

Managing Risk for Green Supply Chain Management: Competitive Strategies for Manufacturing Companies

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Abstract:

The roll-out of the ISO 14001 Environmental Management System (EMS) is in fact driving this type of transition towards a time where environmental friendly practices are no longer be an optional business practice, but rather a competitive necessity for survival. In the process of evaluating the environmental consideration, companies need to shift its paradigm from the conventional departmental time-static worldview to a more holistic perspective which can effectively enable the observers to envision the interconnection between economic growth, environmental and social responsibility. Such efforts will eventually result in cleaner, safer operations, reduced usage and acceptable substitutions for hazardous substances, increased product recyclability and recovery, and improved transparency of information available to all stakeholders. The primary objectives of this research paper is to explore the antecedence outcome effects of (i) Sustainable Development in creating the Green Value Chain; and (ii) Green Value Chain in creating the Sustainable Competitive Advantage, for the manufacturing companies in India

Keywords: *Green Value Chain, Sustainable Development, Sustainable Competitive Advantage*

Introduction

Towards the inception of new millennium, the world has quickly taken an entire new look against the evolution of novel manufacturing practices in the wake of growing environmental conscious (Zhu & Dou, 2007), whereby companies attempt to out-perform each other through creation of a nexus of Sustainability Development strategies via implementation of various environmental initiatives along the value chains (Handfield et al., 1997; Arifin et al., 2009) which span across the entire customer order cycle, start right from the beginning of raw material procurement, systematically trading through the designing, manufacturing, assembling, packaging, and logistics stages, and finally deliver to the hands of customers via distribution networks (Grunert & Hildebrandt, 2004).

The roll-out of the ISO 14001 Environmental Management System (EMS) is in fact driving this type of transition towards a time where environmental friendly practices are no longer be an optional business practice, but rather a competitive necessity for survival (Handfield et al., 1997). Grunert and Hildebrandt (2004) ascribed the changes that companies undertake toward development of special skills for adaptability and innovativeness to the environmental dynamics forces. These green trends of conserving the Earth's resources and protecting the environment are thereby exerting irresistible pressures on corporate manufacturing practices, and hence anew the entire manufacturing culture through rapid globalization influences, especially with the advancement of the information technology system (Chien & Shih, 2007).

In the process of evaluating the environmental consideration, companies need to shift its paradigm from the conventional departmental time-static worldview to a more holistic perspective which can effectively enable the observers to envision the interconnection between economic growth, environmental and social responsibility (Setthasakko, 2009). Such efforts will eventually result in cleaner, safer operations, reduced usage and acceptable substitutions for hazardous substances, increased product recyclability and recovery, and

improved transparency of information available to all stakeholders (Dawes, 2009).

1.1 Evolution of Green Value Chain

The concept of a value chain has assumed a dominant position in the strategic analysis of industries over the past decades (Peppard & Rylander, 2006). Following a wave of change termed as Business Process Reengineering (BPR), that began in 1990s (Figure 1), manufacturing companies worldwide started to give due emphasis on the crucial importance of processes in value creation and management by adopting TQM and JIT management tools (Hammer, 1990). The subsequent impetus which further stressed the need for companies to develop technology-based and organizational competencies that could not be easily imitated by their business rivals was boosted under the second wave of change which was termed as Core Competency Movement (CCM) (Hamel & Prahalad, 1994). The confluence of the Business Process Reengineering and Core Competency movement had eventually engendered in unbundling of value chains, outsourcing, and innovations in contracting and supply chains. The trends which was centered on the supply chain has inspired similar trends at the corporate level as companies evolved from lean operations to lean enterprises and then to lean consumption (Kleindorfer et al, 2005).

As the new economic order unfolded, and concurrently, there has been increasing public attention placed on the overall condition of the natural environment. Manufacturing companies started to realize and recognize that the long-term success of companies actually lies not only on the profitability of business, but also the future of people and the future of the planet Earth. Waste generation and depletion of natural resources are said have outstripped the earth's ability to recuperate (Beamon, 1999). These new legitimacy concerns, which are being captured in the concept of 3P namely People, Profit and Planet. , are well aligned with the concept of Sustainable Development.

