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Sustainable Supply Chain Management: State- of- the- Art

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Abstract— Sustainability is a very vital issue which receives key attention in the media, press, journals, business and academic research arena. Most of the conversation and argument is about the environmental impact that happened on the organizational supply chains. It is mostly regarding how to convert the traditional Supply chain management practices into Sustainable supply chain management (sSCM) system. In this paper we exert our effort to show a state of art regarding sustainable supply chain management. This research is a systematic literature and analyzed articles based study intended to provide an overview of multifaceted discussion of sSCM by different authors and establish a conceptual basis of this discipline.

Keywords: Supply Chain Management, Sustainability, Green Supply chain, Environmental, Economic and Social dimension.

I. INTRODUCTION

Sustainable supply chain management has emerged as a proactive approach for improving business processes and activities by social, economic and environmental aspect. All businesses rely on their supply base and customers to survive. Increasingly business peoples are being expected to know that their suppliers are as mindful of their environmental and social responsibilities as they are or should be. This is not always easy to do with local suppliers but it is even harder with suppliers from other countries. However being difficult to do is no excuse because if business body don't find out about their own supply chain, someone else might do it for them. These hard lessons have been learned by many companies and have prompted them to work towards sustainable supply chains.

There is a compelling business issue for companies to work with suppliers to jointly develop products and services which are commercially viable, preserve environmental resources and look after workforce and communities. However sustainable development starts at home and at the top. We need to start implementing it in

our own organization before we can start reaching out to suppliers or customers.

The objective of this paper is to find out the state of the art of Sustainable Supply Chain Management and establish a conceptual ground regarding sSCM. It is one of the growing current phenomena to know the details of this field.

In each phase of the sustainable supply chain discipline is nourished by the three key elements like environmental, economic and social aspect.

II. RELATED WORKS

Until the early 1970s, most researchers coincide that supply chain management (SCM) is both an emerging field of practice and an academic domain [1].

With increase in environmental concerns during the past decade, a consensus is growing that environmental pollution issues accompanying industrial development should be address together with supply chain management, there by contributing to green supply chain management [2] [3].

Environmentally conscious supply chain management refers to the control exerted over all immediate and eventual environmental effects of products and processes associated with converting raw materials into final products [4].

During the 1990s, a fresh posture regarding the relationship among supply chain management, social responsibility and environmental consciousness began to "catch on". Companies embraced the importance of working collaboratively with their supply chain partners to improve social responsibility performance [5].

Sustainable supply chain management is the strategic achievement and integration of an organization’s social, environmental, and economic goals through the systematic coordination of key inter-organizational business processes to improve the long-term economic performance of the individual company and its value network [6].

Scope of Sustainable supply chain management is defined from the idea of triple-bottom line “environmental, social, economic dimension”. Carter and Rogers also has taken the same things to show a house of sustainable supply chain management [6] [7]. House of Sustainable supply chain is like following -

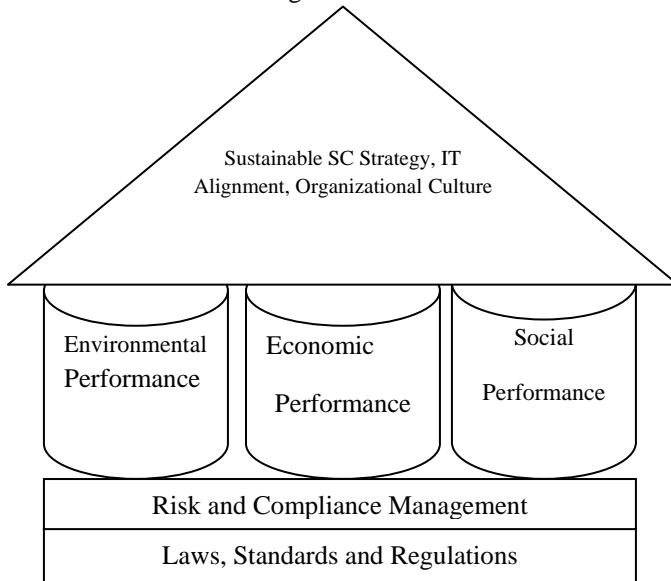


Fig1: House of sSCM

Researcher Marisa P. et al. [8] Opines that it is still not mainstream practice to systematically take a sustainability approach in tackling supply chain and operations management issues. They conclude through abductive reasoning that the reasons for procrastinating integration of sustainability in supply chain and operations management research are the conflicting nature of the task and the inherent context, which is the focus on operations rather than environmental or social issues.

