Converging sustainability definitions: industry independent dimensions

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Abstract

Purpose – Sustainability as a construct is still debated and is yet to attain a consensus among researchers and practitioners. Sustainable development has been seen differently by players from different industry sectors. There is need to understand the commonality prevailing on sustainability practices across different industry sectors to arrive at a consensual sustainability definition. The purpose of this paper is to propose four dimensions of sustainability and studies how it captures sustainability practices across key industrial sectors.

Design/methodology/approach – Current study argues the case for sustainability using four constructs, namely, economical, environmental, ethical, and social. Subsequently a holistic definition with a model is proposed incorporating the four constructs for sustainability. Studies documenting sustainability practices across industries, namely, automobile, infrastructure, cement and concrete, electronics, mining, paper, pharmaceutical, and logistics were reviewed to validate the applicability of the proposed four construct model across different key industrial sectors.

Findings – Current study validates the industry independence of the proposed four constructs of sustainability model through a literature review. Very few studies have documented industry-specific sustainability practices and much lesser have studied the ethical dimension of sustainability. Furthermore, the organizational strategic plan is developed for incorporating the environmental, economical, ethical, and social needs into the organizational business operations at the strategic, tactical, and the operational levels.

Research limitations/implications – Proposed model needs to be applied in multiple case organizations from diverse sectors to evaluate its capacity to capture the aspects of sustainability across different sectors. Future study could attempt to understand the interrelationships between the identified constructs and how they impact each other within different industrial sectors.

Practical implications – Model linked to organizational business operations at the strategic, tactical, and the operational levels helps in the alignment of the organizational activity towards the strategic intent of the organizational sustainability philosophy in the business ecology. It also helps in equipping the organization to achieve the operational excellence and the strategic business growth at the same time.

Originality/value – Current study is unique in its attempt to understand the capability of proposed sustainability dimensions to capture the sustainability practices followed across different industrial sectors.

Keywords Sustainability, Social, Environmental, Economical, Ethical

Paper type Research paper

1. Introduction

Sustainability considered in this study is defined as the complete plan of ethical action for an organization which is attempting to transform itself into sustainable, i.e. to become pro-environmental, pro-social, and traditional pro-economic, both internally within the organization and externally across the supply chain (Zhu and Sarkis, 2006). Sustainability articles in literature have been maturing for the past two decades and very rapidly in the past decade (Seuring and Muller, 2008). Sustainability has taken multiple forms in literature under the terminologies green management (Molina-Azorín *et al.*, 2009; Alfred and Adam, 2009), green supply chain management

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(GSCM) (Sarkis *et al.*, 2011; Srivastava, 2007; Zhu and Sarkis, 2006), green supply chain (Walton *et al.*, 1998), sustainability (Gunasekaran and Spalanzani, 2012) and sustainable supply chain management (SSCM) (Seuring and Muller, 2008), etc. Review studies also exist in literature on this topic as listed below:

- Srivastava (2007) – classified the GSCM literature on the basis of the problem context, methodology adopted, mathematical tools/techniques used, and a timeline indicating relevant papers;
- Molina-Azorín *et al.* (2009) – considered only the quantitative studies until 2008 which discussed the link between environmental variables and financial performance;
- Sarkis *et al.* (2011) – review and categorized recent GSCM literature under nine broad organizational theories; and
- Gunasekaran and Spalanzani (2012) – developed a framework for Sustainable Business Development (SBD) including tools, techniques and some performance measures and metrics for SBD.

In literature, sustainability was considered to be one of the key criterion in logistics and was initially studied under the domain of reverse logistics. In this study, we discuss sustainability dimensions from reverse-logistics lens as we believe it be one of the popular and explicitly documented sustainability initiative of an organization. Poist (1989) divides the evolution of the commercial logistics practice into three eras, namely, pre-logistics era, the logistics era, and the neo-logistics era. In the pre-logistics era the central idea was to concentrate on building the transportation facilities for the industrial products to reach their customers. In logistics era the focus shifted from the transportation systems to building a more comprehensive logistics system encompassing the elements of efficiency such as cost reduction, profit maximization, and channel specification. Neo-logistics era saw an organizational maturity by incorporating the logistics into the functional enterprise system where the logistics became a constantly interacting system between the organization and the society. Elkington (1997) is credited with popularizing the latter three dimensions, which he called the triple bottom line (TBL) principle (also known as the three pillars: profit, planet, and people). As a sign of their sustainability practices companies issued periodic TBL reports to their stakeholders. Reverse logistics gained increasing importance as a profitable and sustainable business strategy. A reverse-logistics system translated itself into a sustainable supply chain system that has been redesigned to manage the flow of products or parts destined for remanufacturing, recycling, or disposal and to use resources effectively.

Reverse logistics consists of all logistic activities necessary to unlock the value of a product through recovery. It consists of collecting discarded goods, inspecting, and sorting them, followed by some recovery action, which can either be a simple cleaning or a complex disassembly, and finally a remanufacturing process and a remarketing of the output (Dekker *et al.*, 2012). The reverse logistics, at the starting, concerned with the retrieval of products which did not conform to the quality. The Tylenol scare in 1984, where Johnson and Johnson and McNeil Laboratories responded quickly to a lot of tainted bottles that had to be removed from the shelves and was replaced by the fresh bottles can be treated as one of the earliest examples of reverse logistics in the modern business history (Walden, 2005). In less than a decade's time the German Government passed an ordinance where it made mandatory for the manufactures to retract and recycle the hazardous waste (de Brito and Dekker, 2002). The producers

and suppliers in the present day business environment are taking more responsibility to effectively design, produce, and recall their products owing to the fact that the customers are becoming more environmentally cautious and the government regulations are put in place (Vandermerwe and Oliff, 1990). The reverse-logistics initiatives currently are generated by three initiatives: from the customer and society, who returns the goods; from industry, interested in recycling; and from the government, which aims to promote practices of this type (Adenso-Diaz *et al.*, 2004). The pressing need from the customer and government for more responsible business model from the business community demands for an integrated closed loop approach. Even though the customer and government have stake in influencing organizations to adopt sustainability dimensions in their business model, it is the organization which has to develop strategy and plans to implement it in correspondence with its mission and vision statements. In this paper, a different approach towards perceiving sustainability is put forward by answering the questions as to why an organization should adopt reverse logistics from four different sustainability dimensions, namely, environmental, economical, ethical, and social. Following it, we show how the four sustainability dimensions proposed captures other sustainability initiatives across different industries. The remaining paper is organized as follows. Section 2 evaluates the economical, environmental, ethical, and social aspects of sustainability. In Section 3, a model pertaining to the four realms is being proposed. In Section 4, the suggested model is being included in the strategic, tactical, and operational planning of the firm. In Section 5, we discuss how the sustainability practices adopted across different industries is captured by the sustainability model proposed. Finally in Section 6, concluding remarks and a few future research directions are drawn.

2. Literature review

For a variety of economical, environmental, or legislative reasons, product disposal may no longer be the consumer's responsibility as the products are increasingly being recycled or remanufactured by the original manufacturers. With the increasingly stringent environmental and packaging regulations, companies are forced to become more accountable for residual and final products even after they sell the products. Fewer products will end up for disposal in future as the firms are continuously investigating their reusability, re-manufacturability, and recyclability. This paper evaluates the practical implication of incorporating the sustainability initiative through reverse-logistics approach into the business model. The arguments are presented on four dimensions, namely, economical, environmental, ethical, and social terms.