Another relatively new concept which is well in line with the green value chain concept is termed as Environmental Responsible Manufacturing (ERM). Fundamental to ERM rests on the recognition that pollution, irrespective of its type and form, is all waste. By minimizing waste, companies can reduce disposal costs, and permit requirements, avoid environmental fines, boost profits, discover new morale, protect and improve the state of the environment (Curkovic, 2003). The inception of 21st century sees the emergence of another imperative modern manufacturing strategy namely Green Manufacturing, which integrates all issues related to manufacturing with ultimate goal to reduce and minimize environmental impact and resource consumption during a product life cycle inclusive of designing, synthesis, processing, packaging, transportation, and the use of products in continuous or discrete manufacturing industries. Pursuing the Green Manufacturing strategy would enable manufacturing companies to effectively allay the environment burdens (Tan et al., 2002).

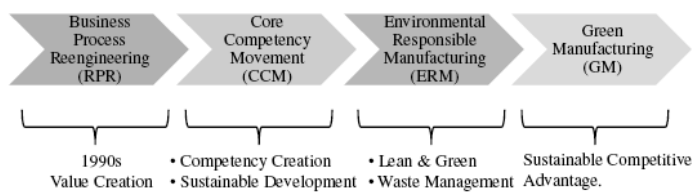


Figure 1: Evolution of Green Value Chain

In view of the increasingly wide-spread adoption of the ISO 14001 standards, it is expected that there will be reaching such a time where emphasis on Green Value Chain (GVC) via implementation of the Environmental Management System will sooner or later become a norm among the manufacturing companies in India, whereby benefits of which are evidently clear, such as increasing in overall operating efficiency; reduction in energy usage; cost saving through recycling of product inputs; improved product and service quality; less rejects and reworks; reduced packaging cost etc. (Tan, 2005). Extensive literature review indicated that most of the research studies carried out thus far is in fact:

- i. Merely concentrated on Green Supply Chain management per se (Beamon, 1999; Ofori, 2000; Hervani et al., 2005; Zhu et al., 2005; Ferretti et al., 2007; Chien & Shih, 2007; Zhu & Dou, 2007; Simpson et al., 2007; Zhu et al., 2008) and in most of the circumstances, these researches tend to focus on single aspect such as Green Purchasing (Green et al., 1998; Geng & Doberstein, 2008), Green Design (Madu et al., 2002; Pujari et al., 2003; Knight et al., 2009), Green Production (Tan et al., 2002; Taylor, 2005), Green Consumption (Spaargaren & Mol, 2008) etc., as oppose to investigate from the perspective of Green Value Chain (Sarkis & Rasheed, 1995; Caldwell & Smallman, 1996; Handfield et al., 1997; Solvang et al., 2006; Dahlstrom & Ekins, 2006).
- ii. Only covered the ostensible aspects of Green Value Chain and the linkages with its antecedence such as Sustainable development (Callens & Tyteca, 1999; Bond et al., 2001; Mog, 2004; Gandhi et al., 2006).
- iii. Rarely covered the linkage between Green Value Chain

and Sustainable Competitive Advantage (Rao & Holt, 2005).

From the aforementioned findings, it can be inferred that albeit more and more management theorists have begun to consider ecological and green sustainability as a study framework for organization, little prior theories exist to ground testable hypotheses concerning the antecedence outcome effects of Sustainable Development towards creation of Green Value Chain and therefore, the Sustainable Competitive Advantage. Lacking understanding of which may culminate in underestimating the important and crucial roles lead by these very important drivers in the efforts of creating effective sustainable strategies for the manufacturing companies.

2.0 Literature Review

Increasing awareness of environmental protection worldwide, and the pressure accompanying globalization has prompted manufacturing companies to improve their environmental performance (Chien & Shih, 2007), and to address all environmental related issues in order to maintain customers, exist, and thrive in an ever more critical global economy (Chavan, 2005). This environmental preoccupation appeared to become part of Sustainable Development (Callens & Tyteca, 1999). Sustainable Development often been cited as one of the main mechanism for changing the economic growth. Nevertheless, one of the main barriers to sustainable industrial development rests on how to implement these sustainable strategies or more importantly, how to introduce them into the existing practices whilst ideally improving competitiveness (Baldwin et al., 2005).

2.1 Value Chain versus Supply Chain

The Value Chain concept, which was epitomized by Porter (1985), defined "value chain" as the combination of nine generic value added activities that work together and are being practising within a company to provide value to customers. Value, within the context of Michael Porter's Competitive Advantage framework, is being perceived as the amount buyers are willing to pay in return for what a company provides. According to Houlihan (1987), the value created is then managed through what has been referred to as the supply chain. Al-Mudimigh et al. (2004) and Feller et al. (2006) had later extended the definition of value to a broader extend:

- i. Value is perceived by the customers rather than objectively determined by the seller;
- ii. Value is a subjective experience that is dependent on context and varies in the eyes of the beholder;
- iii. Value occurs when needs are met through the provision of products, resources, or services; and
- iv. Value is an experience, and it flows from the customers.
- v. Value typically involves a trade-off between what the customers receive and what they give up to acquire and use a product or service.

