) to foster environmental improvement.

2.7.3.2 Pollution Prevention

Environmental performance can be improved by capturing pollutants. Capturing and treatment of pollutants and harmful by-products at the various stages of supply chain is called pollution control. In contrast, pollution prevention emphasizes approaches that involve fundamental changes to the basic product or manufacturing processes along the supply chain. Pollution prevention reduces or eliminates pollutants by using cleaner alternatives than traditional means (Freeman et al., 1992; OECD, 1995). Pollution prevention requires concerted efforts that extend beyond the manufacturing operations of a single plant to suppliers and buyers, or even across a broader supply

chain network. Thus, stronger supply chain integration allows supplier's greater access and influence in downstream operations, and can leverage supplier expertise to improve implementation of the more environmentally friendly product or process configuration (Geffen and Rothenberg, 2000).

2.7.3.3 Life Cycle Assessment (LCA)

Life cycle assessment is needed to identify the environmental impacts before the products are actually introduced in to the marketplace. The methods associated with quantifying the environmental burden and impact of a product, process or service is termed environmental LCA, which ideally encompasses cradle-to-grave (Fava *et* al., 1991; Hart, 1995). LCA starts from extraction and processing of raw materials and finishes at recycling and final disposal. Depending upon the scope and analysis, the LCA and lead to two possible outcomes: comparison versus improvement (Klassen and Greis, 1993). The first focuses on identifying environmentally preferable product or process alternatives (Klöpffer and Ripen, 1992), that in turn, may influence customer purchasing patterns based on the degree and form of any environmental impact (Hartwell and Bergkamp, 1992). A comparative LCA can also form the basis for new public policies (Huppes, 1998).

2.7.3.4 Design for Environment (DfE)

An important phase in manufacturing of products is the design. The type of design affects the environmental compatibility of the product (Madu *et* al., 2002). Early involvement of the supply function in the product design process can provide benefit for the organization (Stuart, 1991) because then it becomes much easier to design according to environmental considerations. Hence organizations try to include the supply function at an early stage in the product design process. Design for environment is also termed as green product design (Dechant and Altman, 1994), with potential benefits including less waste, greater productivity, and higher level of innovation (Porter and Van der Linde, 1995). Using DfE it is possible to identify less costly and more effective opportunities to minimize environmental impacts of both manufacturing processes and products during the use.

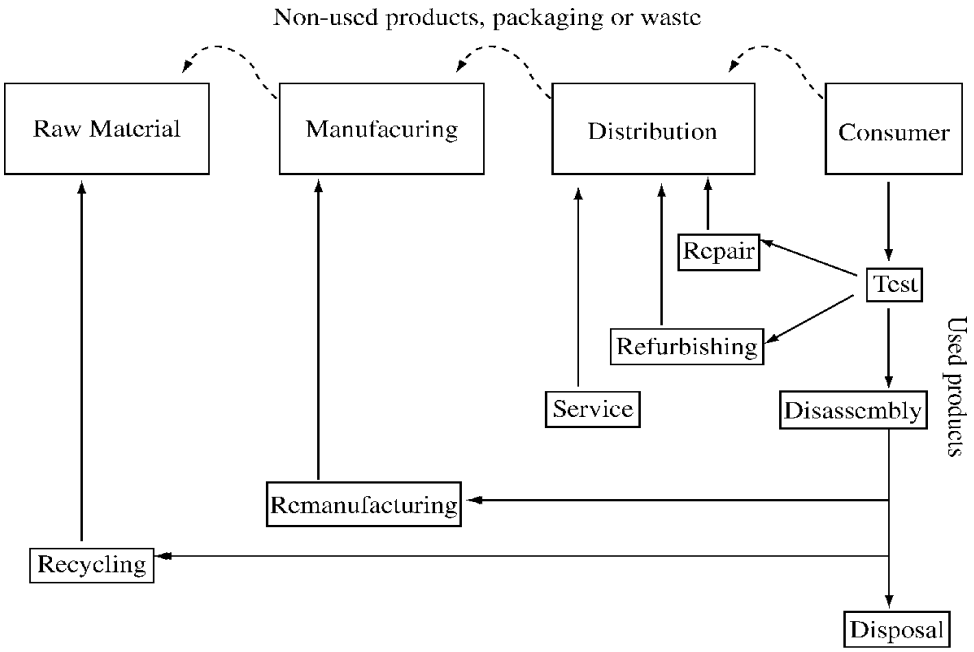
However, research shows that DfE and LCA are unfamiliar to product designers and not well integrated with other design tools along the supply chain (Smith and Melnyk,

1996; Lenox *et* al. 2000). This is a hindrance for the designers at the design phase to integrate environmental consideration in the design of products. However, involving the designers in the LCA activity can improve their skills and understanding about the integration of environmental issues in the design phase.

2.7.3.5 Reverse Logistics

Reverse logistics is an environmental strategy adopted by companies also termed as product stewardship to Internalizing environmental costs and risk during manufacturing, use and post-consumption. The general view of supply chain is one-way, downstream flow of materials and services; effective product stewardship requires organizations to manage its reverse supply chain, which is upstream flow of consumed goods and by-products. A simplified flow detail of various activities in reverse logistics is shown in figure 2.2.

Figure 2.2: Basic flow detail of Reverse logistics



Source: Krumwiede and Sheu (2002)

The important stage is the product return phase, which encompasses testing and disassembling of the received product. Improving the reverse logistics means that it will be beneficial for manufacturing companies to implement recycling, refurbishing

and remanufacturing operations for economic reasons alone besides meeting the consumer pressures and regulatory norms (Srivastava and Srivastava, 2006). With the reverse supply chain, there are various activities that take place – re-use, repair, remanufacturing or recycling. However, the problem of quality control exists in some cases at the various stages especially disassembly is critical which guides where to send the product after disassembling.

2.7.3.6 Internal Environmental Management

Internal environmental management consists of various internal management factors, which affects the overall green supply chain policies of the organizations. These factors include commitment and support from senior and mid-level managers, cross-functional cooperation for environmental improvements, total quality environmental management, environmental compliance and auditing and internal environmental system (Zhu, and Sarkis, 2005). It leads to the internal improvement of products and services. However the internal approach differs from one company to another**.** Embracing environmental issues without changing current processes provides the company with a sense of social legitimacy; it usually leads to narrow, incremental solutions (Corbett and Wassenhove, 1993; Wood, 1991). The commitment from top management is the main driving force because without it most initiatives are bound to fail.

Some sectors have a higher degree of internal environmental practices than the others. It also depends upon country specific and industry specific regulatory compliance hence the commitment of top management differs in different industries. In Organizations top-level management also change their orientation towards internal environment management practices over a period of time.

2.7.3.7 Green Purchasing

Min and Galle (1997) noted that the high cost of environmental programs is the most serious obstacle to effective "green purchasing". In general, green purchasing is defined as an environmentally conscious purchasing practice that reduces sources of waste and promotes recycling and reclamation of purchased materials without adversely affecting performance requirements of such materials.

Green purchasing gets significant attention within big organizations in developed countries. The organizations keep a track on their direct supplier and also on the second tier suppliers. Walton *et* al. (1998) put forward the ten top environmental supplier evaluation criteria and that, among these, second-tier supplier environmentally friendly practice evaluation is the second most important criterion. The evaluation of second-tier supplier is still in the initial stage in developing countries.

Green purchasing can create economic value such as reduced disposal and liability cost, while improving the company's resource conservation and public image (Dassapa and Maggioni, 1993). There are different aspects of green purchasing, for example some organizations provide design specifications to suppliers that include environmental requirements for purchased items, some organizations conduct environmental audits for supplier's internal management and check the supplier's ISO 14000 certification. This leads to suppliers to improve their own green supply and take initiative on their own. The direct suppliers keep track on the second tier supplier's green status and their green practices. Innovative packaging is also in green purchasing and organizations are focusing on degradable packaging.

2.7.3.8 Cooperation with Customer Including Environment Requirement

Contemporary organizations have an increased focus on customer's needs and the development of value-added products and services. Moreover, cooperation with both suppliers and customers has become extremely important for closing the supply chain loop for organizations and products (Zhu et al, 2008b). A study conducted by Zhu and Geng (2001) suggest that international organizations in electrical and electronics industry have more advanced closed loop supply chain practices due to the institutional pressures especially from direct competitors and from supply chain partners.

Type of supplier is also important factor in knowing the innovativeness of supplier. While Independent suppliers would innovate only if they were able to perceive a cost-benefit ratio based on the principals of a more traditional model. However, dependent suppliers are more willing to innovate if they are clear what kind of innovation their customers desire. They are even ready to invest in Innovation even if they don't see

the return in short term. The reason behind dependent supplier's willingness to innovate is because they seek the investment in innovation with the customer as a long-term plan and perceive the advantages in future. Hence it is more a strategic decision to keep their global competitiveness (Upadhyay and Baglieri, 2010).

International organizations started their focus on understanding their supplier better and also established the real and anticipated requirements for their suppliers. Some organizations expect their supplier to obtain ISO 14000 certification or to develop environmental systems. Moreover, organizations start joint ventures with their suppliers and initiate the cooperation for cleaner production, eco-design, using less energy during product transportation etc.

2.7.3.9 Investment Recovery

Investment recovery is considered as the most important practice for green purchasing in developing countries especially US and Germany (Zsidisin and Hendrick, 1998). In developing countries investment recovery has received much less attention due to the different policies for waste management and recycling systems. Investment recovery is measured by sale of excess inventories, scrap and excess capital equipment (Zhu *et* al., 2008a) for GSCM practices implementation.

Investment recovery such as material recycling and recovery are to be completed internally, or for internal environmental reasons, than for supply chain reasons. Moreover, the recovery operation such as remanufacturing, reuse and reclamation, even in developed countries can be mainly manual operations, which require significantly more labour costs (Zhu and Sarkis, 2004a). The increasing labour cost can significantly affect the recovery operation.

The developing countries, which have lower labour cost, may find that resource recovery across the supply chain may provide its industries with a better competitive advantage (Zhu *et* al., 2008b). Thus, in developing countries it is possible that investment recovery across the supply chain will emerge and dominate, especially for internationally linked industries such as automobile and electronics industries.

2.7.3.10 Environmental Collaboration and Monitoring

Companies are now starting to recognize the possible competitive advantages associated with environmental awareness (Bonifant *et* al, 1995; Gupta, 1995; Sarkis and Rasheed, 1995). Hence they are now focusing on environmental collaboration and monitoring activities.

Environmental collaboration within green supply chain practices is more broadly defined to capture activities – not only activities with suppliers – but also interactions with downstream customers of the supply chain (Geffen and Rothenberg, 2000; Rao, 2002). On the supplier side, selecting the activities to work jointly is difficult for the organizations. It should be beneficial for both supplier and the organization. Some collaborative activities lead to benefit for the suppliers but not for the organizations hence the industry should be fairly concentrated (Klassen and McLaughlin, 1996).

In such a case, it's an investment from the organization's point of view. It focuses less on immediate results for the suppliers but focus more on the processes, which will lead to more environmentally sound operations. But the unit of measurement for such practices is quite ambiguous; it's not properly defined that in which terms the environmentally sound operations will take place and how long it will take to come in to practice.

Environmental monitoring practices usually involve activities like an examination of a supplier's environmental practices through publicly disclosed environmental records, questionnaires, and audits conducted by either the buyer or an independent third party (Min and Galle, 2001). The authenticity of such environmental audits and records is still not clear. There are various third party organizations, which conduct the audits, however their level and standard varies quite a lot. Hence there are no such guidelines about the type of audit and the list of authenticated independent audit conducting organizations.

Generally, major organizations in a specific domain area come together to form an assessment consortium, which conduct such type of environmental audits and keep a track on supplier's environmental practices. It has been suggested that different industrial sectors have different business conditions hence they also follow the some

or different green supply chain practices (Russo and Fouts, 1997; King and Lenox, 2000). It also depends upon the competition in the specific sector and international exposure. In some sectors, due to the heavy exposure to International markets, it becomes necessary to implement some or most of the green supply chain practices, while in case of local businesses, the implementation of a few green supply chain practices is sufficient.

Environmental monitoring focuses on the outcome of environmental efforts made by the suppliers in terms of gaining certification (e.g. ISO 14001 or EMAS), being in compliance with particular regulations (e.g. emissions caps, hazardous material labelling, product specifications), and having environment-related documentation in order. However, these environmental regulations (e.g. emissions caps, hazardous material labelling, and product specifications) differs from one geographical location to the other; e.g. In European Union (EU) area these regulations are different from Asia, Africa and North America. The following section will discuss alignment and integration of supply chain orientation and environmental orientation, which leads to green supply chain practices.

2.8 Supply Chain Orientation (SCO) & Environmental Orientation (EO)

SCO is necessary antecedent for effective SCM. It has been also suggested that an organization must first look inward before it can effectively engage in strategic management of supply chain processes (Min and Mentzer, 2004).

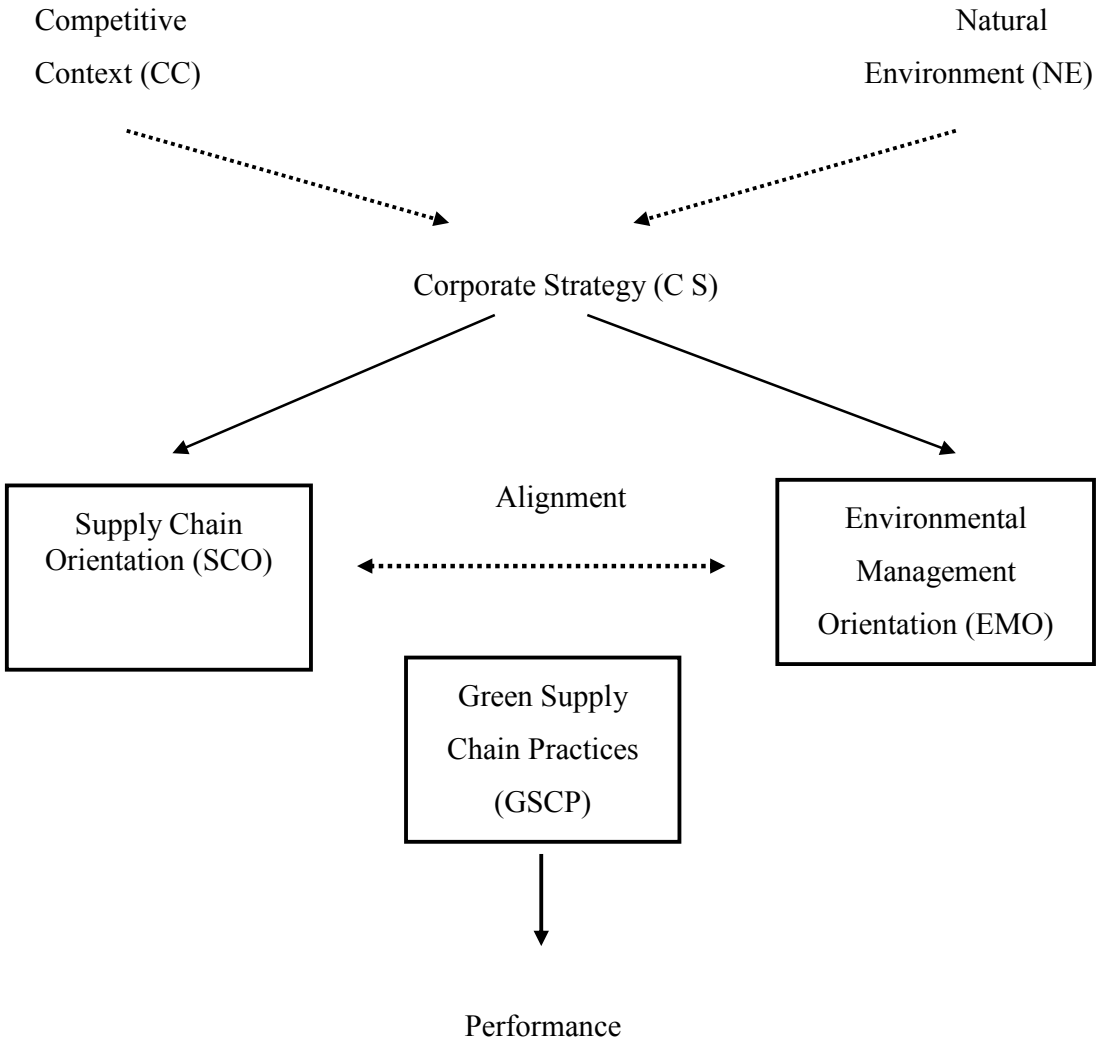
Supply chain orientation emphasizes the strategic awareness and embracing of supply chain management within an individual supply chain firm. Mentzer (2001, p. 14) defines as:

"The recognition by a company of the systemic, strategic implications of the activities and processes involved in managing the various flows in a supply chain"

It has been suggested that green supply chain practices are the result of supply chain orientation and environmental orientation (Klassen and Johnson, 2004). Supply chain orientation, environmental orientation and the resulting green supply chain practices

can be linked with a basic conceptual model as shown in Figure 2.3. The term supply chain orientation (SCO) refers to the management philosophy that underlies efforts to create coordinated interactions among members across a supply chain (Shin *et* al., 2000). Taken one step down, corporate strategy then drives both supply chain orientation and environmental orientation and then successfully leads to development and implementation of green supply chain practices.

Figure 2.3: Supply Chain and Environmental Orientation (Klassen and Johnson, 2006)



Supply chain is a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and or information from a source to a customer (Mentzer *et* al., 2001). Supply chain orientation focuses from the transactional to the network approach. A weak supply

chain orientation is primarily transactional in nature; while a strong supply chain orientation emphasizes the supply network, with partnership positioned between these two ends. Transaction orientation is very basic and the main objective is to avoid any trouble and to keep the smooth functioning of acquisition of material at the lowest cost. Sourcing is driven by price and the goal is to achieve short-term profit. However the strong supply chain management orientation focus on building relationships with key suppliers and it can be upstream or downstream in the supply chain (Frohlich and Westbrook, 2001).

Environmental orientation focuses towards different environment approaches implemented by organizations from reactive to proactive and it is defined as the set of objectives, plans and mechanisms that determine the responsiveness of operations to environmental issues (Klassen, 2001). For example, if an organization predicts new environmental regulations, issues and moves ahead of public pressure and integrates environmental concerns throughout the manufacturing process and supply chain, then it is considered as proactive environmental orientation. However, its difficult to anticipate the future environmental issues and challenges and organizations change their orientation over a period of time, due to the change in internal management factors and plant outlook (Klassen, 2001).

Environmental and supply chain practices must be viewed as mutually supportive and they are positively linked to green supply chain practices (Bowen *et* al., 2001). Hence the green supply chain practices are the result of supply chain orientation and environmental management orientation.

2.9 Macro and Micro Model for Green Supply Chain Practices

Macro and micro model for green supply chain management focuses on different philosophies, tools / techniques and their antecedents, enablers, inhibitors and consequences due to them as illustrated in table 2.5 and 2.6. Philosophies have some differences and similarities among them. Carter and Carter (1998) discuss about asset specificity and investment in the asset specificity needs investment, which can be inhibitors for some organizations. However it makes the competitors to replicate or imitate the product. Sarkis (2001) states that clustering plays an important role in green supply chain practices. Clustering can have consequences of re-utilization of

waste and by products. Pressure from local groups and environmental standards are also antecedents for the green supply chain management (Kleindorfer *et* al., 2005; Zhu *et* al., 2005; Vachon and Klassen, 2006). These pressures can come due to change in government policy or change in approach of local groups.

