Sustainable Supply Chain Initiatives

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The supply chain initiatives can be described as a set of activities performed by the firms for smooth functioning of the holistic supply chain system with the socio-economic and environmental needs in a long term period. The traditional supply chain management (SCM) practices replaced in favor of the sustainable supply chain management (SSCM) initiatives in most of the Asian industries. Nowadays, the adoption of sustainable supply chain initiatives (SSCIs) is critical for the organization to mitigate risk, handle complexities, and business dynamics of the global outsourcing. For managing supply chains smoothly, it is the very important for industries to integrate supply chains through networks designed for achieving higher business volume. This synergistic linking of sustainable supply chain practices moves the organization towards the building of the competitive edge in the global market.

Keywords: sustainability ; Sustainable Supply Chain Initiatives ; SSCI

1. Sustainable Supply Chain Initiatives (SSCI)

In recent years, the term sustainability has gained popularity and significant attention due to globalization and competitiveness in the food industry [1]. The benefits of adopting sustainable practices in a typical supply chain of food products may generate more valuable creation opportunities, and offer significant food safety, and quality edges in process improvements for organizations. The application of sustainable practices has been taken as a core business issue, as it influences the firm's overall performance. There is a crucial need for combining eco practices in a holistic SSCM.

1.1. Greener Perspectives

In recent years, the significance of environment consciousness in a food supply chain is getting more popular due to customer demands [2]. In order to achieve the environmental objectives, the manufacturing companies are greatly concerned to adopt greener philosophy in the various stages of supply chain, such as value chain, new product designing, purchase, operations and physical distribution, selling, and advertising of goods and services. Walton [3] emphasized that the companies should develop environment friendly policies while performing the business operations within the stipulated time span smoothly. Chen [4] proposed a model to identify and evaluate the corporate business goals at each level of management in accordance with the greener practices in a supply chain. A lot of environmental factors, domestic, territorial, geographical, global implications, carbon emissions, disposal of wastages, and usage of natural resources, which have to be evaluated and controlled during these growth phases [5]. In this perspective, greener practices are essential to impart the environmental thinking in traditional supply chain management [6].

1.2. Social Perspectives

The occupational health and safety of workers is linked with the social aspect of supply chain. The social aspect is a very important variable to measure and monitor the level of involvement of the organization with workers' concerns. The corporate social responsibility (CSR) deals with the betterment of workers and organizational performance of the organizations, as it directly affects the productivity of the workers. Hence, the social aspects are considered as the vital elements of the organizations because the survival of most of the firms is based on CSR practices. By applying the concept of CSR, firms can establish an effective working environment in achieving goodwill for the firms in local, as well as international, markets.

1.3. Economic Perspectives

The integration of financial perspective into the SC network may facilitate boosting the economic performance of the organization to sustain in the global market [7]. The economic aspect is considered a key factor to manage the organizational performance, after social and environmental aspects, because it directly influences the profitability of the

firms [8]. In addition, this perspective focus not only on the supply chain optimization but also to maximize the SC surplus by reducing the procurement cost and cost of production and physical distributions.

2. Overview of Barriers in Implementing SSCIs

Based on the previous studies and literature, it has been observed that much attention paid on specific areas of SSCIs such as sustainable outsourcing, organizational environment, intrinsic production systems and extrinsic physical distribution system, capabilities and competitiveness, buyer-supplier relationship, marketing management, knowledge creation and dissemination, and technology transfer in the whole supply chain process. Most of the researchers suggest that the SSC related research should shift from the qualitative studies towards empirical and theoretical based approaches in order to tackle the uncertainty in data [9]. The management and prioritization of barriers, while adopting sustainability aspects in micro small and medium enterprises (MSMEs), is totally varied from those of large industries in different aspects. Some of the researchers suggested that adoption of SSCIs in SMEs is complicated and not easy to distinguish [10]. Carter and Rogers [11] examined that industries usually flop to implement SSCIs due to certain aspects such as sinking costs, lack of communication structures, departmental politics, organizational culture, and institutional norms. Similarly, Junaid [12] conducted research to explore the sustainable supply chain risk and further integrate supply chain practices in the automotive industry of Pakistan. Nazam et al. [13] evaluated the risk-oriented assessment model against supply chain practices implementation in the textile industry of Pakistan. They further circulated cross-sectional questionnaires to the industrial experts, seeking input through the (FAHP) technique. Rasool et al. [14] evaluated the barriers in adoption of SSCM initiatives in the textile sector of Pakistan and recommended that barriers directly influence the profitability and success ratio of industries. Abbasi [15] analyzed sustainable practices in Pakistani manufacturing supply chains and evaluated critical success factors for SSCM adoption. Mumtaz et al. [16] analyzed the impact of SSC on industrial organizational performance in the manufacturing industries of Pakistan. The literature evident that fewer researches were found to analyze barriers in the adoption of SSCIs in the perspectives of Pakistani industry. However, modeling the barriers is a multi-criteria scenario, which can be addressed by applying (FAHP) methodology in order to tackle the complexity and subjectivity of the variables, considered in the proposed model. For this reason, the (FTOPSIS) approach is also very appropriate in managing real world practical problems under uncertain environment. Based on the review of literature, none of the work has been done for the identification of key barriers in (FPIs) of Pakistan. Similar research studies were attempted by the industries of China, Turkey, Iran, India, and Malaysia [17], but the different industries have the different opinions about SSCIs implementation. The detailed list of barriers identified for implementing SSCIs in FPIs is given in **Table 1**.

