Social sustainable supply chains in the food industry: A perspective of an emerging economy

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Abstract

The purpose of this study is to identify a list of important social sustainable supply chain indicators and determine the cause and effect group from the food sector of an emerging economy of Pakistan. The Decision-Making Trial and Evaluation Laboratory (DEMATEL) based methodology is introduced to aid the evaluation of these indicators. The results show that the "*balance between work and life*" is the topmost influential and cause indicator among the cause group indicators. Similarly, a "*safe and healthy working environment*" is the topmost effect indicator among the effect group indicators. These results will inform managers and policy makers in the food sector, especially from the emerging economies such as Pakistan to formulate strategies that could aid in advancing social sustainability and transitioning towards a truly sustainable supply chain.

***Keywords*:** Social sustainable supply chain; Social sustainable indicators; Food sectors; DEMATEL; Emerging economy; Sustainable development, Stakeholder engagement, Environmental policy.

1. Introduction

Globalization and ever-rising customer demand is making organizations compete with each other on the basis of their supply chain performance (Khan, Chaabane, & Dweiri, 2019, 2020). The primary objective of any supply chain is to convert raw material into finished goods and manage all activities related to this transformation (D'Eusanio, Zamagni, & Petti, 2019). In pursing this transformational activities, organizations must consider sustainability for long-term success and to remain competitive, (Bubicz, Barbosa-Póvoa, & Carvalho, 2019). In addition, stakeholder pressures and governmental regulations have forced organizations to pay more attention to sustainability (Bai et al., 2019). Customer awareness and highly volatile demand also encourage businesses to implement sustainability in all aspects of their operations (Chen et al., 2017; Dubey et al., 2017; Jabbour, Neto, Gobbo Jr, de Souza Ribeiro, & de Sousa Jabbour, 2015; Venkatesh Mani, Jabbour, & Mani, 2020; Porteous, Rammohan, & Lee, 2015; Silvestre, 2015; M. Zhang, Pawar, & Bhardwaj, 2017). Overall sustainability objectives can only be achieved by incorporating all three pillars of sustainability, namely; economic, environmental, and social dimensions (Hopwood, Mellor, & O'Brien, 2005; Kusi-Sarpong et al., 2019; Lozano, 2015).

Social sustainability is basically how organizations deal with the health, safety, and well-being of its workforce, which is associated with its supply chains (Venkatesh Mani et al., 2020; Ahmadi et al., 2017). Incorporating social sustainability not only helps organizations to achieve sustainability but also helps in attaining the well-being of future generations (D'Eusanio et al., 2019). Social sustainability is defined as the "*Social sustainability is concerned with the human side of sustainability"* (Hussain et al. 2018). Social supply chain sustainability should be cautiously deliberated in a reasonable, comprehensive, and connected manner (Munny et al., 2019; Esfahbodi et al., 2016; Sharma and Ruud, 2003). It is essential for the organizations to not only show responsibility towards the social aspect of sustainability but also measure their performances for improvement (Qorri, Mujkić, & Kraslawski, 2018). Though measuring social sustainability performance is a complex task (Bubicz et al., 2019), there are several studies in the past which have considered and discussed social sustainability performance (Khan et al., 2019; Venkatesh Mani, Agarwal, et al., 2016). In recent past, several authors highlighted the importance of corporate social responsibility in achieving high corporate reputation (Sánchez-Torné, Morán-Álvarez, and Pérez-López, 2020), influence of internal corporate social responsibility belief on employee intention to job continuity (Sanusi and Johl, 2020), in Sustainable strategies and corporate social responsibility (Scarpato et al. 2020)