Dekker (2003) defined value chain as the horizontal linked set of value-creating activities all the way from basic raw material sources for component suppliers through the ultimate end-use product delivered into the hands of final customers. The primary focus in value chains is downstream-pivoted, mainly on the benefits that accrue to customers, the interdependent processes that generate value and the resulting demand and funds flows that are thereof created. Because value is derived from customer needs, activities that do not contribute to meeting these needs are being considered as “non value-added” waste which deserved attention and actions (Feller et al., 2006). By continuously improving material transformation process, a manufacturing system aims to constantly reduce costs and increase value-added to its products and services (Solvang et al., 2006). Hence, effective value chains will eventually lead to top line improvement or profit generation. In addition to these underpinning traditional dimensions, the connotation of value chain has been evolved, further refined and extended to embed environmental aspects. The newly transformed concept is emerged as Green Value Chain. In order to be successful with the environmentally-friendly practices, environmental strategies must be integrated into all stages of the value chain (Feller et al., 2006).

Rabelo et al. (2007) defines supply chains as life cycle processes to support the physical, information, financial, and knowledge aspects for moving products and services from suppliers to customers. Ketchen et al. (2008), on the other hand, defines supply chain as a system of people, activities, information, and resources involved in creating a product and then moving it to the customer. As the name implies, the primary focus in supply chains is upstream-pivoted, mainly on integrating supplier and producer processes, reducing waste and costs, improving efficiencies of supply, and the flow of materials from their various sources to their final destinations. The goal of managing the supply chain is the creation of value for both customers; in the form of high quality products, and the supply chain partners; in the form of increased profits. Efficient supply chain management will lead to bottom line improvement or costs reduction (Feller et al., 2006; Rabelo et al. 2007). An integrated supply chains flowing from supplier, to manufacturer, to customer and reverse logistics, which is closing the loop is termed as Green Supply Chain Management (GSCM) (Zhu et al., 2005). Similarly, when green purchasing, green manufacturing, green distribution, green marketing and reverse logistics are being combined together, they form what is termed as Green Supply Chain Management (GSCM) (Chien & Shih, 2007).

According to Al-Midimigh et al. (2004), value chain management is concerned primarily, with the customer from start to finish whereby supply chain becomes only a subset to value chain. Feller et al. (2006) summarized the relationship between a value chain and a supply chain as complementary views of an extended enterprise with integrated business processes, which enable the flows of products and services in one direction, while value as represented in terms of demand and cash flow in other direction (Figure 2).

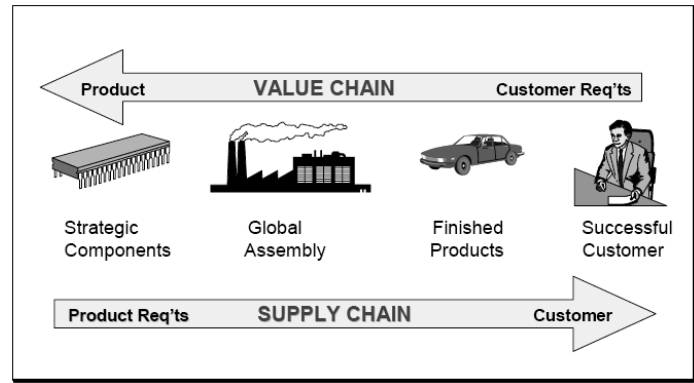


Figure 2.0: Value Chain versus Supply Chain (Feller et al., 2006)

These various definitions denoted by different authors had been summarized in Table 1 for ease of reference. Based on the preceding discussion and by integrating the salient concepts of all authors, value chain can be redefined as an upstream flow of value, in the form of demand or specifications, from customers to supplier via both the horizontal and vertical linked-set. Whereas the supply chain is a downstream flow of value-created, in the form of product and service, from the source to the customers via both the horizontal and vertical linked-set. Green value chain and green supply chain can be created by taking into consideration of the mitigation plan to allay the environmental aspect and impact. These definitions will be adopted throughout the entire research study.