Table 2.5: Macro Model for Green Supply Chain Practices (Philosophies)

Green Supply Chain Practices (GSCP)	Antecedents	Enablers	Inhibitors	Consequences
Carter and Carter (1998)	More difficult to replicate, particularly if suppliers devote asset-specific investments to engage in the design for disassembly and reuse activities of their customers.	Awareness about sustainable practices	Asset-specific investment	Inimitability, difficult to replicate.
Walton *et* al. (1998) and Klimley (2005)	Supply chain considered as integral part of strategic planning	Coordination in complete supply chain.	Strategic planning to implement sustainable practices.	Improvement in complete supply chain through efficient planning.
Dowell *et* al. (2000)	Increased awareness about environmental degradation	Awareness about environmental degradation	Limited Investment	Increase in environmental standards as income increases, and people become more sensitive toward and concerned about environmental degradation.
Geffen and Rothenberg (2000)	Improved information sharing in supply chain	Collaborative relationship	Problem in information sharing	High degree of interdependence along the supply chain.
Sarkis (2001)	Clustering for sustainable business practices. In this situation, wastes of one manufacturing plant may be useful material for another manufacturing plant.	Re-utilization of waste	Difficulty in identifying the reusable waste	Re-utilization of waste and by-products
Woensel *et* al. (2001)	Emergence of Life-cycle	Cost effectiveness	Finding new	Reducing the costs of changing

and Delmas (2004)	assessment.		technologies	technologies and operating policies to comply with new regulations
Kleindorfer *et* al. (2005)	Increased focus on sustainable issues.	Consumer concern for sustainable practice	Pressure from local groups	Community pressures and the threat of liability, however, can drive companies to improve their environmental performance
Vachon and Klassen (2006)	Implementation of environmental standards.	External environmental factors	Environmental standards	Externalizing environmental management in the supply chain by employing market-based mechanisms
Linton *et* al. (2007)	Extensive use of new optimization tools.	Optimization for cost efficiency	Optimization tools	By-products of supply chain, optimization of product from total cost standpoint
Srivastava (2007)	Escalating deterioration of the environment, e.g. diminishing raw material resources, overflowing waster sites and increasing level of pollution. Scarcity of raw material resources.	Finding new raw material sources	Difficulty in finding new source / suppliers.	Emergence of global outsourcing of raw material
De Brito *et* al. (2008)	Supply chain through functional internal integration, and finally a supply chain through external integration	Supply chain Integration	Difficulty in integration process	Improved integration and collaboration in supply chain
Brown (2009) and Zhu *et* al. (2005)	To guide sustainable initiatives	Regulatory framework	Problem in implementation	Focus on implementation of sustainable initiatives

Source: developed for this study

Table 2.6: Micro Model for Green Supply Chain Practices (GSCP)

Green Supply chain Practices (GSCP)	Antecedents	Enablers	Inhibitors	Consequences
Klassen and Johnson (2004)				
Environmental certification	Addressing environmental consideration and improving environmental performance. Comparative environmental life cycle assessment (LCA).	Application of continuous improvement models such as plan-do-check-act (PDCA) to foster environmental improvement.	Different certifications on the basis of region to choose.	Emergence of the environmental and social performance with traditional financial performance.
Pollution prevention	Strong supply chain integration, which allows supplier greater access and influence in downstream operations.	To 'build in' better environmental performance at lower cost rather than fixing it at as an afterthought.	It requires concerted efforts that extend beyond the manufacturing operations of a single plant to whole supply chain	Capturing and treatment of pollutants and harmful by-products at the various stages of supply chain.
Life cycle assessment (LCA)	To identify the environmental impacts before the products are actually introduced in to the marketplace.	Focus on identifying environmentally preferable product or process alternatives.	Quantifying the environmental burden and impact of a product or process.	Detailed assessment of the environmental burden of its products and processes.
Design for environment	Early involvement of supply function in the product design process can provide benefit for the organization.	To identify less costly and more effective opportunity to minimize environmental impact.	Unfamiliar to product designers and not well integration with other design tools.	Less waste, greater productivity and higher level of innovation.
Reverse logistics	Internalizing environmental costs and risk during manufacturing, use and post-	Quality control, planning and scheduling, cost control and measurement	Management of inter-firm relationship and cross-functional	Combination of re-use, repair, remanufacturing or

	consumption.	and inventory management and logistics.	integration to accommodate two-way flow of material.	recycling activities.
Zhu and Sarkis (2005)				
Internal environment management	Environmental certification precedence.	Internal improvement of product and processes.	Internal resistance to change and fear for new system.	Overall internal and external improvement of environment management.
Green purchasing	Inclusion of green performance clause in every purchasing contract.	Developing green standards and specifications.	Identifying and categorizing the purchasing process.	Focus on selection and acquisition of product and services, which minimize the effect on environment over their cycle.
Cooperation with customers including environmental requirements	Downstream cooperation for environmental management impact.	Customer's awareness and involvement in such initiatives.	Information sharing and integration in downstream.	Production of environmental friendly products and services.
Investment recovery	Recouping the value of assets no longer needed by a company by identifying and reusing.	The resale of assets via online disposition avenues such as online auctions.	Clear understanding of environmental principles and policies.	Increase in corporation's return on surplus assets through redeployment and sales efforts.

Source: developed for this study

Micro model for green supply chain practices focus on various green supply chain practices as suggested by Klassen and Johnson (2004) and Zhu and Sarkis (2005). For each green supply chain practice antecedents, enablers, inhibitors and consequences are studied and explored. Life Cycle Assessment (LCA) is antecedent for environmental certification and LCA is used to identify the environmental impacts before the product is actually launched. Reverse logistics leads to combining reuse, repair, remanufacturing, and recycling activities. Environmental certification is precedence for internal environmental management. Focus on green purchasing leads to selection and acquisition of products and services, which minimize the affect on environment over their cycle.

2.9 Synthesis

This part presents, antecedents, enablers, inhibitors and consequences in the form of bullet points as rose from macro and micro model of green supply chain practices as illustrated in table 2.5 and table 2.6.

2.9.1 Antecedents

In the above discussion, the following antecedents have been found:

- Addressing environmental consideration and improving environmental performance is antecedent for environmental certification.
- For preventing the pollution, strong upstream-downstream cooperation and integration is vital.
- Life cycle assessment helps in identifying the environmental impact before the product launch in market and is antecedent of environmental certification.
- Life cycle assessment is antecedent for internalizing environmental costs and risk.
- Environmental certification is antecedent for green purchasing which leads to inclusion of green performance clause in purchasing contracts.
- Life cycle assessment projects the value of obsolete assets / scrap even before it's launch in market.

2.9.2 Enablers

- Application of continuous improvement models, such as plan-do-check-act enables the upgrading of environmental certification and standards.

- To ‘built in’ better environmental performance at lower cost rather than fixing it concept is enabler for pollution prevention.
- Life cycle assessment enables in identifying environmentally preferable product or process alternatives.
- Internal improvement of product or processes helps in better eco friendly designs.
- Developing green standards and specifications for design enables the environmental certification.
- Resale of assets via online disposition avenues, such as online auctions paved the path for investment recovery.

2.9.3 Inhibitors

- Different certifications in different regions inhibit the standardisation of environmental certification.
- Quantifying the environmental burden and impact of a product or process.
- Unfamiliarity with product design tools restricts the designers and engineers to design eco-friendly products and services.
- Internal resistance to change to learn new technologies for life cycle assessment.
- Lack of information sharing of products and service’s environmental impact limit the opportunity for investment recovery.
- Ambiguous environmental principles and policies act as stumble block for the uniform environmental purchasing contracts.

2.9.4 Consequences

- Environmental certification helps in monitoring and improving the environmental and social performance.
- Pollution prevention leads to capturing and treatment of pollutants and harmful by-products.
- Life cycle assessment encourages the combination of reuse, repair, remanufacturing or recycling activities.
- Eco design helps in designing and producing the environmental friendly products and services.

- Investment recovery leads to increase in corporate return on surplus assets through redeployment and sales efforts.

2.10 Conclusion

This chapter synthesised the antecedents and enablers of green supply chain practices and also gave the overview of supply chain and sustainability. The review discussed the various concepts of sustainability and green supply chain and then narrowed down to different philosophies on green supply chain practices and also discuss the antecedents, enablers, inhibitors and consequences. The main green supply chain practices considered for this study consist of five such practices discussed by Klassen and Johnson (2004) and five other practices discussed by Zhu and Sarkis (2005). Eco-design and design for environment is common in both the discussions.

The above discussion helped in finding the gap and future opportunities for research. The next chapter discusses the research design and methodology that is adopted for this study.

3. Research Methodology

3.1 Introduction

The previous chapter reviewed the relevant literature, identified gaps in the literature, and concluded with the research objective and issues. This chapter discusses and determines the research methodology and process for the dissertation. The chapter starts with a review of the two types of research methods, quantitative and qualitative, and is followed by the justification to use qualitative methodology to investigate the research objective. This is followed with a discussion on the preparation of the semi-structured interviews and data collection process. Next, there is a review of the process used for analysis, determining gaps, and generating recommendations from the semi-structured interviews.

The chapter concludes with a discussion on the limitations of case study research, ethical issues, and the conclusion. The research project started with a comprehensive literature review conducted on green supply chain practices. The initial search focused on articles in leading Operations Management and Supply Chain Management related journals, but was expanded to other academic journals (Sustainable and Organization). Besides that, trade press articles and third party reports were reviewed, using the EBSCO BSC and ABI/INFORM databases.

3.2 Research Philosophy

In order to conclude the research author needs to understand his own ontology and epistemology. According to Lacity and Janson (1994) Ontology is the way we view the world and epistemology is the study of knowledge, science, model, testability and what is knowledge and what can be considered as knowledge. Epistemology is appropriate for this research because the first thing in my research is to understand what are the green supply chain practices (GSCP). From author's point of view the knowledge and learning processes

are both explicit and implicit. In this research author explores the antecedents and enablers of green supply chain practices.

Epistemology is further divided in two broad paradigm; positivist paradigm and Interpretist paradigm (Easterby-Smith et al, 1991). It is also important to remember that some authors use terms interchangeably like interpretivism, this is also named as hermeneutic (Lacity and Janson, 1994) but it is specific to the field and context. The world is interpreted through the mind and it cannot be described without investigating that how people react and behave in social surroundings. Interpretivism is based on the understanding that a strategy is needed to consider the difference between people and natural science objects and therefore demand that social science researchers should capture the subjective significance of a social action. To understand and analysis the antecedents and enablers, author gathered the subjective in-depth organization's points of view which are perceived to be essential for this study and to attain his aim to understand the antecedents and enablers of the green supply chain practices; interpretive approach is most suitable for this research.

Another reason why my research is more concerned with the interpretism is, because antecedents and enablers are subjective in nature. It depends on how you interpret them and how you see them in an organization. This is related to my research area because it is qualitative in nature and data is collected by interviews hence it is very important to interpret the response of the interviewee. The basic positivist belief is that the world is external and objective, while the Interpretist belief that the world is socially constructed and subjective (Easterby- Smith et al, 1991). Before moving further in the research, it was important to select the approach for the study. According to Ghauri and Grnhaug (2002) induction is based on empirical evidence while deduction is based on logic. Furthermore they state that induction involves drawing general conclusions from empirical observations; passing from assumption to conclusions.

3.3 Inductive versus Deductive

Data can be quantitative or qualitative. The two methods are considered complementary rather than competitive (Malhotra, 1993; Perry, 1998). Quantitative research attempts to quantify data and uses statistical analysis to test the hypothesis that the researcher begins

with. This is the default research method for much of scientific research. On the other hand, qualitative research produces findings without the use of statistical procedures (Neuman, 1997). Furthermore, qualitative research provides insights and understanding, while quantitative research tries to generalize the insights to a population (Perry 1998).

There is much debate on the benefits and differences between quantitative and qualitative research (Denzin and Lincoln, 1994; Yin, 1994). Many researchers argue that a quantitative approach to research is superior to a qualitative one because the use of surveys, experimental designs, and statistics which are perceived to provide both scientific rigor and objectivity. Therefore quantitative research is assumed to have greater validity, generalizability, and replicability. Hence it provides greater theoretical contributions (Guba and Lincoln 1994).

Despite these criticisms of qualitative research, there are strong counter-pressures against quantitative methods (Guba and Lincoln, 1994). A variety of implicit problems in quantitative research include: context stripping (due to selective selection of variables), exclusion of meaning and purpose (that is, not understanding human behavior), and exclusion of the discovery dimension in inquiry, because the verification of hypothesis tends to gloss over the source or the discovery process (Guba and Lincoln, 1994). For these reasons, qualitative research is gaining popularity (Easterby- Smith, 1991; Parkhe, 1993).

3.4 Why Case Study Research

The methodology chosen to answer the research questions mentioned above is an inductive, multiple-case study. Eisenhardt (1989) says that case study is a methodology that focuses on understanding the dynamics present within single settings. Case study is a research strategy to build theories; using empirical evidence on cases – i.e., instances of a class of events under scrutiny (George and Bennett, 2005) – creates theoretical constructs, propositions and/or midrange theory (Eisenhardt and Graebner, 2007).

The case research method allows the questions of why, what and how, to be answered with a relatively full understanding of the nature and complexity of the complete phenomenon (Voss et al., 2002; Bebensat et al., 1987; Meredith, 1998; Yin, 2003). Hence it seems therefore a perfect fit for a study interested in understanding inter-firms dynamics from green supply chain practice perspectives. Case study research fits well with this project, as the research

questions are either exploratory ‘what’ or explanatory ‘why’, yet still focusing on contemporary events in a supply chain environment in which the author has no direct control as shown in table 3.1.

Table 3.1: Different approaches for different research questions

Approaches	Research questions	Control over behavioral events	Contemporary issues focus
Experiment	How, Why	Yes	Yes
Survey	Who, What, where, How much	No	Yes
History	How, Why	No	No
Case study	How, Why	No	Yes

Source: Adapted from Yin (1994)

Case study is really important to gain understanding on research areas in which theoretical insights are still not well developed, as the green supply chain practices and it’s antecedents and enablers (Ozcan and Eisenhardt, 2009). The case study approach allows in-depth analysis of the complex issues inherent in the research subject (Buckley et al, 2005).

3.5 Selected Research Methodology for this Dissertation

For this research, it is decided to use the qualitative research process using multiple case studies. There are various reasons for this as follows:

- Green supply chain practices are a vast collection of techniques. Hence, selection of green supply chain practices and strategies can be a complex process. In such a dynamic setting it is best to use qualitative research methodology (using case studies) to understand the situation.
- Face-to-face meetings with respondents can help provide understanding and information on several qualitative areas, such as: reasons for implementing specific green supply chain practice, process, discussions and feedback.

- A multiple-case study can provide a robust insight and thus achieve a higher level of external validity and reliability.
- Cases can be viewed and studied alone and across cases (within-case analysis and cross- case analysis) to provide comparison and contrast and richer details and insights regarding the research issues (Eisenhardt 1989; Stake 1994; Yin 1994). Hence it is decided to use a multiple case study approach using semi-structured interviews (Yin, 1994).

However, the convenience and confidentiality of telephonic interviews, lacks non-verbal communication (Beardwell et al, 2003). This limitation is significant as non-verbal communication plays an important role during in-depth interview studies in a sense that the researcher can observe the physical reaction of an interviewee to a question by reading body language (Marshall & Rossman, 1999). However due to resource constraint, telephone interviews were conducted.

3.6 Design of Case Studies

Multiple case study design is most favored approach for this thesis. Van Aken (2004) states that through multiple case studies one can accumulate supporting evidence, which can continue until 'theoretical saturation' (Eisenhardt, 1989) has been obtained.

The multiple case studies are regarded as very robust (Herriott and Firestone, 1983) because the evidences from multiple case studies are more compelling. However Yin (1994) warns that the decision to undertake multiple case study research cannot be taken lightly...each case must be carefully selected so that

(a) It predicts similar results (a literal replication) or

(b) It produces contrasting results but for predictable reasons (a theoretical replication). The studies for this thesis have been designed on three phase approaches as shown in table 3.2.

Table 3.2: There phase approach for research

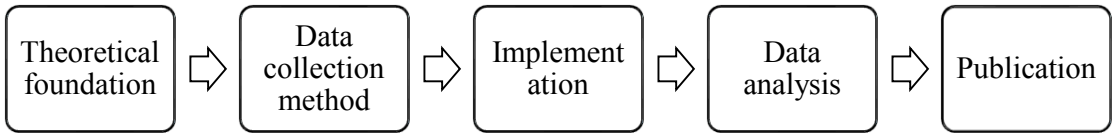
No	Phase	No of Cases	Objective	Time Elapsed
1	Pilot case	1	• Explain the current state of green supply chain practices • Describe and understand the antecedents and enablers of green supply chain practices. • Refine the case study design	3-4 months / case
2	Core cases	2	• Explain the current state of green supply chain practices • Describe and understand the antecedents and enablers of green supply chain practices.	3-4 months / case
3	Cross-case comparison	3 (Pilot and core)	• Compare the underlying states across the 3 different green supply chain contexts to develop a strategy framework and set of concepts and guidelines.	Continuous process + 1-2 months at the end
	Total	3		

There are three cases, which form the heart of the study across all three phases. Theses cases describe the current state of green supply chain practices, antecedents and enablers. The first case should be considered as pilot, as it will also be used to refine and develop the research design (Ellram, 1996). Third stage was cross case analysis, which compares the three cases to develop strategic framework and to develop guidelines.

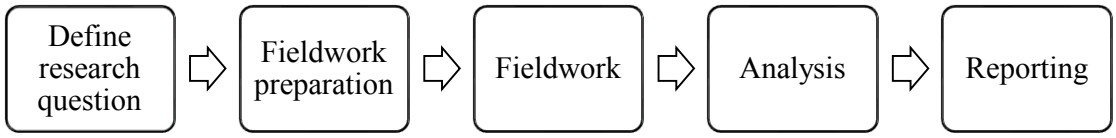
There are a number of different processes for conducting the case study research. Flynn (1990) developed a six stage systematic approach for empirical research. Flynn's Model is not restricted for case study research hence it includes an extra step to enable the selection of a research design. Yin (1994) and Stuart et al. (2002) suggested a five-phase process as

shown in figure 3.1.

Figure 3.1: Different empirical research process



Source: Adapted from Flynn et al. (1990)



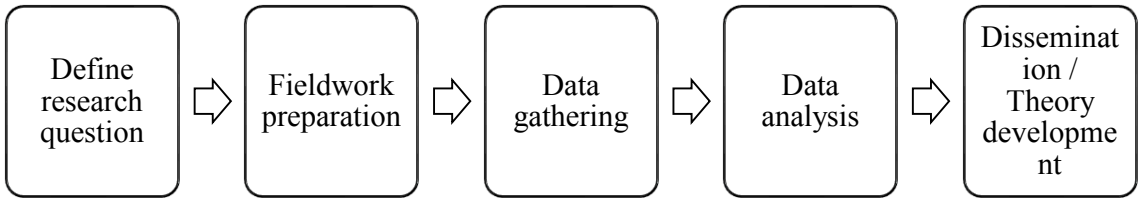
Source: Adapted from Yin (1994) and Stuart et al. (2002)

The process used in this thesis is based upon a five-stage approach suggested by Yin and Stuart et al (2002). A Five-stage approach is applied to three phases of research as shown in figure 3.2.

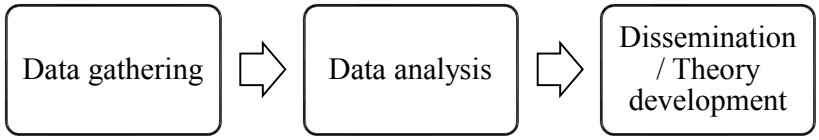
Figure 3.2: Five stages, three phase approach

Phases **Stage1** **Stage2** **Stage3** **Stage4** **Stage5**

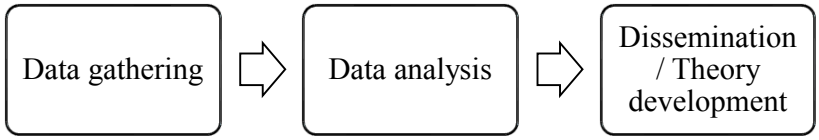
Pilot-case



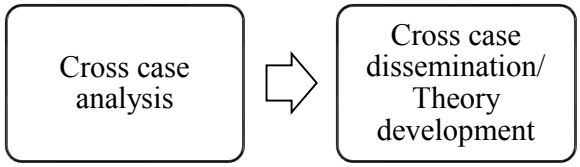
Phase 2: Core Case 1



Core Case 2



Cross Case Comparison



All the three phases are divided in to five stages to obtain very specific result. The pilot case is to check and refine the research question and to get the guidelines for the second phase of research. The core research phase is the most important phase for data gathering, analysis and theory dissemination. Third phase, cross-case comparison is for obtaining the cross cases results and to develop theory.

3.7 Data Collection

The data collection process is explained by Yin (1994) by the help of three independent principles:

1.) Application of multiple sources of evidence
2.) Database of case study record
3.) Keep the record of evidence

3.7.1. Application of Multiple Sources of Evidence

The data collection was in the form of fieldwork for this thesis. As discussed earlier, the primary research instrument for data collection was semi-structured interviews, which were developed in line with the interview protocol. A protocol was developed in which the interviews were conducted. Firstly, a quiet place was selected for interviews usually a meeting room or seminar room and booked for the duration of the interview. Secondly, the interviewees were told that the interviews would be recorded using a mini disc recorder. The notes were taken during the interviews. These notes were then turned into 'contact notes' as suggested by Miles & Huberman (1994) with in twenty-four hours of conducting the interviews. The contact note template is shown in figure 3.3.

Figure 3.3: Sample Contact note

JBM Automobile Limited

Field Work: Contact Notes

Interviewee details	**Interviewer Record**
First Name:	Transcript Number:
Surname:	Date:
Post in company:	Location:
Contact No:	

1.) Brief background of interviewee

2.) Critical agenda

3.) Summary of collected information

4.) Other important issues discussed

5.) New / outstanding agenda for next visit, if any

6.) Secondary data, if any

The first seven interviews from the pilot case study were also transcribed. The main aim was to check the accuracy of the contact notes against the actual interview dialogue. As illustrated

in appendix 2 the accuracy of the contact notes was found to be very high. It was then decided to use contact notes as the primary source of raw data with the recorded interviews as back up if further detail was required.

Secondary data was also collected from the interviewees during the interviews in the form of previous strategic reports, studies, printed official press release, and organizational charts to support the primary data.

3.7.2 Database of Case Study Record

The difficult job was to keep a track record of the large amount of data collected through primary and secondary sources. A database of case study records was created. Contact notes were already in electronic form and secondary data was also requested in the electronic format. In case where the electronic format was not available, the documents were scanned and stored in the electronic format. All documents were than stored in a project specific folders to enable the easy navigation. A summary of case documents was produced in word format and held in the project folder. A summary excerpts is shown below in Table 3.3.

Table 3.3: Excerpts from primary data summary JBM Auto Limited

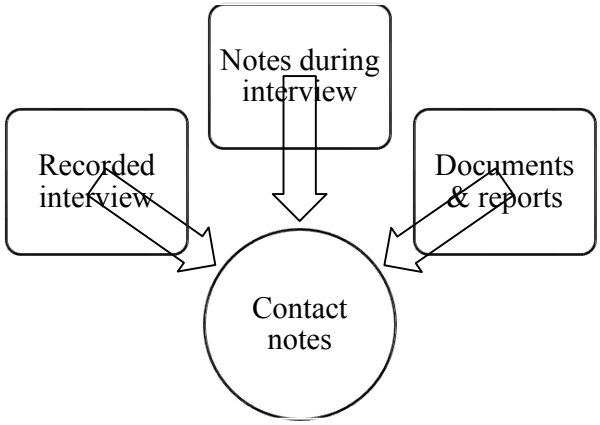
Date / Location	Reference / Code	Interviewee detail	
		Name	Role
Aug 2011	CN = 1, T = 1	AS	General Manager
Corporate	CN = 2, T = 2	PK	President - Strategy
Office	CN = 3, T = 3	SS	Manager – Marketing
	CN = 4, T = 4	AKG	Executive – Supply Chain
	CN = 5, T = 5	RKG	Executive – Purchasing
	CN = 6, T = 6	NA	Executive Director
	CN = 7, T = 7	SC	Director – Projects
Sept 2011	CN = 8	AD	Manager – Quality
Assembly Plant	CN = 9	DC	Executive – Production
	CN = 10	GS	Manager – Operations
	CN = 11	SL	Executive - Control

CN = Contact notes from recorded interviews T= Transcripts

3.7.3 keep the Record of Evidence

The main aim was to keep the record of all the evidence collected during fieldwork. All the primary and secondary data collected are interlinked for the study purpose as shown in figure 3.4.