III. METHODOLOGY OF THIS WORK

For this paper we follow the Systematic Literature and Analyzed Articles approach. Considering the increasing number of books, journals, conferences and work-shops, the systematic literature review has become an indispensable method [9] [10]. In systematic literature review pertinent work and resent findings are analyzed with regard to a particular research question.

The ultimate goal of this study is to find out the state of art sustainable supply chain management. Various sources

are supporting this issue by different way. So we have exerted our effort to gather important aspect of sSCM and articulate those aspects for making conceptual understanding. Following steps are followed for research perspective.

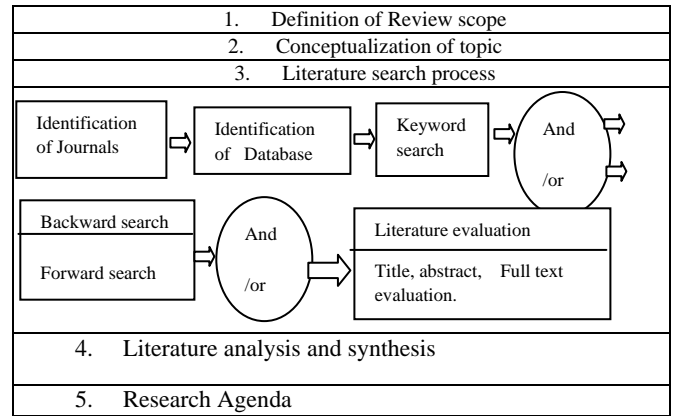


Fig2: Research Process supported from vom Brocke et al. [11], Webster and Watson [12], Frank Teuteberg and David Wittstruck [9])

Definition of review and conceptualization of this topic are shown in through ‘pros and cons of sustainability’ and ‘conceptualization of sSCM’. We tried to collect literature in a systematic manner which mentioned in above figure. Sometimes identified the journals and locating database as a first steps. Prominent online sources are used in this regard. Some key words also used here for searching relevant journal papers like “Sustainable Supply chain” , “Sustainability”, “sSCM”, “Supply chain” , “Corporate Social Responsibility(CSR) and Sustainability”, “ Green Supply Chain” etc. After that we tried to analysis and synthesis the collecting resources. Following table shows the main theme of sustainability of supply chain emphasized by selected authors:

Table 1: Main suggested themes of sSCM field by selected authors

Main suggested theme of sSCM field	Representative references
A validated framework of sSCM is developed and proposition of sSCM are outlined. In addition, relevant literature on sSCM is proposed.	Carter C, Rogers DS [6]: International Journal of Physical Distribution and Logistics Management.
A comprehensive view of published literature on aspects and facts of Green SCM.	Srivastava SK [13]: International Journal of Management Reviews.
The objectives of this paper are to present a literature review on sustainable supply chain	Seuring M, Muller S [14]:Business strategy and the

management and provide a conceptual frame work of research.	Environment
SCM is both an emerging field of practice and an academic domain	Burgess, Singh and Koroglu, [1].
Environmental pollution issues accompanying industrial development should be address together for ensuring green supply chain management.	Sheu et al.[16]; Hsu, C. W.; Hu, A. H [2].
Establishing environmental requirements for purchasing items.	Lamming and Hampson,[15]: British Journal of Management.
More focused on green purchasing for SCM	Yuang and Kielkiewicz-Yuang[16], Rao[17] , Zhu et al. [18].
Establish an environmental risk management system for Green supply chain management	Bowen et al. [19].
Environmental, social and economic dimension built a house of sustainability of supply chain management.	Elkington [7]; Carter and Rogers [6]
Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs”	United Nations. Brundtland Commission: [20]
Arraigning main activities of supply chains; exploring the domain of supply chain management.	Borade, A, Bonsad SV [21]
Environmental ethics for sustainable supply chain management.	Beamon, Benita M [4]
SC network configuration for Product recovery	Beamon, Benita M. and Farnandes [22]
In this research, an integrated multi-objective supply chain (SC) model is Developed for use in simultaneous strategic and operational SC planning.	Sabri, Ehap H. and Benita M. Beamon [23]
This paper describes the challenges and the Opportunities facing the supply chain of the future and describe the various effects these issues have on supply chain design, management, and integration, ultimate goal to establish sSCM.	Beamon, Benita M. [24] <i>Operations and Supply Chain Management: An International Journal.</i>
This paper is set out to examine how concern for environmental impact is being incorporating	Simon Croom, et al. [25]: European Operation