Table 1: Value Chain versus Supply Chain

No	Value Chain	Supply Chain
1	Combination of nine generic value added activities that work together and are being practising within a company to provide value to customers (Porter, 1985).	Tool to manage value created (Houlihan, 1987).
2	The horizontal linked set of value-creating activities from basic raw material sources for component suppliers through the ultimate end-use product delivered into the hands of final customers (Dekker, 2003).	The vertical linked set of value-creating activities between the firm and its buyers and suppliers (Dekker, 2003).
3	Concerned primarily, with the customer from start to finish whereby supply chain becomes only a subset to value chain (Al-Midimigh et al., 2004).	A downstream flow of goods and supplies from the source to the customers (Feller et al., 2006).
4	An upstream flow of value, in the form of demand, from customers to supplier (Feller et al., 2006)	Life cycle processes to support the physical, information, financial, and knowledge aspects for moving products and services from suppliers to customers (Rabelo et al., 2007).
5	A traditional production or assembly supply chain with added component of service (Rabelo et al., 2007).	A system of people, activities, information, and resources involved in creating a product and then moving it to the customer (Ketchen et al., 2008).

2.2 Antecedents of Green Value Chain

Companies are today facing increasing demands from various stakeholders concerning the environmental performance of their products and processes, whereby public authorities place growing demand on companies' environmental performance to comply with legal and other requirements, customers are asking for green products, employees and neighborhood residents are concerned about the health and safety aspects of production and non-governmental organizations are pressing companies for sustainability (Pesonen, 2001). Future sustainable competitiveness is therefore closely dependent on as to what extent the manufacturing companies are greened and being environmental friendly.

In recent years, both regional and global attention has been given to the integration of economic, social and environment in a coherent form of eco-industrial development which seeks to increase business competitiveness, reducing waste and pollution, and improving working environment. Deepening environmental concerns and perceptions of increased risk to health and safety of community residents from industrial activities keeps on pressing corporations to adjust their actions evolutionary to accommodate to these changes by developing strategies and prioritizing environmental tasks (Stormer, 2008). From being perceived as a cost center, environmental management is now gaining wider acceptance as a legitimate business factor and is being viewed as a profit center whereby creating opportunities through innovation becomes a new focus of creating competitive advantage. Hence, current and future developments are expected to evolve to a process of deeper integration where products and processes are designed on the basis of environmental criteria (Stormer, 2008).

In brief, green initiatives can be driven by a combination of drivers – legal compliances, corporate citizenship, environmental protection, sustainable development, as well as long-term sustainable competitive advantages in terms of economic opportunity in the form of potential cost reductions and new marketing opportunities. In fact, the most compelling reason for organizations adopting lean is the economic and environmental benefits of going green (Dawes, 2009). Therefore, it is now imperative to analyze the entire life-cycle effects of all products and processes (Beamon, 1999; Pujari et al., 2003; Knight & Jenkins, 2009). Hervani et al. (2005) had identified competitive forces as primary reason that caused organizations to look externally to determine how to sustain long-term competitive advantage; and stakeholders as secondary reason that caused organizations to explicitly consider the environment in their strategic and operational planning execution. In addition to these, objective evidence presented by Clemens & Douglas (2006) also ascertained that external institutional force such as regulation or legislation play major roles in encouraging companies to adopt voluntary green initiatives. Nevertheless, sustainability is expected not only to be limited by merely going on green, but has to be extended to other dimensions such as Social Corporate Responsibility (Millen & Walker, 2009).

2.2.1 Sustainable Development

Sustainable Development (SD) is being defined by the World Commission on Environment and Development as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Kleindorfer et al. (2005) suggested that the evolution towards sustainable operation shall therefore be integrated into three areas, namely (i) Green product and process development; (ii) Lean and green operation management; and (iii) Remanufacturing and closed-loop supply chains. Gandhi et al. (2006), through their Four Forces Model, advocate that the process leading towards Sustainable Development (SD) is in fact being driven by four forces, namely (i) Unsustainable Development; (ii) Environmental Degradation; (iii) Greening Force; and (iv) Greening Process. The causal relationship among the various constituents has been delineated as follows:

- (i) Current Unsustainable Development will result in current Environmental Degradation, and its effect is Greening Force.
- (ii) This Greening Force, in turn, will result in Greening Process, and its effect is future Sustainable Development.