Figure 3.4: Recorded in the case study database



3.8 Data Analysis

The data analysis approach for this research work was aligned to reporting protocol. The implicit analysis was there at various stages, however for verification and dissemination there were two key types of analysis

1) Individual analysis
2) Cross case analysis

3.8.1 Individual Analysis

For pilot and core cases, the analysis was same. After the completion of the scoping study, a report was developed which provided a summary of the outer and inner context, the research focus for the main study and insight on any company specific questions. The report is in the form of descriptive analysis based on the information gained from direct questioning as part of scoping study. The report is targeted to both academic and practitioner audience hence the

content of the report was kept brief. The contents page from the JBM Auto scoping study is summarized in figure 3.5.

Figure 3.5: List of contents from JBM Auto Limited Scoping Report

Executive Summary
Introduction
Research Context
JBM Auto Limited
- Business
- Categories
Research focus
SWOT Analysis
Leads

The report and analysis was based on the review of contact notes and secondary information documents. The data was extracted from the contact notes by name and reference number and then used for technical analysis.

3.8.2 Cross-Case Analysis

The individual case analysis was helpful in finding the company specific insights while cross-case analysis helped in developing generative mechanism or guiding principles to understand the antecedents and enablers in the implementation of green supply chain practices. The cross-case analysis was almost iterative type and it was based on the individual case analysis, which largely mirrored the structured, and format of the individual case report. This then provided the platform for a second level of explanatory analysis, which identified what was emerging across the cases.

3.9 Dissemination

For any research work dissemination of results is a challenging task. The reporting protocol provided the main platform for disseminating the results, however it was found more appropriate to target the specific audience. The three main target audiences were targeted and

they were: the case study companies, academician and practitioner audience. The different forum used to disseminate to each of these audience is shown in table 3.4.

Table 3.4: Forum to disseminate the output of studies

	Case study companies	Academia	Practitioners
Forum	- Discussing study report - Attending review meetings	- Conference papers - Research lunch seminar (Judge Business School, University of Cambridge) - Doctoral conference - Journal papers	- Industry platform (Venture day, Cranfield University) - Practitioner papers

3.10 Rigor of Research Design

The rigor of the research is achieved by the five-stage process (Stuart et al., 2002; Yin, 1994), which was used to structure the methodology in the earlier section. However to be more clear and precise, research design is tried against four basic tests commonly used in empirical research. These four test are described by Yin (1994):

Construct validity: ability of measurement tool, establishing correct operational measures for the concepts being studied

Internal validity: is relevant in causal or explanatory studies, where certain conditions are shown to lead other conditions

External validity: the extent to which the research result can be generalized or applied to other settings.

Reliability: means the study can be repeated with the same results

The COSMOS Corporation, cited in Yin, has developed a series of case study tactics to check the quality of case study research as shown in table 3.5. Multiple case studies were used for external validity and to develop generative mechanism to explore the antecedents and

enablers in the implementation of green supply chain practices. Internal validity is increased through pattern matching and explanation building, however it was not appropriate to use time analysis. At data collection stage, the author has managed to use both techniques to ensure robust construct validity. Following the case study protocols and maintaining database established reliability.

Table 3.5: Ensuring the quality of the research

Parameters	Case study tactics	Used for this research	Stage of research where tactic used
Construct validity	Use of multiple sources for data collection Establishing link of evidence	Yes Yes	Data collection stage
Internal validity	Explanation building Pattern matching Time series analysis	Yes Yes No	Data analysis
External validity	Use of multiple case study for generalization	Yes	Research design
Reliability	Use case study protocol Develop case study database	Yes Yes	Data collection

3.11 Chapter Summary

This chapter is one of the most important chapters of the thesis because it lays the foundation of research work. In defining the research process for multiple case study design, a five-stage approach was used: defining parameters, instrument development, data collection, data analysis and dissemination.

Next chapter introduces the pilot case study of JBM Auto Limited.

4. Pilot Case – JBM Auto Limited

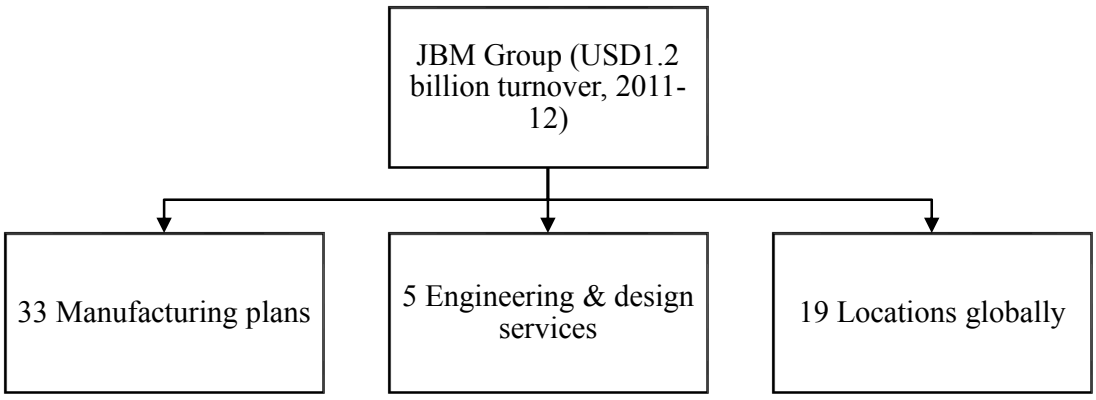
4.1 Introduction

JBM Auto Limited is one of the three cases used in this research and it also happens to be the pilot case. This case was used as an opportunity to develop and refine the methodology. The pilot case was run with same rigor as the care cases. The only difference was that in the pilot case, the research focus was much wider. The questions were asked on a broader spectrum and then they were filtered for the core cases.

4.2 JBM Group – Parent Company

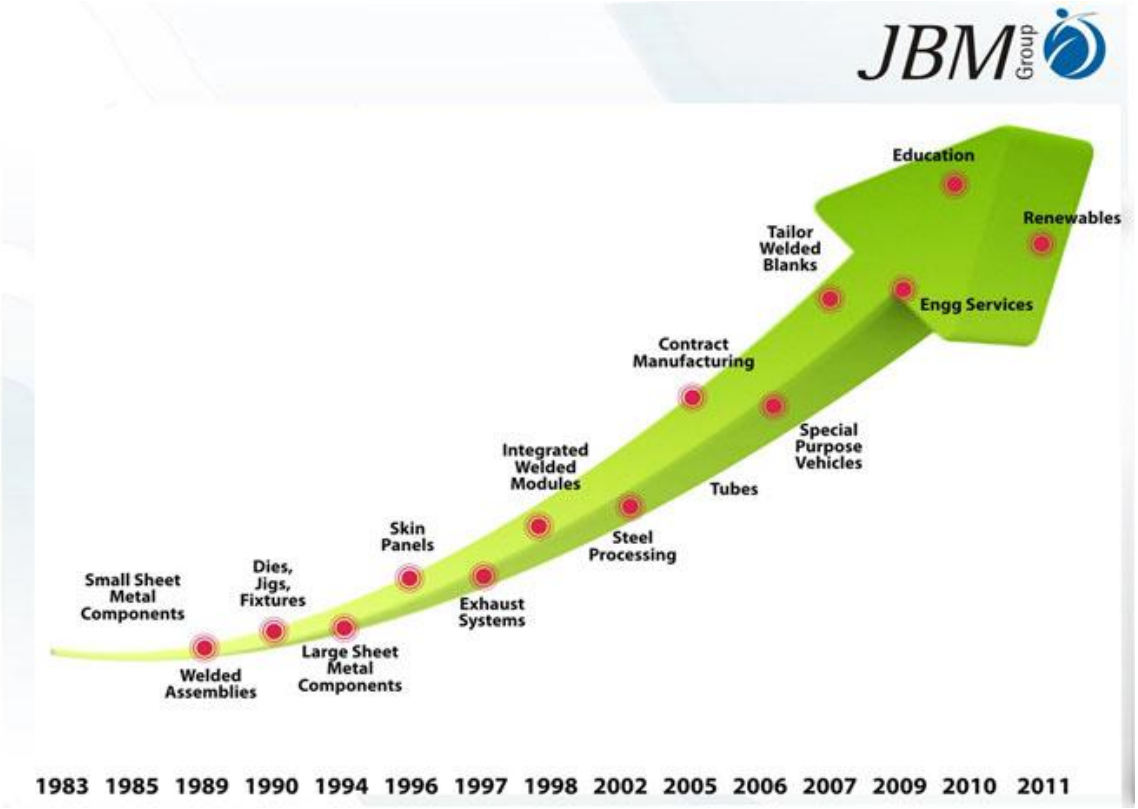
JBM Auto limited is part of JBM Group. JBM Group with corporate headquarters in New Delhi, India is a diversified conglomerate with a presence in automotive, education, engineering and design services globally. The JBM group started in 1983 as small sheet metal components manufacturer. In 1986, a joint venture with Maruti Suzuki India Ltd. was signed for manufacturing sheet metal component and sub assemblies. A brief profile is shown in figure 4.1:

Figure 4.1: JBM Group profile



The JBM Group has grown from a single manufacturing plant to 33 manufacturing plants, 5 engineering design service center and operate from 19 locations globally. With the increase in manufacturing plants and design service centers, it also included different new products in its portfolio as shown in figure 4.2.

Figure 4.2: JBM Group portfolio



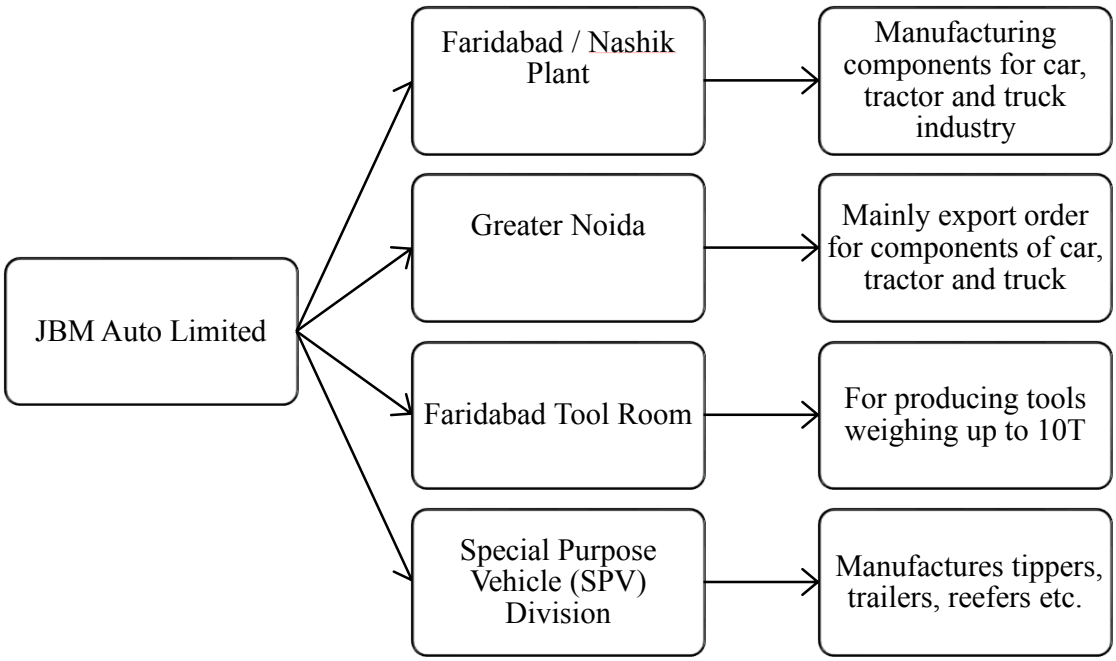
Source: jbm-group.com

The JBM group is committed to social development initiatives and executes these through its corporate responsibility arm, 'Neel Foundation'. JBM Group also started in education and renewal energy sector.

4.3 JBM Auto Limited

The company was set up in 1990, mainly to manufacture tools, dies and moulds at Faridabad, India. The company is listed in Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). The company has also established a press shop for manufacturing sheet metal components and welded sub-assemblies to meet the growing stringent quality requirements of automobile industry. JBM Auto Limited has plants at five locations as illustrated in figure 4.3. The Faridabad plan was under the study for pilot case.

Figure 4.3: JBM Auto Limited, plant locations



4.3.1 JBM Auto Limited (Faridabad Plant) SWOT Analysis

Strength (S), Weakness (W), Opportunity (O) and Threat (T) was conducted during the scoping studied and the inputs were received from eight junior, medium, and senior managers. The SWOT analysis is illustrated in table 4.1. The main strength of the company was to introduce new innovative product and leverage on their technology expertise. The strategic alliances with hi-tech companies across the globe help them to get edge over their competitors. There were two weaknesses that were seen as potential opportunities for JBM Auto Limited. The first one was in terms of new product development, which is always

considered as incremental process that introduced brand extensions rather than new products. Secondly, a conservative and risk adverse culture was also seen as weakness with the opportunity to become more open. The main threat JBM Auto Limited facing is environmental. The issues associated with the green aspects specifically. The company is keen to implement green supply chain practices.

Table 4.1: SWOT analysis of JBM Auto Limited

Strengths	**Weakness**
- Reputed parent group branding - Established relationship with customer - A pool of good suppliers - Strong technical know how - Innovative capabilities	- Conservative, risk averse culture - Incremental new product development - Not focus on promotion of company products, rely on long term contracts - A bit regional business than global business
Opportunities	**Threats**
- Leverage technical know how - New product development - Application of technology for maintaining supplier relations	- Environmental regulation - Multiple pricing issue for different customers - Threat of losing competitive position in Indian auto component market

4.3.2 Supply Chain Context

JBM auto Limited (Faridabad plant) is based in the Industrial belt of Delhi and National Capital Region (NCR). It is one of the major auto component manufacture in the area. Current product range includes sub-assemblies of cars, skin panels and axles for tractors and body components, bumpers, axles and suspension components for trucks. Components are being also exported to various truck manufactures in Europe. JBM Auto Limited also uses sometimes third party manufacturers during peak loads.

JBM Auto Limited has around 140 suppliers who provide a range of components and raw material to the manufacturing site. The suppliers have the responsibility to deliver the material at the manufacturing site. Store facility is available at the manufacturing site.

4.4 Case Focus

Given the complex nature of green supply chain practices, one of the purposes of the initial scoping study was to provide a focus for the more detailed case study exploration. The focus for the JBM Auto Limited study is summarized in table 4.2.

Table 4.2: Focus for the JBM Auto Limited Case

S. No.	Parameter	Focus for JBM Auto Limited Case
1	Business	Industrial
2	Category	Automobile component manufacturer
3	Operating Business	JBM Auto Limited
4	Sector	Manufacturing components for cars, trucks and tractors
5	Product	Sheet metal components and welded sub-assemblies
6	Customers	National: Maruti Udyog Limited (MUL), Tata Motors, Ashoka Leyland etc. International: Toyota, GM, BMW etc.
7	Suppliers	Suppliers: Raw material, components and accessories
8	Green Supply Chain Practices	Environmental certification, Pollution prevention, Life cycle assessment, Design for environment, Internal environmental management, Green Purchasing, Cooperation with customer including environment requirement and Investment recovery

4.5 Leads

This is focused on providing the response to descriptive 'What' research questions. What are the antecedents of green supply chain practices and what are the enablers of green supply chain practices. The responses to these questions are summarized in following section.

4.5.1 What are the Antecedents of Green Supply Chain Practices

At the heart of supply chain practices in JBM Auto Limited were green supply chain issues. Put in the words of Operations Manager:

'The company is looking for green supply chain practices but it's scope is very vague. It is about thinking of environment with the operations processes.' (JBMAL, ♯10)

The operations and marketing manager both have different views on green supply chain practices. Marketing manager is more concern about the better positioning in the market with green supply chain tag. To quote the marketing manager:

'Definitely, following any of the green supply chain practices plays a key role is better marketing the products.' (JBMAL, ♯3)

Green supply chain practices take the center stage in projecting the image of company and boosting the market share and overall image. President Strategy considers implementing the green supply chain practices as an incremental process and it should be implemented step by step. In the words of President Strategy:

'The main concern is to select the green supply chain practice step by step, taking one at a time and to see the fit with the existing supply chain practices'. (JBMAL, ♯2)

Pollution prevention and environmental certification are the first steps in moving towards green supply chain practices. It enables organizations to take a proactive approach towards green supply chain practices. The executive director is determined to take the company to a next stage where it can compete at international level by adopting and following the green supply chain practices. The view of Executive director was:

'Green supply chain practices are now a necessity to compete in the globalized market and to get the edge over the competitors.' (JBMAL, ♯6)

The need is to involve the customers and suppliers as joint partners in the green supply chain initiatives. The collaboration goes with both suppliers and with customers. The design for environment and life cycle assessment are most important and direct affect the product and the customer. Customer's involvement in these green supply chain practices can really change the future of green supply chain practices. The purchasing executive as very well appreciated green purchasing practices:

'Green purchasing is the order of the day, if we follow green purchasing practices and implement it in our system then it will be cost effective in future and ultimately will give us an edge over the competitors.' (JBMAL, ♯5)

4.5.2 What are the Enablers of Green Supply Chain Practices

To extract the information for enablers, explanatory approach was used. Raw information was captured from the contact notes. JBM Auto Limited is considered as one of the best auto component manufactures in India. A continuous PDCA (Plan, Do, Check and Act) cycle was adopted to check the green supply chain practices and to implement them in the supply chain. The manager of quality control department expressed the following:

'PDCA cycle is the most important quality tool because it helps in keeping a track on the progress of the projects and significantly improve the output. It is useful in keeping a track on environmental and pollution control standards.' (JBMAL, ♯8)

Environmental regulation and pollution control certification are the main practices in which JBM Auto Limited focused and it is tools like PDCA, which helps in achieving and implementing these green supply chain practices. Focus on environmentally friendly products is increasing and it leads to implementing life cycle assessment practices in the manufacturing companies. Executive production was concerned about the design and production stage. In the words of production executive:

'Growing focus on environmental friendly products has helped in concentrating on life cycle assessment which is a step forward in the direction of implementing green supply chain practices.' (JBMAL, ♯9)

Hence Life cycle assessment is taking center stage during the design stage and before the final production process. The idea is to check the future affects of a product on the environment.

4.6 Contextual Factors

There were two contextual factors identified during the JBM Auto Limited study that impact the antecedents and enablers of the green supply chain practices. These factors were globalization and outsourcing, their impact on the JBM Auto Limited is summarized in table 4.3.

4.6.1 Globalization

Globalization has changed the whole structure of the market. Two decades ago, companies used to operate in local / regional markets and the same was true for JBM Auto Limited also. The customers were mainly regional customers two decades ago for JBM Auto limited, however during the last decade the whole market structure has changed. Customers have access to all the suppliers with their product details and pricing. This has led companies to fight for the market share and to get the edge over the competitors. Implementing green supply chain practices is one of the main outcomes of globalization. JBM Auto Limited as part of big JBM group has leveraged this opportunity. As a part of a big group JBM Auto Limited has access to all the facilities and infrastructure to implement green supply chain practices.

Table 4.3: Key contextual factors and their impact on JBM Auto Limited

Contextual Factors	**Impact**	**Potential Upside**	**Potential Downside**
Globalization	Market is open for International manufacturer and supplier also.	- Introduction to new market opportunities - Increase in awareness of green supply chain practices - Increase in customer	- Increase in competition -Difficult to select the main green supply chain practices - Focus from regional

		base - More focus on green supply chain practices	to international
Outsourcing	Emergence of contract manufacturing	- Able to take extra business - Focus on supplier's / contractor's supply chain practices - Focus on core competence	- Quality check difficult - Tough to keep track on contractor's green supply chain practices

4.6.2 Outsourcing

JBM Auto limited has felt the impact of increased use of contract manufacturing. JBM Auto Limited has done some contract manufacturing work for its competitors in India and vice versa. During the peak demands JBM Auto limited has used 3rd party manufactures to deal with the peak demand. This has some time shifted the focus from green supply chain practices to serving the customers by contracting the manufacturing to 3rd party manufacturers.

4.7 Learning for Core Cases

There were three key learning points from JBM Auto Limited which were considered in the core cases: level of interviewees, collection of primary and secondary data, Use of underlying mechanism analysis from JBM Auto Limited as a starting point for further development. Each key learning process will now be explained briefly.

4.7.1 Level of Interviewees

In the Pilot case of JBM Auto Limited, a total of 22 interviews were conducted, both at senior and junior management level. However, it emerged that there was a diminishing level of return at the junior level management. Hence the focus of interviews in the core cases was targeted to more senior level management. Some key informants were also identified in the

company to gather relevant information. For the core cases, interviews were restricted to around 15.

4.7.2 Collection of Primary and Secondary Data Together

During the primary data collection at JBM Auto Limited, thinking that the company will be accessible after interviews also ignored secondary data. However, It was very difficult to gain access to the company again after completing the interviews for secondary data collection. Hence for core cases, the secondary data was also collected at the time of interviews.