2.1 Economics in sustainability

The global prices of the resources like iron, copper, and aluminium are on increasing trend. The steel prices have gone up by 19 per cent in 2004, 71 per cent in 2005, and 19 per cent in 2006, respectively. The steel is becoming one of the most recycled materials since it is cheaper to recycle steel compared to mine the virgin ore. According to the US Environment Protection Agency, steel recycling contributes 74 per cent in energy savings in the production process, 90 per cent in virgin materials use, 97 per cent reduction in mining wastes, 88 per cent reduction in air emissions, and 76 per cent reduction in water utilization (Steel Recycling Institute, 2006). Aluminium also is a heavily market driven recycled material with recycling requiring just 5 per cent of the energy required to extract aluminium from the ore. Copper prices have been very volatile over the last several years; annual averages ranged from

$3,679/metric ton in 2005, $6,722/metric ton in 2006, and $6,391/metric ton in the first quarter of 2007 (World Bank, 2007).

The difficulty to source enough raw materials for the manufacturing process has led to the exploration of the avenue with the recycling the used materials. The use of the waste material as the raw materials for manufacturing has been hampered by the uncertainty and availability of the supply. Adding to the complication is the technological advancement and the obsolescence which further makes it difficult for the decision makers to discard the product. These products in the supply chain disrupt the fine ecological balance between the industry and its environment (Linton *et al.*, 2002). Thierry *et al.* (1995) reports that sustainable practices are widely used in the automobile industry. It provides automobile firms with far-reaching cost and strategic advantages in a highly competitive industry. The recycling of the old materials requires collection, sorting, and processing activities. Krupp (1993) focused on bill-of-material restructurings and the development of bills of material to accommodate the unique challenges of remanufacturing, particularly as they apply to "exchange" environments in the automotive industry. Another example of the sustainable practices can be seen in the packaging industry. Even though the environmental considerations had triggered the need for reusable packaging process, economic reasons also played a major role in the attractiveness of the concept. Reusable containers are currently being used in the electronics, automobile, beverage, and appliances industry. These industries use a symbiotic relationship with their dealers and consumers to formulate a reverse-logistics plan to strategically retrieve the packaging units for further use. The reusable containers also helps in establishing and maintaining contact with the customer and stimulating mutual motivation, thus enabling the integration of the distribution and sales activities of new products aimed at the customer and those corresponding to returns in the reverse direction (Dethloff, 2001). A general waste management priority should be established, in order: minimize, reuse, recycle, incinerate, and landfill. Packaging has a significant impact on logistical processes. The cost of packaging includes not only the impact on logistical productivity but also the cost of purchase and now, increasingly, the cost of disposal (Wilmshurst and Newson, 1996).

The profitability of recycling is influenced by the efficiency achieved through the coordination and integration of various actions during the retrieval and recycling of these products. The profits made at each stage depend on the stage of competition and the nature of market. Even though sustainability programmes requires a considerable amount of capital for the construction of reclamation and redistribution facilities, economic growth can be achieved by the production technology process that will reduce the pollution by-products and allow the final products to be reprocessed or used in other production processes. The reverse logistics has been very effective in recovering the materials that would have been otherwise lost once it is shipped to the customers. Developing a reverse-logistics chain can be an immediate solution for the resource poor countries like Japan, Germany, etc. to feed those industries which rely heavily on the natural resources (Sarkis *et al.*, 2010).

The incentive for the company to adopt the sustainability lies in the fact that it directly affects the revenues earned by the company. The company that ensures timely delivery and processing of returns position themselves to save more and therefore earn more from the returned products. The returned parts usually form a great deal of untapped revenue. The growing secondary and reselling markets present a great opportunity for the increase in revenue. Moreover handling the products themselves during the return process may help companies to avoid paying

a huge amount of fine to the regulating authorities. The consumers' too prefer companies which offer them good return experiences. A nationwide survey shows that the companies which tend to invest more on the reverse logistics tend to enjoy up to 12 per cent more of the customer loyalty. Reverse logistics can increase a firm's productivity and profitability by using low-cost, traditionally unused inputs or resources (Dowlatshahi, 2000). Disposing of the waste by the company itself tends to provide a competitive advantage as it becomes easy for the company to monitor and plan centrally the disposal-related activities. This also helps the company to form a database of the by-products helping in the tax reduction and reducing the inventory carrying cost (Greve and Davis, 2010).

2.2 Environment in sustainability

Along with the functional requirement of the product or service offered by the company, the increase in the implicit demands of the customers like the ecological responsibility of the company is also becoming a very important criteria for choosing the product or service by the customer (Lee and Lam, 2012). The product value chain is also characterized by the kind of product it delivers and its nature of association with environmental sustainability. Three product aspects, namely, product development, delivery, and post-delivery processes were identified as relevant in this respect. First, the way they have been produced (their carbon footprint), second, the manner in which the products are transported and waiting for use (inventories), and third, whether their value can be recovered even after their intended use (reverse supply chain). The overall idea is that environmental aspects can be taken into account while choosing between different versions of the same product, even at the level of the individual customer (Dekker *et al.*, 2012). The environmental implications of sustainability practices are becoming increasingly a strategic concern for the business community owing to the requirements towards the conservation of natural resources, reduction of emissions and recycling and reusing the materials (Bowersox, 1998). The environmental innovation is the result of the market pressure forcing the firms to become more efficient. Several methodologies followed by the managers for mapping the environmental impact along the supply chain like life-cycle assessment, product stewardship, and design for the environment principles have a strong linkage with reverse logistics (Sarkis *et al.*, 2010). The sustainable practices also reduce the pressure of procuring new raw material and reduces the related environmental degradation associated with the raw material extraction and processing. The community benefits generated due to the zero-waste programmes by recycling and reducing the waste requires a robust reverse-logistics infrastructure for the success (Connett, 2006). The sustainable manufacturing practices prescribed by the modern environmental management focuses on waste reduction through recycling and reusing the resources.

In electronic industry the challenge to be successful is both in ecological and economical terms. Electronic production processes are designed to build electronic products from scratch. So the greater the level of aggregation is required if a product to be recycled, or when the product still resembles the original product, the more the input and expense are needed to move it back into the market. Manufacturers can be profitable by including recycled materials in production and they likely have the logistics to support this process already. Additionally, the "green" label attracts customers; the reuse of highly aggregated products is better for the environment but opposes many technological and consumer-desired technological upgrades. People are fascinated by changing technology (Wenzek, 2003). Today the remanufacturing is emerging as

one of the most attractive option for retaining the accumulated value of products, assemblies, or components.