into the strategic and operational management of the supply chains	Management Association (EurOMA) Conference.
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Currently Sustainability and sustainable supply chain management is a vital agenda for every business executives for starting their discussion. Sustainability itself creates a new era of business thinking and sources of competitive advantage. Previously SCM activities consider as the behind or back office function to manage somehow. But right now it is one of the major thinking parts of business. Different literature shows the evidence of its importance and emphasizing points also divers as like environmental issue, economic consideration, health footprint, global warming, waste recycling, social perspectives, green awareness of customer, supply chain network and configuration, simultaneous operation and SC strategy etc. Some times legislation and legal perspectives also are taken into account for proper sustainability of supply chain management activities. Form the flavor from different papers regarding Sustainable supply chain management, we get a new clue or research agenda that, this field required further study for showing the state- of-the- art of sSCM.

IV. SUSTAINABILITY: PROS AND CONS OF THIS ISSUE

Sustainability is like an iceberg. Most of us know something about it, but there are many aspects hidden beneath the surface. Issues such as acid rain, deforestation, species extinction, third world poverty, and climate change have captured public attention and shown the relationship between social well-being, environmental stewardship and economic activity [26].

Sustainability refers to an integration of social, environmental and economic issues [6]. Shrivastava defines sustainability as “the potential for reducing long-term risks associated with resource depletion, fluctuations in energy costs, product liabilities, and pollution and waste management” [13].

Sustainability has become a wide-ranging term that can be applied to almost every facet of life on earth, from local to a global scale and over various time periods. This burning issue is still indicating us how to live our life in this world, how to do our business, how to make our product, how to recycle the used materials. As we have the commitment to the future generation. For all aspect, human being should ensure the issue of sustainable

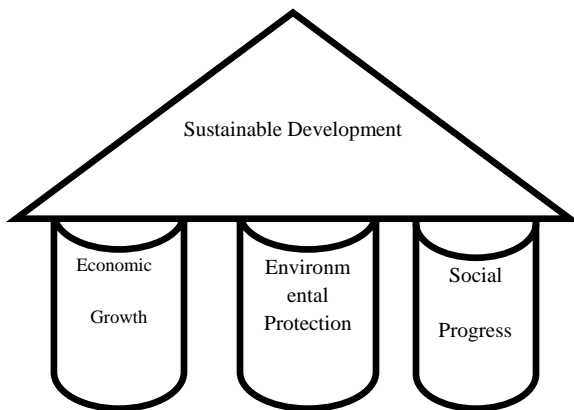
development. The well accepted definition is given by UN Brundtland Commission in 1987, “Meeting the needs of the present without compromising the ability of future generations to meet their own needs” [20]. We can also credit the Brundtland Commission for defining sustainable development which states – “The management of the human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining the potential to meet the needs and aspirations of future generations”[27].

Sustainability is based on obligations toward future generations and presupposes intergenerational equity. Most ethicists would agree to define sustainability as the following way: Sustainability means that present and future persons have the same right to find, on the average equal opportunities for realizing their concepts of a good human life [28].

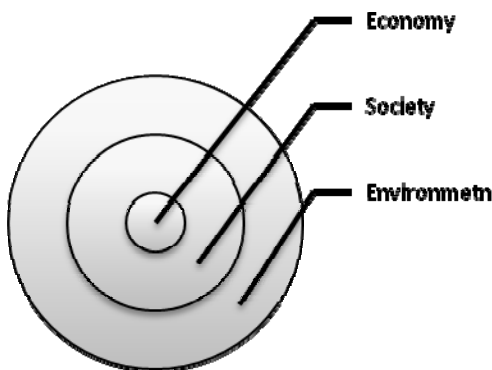
The core of mainstream sustainability thinking has become the idea of three dimensions, environmental, social and economic sustainability. These have been drawn in a variety of ways, as ‘pillars’, as concentric circles, or as interlocking circles [29].