According to Institutional Isomorphism Theory, Greening Force can be further classified as (i) Coercive Force e.g. law or regulations; (ii) Normative Force e.g. Society and professional organization; and (iii) Mimetic Force, where the companies have desire to be market leader (Sharfman et al., 2004). Albeit there exist barriers owing to psychological, organizational, institutional, and economic influences throughout the process of adopting the sustainable technologies in the manufacturing process (Baldwin et al., 2005), extensive studies showed that companies can actually create Sustainable Development through environmental initiatives along the entire length of value and supply chains (Caldwell & Smallman, 1996; Handfield et al., 1997; Setthasakko, 2009; Markley et al., 2007; Vachon & Mao, 2008). In fact, manufacturing companies in industrialized nations had demonstrated that the benefits gained from embarking Environmental Management System are related to green and efficient operation. This is particularly important for newly industrialized countries where Sustainable Development is lacking (Tan, 2005).

2.2.2 Corporate Social Responsibility

Corporate Social Responsibility (CSR), which is the main tool to implement sustainable development (Streimikiene et al., 2009), is being defined by the European Commissions as a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment by integrating social and environmental concerns in their business operations and in their interaction with their stakeholders (COM, 2001). For decades, this popular concept, which appears to be a new battle ground for sustainable competitive advantage, has been a subject of intense debate among the scholars, practitioners and theorists. CSR, in fact, centers on the idea that a corporation may be held socially and ethically accountable by an expansive array of stakeholders such as employees, consumers, governments, communities, NGOs, investors, supply chain members, union, regulators, the media, and even the broader society including future generations (Maloni & Brown, 2006).

Meehan et al. (2006) suggested that a successful corporate responsibility orientation requires the presence of three simultaneous elements i.e. (i) Ethical and social commitments, (ii) Connection with partners in the value network; and (iii) Consistency of behavior over time to build trust. Ethical and social commitments represent the values element of social resources which comprise the ethical standards and social objectives the organization subscribes to and are manifested in its mission, strategic objectives, strategy programmes, organizational policies and corporate culture. When organization-wide commitment to robust ethical standards is deficient, due to a consistent focus on short-term profits across the value network, corporate legitimacy will likely to decline. The structure of relationship within the value, on the other hand, is the means through which a joint implementation of

a socially oriented value network is achieved. Where an individual organization espoused a commitment to particular social values, but fails to work towards their dissemination within the wider value network, a stakeholder deficit will prevail. Consistency, however, refers to the behavioral element of social resources over time and across all facets of an organizations operation. Failure to consistently behave in line with the stated value commitments, using externally assured social auditing systems, will ultimately result in Corporate Social Performance deficit. As summary, weakness in one of these three elements will engender in a failure to adequately achieve a real corporate responsibility orientation.

In the light of the recent upsurge of environmental concerns worldwide, there emerges a new terminology i.e. Ecological Citizenship. Concept of which outlines demand of citizens to be free from environmental risks inflicted on them by others, irrespective of whether these risks are originated from inside or outside of the territory of the nation-states they belong to. With the increase of both formal and informal transnational networks for environmental politics and governance, and strengthened very much by the upsurge in information governance, the post-national forms of ecological citizenship will gain most likely considerable importance in the near future (Spaargaren & Mol, 2008). Customer's environmental performance requirements can sometimes have a positive influence on a supplier's strategic level of commitment toward its environmental responsibilities. Increasing levels of the supplier's strategic environmental commitment is, in turn, expected to have a positive impact on the supplier's environmental performance. Therefore, by encapsulating environmentally relevant goals, practices or technologies within supply chain, large organizations can, through imparting new knowledge and green environmental concept, provide a modus for organizations to extend their goals of CSR, communicate their commitment to such goals and provide a leadership role to their suppliers (Simpson et al., 2007). Business benefits that derive from CSR activities can be classified into five main areas, namely (Weber, 2008):

- i. Positive effects on company image and reputation;
- ii. Positive effects on employee motivation, retention, and recruitment;
- iii. Cost savings;
- iv. Revenue increases from higher sales and market share; and
- v. CSR-related risk reduction or management.

2.3 Outcomes of Green Value Chain

The increasing importance of the environmental management concerns in business has eventually required operations management and value chain managers to carefully reevaluate their actions and influences owing to the very intimate relationship between value chain activities and the environmental footprint of a company (Handfield et al., 1997). Greening the value chain, thus, becomes an important consideration for breaking through the competition in creating sustainable competitive advantage for future survival of many industries (Rao & Holt, 2005).