The sustainability practices have transcended both industrial and social lives of the people in last three decades. For example, landfill was one of the major sources of waste disposal until 1950s and by 1959 it became the primary waste disposal means of the American society. Since then a rapid decrease in the number of landfills has been observed. Along with the rapidly decreasing landfill space there has been a perception of rapidly increasing landfill prices (Rogers and Tibben-Lembke, 1998). Combined with the ever increasing volume of garbage and the reduction in landfill space, legal regulations and the cost of landfills, it is becoming increasingly difficult to dump the waste. The landfill bans should motivate the manufactures and the suppliers to realize that the retracting their product back from the customer is not only their responsibility but it is profitable in economic terms too. With rapid strides in electronic industry and the proliferation of information technology, the environmental concerns are becoming akin to the industry. Disposal of waste materials and goods can be prevented with the increase in efficiency of the secondary market which facilitates the recycling and reuse of materials, extending the life of these materials and thus reducing environmental impact. These efficiencies can be improved by the quick, easy, and reliable information that can be provided through different channels (Sarkis *et al.*, 2004). The firms and civic societies should realize that sustainable initiatives would give a significant as well as beneficial exposure as an environmentally friendly firms and society.

The environmental practices and the activities focusing towards sustainability in particular, are reflected in the relationship between packaging firms and the prior and subsequent links in the supply chain, i.e. relationships with their suppliers (containers manufacturers) and customers (end consumers of the packaged or bottled products). The environmental concern in general is evident in the recovery of empty bottles and jars. This in particular, requires the cooperation of customers and packaging firms. However, this trend has still not extended fundamentally upstream in the value chain (Adenso-Diaz *et al.*, 2004). Some companies have begun to realize the potential marketing benefits of a take-back programme. In the USA, the President's Council on Sustainable Development has begun to study the idea of Extended Product Responsibility (EPR). EPR focuses on the total life of the product, looking for ways to prevent pollution and reduce resource and energy usage through the product's life-cycle (Rogers and Tibben-Lembke, 1998).

Given that an impact on the ecology is produced in all the phases of the life-cycle of products, the integration of ecological questions consequently influences the choice of process technologies, the management of the supply chain or the development of new products (Angell and Klassen, 1999). Accordingly, total quality of ecology management, life-cycle analysis, green supply chain management, and ISO 14000 standards are becoming more and more widespread practices. The aim of this ecological strategic viewpoint is to revalue products once they have been discarded by the end consumer, thus closing/extending their life-cycle. Multiple alternatives exist to do so, such as reutilization, repair, renovation, reprocessing, cannibalization, or recycling. All of these mean the returning of products once they have been used, and hence an inverse flow from the customer to the producer, i.e. what is known as a reverse-logistics chain (Fleischmann *et al.*, 2000). Willits and Giuntini (1994) suggest the need for an integrated environmental management system (EMS) that considered can be used for a costing system from "cradle to grave" for a product. They also explored the role of an accounting system in generating accurate and relevant cost data in EMS. Companies without EMS

are at a competitive disadvantage, and accountants who focus only on liability accounting miss this opportunity of adding value to the customers by failing to become involved in EMS.

2.3 Ethics in sustainability

The underlying principle of environmental ethics is that nature has intrinsic value. This means that nature and its parts are not merely means for accomplishing one's purposes but are ends in and for themselves. The nature of human action has changed so dramatically in our times that it calls for a radical change in ethics as well. Previously, all dealing with the non-human world was ethically neutral. Ethical significance belonged to the direct dealing of man with man, including man dealing with himself: all traditional ethics is anthropocentric. However, of late the nature of ethical interactions between animate and inanimate objects has been brought under the umbrella of ethical considerations. Thus the idea of sustainability too needs to incorporate the ethical dimension as well. Interestingly, one of the results of the 2009 Copenhagen climate change summit was an agreement that developed countries would compensate poorer countries for participating in global environmental initiatives. Some have even asserted that "sustainable development is a dangerous notion that can bring the prosperity of the US, Western Europe and Japan crashing into a prolonged economic dark age". In order to see exactly how this position is short-sighted and unethical, it is worth considering a number of major ethical theories that support our position:, the first is Utilitarianism. Although Utilitarianism is a complicated theory which has admitted of different formulations over time, in general is has traditionally defined "the good" as "that which promotes the greatest happiness and/or the interests of the greatest number of people". The inter-relation between ethics, globalization, and sustainable development is complex, but there is perhaps room for optimism, especially if we consider, for example, how the principles of distributive justice have actually been applied in this case (Depoo and Rosner, 2011).

2.4 Social in sustainability

If the sustainability as a philosophy has to become industrially matured then the practitioners should appreciate the importance of the social facet of the sustainable business practices and not just the economic benefits for the organization. Even though the social aspect of the sustainability has existed for over half a century now, the importance of the social aspect in the managerial decision making has gained a never before importance recently in the wake of the growing environmental and ecological concerns (Murphy and Poist, 2002). The social responsibility concept for an organization requires the organization to go beyond the economic gains and profit maximization for the stakeholders. The social responsibility requires the organization to not just be responsible to the stakeholders but also to the society at large and all the elements organizational sustenance. Even though a few organizations are giving more importance to the social responsibility of the organization while planning the operational and strategic decisions, sustainability still lies neglected by the majority of the organization. The possible explanation can be that the sustainability in business is a recent concept. The organizations tend to perceive that the sustainable practices to be more of a method for cost reduction and to generate additional profit.

Sustainable practices helps an organization focus on developing the three aspects of the social identity. They are: first, perception of oneness with a group of persons; second, the categorization of individuals, the distinctiveness and prestige of the

group, the salience of out groups, and the factors that traditionally are associated with group formation; and third, activities that are congruent with the identity, support for institutions that embody the identity, stereotypical perceptions of self and others, and outcomes that traditionally are associated with group formation, and it reinforces the antecedents of identification. The social identification breeds the organizational commitment and loyalty which can be translated to the economic benefits (Ashforth and Mael, 2012).

The marketing being one of the core functions of any organization is always in pursuit of novel philosophies to differentiate its product from its competitors in the market. Having realized the paradigm shift in the behaviour of the consumers and the organizations at large, the marketing functions across the board believes that a socially sustainable business model adopted by the organization allows it to leverage the psychological association of the consumer towards these organizations. A recent survey showed that around 82 per cent of respondents are willing to increase spending on products offered by the socially responsible organizations (Environmental Leader LLC and Media Buyer Planner LLC, 2009). The marketing and public relations factors refer the efforts of companies to create a value proposition for the customers, especially when the "environmentally friendly" product is more expensive. Companies have to also create awareness of the practices that makes the product more environmentally friendly or makes it sustainable (Hassini *et al.*, 2012). The sustainable practice becomes one of the most integral parts of the sustainable business model. In USA and most of Europe there are legislations that require the manufacturer to take responsibility of their product even after the sales. This does not point towards the after sales service provided by the companies but also includes the after-life retrieval of the product from the market. One such product which requires a great deal of social responsibility from the customers is the automobile batteries. These batteries contain toxic chemical like lead which if gets into the food chain causes serious health hazards. Other countries where the legal regulations are not stringent, the social responsibility of the firms gets weighed against the economic cost associated with setting up of a separate logistics channel to retrieve the used batteries from the market (Kumar and Putnam, 2008). This opens up the opportunities for the companies to project themselves as a social responsible company by employing a social sustainable model for their business.