4.7.3 Use of Underlying Mechanism Analysis from JBM Auto Limited as a Starting Point

During the JBM Auto Limited pilot case study, it was found there exist some contextual factors, which play a vital role in the study. Hence these factors should be considered from starting the core cases. The findings of JBM Auto Limited pilot case also act as basis for the core cases. The core case will not be started on a blank slate; they will be started with the base of JBM Auto Limited and contextual factors.

4.8 Chapter Summary

The JBM Auto Limited pilot case had the dual purpose of providing the basic foundation for the core cases by refining the methodological learning and also by answering the research questions. The methodological improvement was used in the core cases and it helped in rephrasing and questions.

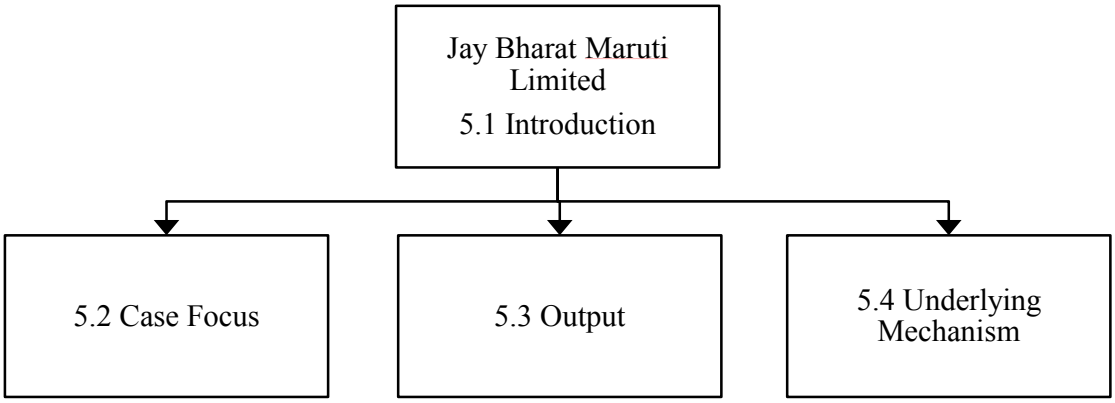
In next chapter, first core case of Jay Bharat Maruti Limited is presented.

5. Core Case 1: Jay Bharat Maruti Limited

5.1 Introduction

The structure of Jay Bharat Maruti Limited case is similar to the pilot case of JBM Auto Limited case. Some components learnt from the pilot case are used in this core case. The structure of this case is shown in figure 5.1.

Figure 5.1: Structure of chapter



5.2 Case Focus

The data was gathered after completing the pilot study hence some changes were adopted to capture the information during core case study of Jay Bharat Maruti Limited. The main focus of this core case is to find out the antecedents and enablers of green supply chain practices. In the pilot case study some contextual factors also emerged so their role is to explore this core case study of Jay Bharat Maruti Limited.

5.2.1 The Parent Company – JBM Group

JBM Group is the parent company for Jay Bharat Maruti Limited also, so the profile of the parent company is described in pilot case study. Jay Bharat Maruti Limited is also one of the oldest flagship companies in JBM Group. JBM Group collaborated with Maruti Suzuki India Limited (MSIL) in 1986 as a joint venture partner to set up Jay Bharat Maruti Limited (JBML).

5.3 Jay Bharat Maruti Limited

The company is the largest joint venture of Maruti Suzuki India Limited (MSIL) for manufacturing of sheet metal components, welded assemblies; exhaust systems, fuel neck filler and axles near Delhi (Gurgaon and Manesar). The company is listed in Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) of India. The major products are welded assemblies, axle assemblies, jigs & fixtures, exhaust and skin panels.

5.3.1. Operating Facilities

Jay Bharat Maruti Limited has excellent facilities for the stamping and welding process and is considered one of the best in India for such facilities. They have press shops with 25 T-1200 T presses and different types of welding process and facilities with equipment to perform such operations. Some of welding techniques and machines include TIG welding, Robotic welding, PSW and TIG welding. The most important thing is the finish to the products after welding and other sheet metal processes. The excellent paint and plating facilities help in giving smooth finish to the final product before dispatching them to customers.

5.3.2. Customers

The main customers of Jay Bharat Maruti Limited are Original Equipment Manufacturer (OEM). The company has long term contracts with OEM's for supplying the auto component parts. The major OEM customers are Maruti Suzuki, Eicher Motors and Mahindra & Mahindra. The major business comes from these big three OEMs. It helps company to organize the production line and raw material sourcing for a longer term. Jay Bharat Maruti Limited has different certifications for different purposes as illustrated in figure 5.2.

Figure 5.2. Different certifications of Jay Bharat Maruti Limited

Jay Bharat Maruti Limited (JBML) Certification
- ISO 9001: Quality Management System
- TS 16949: Quality Management System for Automotive Companies
- ISO 14001: Environmental Management Systems
- OHSAS 18001: Occupational Health & Safety Systems

These certifications are clear indication of their commitment towards Quality, Environment, Health & Safety issues.

5.3 Output

This section focuses on providing the response to research questions on antecedents and enablers of green supply chain practices. The questions are explanatory in nature as they focus on descriptive 'what if' issues and the responses, gave the holistic view on antecedent and enablers of green supply chain practices. The primary data sheet is illustrated in figure 5.3, which depicts the interviews conducted and data collected.

Figure 5.3. Primary data summary for Jay Bharat Maruti Limited

Date / Location	Reference / Code	Interviewee detail	
		Name	Role
Dec. 2011	CN = 1, T = 1	PL	Manager Production
Manufacturing	CN = 2, T = 2	AS	Director Operations
Plant	CN = 3, T = 3	ST	General Manager
	CN = 4, T = 4	RPS	Deputy Manager Planning
	CN = 5, T = 5	KG	Vice President Projects
	CN = 6, T = 6	DA	Senior Manager Quality
	CN = 7, T = 7	TC	Manager Development
Jan 2012	CN = 8, T = 8	DP	Executive Control
Manufacturing	CN = 9, T = 9	RP	Executive Purchasing

Plant	CN = 10	SP	Manager Marketing
	CN = 11	SL	Executive Planning
	CN = 12	PS	Manager Control
	CN = 13	AD	Director Strategy

CN = Contact notes from recorded interviews
T= Transcripts

5.3.1 What are the Antecedents and Enablers of Green Supply Chain Practices

Jay Bharat Maruti Limited is a part of JBM Group, which is one of the biggest auto component manufacturer groups in India. The green supply chain practices are the focal point for most of the companies in the auto component sector.

Manager development was concerned about the involvement of supply function in the product design process, here in his words:

'At design stage, we should be more focused on suppliers also. For example we should consider who could be the prospective supplier on the basis of their green supply chain practices'. (JBML, ♯7)

The General Manager also agreed with the fact that most of the suppliers are not following the green supply chain practices, which can possibly affect the overall green supply chain commitment of the company. In the words of the General Manager:

'Involve the suppliers at design stage and keep them informed about company's commitment towards green supply chain practices is useful.' (JBML, ♯3)

Another important aspect is involvement of customers at the product development stage. Product development is the crucial stage, which decides the fate of the products. Developing products which are environmentally friendly and which don't affect the environment adversely is important. The director of operations was responsible for streamlining the various operations according to the requirements of new products. These processes are very

specific to the product and should also consider environment. As pointed out by the director operations:

'Process designing for each and every product is very crucial. Designing of process should follow the sustainable issues as at JBML we take every concern to keep the sustainable practices in mind.' (JBML, ♯2)

The various stakeholders in the company are also getting concerned about the sustainable practices of the company. These stakeholders include local government, local council, residential associations and Non-Government Organizations (NGO) who are concerned about the workings of the company and the practices followed by the company. As echoed by the director strategy:

'The local government, council, NGO's, and residential associations play a big role in influencing the outside atmosphere of the company and the image. The JBML is having a long term relationship with the local stakeholders and keep them informed about all the new initiatives started by JBML towards sustainable practices.'(JBML, ♯13)

The green supply chain practices are prominent and take centre stage in contemporary manufacturing companies. Jay Bharat Maruti Limited (JBML) as one of the biggest company in JBM Group has spearheaded the green supply chain practices and is emerging as a role model company for adopting green supply chain practices.

The purchasing is the very crucial function of any organization and it becomes more important in the auto component manufacturing companies. The reason is because in auto component manufacturing companies, they purchase various parts in the form of sub-assemblies. These sub-assembly parts are very crucial for the company. In the words of Vice President of Projects:

'We try to add a very specific clause in our purchase orders to the sub – assembly suppliers which clearly states our green supply chain practices and also give them an understanding of what we expect from them.' (JBML, ♯5)

Sometimes, corporate restructuring also plays a vital role in supplier selection (Upadhyay and Baglieri, 2012, a) different types of corporations prefer different types of customers depending upon their need and requirements. Another important issue to consider in purchasing is the innovativeness of suppliers. An innovative supplier can be profitable in long term (Upadhyay and Baglieri, 2012, b).

5.4 Underlying Mechanism

This section describes the contextual factors that emerged during the pilot case study and were included in the core cases. During the pilot case study some inhibitors also emerged which were also explored in core case studies. These contextual factors are explored with reference to antecedents and enablers of green supply chain practices.

5.4.1 Contextual Factors

There were two contextual factors that were explored in pilot case studies: globalization and outsourcing. A new additional contextual factor 'regulatory environment' also emerged and become very useful. The impact of these three contextual factors is summarized in table 5.1

Table 5.1 Key contextual factors and their impact on Jay Bharat Maruti Limited (JBML)

Contextual Factors	**Impact**	**Potential Upside**	**Potential Downside**
Globalization	Market is open for International manufacturer and supplier also.	- Introduction to new market opportunities - Increase in awareness of green supply chain practices - Increase in customer base - More focus on green supply chain practices	- Increase in competition - Difficult to select the main green supply chain practices - Focus from regional to international
Outsourcing	Emergence of	- Able to take extra	- Quality check

	contract manufacturing	business - Focus on supplier's / contractor's supply chain practices - Focus on core competence	difficult - Tough to keep track on contractor's green supply chain practices
Regulatory Environment	Impact due to change in environment regulations.	- Standardization of green supply chain practices for the auto component manufacturer industry. - Uniformity of standards in the auto component sector.	- Administrative hassle and bureaucracy in implementing green supply chain practices.

Regulatory environment is concerned with the change in government rules and regulations for auto component manufacturers. These rules are different for the various regions and also depend upon the local authorities. There are some Special Economic Zones (SEZ) and Export Processing Zone (EPZ), which give extra facilities and provide friendly environments for business. These different zones have special regulations and standards for the sustainability, which affect the green supply chain practices of the company. The companies have to make changes according to these government standards. JBML is also located in the Special Economic Zone (SEZ) and they also have to make changes in their green supply chain practices.

5.4.2 Inhibitors

During the pilot study the focus of research was very broad. The aim was to check and refine methodology and during that process, some inhibitors also emerged. The main aim was to find out the antecedent and enablers of green supply chain practices. However during this pilot study at JBM Auto Limited (JBMAL) some inhibitors also came in to light. During some interviews, respondents touched these issues unintentionally. Hence these inhibitors

were also included in the scope of core case study. The main point addressed by interviewees was the unfamiliarity with the standards. As in the words of the manager of development:

'The challenge is to keep the designers updated with the technical changes and revisions. For green design practices, it's necessary that we keep our designers updated.' (JBML, ♯7)

The design and development is the first stage for any new product development and using green design practice, the company can pave the path for green supply chain practices at other stages also. The main thing is to apply the green supply chain practices beyond the manufacturing operations. When green supply chain practices spread beyond manufacturing then they get the potential to make the whole company more suitable for green supply chain practices. As suggested by the senior manager quality:

'If the green supply chain practices are stuck in one department or at one stage then it can adversely affect the other departments. So the concern is to extend the green supply chain practices beyond the design and manufacturing stage.'(JBML, ♯6)

5.5 Chapter Summary

This chapter is the first core case study; the aim of this core case was to answer the research questions. The research questions were descriptive in nature with the aim to find the response of interviewees addressing the main issues. During interviews, a new contextual factor 'regulatory environment' emerged. The JBML is located in a Special Economic Zone (SEZ), which makes regulatory environment contextual factors more relevant.

While collecting primary data, some interviewees talked about inhibitors. These were not in the scope of study in the start but later included and they played a vital role in studying the green supply chain practices of a company.

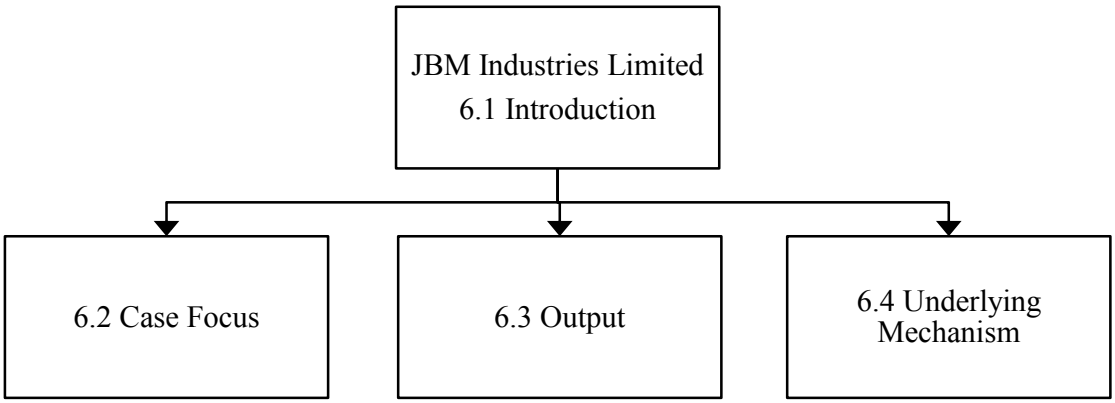
Next chapter, discuss the second core case study of ' JBM Industries Limited'.

6. Core Case 2: JBM Industries Limited

6.1. Introduction

This chapter discusses the second core case for the research. The company under this core case study is 'JBM Industries Limited'. The structure of this case is the mirror image of Jay Bharat Maruti Limited (JBML) study as presented in chapter 5 and summarized in figure 6.1. The outputs of the case study are discussed in 6.3 with chapter summary in 6.5.

Figure 6.1: Structure of chapter



6.2 Case Focus

Data were gathered primarily during scoping study. The purpose was to find the antecedents and enablers of the green supply chain practices. The business context was also studied during the research work; it includes background of the parent company and also more detail study about the JBM Industries Limited itself.

6.2.1 Parent Company – JBM Group

JBM Industries Limited is part of JBM Group. The profile of JBM group was earlier discussed in 4.2 and 5.2.1. JBM Group launched JBM Industries in 1983.

6.2.2 Company Profile – JBM Industries Limited

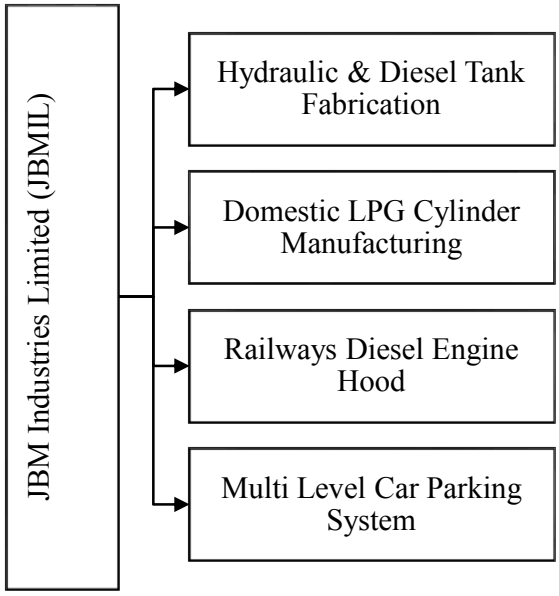
JBM Industries is one of the most diversified companies in the JBM Group. The company has manufactured plant in Faridabad (20 miles from Delhi). The brief profile of JBM Industries is shown figure 6.2. The company has in house power press capacity ranging from 40T to 650 T, which enables the JBM Industries Limited to take the various heavy metal forging and stamping projects.

Figure 6.2: Brief profile of JBM Industries Limited

Established – 1982 Total Plant area -41664 Square meter (Sqm) Manpower – 550 Certification – ISO 9001 Customers – Indian railways, Swaraj Mazda, Joseph Cyril Bamford (JCB), Honda Motorcycle, Terex Vectra, Husqvarna Operations and Facility – Heavy & medium Fabrication, Forging & Stamping Operations, Press Shop –Power Press & Press Brake ranging from 40T to 650, Weld Shop – MIGTIG Welding with Robot, Plasma Cutting Machine, Other Facilities – Pipe cutting

JBM Industries Limited has wide range of different customers from Indian Railways to Husqvana (manufacturer of outdoor power products including Chainsaws, Trimmers, Lawn mowers and garden tractors). The company started with manufacturing of domestic Liquefied Petroleum Gas (LPG) cylinders and sheet metal components and diversified in to heavy fabrication for railways and multi level car parking as shown in figure 6.3

Figure 6.3: Diversified profile of JBM Industries Limited



Presently, JBM Industries Limited has developed itself into a modern diversified engineering company offering customized solutions in house design and development capabilities also. Equipped with state of art machineries and modern gadgets, JBMIL offer wide ranging facilities of heavy fabrication such as Hydraulic & Diesel Tank s, Railways Diesel Engine Hoods, Multi level Car parking systems to name a few, together with domestic & auto LPG cylinders & air reservoirs.

6.3 Output

This part of research work focuses on discussing the response of respondents to research questions on antecedents and enablers of green supply chain practices. The questions were open-ended type, which gave the freedom to interviewee in expressing their views.

The questions were explanatory type, which focus on descriptive 'what' issues, and the response gave the holistic view on antecedents and enablers of green supply chain practices. The primary data sheet is illustrated in figure 6.4, which depicts the interviews conducted, and data collection.

Figure 6.4: Primary data sheet for JBM Industries Limited

Date / Location	Reference / Code	Interviewee detail	
		Name	Role
Jan 2012	CN = 1, T = 1	AD	President Strategy
Manufacturing	CN = 2, T = 2	DS	Manager Marketing
Plant	CN = 3, T = 3	AS	General Manager
	CN = 4, T = 4	VPS	Vice President Planning
	CN = 5, T = 5	SG	Executive Planning
	CN = 6, T = 6	AS	Senior Executive Quality
	CN = 7, T = 7	CA	Manager Design
Feb 2012	CN = 8, T = 8	PS	Executive Production
Manufacturing	CN = 9	PR	Director Operations
Plant	CN = 10	AR	Manager Projects
	CN = 11	KC	Executive Purchasing
	CN = 12	AK	Manager Development
	CN = 13	SP	Junior Executive Strategy
	CN=14	SA	Manager Data Control
	CN=15	PD	Chief Information officer
	CN=16	OP	Chief Technology officer
CN = Contact notes from recorded interviews T= Transcripts			

Middle and top-level management were focused for conducting the interviews. Some employees of junior management level were also interviewed to collect the data. Secondary data was also collected at the time of interviews in the form of annual reports, product leaflets and the product brochure, fliers and pamphlet.

6.3.1 What are the Antecedents and Enablers of Green Supply Chain Practices

JBM Industries Limited is one of the most diversified companies of JBM Group. The top management is same for all the different projects. Hence the top-level management has very diversified views on various issues. It was interesting to see that the concerned head of different products were aware about the issues faced by their areas. Chief Technology officer showed his concern over the green supply chain issues.

'Green Supply chain practices are taking the center stage in the company and every department and division in the company is working towards it.' (JBMIL, ♯16)

The starting point for green supply chain practices is the certification and pollution control. In JBMIL the focus is more of green design and how to involve the customers in design stage and make them contribute. The Manager development suggested:

'JBMIL is concerned about enhancing the green design skill of engineers by providing them proper training and monitoring their progress.' (JBMIL, ♯12)

Training plays a vital role in enhancing the skills of design engineers, which ultimately improves the green design practices. Young engineers are passionate about learning new design practices especially with sustainable approach, so sometimes the design engineer brings green design training issues. JBMIL is mechanical engineering focused company and most of the work involves knowledge of mechanical engineering applications and techniques.

Green design also helps in Life Cycle Assessment (LCA), which helps in analyzing the affect of product on the environment. As also echoed by The Design Manager:

'Training with specific green design technology issues improves the Life Cycle Assessment (LCA) which helps in analyzing the affect on environment.' (JBMIL, ♯7)

Involving the local authorities is helpful in understanding the regional requirements and their expectations. Involving the local stakeholders is crucial during the starting of new plant or launching a new production line. Chief Information Officer discussed his views:

‘Involving local authorities during launching a new production line is helpful in understanding the local pollution control and other relevant laws.’ (JBMIL, ♯15)

6.4. Underlying Mechanism

The underlying mechanism came in to pictures during pilot case study. These are the contextual factors (globalization, outsourcing and regulatory environment) and inhibitors of the green supply chain practices.

6.4.1 Contextual Factors

During the pilot study, contextual factors emerged which were globalization, outsourcing and regulatory environment. These contextual factors are summarized in table 6.1

Table 6.1: Contextual factors and their affects on JBMIL

Contextual Factors	**Impact**	**Potential Upside**	**Potential Downside**
Globalization	Market is open for International manufacturer and supplier also.	- JBMIL diversified into different engineering products - Increase in awareness of green supply chain practices - Increase in customer base	- Risk of entering in to new product market - Difficult to select the main green supply chain practices - Focus from regional to international
Outsourcing	Emergence of contract manufacturing	- JBMIL managed to get extra job work contracts - Focus on supplier’s / contractor’s supply	- Difficult to make quality check - Tough to keep track on contractor’s green supply chain

		chain practices - Focus on core competence	practices
Regulatory Environment	Impact due to change in environment regulations.	- Uniformity of standards in the auto component sector.	- Administrative hassle and bureaucracy in implementing green supply chain practices.