Despite great awareness and ample attention from several academics and researchers towards the social aspect of sustainability, the topic still needs further exploration in the background of emerging economies. Several researches in the past have been done that consider social sustainability for a large corporation in western countries (Venkatesh Mani et al., 2020). United Nations has developed a human development index of organizations in developing countries that helps managers and decision-makers to improve their social performance (Mani, Agrawal, & Sharma, 2014). However, it is quite difficult to come up with a robust social sustainable business framework in the perspective of developing countries that analyze the social sustainability indicator (Hussain et al.2018; Li & Mathiyazhagan, 2018). Some of the reasons maybe due the very diverse nature of the industries and varying social issues confronted by developing nations (Ahmadi et al., 2017; Bai et al., 2019; Ferramosca, & Verona 2020). Globalization and increased customer awareness have caused organizations to focus on the long-term success of not only depending upon economic and environmental performance but also on the well-being of its stakeholders (suppliers, company, customers, and society) along their supply chains. Literature indicates that, the social dimension of sustainable supply chains (SSCs) has started to gain significant interest from academicians, researchers and practitioners.

However, despite the growing trend of studies exploring the social aspect of SSCs, the concept of social sustainability in the food sector has started to see some momentum, particularly in the emerging economy context. The food sector of Pakistan is the second largest sector after Textile in term of its contribution in GDP and country's exports. Owing to the cultural homogeneity of India, Pakistan and Bangladesh, the results obtained from this study can be generalized to the Food sectors of all these three countries. Secondly, the results of the study can also be generalized to the other industries especially Textile sector.

This study therefore aims to provide an understanding of the social sustainability issues in the food sector. More particularly, the purpose of this study is to analyze the most relevant social SSC indicators of the Pakistan's food sector and establish their overall impact on social dimension of SSC. Moreover, the concept and adoption of the social dimension in emerging economies are not widely explored by many researchers, thus, this study contributes to advancing and deepening our understanding.

Thus, the specific objectives of this study are:

- *To identify social SSC indicators from past literature and validate them through judgement of experts of the food sector from an emerging economy, Pakistan.*
- *To identify the most influential and influenced social SSC indicator using DEMATEL.*
- *To develop the casual diagram for the social SSC indicator.*

To achieve the objectives mentioned above, the rest of the paper is organized in the following manner: Section 2 explores the previous literature that addresses and considers the social dimension of SSC in general and the food sector in particular. Section 3 discusses the methodology followed by results analysis and discussion in section 4. Section 5 offers the managerial and practical implications of this study, and finally, section 6 concludes the study and provides future research directions.

2. Literature Review

This section highlights the theoretical foundation of social sustainability, social sustainability in the supply chain in general, and food sector in particular, DEMATEL technique applications in various fields, and provides the literature round-up and contribution of this study.

2.1 Social Sustainability in Supply Chain

Modern production and manufacturing businesses have been observed to have adopted sustainable and balanced models in both their logistics and supply chains. The purpose of such

change is to transform their productions from inefficient and risk-averse to competent and sustainable productions (Neimark, Osterhoudt, Alter, & Gradinar, 2019; Tsalis et al., 2020). The previous literature has highlighted various drivers which have not only motivated but pushed producers to adopt the more sustainable ways of manufacturing. Among these drivers are consumer preferences, government regulations, environmental activism, and competition are prominent in social sustainability (Dubey et al., 2017; Jabbour et al., 2015; M. Zhang et al., 2017). The above studies have been undertaken in the western value chain context. It has been found that the adaptation of a sustainable model of manufacturing and supply chain has enhanced firm's competitiveness (Yadlapalli, Rahman, & Gunasekaran, 2018). Most studies addressing the sustainability issues of organizations have predominately focused upon the environmental and economic impacts with relatively less focus given to the social aspect of sustainability (Venkatesh Mani, Gunasekaran, & Delgado, 2018; Wilding, Wagner, Ashby, Leat, & Hudson-Smith, 2012). Moreover, the supplier's action of environmental manipulation has been endorsed by stakeholders such as government and citizens, which caters for sustainable development goals.