2.5 Sustainability in four dimensions

Interest in sustainable business is at an all-time high, driven by external pressures including regulation and legislation, but also by customer and stakeholder needs and interests. Global operation makes it necessary to compare how companies of different regions approach sustainability (Moore and Wen, 2008). Many organizations have identified that good business ethics and a sustainable approach can lead to long-term value creation in a range of areas. Examples of companies that are finding value from sustainable and ethical business practices include: Ecolean, the Swedish packaging manufacturer founded in 1997, has developed a unique product which not only uses 40-60 per cent less petrochemical products by substituting calcium carbonate, but in addition – and perhaps an even stronger selling point – it costs 25 per cent less than petro-based alternatives. Ecolean has been growing at an average of 50 per cent per year and has seen considerable growth in the markets of the developing world (Ecolean, 2007). At their Hamtramck plant in Detroit, General Motors adopted a sole supplier policy for chemicals. The implementation costs of this project were only $19,000, but it saved the plant $1.6 million in its first year alone. The savings included

a range of resource reduction benefits: a reduction of 11.8 million litres of water, a reduction of 115,000 litres of topcoat paint, and a reduction of 8,200 litres of hydraulic fluid. It also reduced VOC emissions by 40 tonnes, and paint waste and sludge by 750 tonnes (Cullum, 2007). Unfortunately, these dramatic and successful initiatives are all based on environmentally sustainable strategies rather than including more far-reaching social system responses. Companies need to pay more attention to ethical and moral practices in social and cultural contexts.

The task of integrating sustainability into economic welfare considerations could be approached in a number of ways. It might focus on the public good character of environmental services and functions and resulting questions of ownership or transaction costs (Coase); or the externality problem and questions of how to internalize negative externalities might be the central focus (Pigou); or the valuation of environmental goods and methodologies to assess use and non-use values (CV, hedonic pricing, or travel cost methods, etc.) might be its focus. The question of what allocation situation is socially optimal cannot be answered from within the framework of neoclassical economics alone. The construction of the social welfare function would be a step towards this. However, a social welfare function, per definition would need to embody the welfare judgments of society as to the fairness, or desirability, of the distribution of goods among its members. Accepted ethical norms determine what is desirable, socially rewarded, and thus reinforced behaviour that one seeks to emulate. Human induced environmental problems have their roots in the existence of market failures and negative externalities, which spoil the aggregation. This makes sustainability first and foremost an internalization problem, which can be solved by internalizing diverging private and social costs and correcting suboptimal resource allocation (Pearce and Turner, 1990; Tietenberg, 1988). As a theory of personal morality Utilitarianism states that decisions are to be rational, consistent, and based on the utility they generate to the decision maker. Utilitarianism defined in this way constitutes the basic characterization of *homo oeconomicus*, the rational, economically acting, genderless (and thus, according to our dominant culture, male) being who is the idealized economic decision maker. The decisive question then is what exactly constitutes utility. If individual utility is the sole basis for and measure of value, then Pareto optimality may be a decidedly important measure for achieving social welfare. If, however, others rights impact one's individual valuation of utility, and if individual utility maximizing behaviour affects the utility of others (human and non-human) thus generating feedback effects, then Pareto optimality must be rejected. Consistent with this image is a notion of sustainability as "maintaining productivity and resilience of economic systems" or of sustainable growth. This notion of sustainability does not see itself in conflict with its social or ecological context but instead defines sustainability from a perspective of economic usefulness (Pierce and Turner, 1990).

Some firms seem to have recognized the value of sustainability long before it became a buzz word, and were able to adopt practices that valued community over corporate greed. The expected outcomes were staff and customer satisfaction; the surprising outcome was high profitability. One such example is Harley Davidson, the legendary motorcycle manufacturer. While the name "Harley" evokes an emotional response in motorcycle enthusiasts and baby boomers around the globe, this brand nostalgia was not enough to prevent the firm from tumbling to the verge of bankruptcy in the late 1980s. Everyone loved a Harley but no one wanted to buy one when Richard Teerlink took over as CEO in 1989. Shunning the normal cost-cutting practices of staff redundancies and off-shore manufacturing, he engaged the firm's 5,000 employees

in improving quality and customer service and rewarded them when their efforts produced results. Over the next 20 years Harley doubled its staff to 10,000 workers, increased exports, and watched its profits grow.

From the detailed review conducted, we propose a holistic model and definition of sustainability in the following section by incorporating the discussed four dimensions.

3. E3S model and holistic definition for sustainability

Sustainability unmistakably has economical, environmental, ethical, and social aspects to it. It is quite difficult to demarcate between these implications for sustainability as a philosophy. However, a careful evaluation of the interaction between these aspects of sustainability tends to shed light on certain important understandings. Based on the preceding discussion, a four way model called E3S model for sustainability is being suggested. The E3S model tries to aggregate the economical, environmental, ethical and the social implications for a firm and industry to adopt sustainable practices at the strategic level. Figure 1 represents the E3S model for sustainability.

The E3S model is a four way model which tries to answer why a firm or industry should adopt sustainability as a philosophy. The model summarizes arguments presented in the preceding section. The market pressure is an outcome of the need for sustainable growth of the industry. The increase in the consciousness of the customers towards the effects of the industrial degradation of the environment has created a need for more sustainable growth model. Combined with the stakeholder pressure, the sustainable impact of the product needs to be evaluated by the firm or the industry during the conceptualization and design phase itself. An evaluation of the product life-cycle and incorporating sustainable design practices during the early stages of product design and development helps a firm to track its impact along the forward and reverse supply chains. The product stewardship of the firm requires it to adapt more sustainable technological practices for the company's production activities. The responsibility of the company towards its product is not limited from concept to commission rather it is concept to commission to reconceptualising. The reconceptualizing stage draws heavily from the principle of reverse logistics well anchored in the sustainable practices. The environmental implication of the product

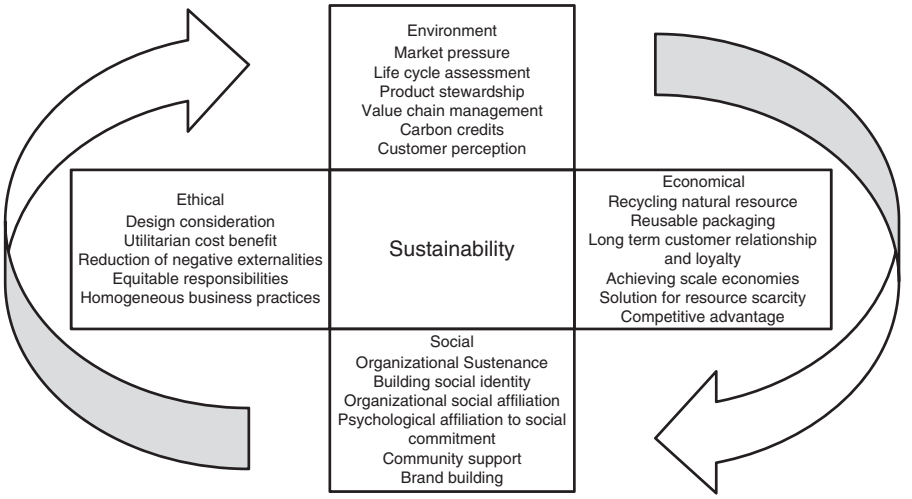

Figure 1.
E3S model for sustainability

starts with the design phase rather than the end-of-life which is a general notion. Few exceptions to this can be seen in the automobile industry, chemical industry, etc. where operational phase of the product should adhere to sustainability. However, a majority of industries focus on the end-of-life ecological impact of the product rather than operational phase. There is a need for a revised focus on the sustainability of the operational phase of the product as the majority of a product's life span is at the operational phase. This radical change in the perception of the design objective will require the companies to promote a more responsible and environment friendly designs (Lee and Lam, 2012).