Globalization opened the boundaries of international market and buyers and suppliers are free to check and contact each other. JBMIL used this opportunity to diversify into different engineering and heavy metal engineering industry. They started manufacturing hydraulic and diesel tank and other similar fabrication and engineering work.

6.5 Chapter Summary

This chapter presented the second core case study. The company JBM Industries Limited is one of the most diversified companies in JBM Group. For collecting the data, interviews were conducted with the main aim of collecting the primary data to find out the antecedents and enablers of green supply chain practices. Secondary data in the form of booklets, leaflets, flier and company reports are also collected. The interviews were targeted to top, middle, and junior level management. In the next chapter, cross case analysis is presented.

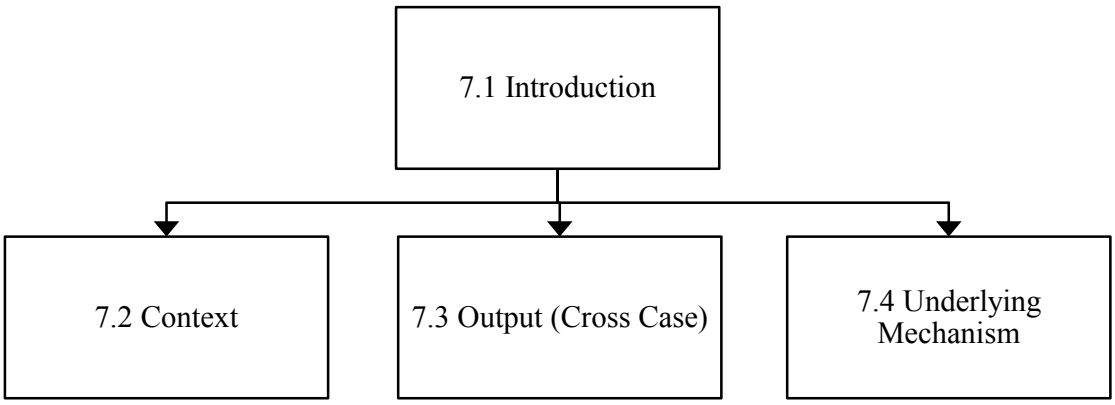
7. Cross Case Analysis

7.1 Introduction

As discussed in Research Methodology chapter, the strength of multiple case study research is that it provides theoretical or literal replication (Yin, 1994) of results. This is often contemplated more compelling, and the overall study is regarded as more robust (Herriott and Firestone, 1983). However green supply chain practices are very content specific in nature and literal replication is questionable hence research design sought to provide an opportunity to look for theoretical replication of the guiding principles and generative mechanism that underpin the antecedents and enablers of green supply chain practices. This chapter presents a comparison of individual case study – from chapter 4 (Pilot case), chapter 5 (Core case 1) and chapter 6 (Core case 2) – to aid their identification.

The structure of this chapter is illustrated in figure 7.1. In section 7.2, there is a comparison of the context in which all three case studies are embedded.

Figure 7.1: Structure of Chapter (Cross case analysis)



presents the similarities and differences of all three case studies. Section 7.4 discusses the underlying mechanism and in last section concludes with the chapter summary. This chapter gives the foundation for the last chapter which summary of key findings and contribution to knowledge of the research will be discussed.

7.2 Context

Pettigrew (1992) argues that understanding context is an essential part of case based research design, as it is inextricably linked to the business processes embedded within it. This is particularly true for the complicated reality of green supply chain practices. Section 7.2.1 provides an overview of the business context that provides a backdrop for the case studies.

7.2.1 Business Context

The companies were selected due to their role in green supply chain practices. The case study companies are in same auto component manufacturing sector. The detail business context is summarized in table 7.1

Table 7.1: Summary of the business context for three case studies

Descriptive Variables	**Case study**		
Case context	JBM Auto Limited	Jay Bharat Maruti Limited	JBM Industries Limited
Role of focal firm	Automobile component manufacturer	Automobile component manufacturer	Automobile component manufacturer
Geographical area of operation	India	India	India
Business type	Business to Business	Business to Business	Business to Business
Year of case study	2011-12	2011-12	2011-12
Parent Company	JBM Group	JBM Group	JBM Group
Turnover ($ billion)	1.2	1.2	1.2
Product range	Sheet metal parts,	Sheet metal parts,	Sheet metal parts,

	Skin panels, Welded assemblies, steel fasteners, Tubes, Special purpose vehicles, Education, Renewal services	Skin panels, Welded assemblies, steel fasteners, Tubes, Special purpose vehicles, Education, Renewal services	Skin panels, Welded assemblies, steel fasteners, Tubes, Special purpose vehicles, Education, Renewal services
Business divison	India, Italy, UK	India, Italy, UK	India, Italy, UK
Employees	3500	3500	3500
Focal Business Unit	JBM Auto Limited	Jay Bharat Maruti Limited	JBM Industries Limited
Business division	India	India	India
Product range	Sheet metal parts, Special purpose vehicles	Sheet metal parts, Skin panels, Welded assemblies, steel fasteners, Tubes, Special purpose	Sheet metal parts, Skin panels, Welded assemblies, steel fasteners,
No of employees	900	700	550

The summary gives the details of business information about the three case studies. From the detailed data it is clear that three companies have some similarities and differences. All three companies are part of same JBM Group and operate in business-to-business segment.

7.3 Output (Cross Case)

This section presents the comparative case data that will provide a response to research questions. The green supply chain practices followed by these three companies are different from each other and they are in at different stage of implementing the green supply chain practices. Table 7.2 illustrates the current stage of these companies. Jay Bharat Maruti Limited (JBML) is the most advanced company in terms of adapting new technology, standards and regulations. They have adopted and implemented various quality, environmental and design standards to help them in successfully implementing the green supply chain practices. The other two companies, JBM Auto Limited (JBMAL) and JBM

Industries Limited (JBMIL) are also working towards implementing green supply chain practices.

Table 7.2: Green supply chain practices status in cases

S. No	**Green Supply Chain Practices \ Cases**	**JBM Auto Limited**	**Jay Bharat Maruti Limited**	**JBM Industries Limited**
1	Environmental certification			
2	Pollution prevention			
3	Life cycle assessment (LCA)			
4	Design for the environment			
5	Reverse logistics			
6	Internal environmental management			
7	Green Purchasing			
8	Cooperation with customer including environment requirement			
9	Investment recovery			
10	Eco-design practices			

The antecedents for all three companies are quite similar to each other because they started almost together and they work in same sector. So the business and environment conditions faced by them are quite similar.

7.4 Underlying Mechanism

The underlying mechanisms were the contextual factors and some inhibitors, which emerged during pilot study, and core cast study. They are explained in chapter 8.

7.5 Chapter Summary

The chapter presents the cross case analysis of the three case study (one pilot and two core studies). During the individual case study, some similarities and difference emerged. These similarities and differences are analyzed in cross case study and it acts as a base for the conclusion chapter.

All three cases were compared on the basis of different descriptive variables, which were shown in tabular form. The green supply chain practices are discussed and compared among the three case studies.

8. Conclusion

8.1 Introduction

The chapter presents the final conclusion from the studies for this thesis. The thesis started with research question antecedents and enablers of the green supply chain practices and data was collected and analyzed to answer the question. In last chapters, data was collected and analyzed. Individual company data was collected and analyzed in chapter 4,5 and 6 while chapter 7 analyze the cross case data. The structure of this chapter is illustrated in figure 8.1

Figure 8.1: Structure for chapter 8 (Conclusion)

The structure for this chapter is different from other chapters. Being the last chapter of the thesis, it starts by discussing the summary of research project and findings. It ends with contribution to the research and future research directions.

8.2 Summary of Research Project

The summary of research project includes three key elements. These elements are; A review of research opportunity, research gap, processing of conducting research, rigor and relevance of results. These are discussed in next sections.

As mentioned in chapter 2 (Literature review), a gap was found for the empirical research in the context of green supply chain practices. The companies were contacted and agreed to take part in my research work. The support and coordination was great from all the three companies. It is difficult to get in to a company to conduct the interviews and collect the data, however the previous connections worked and it was quite nice experience. After deciding the research question and companies in context, next stage was the actual research operation. The objective of the research was to focus on antecedents and enablers of green supply chain practices.

To ensure the rigor of the research design, five stage process was used Flynn et al., 1990; Stuart et al., 2009; Yin, 1994) was used to structure the methodology. As a final check author assessed his research against the four basic tests commonly used in empirical research; construct validity, internal validity, external validity and reliability. Yin (1994) suggested a number of tactics that can be used to meet these four basic tests. Table 8.1 (originally presented in chapter 3 as table 3.5) provides a summary of the tactics used in the studies for this thesis.

Table 8.1: Tactics for Ensuring the Quality of the studies for this thesis

Parameters	Case study tactics	Used for this research	Stage of research where tactic used
Construct validity	Use of multiple sources for data collection	Yes	Data collection stage

	Establishing link of evidence	Yes	
Internal validity	Explanation building Pattern matching Time series analysis	Yes Yes No	Data analysis
External validity	Use of multiple case study for generalization	Yes	Research design
Reliability	Use case study protocol Develop case study database	Yes Yes	Data collection

8.3 Summary of Findings

There were three objectives for this thesis:

1. Describing the current state of green supply chain practices?
2. What are the antecedents and enablers for green supply chain practices?
3. What are the underlying mechanisms, if any?

The purpose of this section is to demonstrate how those objectives have been met. In each following section, the objectives are discussed.

8.3.1 Describing the Current State of Green Supply Chain Practices

A thorough literature review was done around sustainability and then narrowed down on green supply chain practices. The literature study started with the history of sustainability and green supply chain practices. Several papers discuss environmental issues in the supply chain (Bowen *et* al., 2001; Zhu and Sarkis, 2004). However, a clear and widely accepted definition of green supply chain practices is lacking (Klassen and Johnson, 2004). There is no such specific definition for green supply chain practices hence different authors give the common characteristics of green supply chain practices.

Lately, the internalization / externalization framework from the international management literature (Buckley and Casson, 1976) was proposed as a theoretical foundation to categorize environmental management in the supply chain (Vachon and Klassen, 2006a). The framework, which was also used recently to characterize supplier development activities (Krause *et* al., 2000) and corporate social responsibility (Husted, 2003), suggests that

organizations can either conduct activities through markets (externalizing) or by incorporating those activities within the organization hierarchy (internalizing). A macro model was developed with the different philosophies on green supply chain practices Table 8.2 (originally presented in chapter 2 as table 2.8).

Table 8.2: Macro model of green supply chain practices (Philosophies)

Green Supply Chain Management (GSCM)	Antecedents	Enablers	Inhibitors	Consequences
Carter and Carter (1998)	More difficult to replicate, particularly if suppliers devote asset-specific investments to engage in the design for disassembly and reuse activities of their customers.	Awareness about sustainable practices	Asset-specific investment	Inimitability, difficult to replicate.
Walton *et* al. (1998) and Klimley (2005)	Supply chain considered as integral part of strategic planning	Coordination in complete supply chain.	Strategic planning to implement sustainable practices.	Improvement in complete supply chain through efficient planning.
Dowell *et* al. (2000)	Increased awareness about environmental degradation	Awareness about environmental degradation	Limited Investment	Increase in environmental standards as income increases, and people become more sensitive toward and concerned about environmental degradation.
Geffen and Rothenberg (2000)	Improved information sharing in supply chain	Collaborative relationship	Problem in information sharing	High degree of interdependence along the supply chain.
Sarkis (2001)	Clustering for sustainable business practices. In this situation, wastes of one manufacturing plant may be useful material for another manufacturing plant.	Re-utilization of waste	Difficulty in identifying the reusable waste	Re-utilization of waste and by-products

Woensel *et* al. (2001) and Delmas (2004)	Emergence of Life-cycle assessment.	Cost effectiveness	Finding new technologies	Reducing the costs of changing technologies and operating policies to comply with new regulations
Kleindorfer *et* al. (2005)	Increased focus on sustainable issues.	Consumer concern for sustainable practice	Pressure from local groups	Community pressures and the threat of liability, however, can drive companies to improve their environmental performance
Vachon and Klassen (2006)	Implementation of environmental standards.	External environmental factors	Environmental standards	Externalizing environmental management in the supply chain by employing market-based mechanisms
Linton *et* al. (2007)	Extensive use of new optimization tools.	Optimization for cost efficiency	Optimization tools	By-products of supply chain, optimization of product from total cost standpoint
Srivastava (2007)	Escalating deterioration of the environment, e.g. diminishing raw material resources, overflowing waster sites and increasing level of pollution. Scarcity of raw material resources.	Finding new raw material sources	Difficulty in finding new source / suppliers.	Emergence of global outsourcing of raw material
De Brito *et* al. (2008)	Supply chain through functional internal integration, and finally a supply chain through external integration	Supply chain Integration	Difficulty in integration process	Improved integration and collaboration in supply chain
Brown (2009) and Zhu *et* al. (2005)	To guide sustainable initiatives	Regulatory framework	Problem in implementation	Focus on implementation of sustainable initiatives

Using a similar premise, Vachon and Klassen, (2006a) put forward the concept of green supply chain practices, which comprise two sets of related yet independent environmental activities: Environmental collaboration and environmental monitoring. Hence, an organization's green supply chain practices imply

1. Internalizing by integrating its environmental management activities with other organizations in the supply chain or
2. Externalizing environmental management in the supply chain by employing market-based mechanisms. The former is termed environmental collaboration while the latter is environmental monitoring (Vachon and Klassen, 2006a).

8.2 What are the Antecedents and Enablers for Green Supply Chain Practices?

After the first objective, next objective was to explore the antecedents and enablers. The antecedents were discussed in the theory for the different green supply chain practices. Hence first the green supply chain practices were studied and then ten green supply chain practices were selected as suggested by Zhu and Sarkis (2005) and (Klassen and Johnson, 2004). A micro economic model was developed to show the antecedents and enablers for green supply chain practices as shown in table 8.3 (originally presented in chapter 2 as table 2.9). This model consists of ten green supply chain practices and the antecedents and enablers linked with them. Inhibitors and consequences were also explored. In the three case studies, there were different antecedents and enablers depending upon the specific company structure and organization. The ten green supply chain practices acts as a base for finding the antecedents and enablers. Micro model for green supply chain practices focus on various green supply chain practices as suggested by Klassen and Johnson (2004) and Zhu and Sarkis (2005). For each green supply chain practice antecedents, enablers, inhibitors and consequences are studied and explored. Life Cycle Assessment (LCA) is antecedent for environmental certification and LCA is used to identify the environmental impacts before the product is actually launched. Reverse logistics leads to combining reuse, repair, remanufacturing, and recycling activities. Environmental certification is precedence for internal environmental management. Focus on green purchasing leads to selection and acquisition of products and services, which minimize the affect on environment over their cycle.

Table 8.3 Antecedents and enablers of green supply chain practices

Green Supply chain Practices (GSCP)	**Antecedents**	**Enablers**	**Inhibitors**	**Consequences**
Klassen and Johnson (2004)				
Environmental certification	Addressing environmental consideration and improving environmental performance. Comparative environmental life cycle assessment (LCA).	Application of continuous improvement models such as plan-do-check-act (PDCA) to foster environmental improvement.	Different certifications on the basis of region to choose.	Emergence of the environmental and social performance with traditional financial performance.
Pollution prevention	Strong supply chain integration, which allows supplier greater access and influence in downstream operations.	To 'build in' better environmental performance at lower cost rather than fixing it at as an afterthought.	It requires concerted efforts that extend beyond the manufacturing operations of a single plant to whole supply chain	Capturing and treatment of pollutants and harmful by-products at the various stages of supply chain.
Life cycle assessment (LCA)	To identify the environmental impacts before the products are actually introduced in to the marketplace.	Focus on identifying environmentally preferable product or process alternatives.	Quantifying the environmental burden and impact of a product or process.	Detailed assessment of the environmental burden of its products and processes.
Design for environment	Early involvement of supply function in the product design process can provide benefit for the organization.	To identify less costly and more effective opportunity to minimize environmental impact.	Unfamiliar to product designers and not well integration with other design tools.	Less waste, greater productivity and higher level of innovation.
Reverse logistics	Internalizing environmental costs and risk during manufacturing, use and post-consumption.	Quality control, planning and scheduling, cost control and measurement and inventory management and logistics.	Management of inter-firm relationship and cross-functional integration to accommodate two-way	Combination of re-use, repair, remanufacturing or recycling activities.

			flow of material.	
Zhu and Sarkis (2005)				
Internal environment management	Environmental certification precedence.	Internal improvement of product and processes.	Internal resistance to change and fear for new system.	Overall internal and external improvement of environment management.
Green purchasing	Inclusion of green performance clause in every purchasing contract.	Developing green standards and specifications.	Identifying and categorizing the purchasing process.	Focus on selection and acquisition of product and services, which minimize the effect on environment over their cycle.
Cooperation with customers including environmental requirements	Downstream cooperation for environmental management impact.	Customer's awareness and involvement in such initiatives.	Information sharing and integration in downstream.	Production of environmental friendly products and services.
Investment recovery	Recouping the value of assets no longer needed by a company by identifying and reusing.	The resale of assets via online disposition avenues such as online auctions.	Clear understanding of environmental principles and policies.	Increase in corporation's return on surplus assets through redeployment and sales efforts.

Table 8.4: Underlying mechanism (contextual factors)

	Jay Bharat Maruti Limited (JBML)			JBM Industries Limited		
Contextual Factors	**Impact**	**Potential Upside**	**Potential Downside**	**Impact**	**Potential Upside**	**Potential Downside**
Globalization	Market is open for International manufacturer and supplier also.	- Introduction to new market opportunities - Increase in awareness of green supply chain practices - Increase in customer base - More focus on green supply chain practices	- Increase in competition -Difficult to select the main green supply chain practices - Focus from regional to international	Market is open for International manufacturer and supplier also.	- JBMIL diversified into different engineering products - Increase in awareness of green supply chain practices - Increase in customer base	- Risk of entering in to new product market - Difficult to select the main green supply chain practices - Focus from regional to international
Outsourcing	Emergence of contract manufacturing	- Able to take extra business - Focus on supplier's / contractor's supply chain practices - Focus on core competence	- Quality check difficult - Tough to keep track on contractor's green supply chain practices	Emergence of contract manufacturing	-JBMIL managed to get extra job work contracts -Focus on supplier's / contractor's supply chain practices - Focus on core competence	- Difficult to make quality check - Tough to keep track on contractor's green supply chain practices
Regulatory Environment	Impact due to change in environment regulations.	-Standardization of green supply chain practices for the auto component manufacturer industry. - Uniformity of standards.	-Administrative hassle and bureaucracy in implementing green supply chain practices.	Impact due to change in environment regulations.	- Uniformity of standards in the auto component sector.	- Administrative hassle and bureaucracy in implementing green supply chain practices.

8.3. What are the Underlying Mechanism, if any?

During the pilot case study, some underlying mechanism emerged. These underline mechanism include contextual factors and inhibitors as illustrated in table 8.4. The contextual factors were globalization, outsourcing and government regulations.

8.4 Contribution for the Research

The contribution of this research to both theory (section 8.4.1) and practice (section 8.4.2) will now be discussed

8.4.1. Contribution to Theory

These research studies have contributed both to the development and testing of theory relating to the antecedents and enablers of green supply chain practices. The review of literature in Chapter 2 (Literature review) provided a synthesis of the underpinning bodies of literature that has not previously been conducted in this way. This resulted in the identification of ten core green supply chain practices for the development of antecedents and enablers that created the foundation for author's empirical investigation. It was found that previous studies have been largely theoretical. The empirical studies that do exist have focused on one particular dyadic relationship with in green supply chain practices.

A double contribution has been made to testing the theory of green supply chain practices from a process and output perspective. As process perspective, a contribution has been made to methodology by developing a robust approach for conducting supply chain research beyond the dyad. From output perspective, the author has the empirical results from the three individual case studies and their cross-case comparison for dissemination to an academic audience.

Specific contribution of this research to theory development include:

- Development of macro model of green supply chain practices with the inputs from literature.
- The synthesis of ten core green supply chain practices with antecedents and enablers from existing body of literature enriched through empirical testing
- Empirical derivation of three contextual factors.

Finally, as listed in table 3.4, the author has published a number of conference and journal papers disseminating the results of his research.

8.4.2 Contribution to Practice

A good research should turn into good practice. This was the aim during the research process and has therefore actively sought opportunities to disseminate the output of his research to practitioners. This is also aligned with the objective of 'Fondazione Italcementi' who funded this PhD program. The author is also planning to develop a 3-day executive program based on the emerging output of his studies.

A key output of the research has been the development of deep and lasting relationship with JBM Group.

The author has been asked to contribute editorial of a journal based on his thesis and to contribute chapter in an edited book.

8.5 Research Limitations

Although every step were taken to ensure the rigor and reliability of case studies has been taken, in a field as complex green supply chain practices there are inevitably some limitations. Four minor limitations have been identified:

1. Generalizability of result to practice to practice: Due to the limited size of the case study approach, the results can only be generalized to theory and not to practice.
2. Variation in quality of information: The scope of data collection for all three case studies was same still the quality of information gathered was different. As demonstrated in chapter 7, good quality cross-case analysis was still possible but the relative strengths of the three cases varied.
3. Restricted access to data: In certain case, focal firms and their client's restricted access to certain part of the green supply chain practices. In Particular JBM Industries would not permit to interview their 1st tier customers.