Table 1. List of barriers identified for implementing SSCIs in FPIs.

Categories of Barriers	Codes	Key Barriers in Adopting (SSCI)	Brief Descriptions	Sources
Sustainable Outsourcing (SO)	SO_1	Facing problems in maintaining sustainable suppliers	With sustainability perspective, industries find it difficult to maintain sustainable suppliers as the interest of supplier is different in the entire supply chain	[18][10][19] [20]
	SO_2	Complexity in monitoring suppliers' eco-practices	Due to conservative managerial styles, it's difficult mitigate the eco-friendly practices of suppliers	[10][21][22]
	SO_3	Lack of buyer-supplier partnerships based on environmental aspects	Due to lack of compliance and implementation of ISO 14,001 standards, firms face challenges to keep buyer-supplier partnerships	[23]
	SO_4	No proper focus of Govt. to support (SSCI)	Government is not so much concerned to develop eco-friendly regulations and policies for industries operating in special industrial zones	[5]
	SO_5	Lack of distinction and appreciation system for vendors	The industries are silent and not taking interest to educate the personnel of suppliers for adopting sustainable concepts	[24]
	SO_6	Trust deficit in maintaining sustainable relationship with sustainable supplier	Lack of trust on developing sustainable relationship with supplier in long run	[6]

Categories of Barriers	Codes	Key Barriers in Adopting (SSCI)	Brief Descriptions	Sources
Sustainable Production and Distribution (SPD)	SPD_1	Usage of toxic and polluted raw material inside the factory premises	The application of contaminated raw material in operational process leads towards the toxic finished product which eventually decrease the market value of the product	[7]
	SPD_2	Involvement of key Customers in new product development	During product development the inclusion of key customer is crucial in designing new product	[25][26]
	SPD_3	Adequacy for disposal of the waste	Industries have no proper drainage system for disposal of the wastage	[27][28][29]
	SPD_4	Stock availability for performing the operations in a sustainable ways	Due to lack of awareness in the market, producer find it difficult to arrange contamination free stock for operational functions	[30]
	SPD_5	Waste minimization In production process	Implementation of lean six sigma concept can reduce the wastage in production phase	[31]
	SPD_6	Requesting compliance statements	Organizations are unable to comply particular rules and regulations set by the Government bodies and international authorities	[10]
	SPD_7	Lack of flexibility in operations and production and process	Operational flexibility and production capacity is poor; still all organization are not well-integrated computer-controlled	[29][32]
Sustainable Competitiveness and Innovation (SCI)	SCI_1	Gain competitive advantage to keep the competition in market	Industries are facing rapid changes and competition in the market, due to the competitive advantage companies are unable to attract new customers at a faster rate than its competitors.	[18][33]
	SCI_2	Develop an appropriate database management system for maintenance of products	Industries need to struggle for developing a sustainable database system for recording of products. Maintaining highly hazardous material involves the probability of financial loss	[34]
	SCI_3	Analyzing SSCM practices of Competitors	Industries are incapable to analyze the SSCM practices of competitors	[35]
	SCI_4	Development of R&D Department for research, innovation and commercialization of Products	Existing R&D cell in the industries are not fully functional; there is a need to restructure the R&D cell for innovation of products	[13][9][36]