Economic reasons to adopt sustainable practices are perhaps the most attractive avenue for the practitioners. The natural resources or products derived of natural resources are being used in some way or the other in all industries. For example, the automobile industry use steel, aluminium, copper, etc. The natural resources, both raw and processed, have witnessed a rapid increase in their prices over the last decade. With sustainable practices in place the end-of-life products can be retraced and the materials can be reused. This producer responsibility requires the product design team to reassess the design criteria so as to facilitate the dismantling of the products easily. The increase in the investment for R&D cost can be easily compensated by about 30-40 per cent reduction in the cost of manufacturing in the automobile industry (Johnson and Wang, 2002; Lowman, 2005). In the electronic industry a well-structured reverse-logistics chain will make it easy for take-back programmes. The take-back programmes prove to be an indispensable tool for developing a strong customer loyalty towards the brand (Cottrill, 2003). The recycling of the products by the producer does not only provide materials at cheaper cost but also the economies of scale. The resource impoverished countries can rely on the sustainable practices such as reverse logistics to a great deal for their industries which provides them with cheaper alternative than buying new materials. Much of the investment in adopting sustainable practices should be focusing on improving long-term return on investment (ROI) to protect the stockholders' interest. Strategic costs can include the costs of equipment for remanufacturing products, the costs for qualified workers to run the reverse-logistics system, and the costs of additional warehouse facilities. Managers should ensure full utilization of current equipment, labour, and facilities to minimize the total cost of a sustainable system. To use current resources for realigned sustainable operations, the remanufactured products must be compatible with the overall product strategy of the firm (Dowlatshahi, 2000).

Generally, some costs are sunk costs at the beginning stage of any implementation. However, the benefits brought by the new solutions can only be realized at a later stage. This means that even the organizations can achieve desirable outcomes such as cost savings and customer acquisition in the long run, though they may have to incur losses in the short run. Weary of short-term losses, some firms may wish to stay stagnant instead of taking the risk or wait till a practice becomes an industry norm. In order to alter this sluggish situation, the firms have to recognize and focus on the long-term performance and profitability, which is truly defined as sustainable. For such strategic decisions, it is essential to have top management's involvement as decision makers who can take a holistic view towards global optimization than short-sighted view towards local optimization.

Communities and customers are demanding that manufacturers have an ethical responsibility for the environmental impact of their product (Byrne and Deeb, 1993). The utilitarian cost benefit gives the firms and industry a window to consider the

sustainable practices. The utility an action or idea stems from the perceived benefit in terms of volume of beneficiaries or quality of benefit. This view of the ethical practice allows the quantification of benefit for the practitioners. The sustainable practice ethical responsibility of the industry or the firm make is relevant in decision making. Second aspect of the ethical concern to sustainability is reduction of negative externality. The negative externalities can be associated with of the response to an operation for the business. For example in transportation industry the negative externalities include air pollution, water pollution, noise pollution, congestion, accidents, and land use. The costing of negative externalities is a gives the firms a quantitative measure of the impact of operations. Alternatively, it provides a justification for incorporating the efforts towards reduction of these externalities as part of operations and measure for the reduction in externalities. The ROI calculations based on the reduction of overall negative externalities and creation of sustainable ROI indices helps quantifying the efforts.

The customers have an implicit demand which is becoming more and more relevant with the growing environmental and ecological concerns. The ecological responsibility of the manufacturer provides competitive advantage to the firms and industries. This implicit demand of the customer requires the organization to develop an ecologically responsible attitude. In future, the companies with strong ecologically responsible tag will fetch more loyal customers and hence more profits. The selection of process technology also needs ecological consideration. A vision into future is essential since with changing legislature and ecological concerns the technology will need either fine tuning or a re-adoption. The selection of the technology also needs to keep in mind the process by-products. A cheaper process with harmful by-products are no longer going to be a viable option.

Therefore, a sustainability initiative in this study is defined as an initiative that contributes positively to the four dimensions described, namely, economical, environmental, ethical, and social. Sustainability initiative capturing these dimensions with minimal investment would be a highly impactful initiative preferred by managers. The social dimension to the entire sustainability programme makes this a core function of the organization. The organizational sustenance in future will depend to a large extent on how they manage the environmental concerns and ecological balance. Doing this most economically and yet profit maximizing is going to be an uphill task. The social identity for the organization depicts the level of ethicality it shows while being a part of the society. The social identity develops from the organizational social affiliation which links the society and the organization in a symbiotic relationship with mutual development as the prime agenda.

4. Organizational strategic map and E3S model

The E3S model connects the four pillars for the case of sustainability. However, the integration of the model into the firm's long-term planning requires the firm to have focus on the three levels of planning. The strategic, tactical, and operational levels of a firms working should associate itself with the four dimensions of the E3S model. Figure 2 sums up the broad overview of incorporating the model into the firm's long-term as well as short-term planning.

4.1 Strategic association of E3S model

The strategic objective of the firm focuses on building long-term competitiveness for the firm in alignment with the firm's vision and mission. The E3S model for the firm's

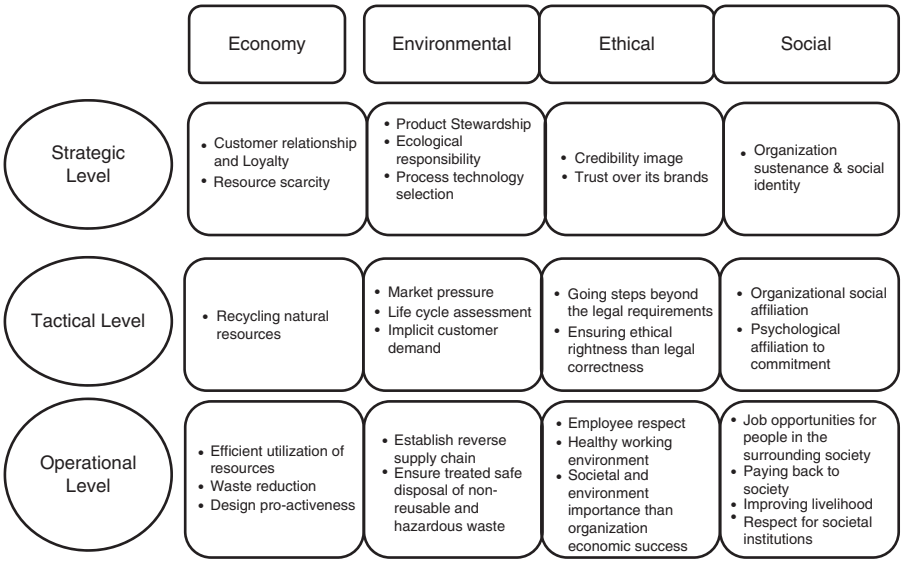

Figure 2.
E3S model to firms long-term planning

strategic planning drives towards economical by focusing on building long-term customer relationship and loyalty, optimum planning for the resource utilization, and building long-term associations with the resource providers. For environmental dimension, E3S model contributes through building product stewardship, developing an ecological responsibility with the supply chain actors, focusing on the long-term selection of the technology for the firm's operations. Contributions by the E3S model for ethical and social dimensions at strategic level are credibility image with earned rust over its brands and ensuring organization sustenance by building social identity for the firm.