8.6 Future Direction for Research

As one journey ends another one starts.

1. This research employs the case study methodology that relies primarily on an inductive approach to obtain data for analytical generalization rather than statistical generalization. Thus, the focus of this research is theory building and analytical generalization. It is recommended that further research should test this theory using a larger sample and use a more quantitative research method for the purpose of statistical generalization. After all, qualitative and quantitative methods are complementary to each other and enhance investigation findings (Zikmund, 1997)
2. In this research, only automobile component manufacturing companies in India, have been studied. Future research can extend research into different geographical areas. With globalization creating a borderless marketplace today, research about green supply chain practices in countries in Europe, Asia, and the USA could lead to interesting results.
3. Future research can also try to understand if there is different behaviour towards green supply chain practices of different companies, such as traditional and progressive manufacturing companies.
4. Empirical research to test the usefulness of green supply chain practices. This would include a review of the approach.
5. Empirical research into the evolution of green supply chain practices over time. Access permitting, it would be beneficial to revisit the three case studies to understand how their green supply chain practices has developed over the intervening period and why?

References

Ashford, N. (2002), "Government and environmental innovation in Europe and North America", *American Behavioural Scientist*, vol. 45, no. 9, pp. 1417–1434.

Ayers, J. (2001), *Handbook of Supply Chain Management*, Boca Raton, FL: St Lucie Press.

Ball, J. (2004), "As Kyoto protocol comes alive, so do pollution permit markets", *Wall Street Journal*, A2.

Ballou, R.H. (2007), "The evolution and future of logistics & supply chain management", *European Business Review*, vol. 19, no. 4, pp. 332-48.

Beardwell, I. Holden, L. and Claydon, T. (2003), *Human Resource Management: A Contemporary Approach*, London: Pearson.

Beamon, B.M. (1998), "Supply chain design and analysis: Models and methods", *International Journal of Production Economics*, vol. 55, no. 3, pp. 281–294.

Beamon, B.M. (1999), "Designing the green supply chain", *Logistics Information Management*, vol.12, no. 4, pp. 332–342.

Benbasat, I., Goldstein, D. K., and Mead, M. (1987), "The case research strategy in studies of information systems", *MIS Quarterly*, vol. 11, no. 3, pp. 369-386.

Bensaou, M. (1999), "Portfolios of buyer-supplier relationships:, *Sloan Management Review*, vol. 40, no. 4, pp. 35-44.

Bodansky, D., Chou, S., and Trejolini, C. (2004), "International Climate Efforts Beyond 2012: A Survey of Approaches". *Pew Center on Climate Change*, Arlington, Virginia.

Bonifant, B.C., Arnold, M.B. and Long, F.J. (1995), "Gaining Competitive Advantage through Environmental Investments", *Business Horizons*, vol. 38, no. 4, pp. 37-47.

Bowen, F.E., Cousins, P.D., Lamming, R.C. and Faruk, A.C. (2001), "The role of supply management capabilities in green supply", *Production and Operations Management*, vol. 10, pp. 174–189.

Bras, B. and McIntosh, M.W. (1999), "Product, process, and organizational design for remanufacture – an overview of research", *Robotics and Computer-Integrated Manufacturing*, *vol*. 15, pp. 167– 178.

Brown, A.S. (2009), “Conflict on the green”, *Mechanical Engineering*, vol. 131, no. 3, pp.42-5.

Buckley, P.J. and Casson, M. (1976), *The Future of Multinational Enterprise*, MacMillan Press: London.

Buckley, P. J. Clegg, J. and Tan, H. (2005), “Reform and Restructuring in a Chinese State Owned Enterprise”, *Management International Review*, vol. 45, no. 2, pp. 147-172.

Burgess, K., Singh, P. J. and Koroglu, R. (2006), "Supply chain management: a structured literature review and implications for future research", *International Journal of Operations & Production Management*, vol. 26, no. 7, pp. 703.

Burt DNS, W.R. (1985), “Purchasing’s role in new product development”, *Harvard Business Review*, pp. 90-97.

Carter, C.R., Carter, J.R. (1998), “Interorganizational determinants of environmental purchasing: initial evidence from the consumer products industries”, *Decision Sciences*, vol. 29, no.3, pp.659-85.

Carter, C.R. and Ellram, L.M. (1998), “Reverse logistics: a review of the literature and framework for future investigation”. *Journal of Business Logistics*, vol.19, pp. 85–102.

Carter, C.R., Jennings, M.M. (2002), “Logistics social responsibility: an integrative framework”, *Journal of Business Logistics*, vol. 23, no.1, pp.145-80.

Carter, C. Rogers, D.S. (2008), “A framework of sustainable supply chain management: moving toward new theory”, *International Journal of Physical Distribution & Logistics Management*, vol. 38, no. 5, pp. 360-387.

Chopra, S. and Meindl, P. (2004), *Supply Chain Management: Strategy, Planning, and Operation*, Prentice-Hall, Upper Saddle River, NJ.

Chopra, S., and Sodhi, M. (2004), “Managing risk to avoid supply-chain breakdown”, *MIT Sloan Management Review*, vol. 46, no. 1, pp. 53–61.

Christopher, M. (2005), *Logistics and Supply Chain Management: Creating Value-Adding Network*, Prentice Hall.

Christopher, M. (1992), “Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Services”, *Financial Times* / Pitman: London.

Cooper, M.C, and Ellram, L.M. (1993), “Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy”, *The International Journal of Logistics Management*, vol. 4, no. 2, pp. 13 – 24.

Cooper, M.C, Lambert, D.M., and Pagh, J.D. (1997), "Supply Chain Management: More than a new Name for Logistics", *The International Journal of Logistics Management,* vol. 8, pp.1-13.

Corbett, C.J., and Wassenhove, L.N.V. (1993), "The Green Fee: Internalizing and Operationalizing Environmental Issues", *California Management Review*, vol. 36, no. 1 pp. 116-135.

Corey, J. (2005), "Global warming: suddenly the climate in Washington is changing", *BusinessWeek* (June 27), pp. 91–92.

Cousins, P.D., Lawson, B. and Squire, B. (2006), "Supply chain management: theory and practice – the emergence of an academic discipline"?, *International Journal of Operations & Production Management*, vol. 26, no. 7, pp. 697 – 702.

Dassapa, V., and Maggioni, C. (1993), *Reuse and Recycling – Reverse Logistics Opportunities*, Council of Logistics Management, Oak Brook, IL.

De Bakker, F. and Nijhof, A. (2002), "Responsible chain Management: A capability Assessment Framework", *Business Strategy and the Environment*, vol. 11, pp. 63-75.

De Brito, M.P., Carbone, V., and Blanquart, C.M. (2008), "Towards a sustainable fashion retail supply chain in Europe: organisation and performance", *International Journal of Production Economics*, vol. 114, no.2, pp.534-53.

Dechant, K. and Altman, B. (1994), "Environmental Leadership: From Compliance to Competitive Advantage", *Academy of Management Executive*, vol. 8, no. 3, pp. 7-27.

Delmas, M.D. (2004), "Stakeholders and competitive advantage: the case of ISO 14001", *Production and Operations Management,* vol. 13, no.4, pp. 398.

Denzi, N. K. and Lincoln, Y. S. (1994), "Introduction: Entering the Field of Qualitative Research", in N. K. Denzin and Y. S. Lincoln, (eds.) *Handbook of Qualitative Research,* Sage, Thousand Oaks, pp. 105-107.

Devinney, T.M., (2009), "Is the socially responsible corporation a myth? The good, the bad, and the ugly of corporate social responsibility", *Academy of Management Perspective,* vol. 23, no. 2, pp. 44–56.

Diabat, A., and Govindah, K. (2011), "An analysis of the drivers affecting the implementation of green supply chain management", *Resources, Conservation and Recycling*, vol. 55, no. 6, pp. 659-667.

Dowell, G., Hart, S., and Yeung, B. (2000), "Do corporate global environmental standards create or destroy market value", *Management Science*, vol. 46, no.8, pp.1059-74.

Easterby-Smith, M., Thorpe, R., and Lowe, A. (1991), *Management Research: An Introduction*, Sage, London.

Eisenhardt, K. M. (1989), "Building theories from case study research", *Academy of Management Review*, vol. 14, no. 4, pp. 532–550.

Eisenhardt, K. M., and M. E. Graebner (2007), "Theory building from cases, Opportunities and challenges", *Academy of Management Journal*, vol. 50, no. 1, pp. 25-42.

Elkington, J. (2004), "Enter the triple bottom line", In: Henriques A, Richardson J (Eds), *The Triple Bottom Line: Does It All Add up*?, Earthscan, London.

Ellram, L.M. (1991), "Supply Chain Management: The Industrial Organisation Perspective", *International Journal of Physical Distribution and Logistics Management*, vol. 21, pp. 13-22.

Ellram, L. M. (1996), "The use of the case study method in logistics research", *Journal of Business Logistics*, vol. 17, no. 2, pp. 93.

Ellram, L.M. and Liu, B. (2002), "The financial impact of supply management", *Supply Chain Management Review*, vol. 6, no. 6, pp. 30-37.

Ellram, L.M., Zsidisin, G.A., Siferd, S.P. and Stanly, M.J. (2002), "The impact of purchasing & supply management activities on corporate success", Journal of Supply Chain Management, vol. 38, no. 1, pp. 4-17.

Fava, J.A., Denison, R., Jones, B., Curran, M.A., Vigon, B., Selke, S., and Barnum, J. (eds.) (1991), *A Technical Framework for Life-cycle Assessments*, Washington, DC: Society of Environmental Toxicology and Chemistry (SETAC).

Fearon, H.E. (1989), "Historical evolution of the purchasing function", *Journal of Purchasing and Materials Management*, vol. 25, pp. 71-81.

Fine, C. H. (1998), *Clockspeed: Winning industry control on the age of temporary advantage*, Reading, MA: Perseus Books.

Fleischmann, M., Van Wassenhove, L.N., van Nunen, J.A.E.E., van der Laan, E.A., Dekker, R. and Bloemhof-Ruwaard, J.M. (1997), "Quantitative models for reverse logistics: a review", *European Journal of Operational Research*, vol. 103, pp. 1–17.

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates, K. A. and Flynn, E. J. (1990), "Empirical Research Methods in Operations Management", *Journal of Operations*

Management, vol. 9, no. 2, pp. 250-284.

Freeman, H., Harten, T., Springer, J., Randall, P., Curran, M.A., and Stone, K. (1192), "Industrial Pollution Prevention: A Critical Review", Journal of the Air and Waste Management Association, vol. 42, no. 5, pp. 617-656.

Frohlich, M.T., and Westbrook, R. (2001), "Arcs of Integration: An International Study of Supply Chain Strategies", *Journal of Operations Management,* vol. 19. No. 2, pp. 185-200.

Geffen, C., and Rothenberg, S. (2000), "Sustainable development across firm boundaries: the critical role of suppliers in environmental innovation", *International Journal of Operations & Production Management,* vol. 20, no. 2, pp.166-86.

George, A. L., and A. Bennett (2005), *Case studies and theory development in the social sciences*, The MIT Press.

Ghauri, P. and Grnhaug, K (2002), *Research Methods in Business Studies 2nd edition,* Prentice Hall, Harlow.

Godfrey, R. (1998), "Ethical purchasing: developing the supply chain beyond the environment", In: Russel, T. (Ed.), *Greener Purchasing: Opportunities and Innovations,* Greenleaf Publishing, Sheffield, England, pp. 244–251.

Gopal, C. (1992), "Manufacturing logistics systems for a competitive global strategy", in Christopher, M. (Ed.), *Logistics: The Strategic Issues,* Chapman & Hall, London.

Green, K., Morton, B., and New, S. (1996), "Purchasing and environmental management: interaction, policies and opportunities", *Business Strategy and the Environment* vol. 5, pp. 188–197.

Guba, E.G. and Lincoln, Y.S., (1994), "Competing Paradigms in Qualitative Research", in N.K. Denzin and Y.S, (eds.), *Handbook of Qualitative Research,* Lincoln, Sage, Thousand Oaks, pp. 105-117.

Guide, V.D.R., Spencer, M.S. and Srivastava, R. (1996), "Are production systems ready for the green revolution?", *Production and Inventory Management Journal,* Fourth Quarter, pp. 70–78.

Guide, V.D.R. (2000), "Production planning and control for remanufacturing: industry practice and research needs", *Journal of Operations Management,* vol. 18, pp. 467–483.

Gungor, A. and Gupta, S.M. (1999), "Issues in environmentally conscious manufacturing and product recovery: a survey", *Computers & Industrial Engineering*, vol. 36, pp. 811–853.

Gupta, M.C. (1995), "Environmental Management and Its Impact on the Operations Function", *International Journal of Operations and Production Management*, vol. 15, no. 8, pp. 34-51.

Handfield, R.B., and Nichols, E.L. (1999), *Introduction to Supply Chain Management*, Prentice Hall, Upper Saddle River, NJ.

Harland, C. (1994), "Perceptions of Requirements and Performance in European Automotive Aftermarket Supply Chains", *PhD thesis*, Warwick.

Harland, C. (1996), "Supply Chain Management: Relationships, Chains and Networks", British Journal of Management, vol. 7, pp. 63-80.

Harrison, A. and Van Hoek, R. I. (2002), *Logistics Management and Strategy*, Pearson Education.

Hart, S.L. (1995), "A Natural Resource-based View of the Firm", *Academy of Management Review*, vol. 20, no. 4, pp.984-1014.

Hartwell, R.V. and Bergkamp, L. (1992), "Eco-labeling in Europe: New Market-related Environmental Risks?", *International Environment Reporter*, vol.15, no.19, pp.623-32.

Hendricks, K., and Singhal, V. (2003), "The effect of supply chain glitches on shareholder wealth", *Journal of Operations Management*, vol. 21, pp. 501–522.

Herriott, R. E. and Firestone, W. A. (1983), "Multi site Qualitative Policy Research: Optimising Description and Unreliability", *Educational Researcher*, vol. 12, pp. 14-19.

Hervani A, Helms M, Sarkis J. (2005), "Performance measurement for green supply chain management", *Benchmarking: An International Journal*, vol. 12, no. 4, pp. 330–353.

Huan, S., Sheoran, S., and Wang, G. (2004), "A review and analysis of supply chain operations reference (SCOR) model", *Supply Chain Management: An International Journal*, vol. 9, no. 1, pp. 23 – 29.

Huppes, G. (1998), "New Instruments for Environmental Policy: A perspective", *International Journal of Social Economics*, vol. 15, no. 3, pp. 43-50.

Husted, B.W., (2003), "Governance choices for corporate social responsibility: to contribute, collaborate or internalize?", *Long Range Planning*, vol. 36, pp. 481–498.

International Institute for Sustainable Development (2001), *Business and Sustainability Development: A Global Guide*.

Jayaraman, V., Patterson, R.A. and Rolland, E. (2003), "The design of reverse distribution net- works: models and solution procedures", *European Journal of Operational Research,* vol. 150, pp. 128–149.

Johnson, M. and Templar, S. (2009), "The relationships between supply chain and firm performance: The development and testing of a unified proxy", *International Journal of Physical Distribution & Logistics Management*, vol. 41, no. 2, pp. 88-103.

Jones, T.C, and Riley, D.W. (1987), "Using Inventory for Competitive Advantage through Supply Chain Management", *International Journal of Physical Distribution and Materials Management,* vol. 17, pp. 94-104.

King A.A, and Lenox M. (2000), "Industry self-regulations with sanctions: the chemical industry's responsible care program", *Academy of Management Journal*, vol. 43, no. 4, pp. 698-716.

Klassen, R.D. (2001), "Plant-level Environmental Management Orientation: The influence of Management Views and Plant Characteristics", *Production and Operations Management,* vol. 10, no. 3, pp.57-75.

Klassen, R.D. and Johnson, P.F. (2006), "The green supply chain", *In Understanding Supply Chains: Concepts, Critiques and Futures,* edited by S. New and R. Westbrrok, Oxford University Press.

Klassen, R.D. and Greis, N.P (1993), "Managing Environmental Improvement Through Product and Process Innovation: Implications of Environmental Life Cycle Assessment", *Industrial and Environmental Crisis Quarterly*, vol. 7, no. 4, pp. 293-318.

Klassen, R.D. and McLaughlin, C.P. (1996), "The Impact of Environmental Management on Firm Performance", *Management Science,* vol. 42, no. 8, pp. 1199-1214.

Kleindorfer, P., & Saad, G. (2005), Managing disruption risks in supply chains, *Production and Operations Management*, vol. 14(1), pp. 53–68.

Kleindorfer, P.R., Singhal, K., Wassenhove, L.N.V. (2005), "Sustainable operations management", *Production and Operations Management*, vol. 14, no.4, pp.482-92.

Klimley, A. (2005), “Sustainable development becoming integral part of business strategy”, *Research Technology Management*, vol. 48, no. 5, pp. 20-34.

Klöpffer, W., and Rippen, G. (1992), “Life Cycle Analysis and Ecological Balance: Methodological Approaches to Assessment of Environmental Aspects of Products”, *Environment International*, vol. 18, no. 1, pp. 55-61.

Kraljic, P. (1983), “Purchasing must become supply management”, *Harvard Business Review*, pp. 110-7.

Krause, D.R., Scannell, T.V. and Calantone, R.J., (2000), “A structural analysis of the effectiveness of buying firms’ strategies to improve supplier performances”, *Decision Science*, vol. 31, pp. 33–55.

Krumwiede, D.W., and Sheu, C. (2002), "A model for reverse logistics entry by third-party providers", *Omega*, vol. 30, no. 5, pp. 322-33.

Lacity, M. Janson, M (1994), “Understanding Qualitative Data: A Framework of Text Analysis methods”, *Journal of Management information Systems,* vol. 11, no. 2, pp. 137-155.

Lai, K.H., Ngai, E.W.T., and Cheng, T.C.E. (2004), “An empirical study of supply chain performance in transport logistics”, *International Journal of Production Economics,* vol. 87, no. 3, pp. 321–331.

Lambert D. M., Cooper M. C., and Pagh J. D. (1998), “Supply chain management: implementation issues and research opportunities”, *International Journal of Logistics Management,* vol. 9, No. 2, pp. 1-19.

Lambert, D. M. and Cooper, M.C. (2000), “Issues in Supply Chain Management”, *Industrial Marketing Management*, vol. 29, no. 1, pp. 65-83.

Lamming, R.C. (1993), *Beyond Partnership: Strategies for Innovation and Lean Supply*, 1st ed., Prentice-Hall, London.

Lederer, P.J. and Li, L. (1997), “Production, scheduling, and delivery-time competition”, *Operations Research*, vol. 45, pp. 407-20.

Lee, H.L., and Ng S.M. (1997), “Introduction to the special issue on Global Supply Chain Management”, *Production and Operations Management,* vol. 6, pp.191-2.

Lee, S.Y. and Rhee, S.K (2007), “The change in corporate environmental strategies: a longitudinal empirical study”, *Management Decision*, vol. 45, no. 2, pp. 196–216.

Lenox, M., King, A., and Ehrenfeld, J. (2000), "An Assessment of Design-for-Environment Practices in Leading US Electronics firms", *Interfaces*, vol. 33, no. 3, pp. 65-73.

Levi, D., Kaminsky, P., and Levi, E. (2002), *Designing and Managing the Supply Chain,* McGraw-Hill.

Linton, J.D., Klassen, R., and Jayaraman, V. (2007), "Sustainable supply chains: An introduction", *Journal of Operations Management,* vol. 25, pp. 1075-1082.

Madu, C.N., Kuei, C. and Madu, I.E. (2002), "A hierarchic metric approach for integration of green issues in manufacturing: a paper recycling application", *Journal of Environmental Management,* vol. 64, pp. 261–272.

Malhotra, N. K. (1993), *Marketing Research: An Applied Orientation,* Prentice Hall, Englewood Cliffs.

Marksandspencer (2010), *About Plan A (on line)*, Available at http://corporate. marksandspencer.com/documents/publications/2010/planacommitments2010, (Accessed on 5th June 2012).

Marshall, C. and Rossman, C. B. 1(999), *Designing Qualitative Research,* (3rd Edition), London: Sage.

Melnyk, S.A., Sroufe, R.P., Calantone, R., (2003), "Assessing the impact of environmental management systems on corporate and environmental performance", *Journal of Operations Management*, vol. 21, no. 3, pp. 329–353.

Mentzer, J.T. (Ed.) (2001), *Supply Chain Management*, Sage, Thousand Oaks, CA.

Mentzer, J., DeWitt, W., Keebler, J., Min, S., Nix, N., Smith, C., Zacharia, Z. (2001), "Defining Supply Chain Management", *Journal of Business Logistics*, vol. 22, no. 2, pp. 1-25.

Meredith, J. (1998), "Building operations management theory through case and field research", *Journal of Operations Management,* vol. *6,* pp. 441-454.

Miles, M. B. and Huberman, M. A. (1994), *Qualitative Data Analysis,* Sage, Thousand Oaks, California.

Miles, R. E and Snow, C.C. (2007), "Organization theory and supply chain management: an evolving research perspective", *Journal of Operations Management*, vol. 25, no. 2, pp. 459-63.

Min, H., and Galle, W.P. (1997), "Green purchasing strategies: trends and implications", *International Journal of Purchasing & Materials Management*, vol. 33 no.3, pp.10-17.

Min, H. and Galle, W.P. (2001), "Green purchasing practices of US firms", *International Journal of Operation and Production Management*, vol. 21, pp. 1222–1238.

Min, S. and Mentzer, J.T. (2004), "Developing and measuring supply chain management concepts", *Journal of Business Logistics,* vol. 25, no. 1, pp. 63-99.

Mourits, M. and Evers, J.J. (1995), "Distribution network design", *International Journal of Physical Distribution & Logistics Management,* vol. 25, pp. 43-57.