A. Pillars

Three Pillars of Sustainable Development



B. Concentric circles



B. Overlapping Circles

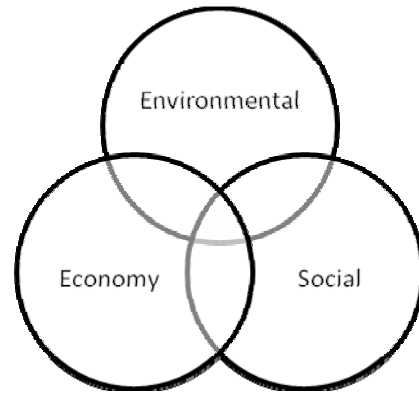


Figure3. Three Visual Representations of Sustainable Development: Pillars, Circles, Interlocking Circles

Sustainability has presented the business community with huge challenges, and therefore, huge opportunities. This issue simultaneously will generate good and bad effect for the business bodies. Among the business firms, those who are smart enough to manipulate the benefits; will be the pioneer firms for future. Companies which are able to address those challenges properly will exist in future and those are not will extinct soon.

V. SUSTAINABLE SUPPLY CHAIN MANAGEMENT: CONCEPTUALIZATION OF THIS TOPIC

There are numerous definitions of the terms ‘Sustainable’ and ‘Supply chain’. More simplified and practical oriented definition is added by New Zealand Business council for Sustainable Development, “Management of raw materials and services from suppliers to manufacturer/service provider to customer and back with improvement of the social and environmental impacts explicitly considered.”The supply chain considers the interactions between a business and its customers and suppliers [30]. Harland defines supply chain management as “the management of a network of interconnected business involved in the ultimate provision of product and service packages required by end customers” [31].

The concept of supply chain management can be extended by adding sustainability. Sustainable supply chain management integrating environment thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life. Besides the environmental issues, there are two other vital part of

sSCM are exists, for instances economic aspect and social aspect which are directly involved with the sustaining of organization in the competitive market.

Some times green issues are replicated with the Sustainability of supply chain management. Many studies addressed product lifecycle along with supply chain or Green Supply Chain Management, for example, Stonebraker & Liao [32] discussed that the stage of lifecycle variables is associated with the various dimensions of supply chain integration. In each stages of product life cycle, there are certain ups and downs are happened. Sometimes production process emitted toxic things which are deadly harmful to the society. That's why reuse and recycling of different materials are referred. Several papers provided green practices such as Duber-Smith [33]. He suggested some practices for ensuring sustainability and green perspectives of society, including reducing energy consumption, recycle and reuse, using biodegradable and non-toxic materials, minimize harmful emissions, and minimize or eliminate waste.

Sustainable Supply chain is a term that refers to a variety of approaches for the management of natural and human resources from the supplier to the manufacturers/ service provider to the consumer and back.

Sustainable supply chain management has its roots in supply chain management, i.e. it is based on the adoption and extension of its concepts [9].

Paul Hawken's book [34], *The Ecology of Commerce*, states paradoxically regarding the issue of sustainability, that although businesses of the industrial age contributed to the current state of affairs, business is the only means to implement the changes required in a "restorative economy." Hawken sees sustainability as a must, as we are exceeding the resource capacity of the planet.

A. Findings and Analysis of the study:

No system is sustainable unless it accommodates the environmental, economic, social and health footprint aspects. Ultimately the system should be friendly to the ecosystem on which it depends. Our current sSCM is based on the notion of perpetual triangular perspective like economic environmental and social perspectives. Currently business bodies need to apply sustainability concept for adapting on going business demand from ultimate consumer. From the huge literature support and different studies, we found that it is everlasting phenomena and going for making the world green and sustainable. It is possible to define the sustainability of supply chain

management in the way of "A environmental, economic and social perspective to carry out proper inbound and outbound supply system including raw materials to ultimate consumer and recycling the waste materials for making the world green and sustainable." This aspect can be shown by following proposed diagram:

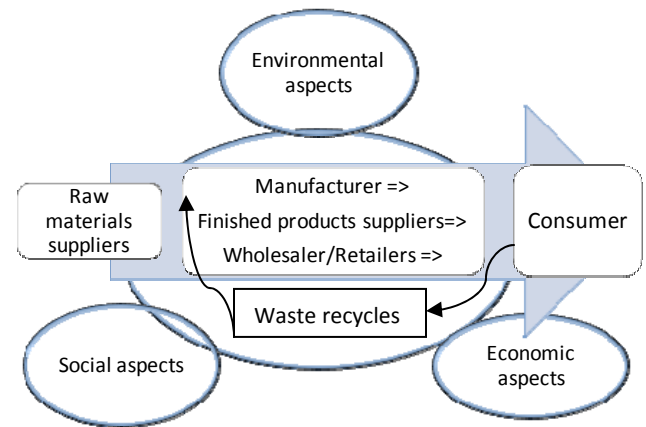


Fig 4: Sustainable supply chain management system

Environmental, social and economic aspect provides the influence over the whole supply chain system. The existing supply chain system started with raw material suppliers and with raw materials manufacturer produces finished products on the basis of customer demand. Finally produced finished goods with the help of wholesalers and retailers it reached to the ultimate consumers. If it is required then some goods again send to the manufacturer after use of consumer as a recycle item. The ultimate goal of the sSCM system is to ensure the overall indicators of the environmental, economic and social aspects in the supply chain system. It is the responsibility of all business people to do their business with obliging all environmental issues. Not to do any activities that's destroying natural system. *Environmental sustainability* aspects is covering natural resources endowments, past and present pollution levels, environmental management efforts, contribution to protection of the global commons and society's capacity to improve its environmental performance over time. All aspects play the vital role over the sustainability issues in supply chain system. Social well being should be ensured by concern bodies. *Social sustainability* encompasses the human rights, labor rights and corporate governance. Social sustainability is the idea that future generations should have the same or greater access of social resources as the current generations. Social sustainability is one of the cultural perspectives which are as broad as environmental, cultural aspects. All the social issues like community, diversity, employee relations, human rights,

product safety, reporting, governance structure, supplier's security, consumer rights etc. are the main indicator of social sustainability. And mentioning issues should be ensured for proper sustainability of supply chain management system. Generally *economic perspective* of business indicates that good cash flow, proper return on investment (ROI), good profit margin, ultimate consumer satisfaction, enhancing sales etc. But business bodies should not concern about their own benefit only, but they have to concern about whole economic system and its sustainability as well. Sometimes triangular view should be considered like profit, planet and people. Ultimately to do business for ensuring people satisfaction and business profit. It is certainly not through destroying the planet where we live.

B. Potential benefit for sustainable supply chain management

Social responsibility, good environmental and economic performances are not just about the activities that the business firms should carry out within the factory walls. As sustainability demand rose from ultimate consumer, so it is act as a source of different potential benefits and competitive advantages.

There are some potential benefits will rise easily from sustainability of supply chain management field:

- Increased productivity through greater efficiency and higher quality,
- Opportunity for innovation and competitive advantage,
- Risk minimization,
- Protection and enhancement of a company's brand reputation,
- Advantages of considering international agendas and joining sustainability indexes

From the marketing perspective of sustainability, there are boundless opportunities to include social responsibility and be financially successful. The Canadian Business for Social Responsibility includes bottom-line benefits having [35]:

- Reduced operating costs
- Enhanced brand and image reputation
- Increased sales and customer loyalty
- Increased ability to attract and retain employees

- Publicity and increased public image from good works

VI. CONCLUSION

In recent years the sustainable supply chain management (sSCM) has received increasing attention and has become a progressively more popular field of academic and research area. Nowadays business bodies must handle manifold challenges like rapid climate change, growing public interest in green perspective of business (Green Supply Chain Management, Green computing, logistics etc.) and ensuring environmental sustainability. Some legislation also imposed by the concern body like European Union, For instances, EU law for saving environment- Restriction of Hazardous Substance (RoHS), Waste Electrical and Electronic Equipment (WEEE) Eco-design for Energy using products(EuP) etc. It is one of the precise demands of time to make every thing on the basis of environmental issue. The sustainable matters are always fit for the environment. So by this paper we tried to address this sustainability issue in the field of supply chain management and showing the way of articulation for different perspectives. And as a secondary goal we also tried to establish a good conceptual basis of this discipline.

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