When any firm is considered in isolation (which essentially does not bring out the complexities) the major questions that needs to be answered are what is the firm going to produce, for whom is it going to produce, how is the firm going to produce it, how is the firm planning to deliver the product, and finally how is the firm going to do all these activities profitably. Considering these questions that need to be answered, the technology selection and addressing the resource scarcity becomes the primary activity associated with the environmental dimension of the business model. The technology for the organization needs to be selected with a hypermetropic vision, the guidelines for which lie in the strategic view supported by the E3S model. The environmental responsibility of the firm should focus on the interaction it has with its stakeholders. The stakeholders include all the actors who have any form of stakes in the operation of the firm. The stakeholder literature defines the interaction between the firm and the ecology of the firm operating environment. Most of the time the ecological stakeholders have a dormant status, however with increase in the unfavourable ecological interactions between the firm and the stakeholder, the dormant stakeholders may change to dangerous stakeholders. Under this transmission, the impact of these stakeholders on the firm's operations could be eventful. The long-term association of the customers with a firm occurs mainly due to the brand association and the brand or product recall by the customer. This leads to the focus on developing the

brand identity for the firm. Developing the brand identity can be achieved through two major philosophies. First philosophy is by focusing on the innate nature of the product. The nature of the product defines the customers it is being focused towards. The nature of the product and how it is being presented to the customers define the extent to which the brand is being defined in the subconscious of the customer. The second philosophy of increasing the brand identity focuses on the characteristic of the firm as well the character of the product. The character of the firm is closely related to the social and ethical aspects and the character of the product is closely related to the operational efficiency (economical) of the firm.

4.2 Tactical association of the E3S model

The medium range planning of the firm in line with the strategic goal requires a range of achievable objective to be defined. In other words the tactical planning is thinking of ways to implement the strategic goals of the firm. This requires a definite set of goals in comparison to strategic level. In the case for reverse logistics, the operationalization of the strategic characterization of the E3S model into the firms can be achieved by factors such as recycling the natural resources, life-cycle assessment, going steps beyond the legal requirements, ensuring ethical rightness than legal correctness, building the organization social affiliation, and psychological affiliation to commitment. These tactical level factors need to be incorporated for achieving the strategic goals into the organizational planning.

Any product matures through a specific set of stages of life-cycle. The product in its maturity stage and the decline stage is usually never a point of investment in the firms planning. This stems from two major reasons. First, the product in the decline stage usually has not much left in from a business perspective and if the product itself is outdated, then it does not make any business sense to expense valuable resource on the product. The second reason for not paying great attention towards the products in mature or declining stages is that these products give a steady flow of income to the firm without much expense. Therefore, for a firm interested in maintaining a constant flow of working capital, these products serve as a cash cow. But from a reverse logistics point of view, the products in the later part of the product life-cycle become important. The implicit demand from the customers to provide the socially responsible products is increasing. This has translated as the need for the organizations to cater to. The life-cycle assessment forms the first input for the product development in this case. The life-cycle assessment provides the information on the products that have reached the end of use stage. These end of use product handling responsibility lies with the firm. The need to devise methods to have the efficient return strategies helps the firm in two ways. First, this helps the firm to cater to the implicit customer demand. This helps the firm to develop the customer's long-term affiliation with the firm. The customer's long-term affiliation with the firm incidentally converts into improving the customer lifetime value for the firm. The challenge for the firm at this juncture is to have higher level of retention. This retention will also depend on the factor that how well the firm can associate itself with the customers who are associating themselves with the reverse logistic philosophy. This need can be bridged by developing and incorporating the E3S model in to the internal planning of the firm.

4.3 Operational association of the E3S model

The operationalization of factors and approaches indicated at tactical level to attain the strategic-level goals needs to be achieved. Operational level in figure

attempts to capture approaches broadly through which they can be attained. Economical dimension of the E3S model can be operationalized through utilization of resources efficiently, by reducing plant-level wastes identified in lean manufacturing literature, and finally through pro-active design by considering for environment and societal benefits. Firms can operationalize environmental dimension by implementing reverse supply chain with proper channel design and ensuring safe disposal of non-reusable scrap and hazardous waste. Social dimension of E3S model can be operationalized through implementation of certain practices such as employee respect, healthy working environment, and societal and environment priority than organization economic success. Finally, for attaining the strategic and tactical goals of social dimension of E3S model, operationalizing practices to be implemented are generation of job opportunities for people in the surrounding society, paying back to society through construction of supportive infrastructure, investing on improving their livelihood, and also importantly respecting the societal institutions around.

The goals, factors, and practices listed at three different levels for E3S model is not comprehensive but is only an attempt to demonstrate the linkage between conceptual E3S model and its practical implementation. It also conveys the operationalization of the sustainability definition put forward. In the following section, attempt is made to understand how the proposed model captures the sustainability practices across different industries to claim its generalizability.

5. E3S model and different industries

E3S model discussed was used to categorize the sustainability practices, regulations, initiatives, etc. prevailing across different industry sectors. Sample articles for different industries from literature were identified and sustainability practices and initiatives taken in the industries were documented under the four dimensions discussed in E3S model (as shown in Table I). Sustainability practices across E3S model were documented for Automobile industry, Infrastructure, cement and concrete industry, electronics industry, mining industry, paper industry, pharmaceutical industry, and logistics. This confirms the industry generic nature of the sustainability model proposed.

Through this categorization, it was clear that very few industry-specific sustainability practices have been documented in literature. Most of the sustainability studies across industry discuss generic sustainability practices. Focus on industry-specific operationalization of those practices were found missing. For example, how is recycling adopted across different industries was not clear. Future studies on sustainability practices specific to industry would be a worthwhile contribution. In addition, ethical dimension of sustainability has been minimally studied and further focus on this dimension would add value to sustainability literature.

6. Conclusion

The case of reverse logistics represented in this paper evaluates the basic question of why should an organization go for reverse logistics. The case for reverse logistics was argued on four levels, namely, economical, environmental, ethical, and social. The case evaluates the interrelationship of each level with the reverse logistics. It will be difficult to demarcate between the levels and categorize the benefits and certain issues in them need to be addressed at more than one level. One such issue is the organizational sustenance which has a social implication to it since the society is the