Narasimhan, R., Carter, J.R. (1998), "Environmental Supply Chain Management", *The Center for Advanced Purchasing Studies,* Arizona State University, Tempe, AZ, USA.

Neuman, W. L. (1997), *Social Research Methods – Qualitative and Quantitative Approaches,* Ally and Bacon, New York.

OECD (1995), *Technologies for Cleaner Production and Products*, Paris, France: OECD.

Oliver, R.K., and Webber, M.D. (1982), "Supply-Chain Management: Logistics Catches up with Strategy", in Christopher, M. *Logistics: the Strategic issue*. London: Chapman and Hall, pp. 63-75.

Ozcan, P., and K. M. Eisenhardt (2009), "Origin of alliance portfolios: entrepreneurs, network strategies, and firm performance," *The Academy of Management Journal*, vol. 52, no. 2, pp. 246–279.

Parkhe, A. (1993), "'Messy' Research, Methodological Predispositions and Theory of Development in International Joint Ventures", *Academy of Management Reviews*, vol. 18, no. 2, pp. 227-268.

Pennington, D.W., Potting, J., Finnveden, G., Lindeijer, E., Jolliet, O., Rydberg, T., Rebitzer, G., (2004), "Life cycle assessment, Current impact assessment practice". *Environment International,* vol. 30, pp. 721–739.

Perry, C. (1998), "Processes of a Case Study Methodology for Postgraduate Research in Marketing", *European Journal of Marketing,* vol. 32, no. 9, pp. 785-802.

Pettigrew, A. M. (1992), "The Character and Significance of Strategy Process Research", *Strategic Management Journal,* vol. 13, no. SPECIAL ISSUE, pp. 5.

Porter, M.E., and Van der Linde, C. (1995), "Green and Competitive: Ending the Stalemate", *Harvard Business Review*, vol. 73, no. 5, pp.120-33.

Puri, S.C. (1996), *Stepping up to ISO 14000: Integrating Environmental Quality with ISO 9000 and TQM, Portland,* OR: Productivity press.

Rao, P. (2002), "Greening the supply chain: a new initiative in South East Asia", *International Journal of Operations and Production Management,* vol. 22, pp. 632–655.

Rao, P., Holt, D. (2005), "Do green supply chains lead to competitiveness and economic performance", *International Journal of Operations & Production Management,* vol. 25, no. 9, pp. 898-916.

Rich, N. and Hines, P. (1997), "Supply-chain management and time-based competition: the role of the supplier association", *International Journal of Physical Distribution & Logistics Management,* vol. 27, pp. 210-225.

Roberts, S. (2003), "Supply chain specific? Understanding the patchy success of ethical sourcing initiatives", *Journal of Business Ethics*, vol. 44, pp.159-70.

Russo M, and Fouts P. A. (1997), "Resource-based perspective on corporate environmental performance and profitability", *Academy of Management Journal*, vol. 40, pp. 534-51.

Sarkis, J. (2001), "Manufacturing's role in corporate environmental sustainability: concerns for the new millennium", *International Journal of Operations & Production Management*, vol. 21, no. 5/6, pp. 666-86.

Sarkis, J. (2002), "A strategic decision framework for green supply chain management", *Journal of Cleaner Production,* vol. 11, no. 4, pp. 397-409.

Sarkis, J. and Rasheed, A. (1995), "Greening the Manufacturing Function", *Business Horizons*, vol. 38, no. 5, pp. 17-27.

Seuring, S. (2004), "Industrial ecology, life cycles, and supply chains: differences and interrelations", *Business Strategy and the Environment,* vol.13, no. 5, pp. 306–319.

Sheffi, Y., and Rice, J. (2005), "A supply chain view of the resilient enterprise", *MIT Sloan Management Review,* vol. 47, no. 1, pp. 41–48.

Shin, H., Collier, D.A., and Wilson, D.D. (2000), "Supply Management Orientation and supplier / buyer performance", *Journal of Operations Management,* vol. 183, pp. 317-33.

Sikdar, S.K. (2003), "Sustainable development and sustainability metrics", *The American Institute of Chemical Engineers Journal, vol*. 49, no. 8, pp. 1928-1932.

Simpson, D. and Samson, D. (2008), *"*Developing Strategies for Green Supply Chain Management*", Decision Line*.

Slack, N., Chambers, S., Harland, C.M., Harrison, A., and Johnston, R., (1980), *Operations Management,* Pitman Publishing, London.

Smith, R.T., and Melnyk, S.A. (1996), "Green manufacturing: Integrating the concerns of Environmental Responsibility with Manufacturing Design and Execution", *Society for Manufacturing Engineering*: MI.

Srivastava, S.K and Srivastava, R.K (2006), "Managing product returns for reverse logistics", *International Journal of Physical Distribution & Logistics Management*, vol. 36, no. 7, pp. 524 – 546.

Stevens, G. C. (1989), "Integrating the Supply Chains", *International Journal of Physical Distribution and Materials Management,* vol. 8, no. 8, pp. 3-8.

Stuart, F.I (1993), "Supplier Partnerships: Influencing Factors and Strategic Benefits", *International Journal of purchasing and Materials Management*, vol. 29, no. 4, pp. 22-8.

Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R. and Samson, D. (2002/9), "Effective case research in operations management: a process perspective", *Journal of Operations Management,* vol. 20, no. 5, pp. 419-433.

Svensson, G. (2000), "A conceptual framework for the analysis of vulnerability in supply chains", *International Journal of Physical Distribution & Logistics Management*, vol. 30, pp. 731–749.

Tan, K. C. (2002), "Supply Chain Management: Practices, Concerns, and Performance Issues", *Journal of Supply Chain Management*, vol. 38, pp. 42–53.

Trent, R. J. (2004), "What everyone needs to know about SCM", *Supply Chain Management Review,* vol. 8, no. 2, pp. 52-9.

UN (1987), *The Brundtland Report* (on line), Available at http://www.un.org/esa/sustdev/csd/csd15/media/backgrounder_brundtland.pdf (Accessed 17th May 2012).

UNEP (2002), *Global Environment Outlook 3, Past, Present and Future Perspectives*, Earthscan: London.

UNFCCC (2011), *National greenhouse gases inventory data for the period 1990-2009* (on line), Available at http://unfccc.int/ documentation/ documents/advanced_search/ items/ 3594. php? rec=j&priref=600006593#beg (Accessed 13th May 2012).

Upadhyay, A. (2012), "Sustainability: Overview and Concepts", *International Journal of Innovations in Business*, vol. 4, pp. 268-273.

Upadhyay, A., and Baglieri, E. (2012, a), "Corporate Restructuring in a Turbulent Economy", *Journal of Investor Relations*, vol. 3, pp. 32-35.

Upadhyay, A., and Baglieri, E. (2012, b), "Innovative Supplier Selection: Key Success Factors", *International Journal of Innovations in Business*, vol. (5), pp. 336-344.

Upadhyay, A., and Baglieri, E. (2010), "Strategic Innovation and Global Competitiveness", In Proceedings: The XXI *The International Society for Professional Innovation Management (ISPIM) Conference 2010*, Bilbao, Spain.

Upadhyay, A., Johnson, M., and Baglieri, E. (2012), "Antecedents and enablers in the implementation of green supply chain practices", In Proceedings: 9th International Annual *EurOMA Conference / 4th World P&OM conference*, Amsterdam.

Vachon, S. (2007), "Green supply chain practices and the selection of environmental technologies", *International Journal of Production Research*, vol. 45, no.18-19, pp. 4357-4379.

Vachon, S. and Klassen, R.D. (2006), "Extending green practices across the supply chain: the impact of upstream and downstream integration", *International Journal of Operation and Production Management*, vol. 26, pp. 795–821.

Van Aken, J. E. (2004), "Management Research Based on the Paradigm of the Design Sciences: The Quest for Field-Tested and Grounded Technological Rules", *The Journal of Management Studies*, vol. 41, no. 2, pp. 219.

Voss, C., Tsikriktsis, N. and Frohlich, M. (2002), "Case research in operations management", *International Journal of Operations & Production Management*, vol. 22, no. 2, pp. 195-219.

Walker H, Di Sisto, L. and McBain D. (2008), "Drivers and barriers to environmental supply chain management practices: lessons from the public and private sectors", *Journal of Purchasing and Supply Management*, vol. 14, no. 1, pp. 69–85.

Walton, S.V., Handfield, R.B. and Melnyk, S.T. (1998), "The green supply chain: integrating suppliers into environmental management process", *International Journal of Purchasing & Materials Management*, Spring, pp.2-11.

Woensel, T.V., Creten, R.C. and Vandaele, N. (2001), "Managing the environmental externalities of traffic logistics: the issue of emissions", *Production and Operations Management*, vol. 10, no.2, pp.207-23.

Womack, J., Jones, D. and Roos, D. (1990), *The Machine that Changed the World*, Rawlinson Associates, New York, NY.

Wu, Z. and Pagell, M. (2011), "Balancing priorities: Decision-making in sustainable supply chain management", *Journal of Operations Management*, vol. 29, pp. 577-590.

Yin, R. K. (2003), *Case study research, Design and Methods (3rd ed.)*, Sage Publications.

Zhang, H.C., Kuo, T.C., Lu, H. and Huang, S.H. (1997), "Environmentally conscious design and manufacturing: a state-of-the-art survey", *Journal of Manufacturing Systems*, vol. 16, pp. 352– 371.

Zhu, Q. and Geng, Y. (2001), "Integrating environmental issues into supplier selection and management: A study of large and medium-sized state-owned enterprises in China", *Greener Management International*, autumn, pp. 27–40.

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Journal of Operations Management*, vol. 22, pp. 265–289.

Zhu, Q. and Sarkis, J. (2005), "An inter-sectoral comparison of green supply chain management in China: Drivers and practices", *Journal of Cleaner Production*, vol. 14, pp. 472-486.

Zhu, Q., Sarkis, J., and Lai, K.H. (2008a), "Confirmation of a measurement model for green supply chain management practices implementation", *International Journal of Production Economics*, vol. 111, no. 2, pp. 261–273.

Zhu, Q., Sarkis, J., and Lai, K.H. (2008b), "Green supply chain management implications for Closing the loop", *Transportation Research Part E: Logistics and Transportation Review*, vol. 44, no.1, pp.1-18.

Zikmund, W. (1997), *Business Research Methods*, Dryden, Fort Worth.

Zsidisin, G.A. and Hendrick, T.E. (1998), “Purchasing's involvement in environmental issues: a multi-country perspective”, *Industrial Management and Data Systems*, vol. 7, pp. 313–320.

Zsidisin, G., Melnyk, S., and Ragatz, G. (2005), “An institutional theory perspective of business continuity planning for purchasing and supply management”, *International Journal of Production Research*, vol. 43, pp. 3401–3420.

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ANNEXURE

Published Research Papers

The outcomes of this research work have been presented and discussed in various international academic conferences, doctoral seminars, research lunch seminars and scientific workshops. The details are given below:

Date	Name of Conference / Seminar	Place
Oct. 2012	Research lunch seminar	Judge Business School, University of Cambridge, UK
July 2012	EurOMA Conference	Amsterdam, The Netherland
May 2012	Venture Day	Cranfield University, UK
Feb 2012	EIASM Doctoral Conference	Brussels, Belgium
June-July10	PhD Summer Academy	University of Bergamo and Zaragoza Logistics Centre, Spain
May 2010	ISPIM Conference	Bilbao, Spain

Research work also received feedback and comments at the following international exchange programs.

Date	Name of Institute
Sept-Dec. 2012	Judge Business School and King's College, University of Cambridge, UK
Feb -July 2012	Cranfield School of Management, Cranfield University, UK
Aug-Dec 2010	MIT-Zaragoza Logistic Centre, Zaragoza, Spain
June-July 2010	PhD Summer Academy, University of Bergamo, Italy and Zaragoza Logistic Centre, Spain

List of papers published during the PhD program

- Upadhyay, A. (2012), " Sustainable Supply Chain Practices: Antecedents and Enablers", *PhD Research lunch Seminar*, Judge Business School, University of Cambridge, Uk.
- Upadhyay, A. (2012), "Sustainability: Overview and Concepts", *International Journal of Innovations in Business*, vol. 4, pp. 268-273.
- Upadhyay, A., and Baglieri, E. (2012, a), "Corporate Restructuring in a Turbulent Economy", *Journal of Investor Relations*, vol. 3, pp. 32-35.
- Upadhyay, A., and Baglieri, E. (2012, b), "Innovative Supplier Selection: Key Success Factors", *International Journal of Innovations in Business*, vol. (5), pp. 336-344.
- Upadhyay, A., Johnson, M., and Baglieri, E. (2012), "Antecedents and enablers in the implementation of green supply chain practices", In Proceedings: 9th International Annual *EurOMA Conference / 4th World P&OM conference*, Amsterdam.
- Upadhyay, A., and Baglieri, E. (2010), "Strategic Innovation and Global Competitiveness", In Proceedings: The XXI *The International Society for Professional Innovation Management (ISPIM) Conference 2010*, Bilbao, Spain.

- EurOMA conference paper is attached as full paper. For rest of the papers, only front page screen shot is attached.

In Proceedings: 19th International Annual EurOMA Conference / 4th World P&OM conference, at Amsterdam from 2-4th July 2012.

Antecedents and enablers in the implementation of green supply chain practices

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Abstract
This paper investigates the sustainability in supply chain and also introduces a framework for the implementation of green supply chain practices. Innovative organizations devise new ways to adopt sustainability and implement green supply chain practices. The paper provides a brief literature review of sustainable supply chain and discusses the green supply chain practices. Antecedents, enablers, inhibitors and consequences of sustainable supply chain are also introduced. The literature review provides the foundation for the frameworks of sustainable supply chain management and for green supply chain practices.

Keywords: Sustainability, Supply chain management, Green supply chain Practices

Introduction
It has been observed that firm's focus on generic strategies (Porter, 1980) and on their core competencies (Prahalad & Hamel, 1990). This lead the firm's to outsource their non-core activities and production of low value and low-technological parts and sub-assemblies to

lower cost providers. Manufacturers also compete on cost (Hayes & Wheelwright, 1984). This outsourcing has lead to manufacturers transferring production to low-cost economies.
By outsourcing production firms reduce costs. However this creates other challenges. One of these is high cost due to the need to transport these outsourced goods, the environmental impact becomes greater (Green et al, 1996). Legislative and regulatory compliance requires organisations to become more sustainable and reduce environment impact. Thus firms are implementing green supply chain practices (GSCP). It is interesting to explore the antecedents and enablers, which prevailed in past and still play a vital role in green supply chain practices. This paper explores the literature on green supply chain practices and presents models for green supply chain management and green supply chain practices. The models are based on different prevalent philosophies and tools and techniques of green supply chain management and practices respectively. The paper is divided in to three main parts; Introduction, literature review and framework (which also include the discussion). Literature reviews starts with sustainable supply chain management and builds the theory for developing framework for green supply chain practices.

Literature Review

Sustainable Supply Chain Management

Sustainable supply chain management (SSCM) is linked with supply chain management and environment management. SSCM integrates environment thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life (Srivastava, 2007). Hence it involves sustainability in the entire supply chain starting from raw material sourcing to the final consumption. The awareness and the government regulations are also big factors in prompting the organizations to take necessary steps towards sustainability and supply chain is a major department in the same direction.

The interaction between sustainability and supply chains is the critical next step from recent examinations of operations and the environment (Corbett and Kleindorfer, 2003) and operations and sustainability (Kleindorfer et al., 2005). A focus on supply chains is a step towards the broader adoption and development of sustainable supply chain, since the supply chain considers the product from initial processing of raw materials to delivery to the customer (Linton et al, 2007). Supply chain is crucial from the first stage (raw material processing) to the delivery of end customer and now to recollection, recycle and remanufacturing of the product. However, sustainable supply chain should also focus on the issues, which are beyond the normal supply chain management: product design, manufacturing by-products, by-products produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life. Lee and Rhee (2007) developed four types of environmental strategies reactive, focused, opportunistic, and proactive. Reactive strategies are applied for low levels of environmental responsiveness, focused strategies are applied for high levels of environmental management opportunistic strategies are applied for a medium level and proactive strategies are applied to the latest environmental practices. Research showed that organizations could achieve their business goals and also reduces environmental impact (Melnyk et al, 2003). However, there is no guarantee that all the investment in sustainable practices will bring cost savings and ultimately generate profit. This becomes a major issue when the investment in sustainable supply chain practice is proactive, and then it may not pay off for decades (Wu and Pagell, 2011). However, there are

some organizations, which take bold sustainable supply chain action at the expense of the financial health of the organization. But it is a risky proposition, sometimes it pays off in the future and sometimes it does not. I argue that it depends upon the mission and vision of the organization; what does an organization want to achieve in long run? Moreover, sometimes organizations change their decisions mid-way depending upon various internal and external factors and these organizations operate in a dynamic and complex setting (Devinney, 2009).

There is a wide range of literature available on different aspects and issues of sustainable supply chain management. These include green design (Zhang et al. 1997), green manufacturing and product recovery (Guide et al. 1996; Gungor and Gupta 1999), reverse logistics (Carter and Ellram 1998; Fleischmann et al. 1997), production planning and control for remanufacturing (Bras and McIntosh 1999; Guide 2000) and logistics networks redesign (Jayaraman et al. 2003). These aspects and issues come together and form sustainable supply chain practices, which can be used in alignment with other practices. The next step is to explore the sustainable supply chain practices.

Sustainable supply chain practices

To reduce environmental impact there are sustainable supply chain practices which affect the organization in the short-term and also in long-term. It has been suggested that life cycle assessment are used to design a product to minimize the environmental impact over it's life and afterwards (Pennington et al, 2004). This is a step towards sustainable supply chain practices.

Sustainable supply chains require awareness about sustainable practices like ethical sourcing (Roberts, 2003), green purchasing (Rao and Holt, 2005), environmental purchasing (Min and Galle, 1997), and logistics social responsibility (Carter and Jennings, 2002). Different sustainable practices cover the specific area in supply chain. Moreover, it also defines the boundaries for every unique practice and it's effect on the whole supply chain. I argue here that it's not possible and appropriate to implement all the sustainable supply chain practices in an organization. These practices are sometimes specific to specific domain areas. At the supply chain level, organizations that involve suppliers and third parties in the sustainable process early and well in advance of competitors start a development path that may provide a sustained competitive advantage that lasts well into the future. Hence it is very important for the organizations to involve the vendors, supplier and third parties in their sustainability process. There is immense pressure on the manufacturing organizations to go greener and reduce the impact on the environment. Organizations are continuously monitoring their practises by implementing environmental collaboration with customers and suppliers and also by using environmental technologies (Vachon, 2007). These include certification of their suppliers and evaluating the new supplier's on the basis of their contribution towards the organization's sustainability goal. Remanufacturing and recycling of used products is also a major concern for organizations. Green supply chain management and green supply chain practices are the next to be discussed for the development of framework.

Green Supply Chain Management

Green Supply Chain Management (GSCM) is a broad term which covers activities such as green design, green sourcing/procurement, green operations or green manufacturing', 'green distribution, logistics'/marketing' and 'reverse logistics' (Srivastava, 2007). However, the green supply chain management concept also covers all phases of a product's life cycle, from the extraction of raw materials through the design, production, and distribution phases,

to the use of the product by consumers and its disposal at the end of the product's life cycle (Walker et al., 2008; Hervani et al., 2005). Zhu and Sarkis (2004) discussed the broad perspective of Green supply chain management and include internal and external practices that play a vital role in greening the supply chain and they developed four factors for Green supply chain practices as given below:

- Internal environmental management
- External green supply chain management
- Investment recovery
- Eco-design

These four factors constitute the four main categories for the green supply chain management. Now we move to green supply chain practices to explore their nature and classify in to different categories.

Green Supply Chain Practices

Several papers discuss environmental issues in the supply chain (Bowen et al. 2001, Zhu and Sarkis 2004). However, a clear and widely accepted definition of green supply chain practices is lacking (Klassen and Johnson 2004). There is no such specific definition for green supply chain practices.

Lately, the internalization/externalization framework from the international management literature (Buckley and Casson 1976) was proposed as a theoretical foundation to categorize environmental management in the supply chain (Vachon and Klassen 2006). The framework, which was also used recently to characterize supplier development activities (Krause et al. 2000) and corporate social responsibility (Husted 2003), suggests that organizations can either conduct activities through markets (externalizing) or by incorporating those activities within the organization hierarchy (internalizing). Using a similar premise, Vachon and Klassen (2006) put forward the concept of green supply chain practices, which comprise two sets of related yet independent environmental activities: Environmental collaboration and environmental monitoring. Hence, an organization's green supply chain practices imply

1. Internalizing by integrating its environmental management activities with other organizations in the supply chain or
2. Externalizing environmental management in the supply chain by employing market-based mechanisms. The former is termed environmental collaboration while the latter is environmental monitoring (Vachon and Klassen 2006).

The most comprehensive set of green supply chain practices comprises environmental collaboration (internalizing by integrating its environmental management activities with other organizations in the supply chain) and environmental monitoring (externalizing environmental management in the supply chain by employing market-based mechanisms) as suggested by Vachon and Klassen (2006). However, its still not clear that which activities an organization should internalize or externalize with other organizations in supply chain.

For supply chain management, boundary spanning environmental practices remains particularly challenging, as two or more organizations actively work to coordinate and integrate their management and technological systems are called green supply chain practices (Klassen and Johnson, 2004) as shown below.

- Environmental certification
- Pollution prevention
- Life cycle assessment (LCA)
- Design for the environment

- Reverse logistics

Here the important thing is that two or more organizations come together to work on environmental issues and coordinate and integrate their systems. There are different views on classifying the green supply chain practices and Zhu and Sarkis (2005) classified the green supply chain practices in five different ways shown below.