In a survey conducted by Tan (2005), the main three major "reason-grouping" indicates that manufacturing companies in India generally adopt Environmental Management System attributable to (i) aiming at gaining competitive advantages; (ii) aiming at gaining government incentives; and (iii) influence from authoritative parties such as parent companies. Chavan (2005), on the other hand, grouped these benefits into eight broad categories i.e. (i) Clean and green operation; (ii) Effective operations; (iii) Profitability; (iv) Competitive product or service; (v) Market expansion; (vi) Improvement in company image; (vii) Improvement in management; and (viii) Others.

According to Gandhi et al. (2006), greening of value chain will finally lead to future sustainability via formation of win-win alliance with regulatory, community and consumers. Hence, greening shall no longer be perceived as merely to reduce environmental impact, but also to improve efficiency and sustainable competitive advantage (Gandhi et al., 2006), whereby environmental profits are believed can be realized through achieving eco-efficiency via reducing of material flows and increasing resource productivity; using of biodegradable goods which avoid toxic emissions and waste generation etc. This implies that the strategy of the corporation has to be continually adjusted. In reality, sustainable strategies that managed to seize value-creation opportunities offers significant competitive advantages for early adopters and process innovators (Miller & Walker, 2009). Despite of various possible outcomes as being expounded in the preceding discussion, these outcomes are believed will eventually converge towards supporting the Sustainable Competitive Advantage. Hence, in this research study, Sustainable Competitive Advantage will be deemed as the sole outcome of the research interest.

2.3.1 Sustainable Competitive Advantage (SCA)

Sustainable Competitive Advantage is a key to ensure a sustained, superior long-term performance (Bharadwaj et al., 1993; Lado & Wilson, 1994). According to the industrial-organization economics, sustainable competitive advantage is based on strategic positioning of companies within an industry. Mobility barriers within an industry are the first major factor that sustains competitive advantage (Baaij et al., 2004). The ability of some companies to exploit the environment issue as a competitive advantage has turned eco-efficiency in an opportunity to improve production process performance by means of new cleaner technologies, process modifications and appropriate management practices. Analyses had demonstrated that environmental management towards cleaner production processes has now been shifted from a compliance point of view into a strategic issue which supports company's long-term competitiveness (Cagno et al., 2005).

The sources of Sustainable Competitive Advantage can be classified according to four types of capability differential viz. (i) Functional differential; (ii) Positional differential; (iii) Cultural differential; and (iv) Regulatory differential (Coyne, 1986; Hall, 1992). Functional differential results from the knowledge, skill and experience of employees and other stakeholders within the value chain. When this know-

how can be utilized to produce products which will maintain and win the market share, Functional differential is created. Cultural differential includes the habits, attitudes, beliefs and values, which permeate individuals and groups throughout the entire organization. Positive organizational culture will most likely render to competitive advantage. Positional differential is closely associated with a consequence of past action which led to creation of reputation, goodwill, or a special vantage position in marketplace etc. Besides contributing to competitive advantage, Positional differential also leads to a defensible position. Regulatory differential results from the possession of legal entities such as intellectual property rights, contracts, trade secrets etc. Similar to Positional differential, Regulatory differential also leads to a defensible position, attributable mainly to protection by law (Coyne, 1986; Hall, 1992).

2.4 Green Value Chain and Sustainable Competitive Advantage

The concept of Sustainability is inherently difficult to define in the light of its specific meaning and practical applications are in nature (a) highly dynamic – as a result of constantly seeking for balance in the face of shifting background conditions; (b) largely indefinite – as a result of being based on necessarily abstract, context-specific, and very long-term goals; and finally, (c) highly contested – as a result of the interweaving human values, perceptions and competing political interests evoked by the concept. These important attributes are in clear contrast against those of the one-time improvements in policy, practices, infrastructure, technology etc. that can be easily eroded over time (Mog, 2004). In general, competitive advantage can result either from implementing a value-creating strategy not simultaneously being implemented by any current or potential competitors or through superior execution of the same strategy as competitors, and sustainability is said had been achieved when the advantage resists erosion by competitor behavior (Bharadwaj et al., 1993). In the context of Green Value Chain, companies will thereby improve their public image and market position, and at the same time boosting their sales and profits. Hence, environmental leadership can often deliver competitive advantages (Sarmiento et al., 2007).