Attribute	Description
Industry	*Automotive*
Economical	Life-cycle cost (sum of vehicle price and three years service minus residual value), cost savings from reduced energy consumption, cost savings from reduced waste processing costs, sale of recyclable goods, ultra-light design with a likely hybrid or fuel cell engine technology, fulfilment of legal regulations, efficient resource usage, cost reduction, low raw material costs, shorten supply pipeline, mobility capability (mobility capacity to vehicle size), and build an agile supply channel
Environmental	Life-cycle global warming, life-cycle air quality, sustainable materials, drive-by-noise, design for energy efficiency, vehicle design for end-of-life, alternative fuel or engine technologies, rolling resistance, aerodynamics, drive train design, reducing friction and vehicle weight, reusable packaging system, packing reduction, eco-marketing, high thermal recovery rate, integration of environmental standards into all purchasing decisions, green energy will make the industry independent to uncertainty of gas prices, enhance green energy research, and increase gas efficiency
Ethical	Reduced health risks in production, ethical sourcing, and ethical triple-C (cease-control-combine) remedy
Social	Safety (including occupant and pedestrian protection), jobs for under-developed regions, social responsible buying, social accountability 8000 standard, keep jobs and reduce layoffs, gather domestic support, and boost corporate social image
Reference	Mayyas *et al.* (2012), Mcauley (2003), Thun and Müller (2010), Zah *et al.* (2007), Koplin *et al.* (2007), Xia and Li-Ping Tang (2011)
Industry	*Infrastructure, cement and concrete*
Economical	Concrete produced with little waste, responsible use of fuels and raw materials, predict density and optimize magnitude directly from mix design, LEED (leadership in energy and environmental design) rating system, pre-fabricated buildings use precast columns and beams specially detailed for easy assembly, disassembly, and reassembly, whole life cost, image/business enhancement, legislation compliance, matching user needs with facility design, rehabilitation, repair, and maintenance for life-cycle cost, resettling cost of people, rehabilitating cost of ecosystem, passive heating and cooling through orientation, choosing materials with low embodied energy, and avoidance of heat gain and loss through insulation
Environmental	Concrete with very low inherent energy requirement, made with most plentiful resources on earth, low maintenance requirements, very high thermal mass, made with recycled materials, blending materials using substitutes for clinker, carbon capture and storage, consume less concrete for new structures, consume less clinker in cementing material, consume less cement in concrete mixtures, and use plasticizing chemical admixtures, minimal negative impact on the earth's ecosystems, reusability of moulds, formwork, etc., rehabilitation, retro-fitting, integrating the built environment into ecological systems, life-cycle assessment, land use (extent of land acquisition, extent of tree felling, extent of loss of habitat or feeding grounds, connectivity with hinterland), water reuse, air outlet design, ventilation design during construction, ventilation design service stage, design flexibility towards noise reduction measures, reprovision of habitat, harmony with surrounding, solid construction material, solid dredged/excavated material, liquid waste toxic, liquid waste non-toxic, extent of encroachment upon concerned areas, scrap value after decommissioning, preservation of natural conditions, life-cycle design, flexible design, and using non-toxic construction materials and products
Ethical	Employee health and safety, opportunities to improve access to information and encourage ethics and professionalism, inclusion of sustainability-related clauses in

(*continued*)

Table I.
E3S model capturing sustainability practices across industries

Attribute	Description
	project specification, selecting non-toxic, non-outgassing furniture, flooring, wall finishes, and cleaning and maintenance materials
Social	Concrete producing durable structures, public progress reporting, reduction in accident frequency, control target strength to exact requirements to avoid overdesign, excessive use of raw materials, use highly durable concrete mixtures, workers well-being and community/users benefits (safety issues, user comfort, aesthetics, no nuisance to neighbours, social involvement), satisfying human needs and aspirations with sensitivity to cultural context, empowering people to meet their own needs, cultural heritage (footprint of project in archaeological site, complaints from local parties/villages, extent of diversion), public access (extent of blockage, extent of congestion, view from local authorities), public perception (ubuntu, route(s) for waste disposal), conserving cultural resources, and protecting health and comfort
Reference	Naik (2005), Klee and Coles (2004), Van Vliet *et al.* (2012), Mehta and Meryman (2009), Azis *et al.* (2012), Vanegas *et al.* (1996), Ortiz *et al.* (2009), Ugwu and Haupt (2007), Sev (2009)
Industry	*Electronics*
Economical	Refurbishment, component recovery, disassembly, size reduction, specialized material reclamation, short product life and design time, modular components and processes, use of analytical design tools, reducing environmental impact in the form of reduced cost and reduced risk of liability, eco-features, non-conflicting regulatory requirements, recycling, disposal options, re-manufacturability, and recovery of materials "Hazardous Wastes (Management and Handling) Rules" (2008), and National Electronics Action Plan
Environmental	Regulations on end-of-life (EOL) electronics, Reuse, Disassembly, Size reduction, Material sorting, Repair, Refurbish, Life-cycle factor (Recovery rate after first life, Recovery cost, Potential for next life), Environmental accounting system, Environmental conservation cost, Environmental conservation effects, Advance recycling fee, Close the loop, and Design for environment
Ethical	Take-back options and Pricing the Product
Social	Extended producer responsibility, Take-back, Safety, Quality of life, and Extended producer responsibility
Reference	Atlee and Kirchain (2006), De Silva *et al.* (2009), Cortez and Cudia (2010), Kumar *et al.* (2011)
Industry	*Mining*
Economical	Public reporting on sustainability initiatives, portray mining companies as homogenous masking their internal complexity, ICMM's Sustainable Development Framework, Minerals Council of Australia's version 'Enduring Value', determining the likely participation of local people in the mine project, and calculating economic costs of protecting the community's cultural values
Environmental	Eco-efficiency, environmental disclosure, labelling of products to promote environmental concerns, certification schemes (Australian Mineral Industry Code for Environmental Management), public reporting on environmental initiatives, water discharge treatment, smelting environment friendly, cyanidation plants, scrubbers, flash smelting, industrial wetlands/tailings ponds, and bio-detoxification
Ethical	The extractive industries transparency initiative, voluntary initiatives, labour relations, mining certification evaluation project, Cyanide Code, and determining beforehand the likely effects of development on normal evolutionary processes within the community (way of life, relationships, behaviour, and social resilience)
Social	Alignment of industry values with those of the societies, social disclosure, supplements to the annual reports or produced at interim dates, health and safety, employee well-being, social/community relations, public reporting on social initiatives,

Table I. (*continued*)

Attribute	Description
	employment and training of indigenous people, community engagement and community development, social license, public participatory processes, gathering local community perceptions on mine development, identifying the possible effects of the project on religious or historic elements of the community's way of life, assessing whether there is a need for relocation of the population as a result of the mine project, and determining whether or not there is potential for community conflict
Reference	Humphreys (2001), Jenkins and Yakovleva (2006), Solomon *et al.* (2008), Hilson and Murck (2000), Yelpaala and Ali (2005), Amankwah and Anim-Sackey (2003),
Industry	*Paper*
Economical	Return on capital employed, return on equity, return on sales, exploitation of green image for revenues, cutting down the amount of energy or materials used, workforce training, regulatory requirements, sewerage levy, obtaining a subsidy, gross value added, energetic efficiency, dependence on industrial roundwood, and acquisition of built-in technology
Environmental	Minimization of emission of chemical oxygen demand, emission of sulphur dioxide, emission of nitrogenous oxides, total energy input, total water input, waste water treatment plants, cogeneration (biomass or natural gas, fuel oil), closing of water circuits (incremental and radical), recycling technologies, waste selection, fuel substitution (from fuel oil to natural gas), change to TCF bleaching, combustion of black liquors (heat recovery), change to ECF bleaching
Ethical	–
Social	Pressures for change, cooperation/collaboration/networks, workers (labour unions), unitary average wage, gross value added per employee, and Intensity in labour force
Reference	Wagner (2005), Wagner *et al.* (2002), del Río González (2005), Ren *et al.* (2010), Diaz-Balteiro *et al.* (2011)
Industry	*Pharmaceutical*
Economical	Uses recycled materials, communicates on its product labels the positive environmental effects of buying the product, company's public image, purchasing and encouraging energy-efficient products, public image, articulating the sustainability concept in a vision statement, top management support and guidance, pre-screening of suppliers coupled with ongoing auditing, strong in employee relations issues such as diversity, remuneration, and personal and professional development as well as employee engagement in charitable activities, preferential pricing, intangible strategic assets such as reputation, employee know how, and corporate culture, satisfying new government regulations, comply with global regulations and legal requirements, high brand awareness, risk mitigation, focus on product availability, and willingness to pay for sustainability
Environmental	Total water use, energy use, CO2 emissions, CFC emissions, hazardous waste, total eco-efficiency rate, heavy metal emissions to water, total hectares of biologically diverse land preserved, post-consumer recycled material use, per cent of water from local sources used within average local recharge rate, per cent of total energy used from renewable sources harvested sustainably, expanded LCA, waste management, efficient use of key resources like water, and focus on emissions
Ethical	
Social	Sustainable community systems, focus on worker health, safety and well-being, long-term quality of life and human development within the ecological carrying capacity, community relations, foster human rights, Involve and empower both internal and external stakeholders at all levels to produce buy in and alignment, FTSE4 good index series, donations amongst societies, increase community goodwill, community