- Internal environmental management
- Green Purchasing
- Cooperation with customer including environment requirement
- Investment recovery
- Eco-design practices

In total there are ten green supply chain practices as mentioned by Klassen and Johnson (2004) and Zhu and Sarkis (2005) and these are shown below.

- Environmental certification
- Pollution prevention
- Life cycle assessment (LCA)
- Design for the environment
- Reverse logistics
- Internal environmental management
- Green Purchasing
- Cooperation with customer including environment requirement
- Investment recovery
- Eco-design practices

The green supply chain practices as mentioned above constitute a cluster of green supply chain practices. These practices are different in different sectors. In some sectors, it is easy for the organizations to implement these green supply chain practices than the other sectors.

Framework and Discussion

A theoretical framework is developed for the green supply chain practices on the basis of the different prevalent philosophies and tools and techniques as shown in table 1. It also includes antecedents, enablers, inhibitors and consequences.

Table 1-Green supply chain practices

Green Supply chain Practices (GSCP)	Antecedents	Enablers	Inhibitors	Consequences
Klassen and Johnson (2004)				
Environmental certification	Addressing environmental consideration	Application of continuous improvement models	Different certifications	Emergence of environmental and social performance
Pollution prevention	Strong supply chain integration	To ‘build in’ better environmental performance	Requires concerted efforts	Capturing and treatment of pollutants
Life cycle assessment (LCA)	To identify the environmental impacts before hand.	Focus on identifying environmentally preferable product or process alternatives.	Quantifying environmental burden and impact	Detailed assessment of environmental burden

Design for environment	Early involvement of supply function	To identify less costly and more effective opportunity	Unfamiliar to product designers	Less waste, and greater productivity
Reverse logistics	Internalizing environmental costs and risk	Quality control, planning and scheduling	Management of inter-firm relationship	Combination of re-use, repair, remanufacturing or recycling
Zhu and Sarkis (2005)				
Internal environment management	Environmental certification precedence.	Internal improvement of product and processes.	Internal resistance to change and fear for new system.	Overall internal and external improvement of environment management.
Green purchasing	Inclusion of green performance	Developing green standards and specifications.	Identifying, categorizing the purchasing process.	Focus on selection and acquisition of product and services
Cooperation with customers including environmental requirements	Downstream cooperation for environmental management impact.	Customer's awareness and involvement in such initiatives.	Information sharing and integration in downstream.	Production of environmental friendly products and services.
Investment recovery	Recouping the value of assets	The resale of assets via online disposition avenues such as online auctions.	Clear understanding of environmental principles and policies.	Increase in corporation's return on surplus assets

To develop the framework, an in-depth theoretical analysis of different prevalent philosophies of green supply chain practices was done in conjugation with different tools and techniques. Green supply chain practices were selected on the basis of theoretical evidence (Klassen and Johnson, 2004; Zhu and Sarkis, 2005) and were considered as the benchmark for this research. Enablers and inhibitors give the extra strength to the framework because they explore the green supply chain practices in a wider context and include all the possibilities.

This framework is useful in implementation of green supply chain practices and also gives the detail about the different philosophies behind the framework. The data has been collected through semi-structured interviews in the four public listed manufacturing companies and the analysis process is in the way. The result will give us the clear picture and the feasibility of the above framework. It will be interesting to see the consequences in the framework after the data analysis and this can give a new direction for the future research in the area of green supply chain practices. Another interesting area for future research will be to analysis green supply chain practices in family owned companies.

Reference

Bowen, F.E., Cousins, P.D., Lamming, R.C. and Faruk, A.C. (2001), The role of supply management capabilities in green supply, *Production and Operations Management,* 10, 174–189.

Bras, B. and McIntosh, M.W. (1999), Product, process, and organizational design for remanufacture – an overview of research, *Robotics and Computer-Integrated Manufacturing,* 15, 167– 178.

Buckley, P.J. and Casson, M. (1976), *The Future of Multinational Enterprise*, MacMillan Press: London.

Carter, C.R. and Ellram, L.M. (1998), Reverse logistics: a review of the literature and framework for future investigation, *Journal of Business Logistics,* 19, 85–102.

Carter, C.R., Jennings, M.M. (2002), Logistics social responsibility: an integrative framework, *Journal of Business Logistics,* Vol. 23 No.1, pp.145-80.

Corbett, C.J., Kleindorfer, P.R. (2003), Environmental management and operations management: introduction to the third special issue, *Production and Operations Management* 12 (3), 287–289.

Devinney, T.M., (2009), Is the socially responsible corporation a myth? The good, the bad, and the ugly of corporate social responsibility, *Academy of Management Perspectives* 23 (2), 44–56.

Fleischmann, M., Van Wassenhove, L.N., van Nunen, J.A.E.E., van der Laan, E.A., Dekker, R. and Bloemhof-Ruwaard, J.M. (1997), Quantita- tive models for reverse logistics: a review, *European Journal of Operational Research,* 103, 1–17.

Green, K., Morton, B., and New, S. (1996), Purchasing and environmental management: interaction, policies and opportunities, *Business Strategy and the Environment, Vol*. 5, pp.188–197.

Guide, V.D.R., Spencer, M.S. and Srivastava, R. (1996), Are production systems ready for the green revolution? *Production and Inventory Management Journal,* Fourth Quarter, 70–78.

Guide, V.D.R. (2000), Production planning and control for remanufacturing: industry practice and research needs, *Journal of Operations Management,* 18, 467–483.

Gungor, A. and Gupta, S.M. (1999), Issues in environmentally conscious manufacturing and product recovery: a survey, *Computers & Industrial Engineering,* 36, 811–853.

Hayes, R.H. and Wheelwright, S.C. (1984), *Restoring our competitive edge; Competing through manufacturing,* New York: Wiley.

Hervani AA, Helms MM, Sarkis J. (2005), Performance measurement for green supply chain management, *Benchmarking: An International Journal*, 12(4): 330–53.

Husted, B.W., (2003), Governance choices for corporate social responsibility: to contribute, collaborate or internalize? *Long Range Planning*, 36, 481–498.

Jayaraman, V., Patterson, R.A. and Rolland, E. (2003), The design of reverse distribution net- works: models and solution procedures, *European Journal of Operational Research,* 150, 128–149.

Klassen, R.D. and Johnson, P.F. (2004), The green supply chain. *In Understanding Supply Chains: Concepts, Critiques and Futures,* edited by S. New and R. Westbrrok, Oxford University Press.

Kleindorfer, P.R., Singhal, K., van Wassenhove, L.N. (2005), Sustainable operations management, *Production and Operations Management* 14 (4), 482–492.

Krause, D.R., Scannell, T.V. and Calantone, R.J. (2000), A structural analysis of the effectiveness of buying firms' strategies to improve supplier performances, *Decision Science*, 31, 33–55.

Lee, S.Y. and Rhee, S.K (2007), The change in corporate environmental strategies: a longitudinal empirical study, *Management Decision,* 45 (2), pp. 196–216.

Linton, J.D., Klassen, R., and Jayaraman, V. (2007), Sustainable supply chains: An introduction, *Journal of Operations Management*, Vol. 25, 75-82.

Melnyk, S.A., Sroufe, R.P., and Calantone, R. (2003), Assessing the impact of environmental management systems on corporate and environmental performance, *Journal of Operations Management, Vol*. 21 (3), pp. 329–353.

Min, H., Galle, W.P. (1997), Green purchasing strategies: trends and implications, *International Journal of Purchasing & Materials Management,* Vol. 33 No.3, pp.10-17.

Pennington, D.W., Potting, J., Finnveden, G., Lindeijer, E., Jolliet, O., Rydberg, T., Rebitzer, G. (2004), Life cycle assessment Part 2 Current impact assessment practice, *Environment International,* Vol. 30, 721–739.

Porter, M.E. (1980), *Competitive strategy*, New York: The Free Press.

Prahalad, C.K. and Hamel, G. (1990), The core competence of the corporation, *Harvard Business Review*, Vol. 68, No. 3, pp. 79-91.

Rao, P., Holt, D. (2005), Do green supply chains lead to competitiveness and economic performance, *International Journal of Operations & Production Management*, Vol. 25 No.9/10, pp.898-916.
Roberts, S. (2003), Supply chain specific? Understanding the patchy success of ethical sourcing initiatives, *Journal of Business Ethics*, Vol. 44 pp.159-70.
Srivastava, S. (2007), Green supply-chain management: A state-of- the-art literature review. *International Journal of Management Reviews*, Volume 9 Issue 1 pp. 53–80.
Vachon, S. and Klassen, R.D. (2006), Extending green practices across the supply chain: the impact of upstream and downstream integration, *International Journal of Operation and Production Management*, 26, 795–821.
Vachon, S. (2007), Green supply chain practices and the selection of environmental technologies, *International Journal of Production Research*, 45:18-19, 57-79.
Walker H, Di Sisto L, McBain D. (2008), Drivers and barriers to environmental supply chain management practices: lessons from the public and private sectors, *Journal of Purchasing and Supply Management*, 14(1): 69–85.
Wu, Z. and Pagell, M. (2011), Balancing priorities: Decision-making in sustainable supply chain management, *Journal of Operations Management, Vol*. 29, pp.577-590.
Zhang, H.C., Kuo, T.C., Lu, H. and Huang, S.H. (1997), Environmentally conscious design and manufacturing: a state-of-the-art survey, *Journal of Manufacturing Systems*, 16, 352– 371.
Zhu, Q. and Sarkis, J. (2005), Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises, *Journal of Operations Management*, 22, 265–289.

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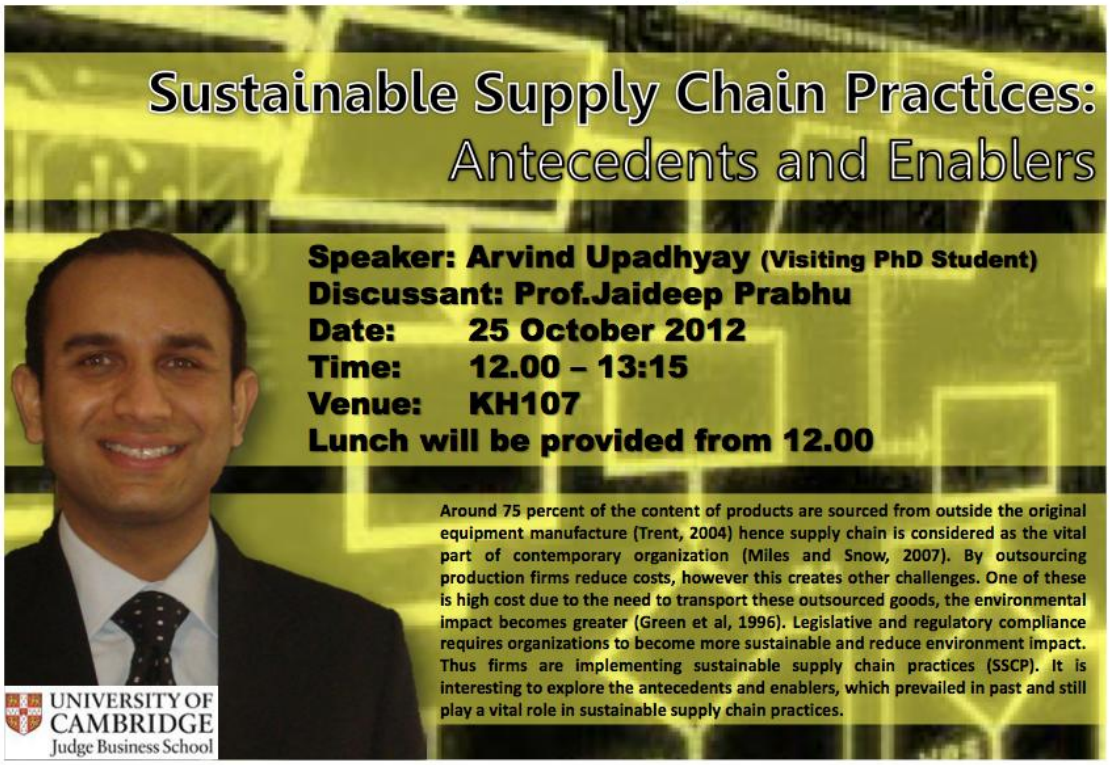

Editorial:

Innovative Supplier Selection: Key Success Factors

Arvind Upadhyay[a] and Enzo Baglieri[b]

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Abstract

Due to the emergence of globalization and shrinking distances, companies don't mind going to new unexplored locations in search of suitable suppliers. However, the suitability of suppliers can be measured in terms of its technical competence and innovativeness. The aim of this paper is to find out the necessary parameters to check the innovativeness of suppliers. This paper looks at how the authors analyzed existing literature on supplier selection based on their innovativeness.

Keywords: Supplier Selection, Innovative Selection, Buyer-Supplier, Innovative Supplier, Innovative Supplier Selection

Introduction

The activities of innovative supplier's are dependent upon the environment of the industry and the various types of supplier-buyer relationships. However, some practitioners feel that product development and innovation is a cooperative venture (Burt and Soukup, 1985). But a cooperative venture only, is not enough in innovation and product development as the

academy

Corporate Restructuring in the Turbulent Economy

"This paper is part of an ongoing research work on corporate governance. Corporate governance and restructuring is the prime concern for the organizations. There are different reasons for the organizations to go for corporate restructuring depending upon the circumstances. The authors explore the role of corporate restructuring and it's affect on the company's performance"

Arvind Upadhyay *
Enzo Baglieri **

In the contemporary scenario, companies are facing huge challenges to survive and proliferate in the globalized business environment. On top of that a turbulent economy and the market, force company executives to think about reorganizing the company structure (Bowman et al, 1999; Bowman and Singh, 1993). Top executives and board members are responsible for the smooth sailing of the company. Bebchuk and Roe (1999) argue about the path dependency phenomenon that is driven either by structure or by rule dependent mechanism governing a country. Board accountability is related to the value creation (Cadbury, 1992; Taylor, 2001). However, there is a gap between board role expectations and actual board task performance (Huse, 2005). The board role is still important in corporate restructuring and how it affects the performance of the company. The corporate restructuring process is the responsibility of promoters to reassure the faith of the stakeholder in the organization. However, sometimes the pressure for corporate restructuring comes from the outside economic environment and peer pressure.
In this research work, we study the role of corporate restructuring and its affect on company's performance.

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Literature on Corporate Restructuring

Corporate restructuring doesn't have any standard definition. Different scholars define it in different ways; It is a major change in the composition of a firm's assets combined with changes in its corporate strategy (Hoskinson & Turk, 1990).

Others, such as Bowman & Singh (1993), simply refer to it as reconfiguring the firm in a different way. Gibbs (1993) talks about free cash flow, corporate governance, and takeover threat in determining financial and portfolio restructuring. So the concept of corporate restructuring is also linked with corporate governance, financial and portfolio restructuring. Hence corporate restructuring is an umbrella term, which encompasses different aspects of organizing, reconfiguring and restructuring the firm from financial and governance consideration.

It has been suggested that increased awareness of corporate governance parallels with increased restructuring activities. Johnson (1996) argues that weak corporate governance is another motivator of corporate restructuring. Corporate restructuring helps in overall improvement in all fronts e.g. portfolio, financial and governance. Hence weak corporate governance sometimes acts as a trigger for corporate restructuring. Corporate restructuring and governance is an emerging area of management research for academicians and practitioners. This area became more popular in the last two decades after the debacle of some of the biggest organizations due to the lack or bad management of corporate governance. In the last decade, a number of papers are published on risks and issues of corporate governance. A number of case studies are developed to monitor the current practice and comparing them with the best practices in the area. There is a link between ownership structure and the corporate restructuring (Bethel and Liebeskind, 1993) and they suggested that many managers restructu-

Editorial:

Sustainability: Overview and Concepts

Arvind Upadhyay

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I am pleased to write the first Editorial for the International Journal of Innovation in Business. The journal was launched in the summer of 2012 and since then we have published three issues, and more than 10 papers. On most occasions, each issue of the journal is accompanied by a book review or case study relating to business and management topics.

The current issue is Volume 1 number 4. This issue starts with a discussion on sustainability, key definitions, background and some new research areas.

Abstract

In this paper, the author discusses the sustainability and explores some seminal definitions and the background of sustainability. Due to the globalization and severe competition, organizations are working hard to get the edge over competitors. In such volatile situations, understanding sustainability, its concepts and applications can pave the path for success. In brief, this paper provides an overview of sustainability and its concepts.

Keywords: Sustainability, Definitions of sustainability, Brundtland report, Greenhouse gas (GHG).

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APPENDICES

Appendix - 1

Key Greenhouse gas emission trends for Annexure 1 (Industrialised) countries based on the latest UNFCCC publication

GHGs including LULUCF, in Gg CO_2 equivalent								
	Base year (Convention)	1990	1995	2000	2005	2008	2009	Change from base year to latest reported year (%)
Australia	461,618	461,618	545,707	482,746	572,687	620,409	599,829	29.9
Austria	64,435	64,435	63,365	63,005	75,205	69,374	62,534	-3.0
Belarus	110,605	110,605	51,628	48,271	57,972	63,468	57,843	-47.7
Belgium	141,892	141,892	149,081	144,347	141,181	133,715	122,976	-13.3
Bulgaria	110,369	97,625	67,956	53,075	55,779	57,467	47,715	-56.8
Canada	523,777	523,777	825,558	655,463	787,016	716,763	679,734	29.8
Croatia	24,507	24,507	16,115	18,801	22,175	22,319	20,155	-17.8
Czech Republic	192,818	192,818	147,049	140,571	138,700	137,025	126,740	-34.3
Denmark	72,546	72,546	78,499	72,197	68,686	63,035	61,204	-15.6
Estonia	30,813	30,813	10,921	21,684	10,362	19,792	9,620	-68.8
European Union (15)	4,035,916	4,035,916	3,898,259	3,864,024	3,922,520	3,719,851	3,430,533	-15.0
European Union (27)	5,244,184	5,244,184	4,858,538	4,716,084	4,768,207	4,560,300	4,182,394	-20.2
Finland	55,330	55,330	57,498	48,234	40,823	43,418	25,786	-53.4
France	526,288	526,288	515,566	521,895	508,939	475,397	458,483	-12.9
Germany	1,216,727	1,216,727	1,088,056	1,009,687	1,015,537	996,328	937,262	-23.0
Greece	102,069	102,069	105,968	123,336	131,509	125,657	119,706	17.3
Hungary	111,953	94,993	72,572	76,460	75,311	69,223	63,765	-43.0
Iceland	4,544	4,544	4,280	4,720	4,561	5,624	5,326	17.2
Ireland	54,255	54,255	57,706	67,077	67,857	65,460	60,222	11.0

Italy	457,362	457,362	450,027	472,749	484,351	448,921	396,449	-13.3
Japan	1,196,976	1,196,976	1,255,905	1,254,511	1,261,056	1,202,302	1,137,690	-5.0
Latvia	11,425	11,425	-3,533	-3,970	-5,711	-10,812	-9,748	-185.3
Liechtenstein	221	221	227	252	265	257	241	9.0
Lithuania	45,321	45,321	17,255	15,393	19,891	20,699	16,661	-63.2
Luxembourg	13,175	13,175	9,866	9,381	12,767	11,987	11,388	-13.6
Malta	2,008	2,008	2,406	2,556	2,868	2,948	2,806	39.7
Monaco	108	108	115	120	104	96	91	-15.8
Netherlands	214,697	214,697	225,939	215,879	213,714	207,344	201,548	-6.1
New Zealand	35,661	35,661	40,363	41,719	49,507	43,485	43,881	23.1
Norway	41,211	41,211	38,450	34,857	24,291	19,445	25,964	-37.0
Poland	553,856	433,343	430,831	377,568	363,406	365,183	346,049	-37.5
Portugal	50,098	50,098	58,683	67,732	79,839	64,569	60,566	20.9
Romania	263,521	229,157	163,493	115,395	127,765	125,892	102,033	-61.3
Russian Federation	3,449,581	3,449,581	1,983,143	1,593,311	1,597,979	1,651,011	1,477,756	-57.2
Slovakia	71,193	71,193	49,977	46,207	48,683	45,019	39,944	-43.9
Slovenia	12,541	11,204	11,165	11,580	11,839	12,883	10,978	-12.5
Spain	264,110	264,110	295,739	357,054	410,217	377,618	340,862	29.1
Sweden	27,814	27,814	35,093	27,979	31,413	29,765	18,430	-33.7
Switzerland	50,398	50,398	47,965	53,395	53,818	54,020	52,040	3.3
Turkey	142,159	142,159	175,671	229,448	260,365	285,922	287,120	102.0
Ukraine	863,361	863,361	463,252	351,612	394,581	414,933	354,875	-58.9
United Kingdom	783,308	783,308	716,129	673,900	651,669	620,121	565,987	-27.7
United States	5,320,257	5,320,257	5,738,096	6,536,083	6,157,077	6,020,660	5,618,165	5.6

Appendix: 2

Evidence of High Degree of Accuracy between the Interview Summary in Contact Note Format and Recorded Interview

The purpose of this appendix is to show the accuracy and efficiency of contact notes as a way of capturing information from semi-structured interviews. Contact notes were made within 24 hours based on the field notes taken during the interview. They introduced a level of structure to aid analysis and tried to capture the most relevant information in a digestible and easy to use format. The first seven full interviews in the pilot study were fully transcribed and the transcripts compared to the contact notes. This was to check for accuracy and the ability to capture of the most relevant information.

The example used is from interview 4, transcript T#04 and contact notes N#04. It shows how the information recorded in the contact notes refers to information in the transcript. It uses a color-coding system to do this and does so using five different colors to make the link between five different pieces of information between the contact notes and transcript.