2.5 Theoretical Framework and Hypotheses

Gil et al. (2007) had, through his research works, identified four antecedents of environmentalism i.e. social concern, regulatory forces, the possibility of gaining competitive advantage, and finally management commitment. Social concern is a two-sense antecedent. On one hand, consumers may demand environmentally friendly products. On the other hand, activists, Non-profit Organizations etc. may influence the companies' strategies and orientation. The second antecedent encompasses regulatory forces, whereby political and institutional pressure may exert on the adoption of environmental marketing actions. Furthermore, regulatory forces are an antecedent of green initiatives as they condition decisions related to packaging, product formulation and distribution channels. Thirdly, the possibility of obtaining competitive advantage is seen as an extremely important economic force

that, both internal and externally, influences this greening efforts of manufacturing companies. Apart from these, management commitment is also being considered as one of the major antecedents as its presence substantially influences companies' determination to implement greening initiatives. Apart from the preceding mentioned antecedents, the firm's size and type are also being considered as having a moderating effect between those factors and managerial behavior (Gil et al., 2007).

In order to enable realization of the greening efforts, Zhu et al. (2005) emphasized that due attention must also be placed on the development of infrastructure. Cagno et al. (2005) argued that technological change is in fact one of the most common and effective path in reduction at source interventions i.e. to come out with new cleaner technology and process, technology and process improvement. This has been supported by other authors, for example, Omer (2008) had pointed out that the development and adoption of suitable renewable energy technology in buildings has played a vital role in the greening initiative. Hence, technology availability shall also be perceived as one of the important antecedent among the others. Donnelly et al. (2006), on the other hand, are opined that apart from technology, it is imperative for the management to provide sufficient skilled personnel and financial resources to ensure implementation and continual improvement of the environmental project. The following proposition of research framework (Figure 3) adopts the basic logic of the Antecedence-Outcomes Effect Theory which links (i) various Sustainable Development Indicators to possible outcomes of Green Value Chain; and (ii) various Green Value Chain Indicators to possible outcomes of Sustainable Competitive Advantage:



3.0 Methodology

The present study on the “Antecedence-outcomes Analysis on Green Value Chain: Perspectives from Sustainable Development and Sustainable Competitive Advantage” for manufacturing companies in India is based on a survey which are closely related to the respective independent variables and dependent variables as presented in the Research Design Framework (Figure 3), by adopting the 5-points Likert scale. The targeted respondents comprised of those managers or executives who are directly involved in handling the environmental related projects or programs in Indian manufacturing companies.

3.1 Indicators of Sustainable Development

Sustainable Development, as being defined by the United Nation, encompasses the economic, environmental and social dimensions of the development process. It is a process of

change in which the exploitation of resources, the direction of investments, the orientation of technological development and the institutional change are in harmony and increase the present, as well as the future, possibility to accommodate human needs (Ragas et al., 1995). Extensive research studies indicate that economic analysis is the most developed at the strategic level, environmental assessment is much less developed, and social appraisal is the least developed form of strategic assessment (Bond et al., 2001). CSR management is, by its underpinning working principles, very similar to corporate sustainability management, which aims to integrate the economic, environment, and social aspects of business management. Hence, economic success in terms of financial performance is always been seen as a possible outcome of CSR management (Weber, 2008). In this research study, indicators for the measurement of Sustainable Development for manufacturing companies are being identified as the degree to which a company meets the legal requirements, as well as costs or expenses spent by the companies on EMS training, installation of environmental related equipment, risk mitigation plan, and for conducting CSR programs.

3.2 Indicators of Green Value Chain

Achievement of Green Value Chain can be measured in terms of waste recycling, lower level of greenhouse gas emission, and environmental innovation (Vachon & Mao, 2008). Nevertheless, in order to achieve Green Value Chain, Beamon (1999) advocated that manufacturing companies must develop procedures that focus on operations analysis, continuous improvement, measurement, and objectives. According to Beamon (1999), a single performance measure will likely be inadequate in assessing the true performance. Hence, such a performance system must be viewed from a much more broaden and holistic perspective to include in the assessment of the environmental impact gave rise due to the manufacturing value chains in terms of waste, energy usage, and resource usage.

3.3 Indicators Of Sustainable Competitive Advantage

Sustainable competitive advantage of an organization can be obtained through rational architecture, reputation, innovation, and strategic assets (Kay, 1995). Where resources with these kinds of characteristics are deployed in ways that create value for customers, a Sustainable Competitive Advantage can be attained leading to enduring superior marketplace performance which can be measured in conventional terms such as market share, customer satisfaction etc., and financial performance such as return in investment shareholder wealth creation, profitability etc. (Bharadwaj et al., 1993). Cagno et al. (2005) had, through analysis of 134 industrial pollution prevention project reports, confirmed that economic returns derived from cleaner production is evident.