The interests in studying social sustainability within supply chains have seen some accelerating pace more recently (Venkatesh Mani, Agarwal, et al., 2016; Venkatesh Mani, Gunasekaran, Papadopoulos, Hazen, & Dubey, 2016) because such practices promise high corporate performance (Carter, 2005). Even though the literature on social sustainability in developed markets has been found to be the building block of developing new and relevant theories within sustainable supply chain management (SSCM), there exists a gap in emerging economies social sustainability practices within supply chains (Wilding et al., 2012; Zorzini, Hendry, Huq, & Stevenson, 2015; Mani Gunasekaran, & Delgado 2016, Kamble, Gunasekaran, & Gawankar 2020). Moreover, literature has already pointed out that features of social sustainability in supply chains can be different in both developed and developing markets (Venkatesh Mani, Agarwal, et al., 2016; Venkatesh Mani, Gunasekaran, et al., 2016; Zorzini et al., 2015; Mubarik et al., 2018; Mubarik 2015).

Furthermore, consistent with the theory of stakeholder's view, which proposes that organizations are a structure where different people can work together and achieve various but non-consistent goals (Donaldson & Preston, 1995). Stakeholders are always an essential part of organizations as their behavior impacts the organization. Stakeholder theory is based upon two views; first is instrumental view which defines both relationships and lack of relationships

among different stakeholders of organizations and second is normative view that defines functions of organizations from both management and moral perspective.

The literature recently has studied (Chin & Tat, 2015; Klassen & Vereecke, 2012) numerous social issues and impacts of such social issues on enhancing the performance of supply chains (Husgafvel et al., 2015). While others (e.g. Zameer et al.2020; Mujahid et al., 2019; Mahmood and Mubarik 2020) have investigated and explored measures of social performance along with their interrelationship with the organizational performance and supply chains, researchers such as Venkatesh Mani et al. (2018) have studied sustainability within social suppliers in an emerging economy and concluded that such practices have a substantial influence on organizations performance. Therefore, it can be said that there exists some empirical evidence which points out the relationship between variables such as social sustainability and supply chain performance. Significant numbers of these studies are focused upon both renowned and western manufacturers, with studies from the emerging economies showing insistent results on such relationship (Chin & Tat, 2015; Venkatesh Mani, Agarwal, et al., 2016). Further, as concluded by Hutchins and Sutherland (2008), firms can both increase the performance of their supply chains and financial management by focusing upon the social issues. It is established that there exists a correlation between social sustainability and supply chain performance (Lindgreen, Swaen, Maon, Andersen, & Skjoett-Larsen, 2009).

2.2 Social Sustainability in Food Supply Chains

Scholars have studied supply chain sustainability performances in industrial food plant management (Ala-Harja & Helo, 2016; Bourlakis et al. 2014; Yakovleva, Sarkis, and Sloan, 2012; Rogerson and Parry, 2020). Researchers like Munny et al. (2019) and Emamisaleh and Rahmani (2017), revealed in their studies on sustainable food manufacturing the significant growth strategies and drivers toward sustainability success. A case analysis on the sustainability supply chains performances at IKEA Corporation was exhibited by Laurin and Fantazy (2017). Mokhtar et al. (2017) investigated the environmental aspect of the supply chain sustainability. Schönborn et al. (2019) studied the effect of corporate social sustainable philosophy on economic success. Sanitation, Food and housing are the main concerns with the wellbeing of organizations by effectively offering healthy food, housing and sanitation on time (Venkatesh Mani, Agrawal, & Sharma, 2015).

It is generally recognized that agriculture-food manufacturers have environmental related outcomes in every part of the globe (Beccali, Cellura, Iudicello, & Mistretta, 2009; Vinyes et

al., 2017). Hence it is desirable to implement strategies that are impactful, along with assessing the costs of the solutions that are ecologically friendly as well. For example, when considering the usage of materials which are organic based as in packaging stage, it offers the prospect of enhancement in the shelf-life of fruits (e.g. berries), at the same time reducing the loss of weight (significant criteria for fruit sales) in this manner improving the level of wastage. In last few years, there is a shift in the consumption patterns of people for foods with high quality, more hygienic, better taste and nonetheless these are achieved through ecological sustainable practices (Blanc et al., 2019; Vinyes et al., 2017).