Categories of Barriers	Codes	Key Barriers in Adopting (SSCI)	Brief Descriptions	Sources
Sustainable Buyer-Supplier Relationship (SBSR)	$SBSR_1$	Collaborations with buyer and supplier	With sustainable perspectives, industries have lack of collaborations with suppliers	[37][38]
	$SBSR_2$	Development of supplier of son on the basis of sustainability attributes	Lack of awareness of selecting supplier on the basis of sustainability attributes	[39]
	$SBSR_3$	Providing awareness to SC partners for SSCM	Supply chain actors are generally unaware of sustainable practices	[40]
	$SBSR_4$	Providing access to supplier in getting design specification	Industries are inefficient to provide design specification to the supplier	[41]
	$SBSR_5$	Perform sustainable procurement functions in a supplier context only	Due to lack of sustainable supplier, the industries are dependent traditional supplier to procure the hazardous raw material	[42]
	$SBSR_6$	Provide assurance to deliver sustainable raw material	Lack of assurance of sustainable raw material disturb the entire supply chain	[43][44]
	$SBSR_7$	Providing rewards /incentives to buyer and suppliers	There is no proper reward system developed by the Govt. bodies.	[45]
Sustainable Marketing and Organizational Culture (SMOC)	$SMOC_1$	Providing awareness about Sustainable products	Lack of awareness about sustainable products	[11]
	$SMOC_2$	Acquiring customer satisfaction and loyalty	Facing difficulty to acquire customer satisfaction and loyalty	[46]
	$SMOC_3$	Difficulty in finding markets for sustainable customers	Present industrial mindset and practices incapable of finding markets for sustainable customer	[47]
	$SMOC_4$	Complexity in establishing culture for producing sustainable products	Industries reluctant to establish culture for producing sustainable products	[48]
	$SMOC_5$	Lack of awareness about marketing constraints	Market plays a dynamic role towards sustainable supply chaint; as a diversified consumer mindset exist in the market	[49]
	$SMOC_6$	Lack of employees awareness regarding sustainable practices	Inadequate awareness of employees about benefits of SSCM practices	[50]
	$SMOC_7$	Providing awareness to employees about Production benefits	Inadequate awareness of employees regarding production benefits of SSCM practices	[51]
SustainableKnowledge Sharing (SKS)	SKS_1	Sharing awareness regarding forward and reverse logistics implementation	Industries are not well aware about forward and reverse logistics practices in terms of sustainability	[52]
	SKS_2	Sharing business Information with Supply chain partners to avoid disruptions	Facing difficulty in sharing business information with supply chain actors to avoid supply chain disruptions	[53]
	SKS_3	Difficulty in maximizing the information sharing process	Supply chain member encounter difficulties in sharing information of funds, material and manpower	[54]
	SKS_4	Sharing sustainable supply chain concepts	Industries lack belief in sharing sustainable supply chain concepts within holistic supply chain	[55]
	SKS_5	Discouraging disbeliefs about environmental benefits	Industries are reluctant to believe on the ecological benefits of sustainability	[56]

Categories of Barriers	Codes	Key Barriers in Adopting (SSCI)	Brief Descriptions	Sources
Sustainable Technology (ST)	ST_1	Adoption of eco-technology for producing products	Industries face fear in adopting sustainable supply chain as if technology fail to implement then it will create financial loss	[8][57]
	ST_2	Improvement of technological and cleaner production activities	There is a lack of human resources and technological capabilities in the industries	[58][59]
	ST_3	Adoption of technology to conserve energy consumption	Organizations have not enough resources to design technology which reduce energy consumption	[58][60]
	ST_4	Adopting reverse engineering techniques to design used products	Inability to design the reuse products by adopting reverse engineering technique	[61]
	ST_5	Use technical experts to handle the automation digital activities	Lack of skilled labor to operate the digital equipment's	[62][63]
	ST_6	Adoption of emerging technology, Material, information and process	Employees reluctant to adopt new technology, material and follow the process	[64][65]

3. Possible Pathways to Implement (SSCIs)

In the literature, only few studies are available that state the possible pathways as a solution to implement SSCIs in FPIs. A brief piece of discussion about the possible pathways in the light of experts' opinions and literature is as follows:

3.1. Lean Management

Lean management is a primary pre-requisition to adopt SSCIs in manufacturing and service industries. Lean is the process of eliminating all unessential additional activities and values to improve overall business process [19]. Lean is a process of reducing waste, and it results in cost reduction, better usage of resources, and improvement in quality. Lean management includes the waste minimization in both solid and liquid form. Appropriate lean management of solids and liquids enhances enterprises' performance [20]. The careful management of food wastage, generated from the agri-food industry, acts as a key indicator to maintain balance in the ecosystem.

3.2. Appropriate Infrastructure

The role of infrastructure acts as a fuel to accelerate the SSCIs adoption process. In order to manage the wastages, proper functions, and industrial processes, it is easier due to the availability of suitable infrastructure [21]. As the appropriate infrastructure can facilitate the implementation process of SSCIs in the agri-food industries. Therefore, in the agri-food sector, it must be noted that the infrastructure of the plant or manufacturing facility must be as per biological process of different products and operational functions.

3.3. Sustainable Technology and Techniques

Sustainable technology and techniques refers to the management of risk and recyclability of materials, conservation of resources, sustainable supply chain practices, and lifecycle of the products. It has been considered as one of the essential possible pathways which moves the industries towards efficiency and effectiveness [22]. In order to adopt SSCIs successfully in FPIs, the adaptation of sustainable technology and techniques are very important to accelerate the industry 4.0 concept.

3.4. Cleaner Production and Recyclability

This pathway comprises several attributes such as production equipment, techniques, product designs, error free products, and supply chain system [23]. Adoption of cleaner production and recyclability of the products may minimize the adverse reactions of the different type of products on the organizational work environment. This pathway facilitates producing items with less harmful effects through efficient and effective utilization of given resources [24]. The sustainable items could be generated through recycling practices to the greatest possible extent. The adoption of innovative product practices might be accelerating the ecological performance.

3.5. Procurement Management

Procurement management refers to the management of sourcing processes, suppliers' manufacturing capacities, and awareness about environmental aspects and product innovation [25]. It is one of the most vital pathways in adopting the sustainable supply chain practices in FPIs. The vendor must have awareness of greener practices for satisfying their clients under severe environmental situations [26]. The adaptability of the greener practices between suppliers, firms, and buyers plays a significant role in establishing a competitive advantage [28].

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