3.3.1 Financial Performance

Financial performance, within the context of the research study, is being defined as cost reduction, growth of market share, and increment of profit. As Green Value Chain can have a significant reduction on the costs of material purchased, en-

ergy consumed, waste generated, avoidance of fines due to violation against regulations, it can have a positive effect on a corporation's financial performance (Zhu and Sarkis, 2004), and improvement in net sales (Markley & Davis, 2007).

3.3.2 Environmental Performance

Implementation of Green Value Chain is believed can often lead to significant reduction in the environmental accident, and compound due to violation against the environmental regulations (Tan, 2005), mainly attributable to better pollution control and recycling measures (Markley & Davis, 2007). Hence, evaluation on these two indicators, together with the EMS assessment rating, 5R achievement rating and usage of renewable resource in terms of percentage use will also be carried out during the survey (Hervani et al., 2005).

3.3.3 Social Performance

Tan (2005) had posited that implementation of Green Value Chain will lead to improvement of company's image and public awareness as customers and stakeholders would have more confidence in the management, and the way the company conducts its business. Hence, evaluation on these two indicators, together with the CSR rating, Customer Satisfaction rating, employees rating (Markley & Davis, 2007), frequency of customer returns, and unfavorable press coverage will be carried out during the survey (Hervani et al., 2005).

3.4 Control Variables

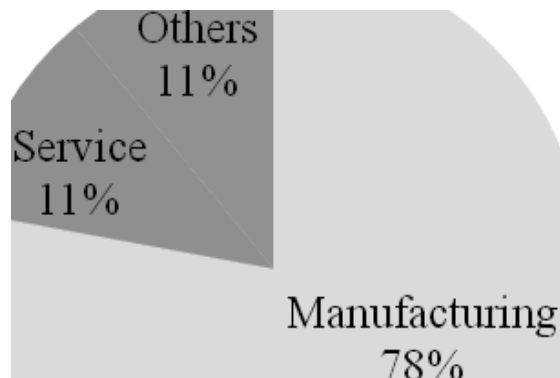
Responsible and sustainable company realizes the important of acknowledging its economic, social, and environmental responsibilities and the needs as well as the concerns of a wide range of stakeholders, while at the same time, to build on a stable platform to sustain its future growth and profitability (Streimikiene et al., 2009). Often, companies that risk regulatory and product compliance breakdowns can suffer costly business interruptions including product re-designs, delayed market launches, product recalls and sometimes, can even be blocked from selling a product in a certain country or region (Dawes, 2009). Deepening environmental concerns and perceptions of increased risk to health and safety of community residents from industrial activities have led to a significant increase in interest in research at the interface of environmental management and operations of industries (Gandhi et al., 2006). Nevertheless, the complexity of the research emerged as there are many contextual variables which could possibly affect the research outcomes. In order to ensure validity and reliability of the research findings, several control variables have been identified in this research study i.e. (i) Types of industry; (ii) Reasons to implement Green Value Chain; and (iii) Degree of involvement of respondent in implementing Green Value Chain.

3.5 Population and Samples

The population of interest for this research is ISO14001 certified manufacturing companies. According to Department of Standards India (2009), there is to-date a total of 774 EMS certified companies throughout the whole India. Out of

which, about 78% or 603 are being classified as manufacturing companies (Figure 4). The related EMS certificates were issued by eight Certification Bodies accredited by Standards India. Since the total number of variables is 4, the sample size is hence determined to be 10 times of the number of variables i.e. 40.

Figure 4: ISO14001 Certified Companies in India as at 31 August 2009



3.5 Procedure

As data analyses involve in the research paper are mainly economic-related indicators, which are often been deemed as the most sensitive, confidential, and difficult to obtain parameters, the main data source for this research will thus be restricted only to the secondary data source released by the Public-listed Manufacturing Companies. Data obtained thereof will be analyzed by using Statistical Software Package, SPSS 16.0.

4.0 Conclusion

The important of environmental practice as competitive necessity in the world of business has lead towards the needs of companies to applying the Green Manufacturing as part of the evolution of Green Supply Chain. The research in the antecedence outcome effect of Sustainable Development in creating the Green Value Chain; and Green Value Chain in creating Sustainable Competitive Advantage, for the manufacturing companies in India will enable to close the gap of understanding the important and crucial role lead by these drivers towards the effort of improving the manufacturing companies sustainable strategies.

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