(*continued*)

Table I.

Attribute	Description
	partnership, attract social responsibility-oriented investors, and risk from adverse action of NGOs
Reference	Veleva *et al.* (2003), Sones *et al.* (2009), Schneider *et al.* (2010), Esteban (2008), Smith (2008), Wolf (2011)
Industry	*Logistics*
Economical	Supplier collaboration, product/package ratio, cube utilization, distributor collaboration, recovery value, Lean Six Sigma initiatives, continuous process reengineering, plant and warehouse site selection, full asset utilization, increase of unit size to small lots to full loads, cost-to-serve reduction, desire to enhance company image, competitive pressures, maximize the utilization of space in each shipment, corporate desire to attract green customers, purchasing more fuel-efficient vehicles, promoting freight consolidation initiatives within the companies, qualifying fleet operators based upon their equipment and performance, shifting freight to more fuel-efficient modes, retro-fitting a company's aircraft with more fuel-efficient engines, reducing vehicle idling time, improve the performance of customer vehicle fleets, auditing and monitoring of suppliers, creating a marketing edge by using greening as a unique selling point with environmentally conscious customers, label products that are recyclable, design for disassembly, cost savings through resource savings, volume of goods disassembled per hour, degree of utilization of transport equipment, promote industry cooperative efforts, vendor selection, vendor location, consolidation, mode selection, carrier selection, backhaul management, channel decisions, facility location, raw materials acquisition (suppliers), and after sales activities
Environmental	Introduction of a Green Training Programme about climate change regulations, experimentation with a paperless office concept, etc., establishment of a dedicated team to review procedures for energy savings and fuel use in facilities and equipment, recycle, reuse, reducing the amount of materials used (fuel, water, and electricity), reprocessing, Innovations leading to reduced GHG, GHG produced by transportation, carbon footprint reduction, optimal usage of oil and gas, return handling, salvage and scrap disposal, ability to ship goods using water freight and rail freight for long distances than using road freight, cruise control, reductions in left hand turns, GPS units, automatic engine shut down devices, experimenting with alternative fuels, participating in government-sponsored programmes such as the Environmental Protection Agency (EPA)'s SmartWay Programme in the trucking industry, sharing vehicles across multiple customers, support customer efforts to reduce their carbon footprints, enhance existing return logistics programmes, identifying appropriate environmental benchmarks/ targets, use of third parties to identify potential lighting upgrades to reduce kilowatt hour consumption, measuring GHG emissions within all company facilities, Development of an Eco-Consumption Programme, establishment of pilot programmes to substantially reduce energy consumption in company warehouses, consolidating a company's warehousing network, adapted packaging, certification of suppliers according to environmental standards, supplier selection based on environmental criteria, ROI squared (integration of environmental protection into the core business), prepare environmental policy statement, perform environmental audit, designing green parts and products, environmental life-cycle analysis to evaluate products, hierarchy of strategies should be from resource reduction, to reuse, to recycling, and finally to disposal, energy efficiency per material per cent of virgin material, returns handling, returns shipment, PUBLICIZE environmental efforts, promote environmentally conscious personnel, replace fleets more often, shift from air to ocean, from road to rail, eco driving, ISO 14001, EMAS, CO2 reports, fewer warehouses (nodes), all nodes have cross-docking, central and local storage, product-specific routing, vehicles allowing

Table I.

(*continued*)

Attribute	Description
	two-level loading, increased pallet utilization, consolidation of flows, larger warehouses, standardized load carriers, standardized vehicles, substitution of environment harmful raw materials with friendly ones, maximize environment friendliness through the use of alternative packaging materials, techniques and design, lightweight design, and use of integrated delivery
Ethical	Responsible sourcing, and corporate desire to do the right thing
Social	Pressure from customers, certification of suppliers according to social standards, supplier selection based on social criteria, societal expectations, and minimizing liability
Reference	Dey *et al.* (2011), Lieb and Lieb (2010), Wolf and Seuring (2010), Van Hoek (1999), Murphy and Poist (2003), Pazirandeh and Jafari (2013), Martinsen and Björklund (2012), Wu and Dunn (1995), Aronsson and Huge Brodin (2006), Hung Lau (2011), Isaksson and Huge-Brodin (2013)

Table I.

larger set to which the organization belongs to. But the sustenance of an organization not depends upon the social aspect of it rather it needs to identify itself in association with the environmental and the ecological balance in the society. The term society is not just a group of people living together but has a wider implication which includes all the aspects like economical payback, environmental stability, ethical responsibilities, and social well-being of all the living beings. The social sustenance of the organization though is on the prime concerns now, the profit making does not find its way out of the agenda of an organizations. Thus it becomes a challenging task for the mangers to make effective decisions which incorporate the social sustenance with the necessary economic gains. To make an effective decision, the managers must be aware of his arsenal and reverse logistics is perhaps the most important tool. The organization as a whole needs to be responsible for the effective implementation and practice of sustainability. The E3S model provides a road map for the firm to understand the relationships with the various factors that affect directly the planning of the firm at strategic, tactical, and operational levels. The proposed four constructs of sustainability model is validated to be a generic model independent of the industry through a literature review.

Model removes the complexity associated with sustainability literature and simplifies its definition for easy application across different sectors. It attempts to capture the maximum variance of sustainability with minimum dimensions thereby proposing a parsimonious model applicable across various sectors. As a scope for future research the model needs to be statistically validated. This can be done using structural equation modelling or interpretive structural modelling. Moreover the interactions analysed in this context is not exhaustive in nature, but nevertheless it provides a starting point for the making an exhaustive and excusive case for the reverse logistics. Proposed model can also be applied in multiple case organizations from diverse sectors to evaluate its capacity to capture the aspects of sustainability across different sectors. Future study can attempt to understand the interrelationships between the identified constructs across different industrial sectors.

Model linked to organizational business operations at the strategic, tactical, and the operational levels helps practitioners in the alignment of the organizational activity towards the strategic intent of the organizational sustainability philosophy in the business ecology. It also helps in equipping the organization to achieve the operational excellence and the strategic business growth at the same time.

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