The International Food Policy Research Institute (IFPRI) has projected that in next forty years palm oil harvesting will be doubled (Y. Zhang, You, Lee, & Block, 2020; Fernández-Gago et al., 2020). The state of Pará in Brazil has underwent a growth of 157% in farming throughout the years starting from 2004 till 2014 (Brandão & Schoneveld, 2015). Pará has high potential for growth in production with state backing for bio-diesels and rising investments from multi-national companies (MNCs), (Levitt & Araujo, 2017). Furthermore, supply chains based LCA (life cycle analysis) are attaining worldwide attention, as an instrument to investigate and articulate solutions for social and environmental effects for long-term systemic prospects. Life cycle analysis is considered as the bottom up tactic which delivers information based on evidence for sustainability development at corporate, countrywide and worldwide levels (Munasinghe, Deraniyagala, Dassanayake, & Karunarathna, 2017; Y. Zhang et al., 2020). For emerging nations, life cycle analysis study may aid in evading environmentally and socially harmful consequences for developing sustainability by following the Balanced Inclusive Green Growth (BIGG) approach (Munasinghe et al., 2017; Munasinghe, Jayasinghe, Ralapanawe, & Gajanayake, 2016).

Integration of sustainability in the food sector is a relatively new area of investigation in the sector (Venkatesh Mani et al., 2018). Still, there is a debate in several theories on how businesses might integrate sustainability practices into their own systems. One approach prevalent in the past literature is the “triple Bottom Line approach” by which businesses attempt to maintain ecological, social and economic features in their businesses. For instance, there are small agriculturalists in large numbers in the palm oil manufacturing, raising several social concerns. In the year 2010, the Brazilian Government started the initiative of sustainable production of palm oil (INCRA, 2010) with the purpose of encouraging alliances between small agriculturalists and agribusinesses. The initiative allows agro-businesses to purchase domestic palm fruits to broaden income sources and job prospects in the countryside while

preventing ecological complications or compromising the production of sustainable food (Homma et al., 2014; Y. Zhang et al., 2020).

3. Research Methodology

To achieve the objectives, we adopted a systematic research methodology. Firstly, a literature review on social SSC indicators was conducted with a list of the indicators identified summarized in a table. Secondly, a questionnaire containing identified social SSC indicators was developed and submitted to experts and decision-makers of Pakistan's food sector for refinement and validation. Then, the refined and finalized list of social SSC indicators is put into questionnaire and submitted again to the experts and decision makers for data collected which is further evaluated using DEMATEL to identity the most influential and influenced indicators. Lastly, the results and outcomes of the research are discussed, and a conclusion is presented. Figure 1 illustrates the solution methodology of this research study.

3.1 DEMATEL

In this study, DEMATEL is used as a solution and explanation methodology. DEMATEL has been employed due to two major reasons: First, it has the ability to convert qualitative judgment into quantitative prioritization robustly. Second, questionnaire developed using DEMATEL allow experts to understand the research objectives clearly, hence minimises inconsistency ratio. Literature shows that DEMATEL is a successful and effective MCDM method used in determining the most influential and influenced indicators. This method is also helpful for the development of long-term strategies to achieve the desired goal (Chou et al., 2012). The DEMATEL is a renowned method. It's a widely applied multi-criteria decision making (MCDM) technique that is used by many authors in the past to analyze factors, indicators, barriers, and critical success factors to find influence of factors or indicators from a recommended list (Altuntas & Dereli, 2015; A. Kumar & Dixit, 2018; Li & Mathiyazhagan, 2018; Lin, Yang, Kang, & Yu, 2011; Wang et al., 2012)(Govindan et al. 2014a Wu and Chang, 2015). This approach is also used to solve a complex industrial problem (Li & Mathiyazhagan, 2018). According to Wu and Lee (2007), DEMATEL is one of the most suitable MCDM methods to examine an association concerning different factors in a complicated situation. It is also useful to find out the most influential factors, the most influenced factors, and the independent factors. Lin et al. (2011) mentioned that it is helpful in getting mathematical solutions in many academic fields. These researchers show that DEMATEL is effective and

efficient tool to aid in analyzing the relationship among a list of validated factors. Our motivations for adopting and using DEMATEL methodology in this research are listed below:

- Mostly, Social SSC indicators depend on each other in decision-making process.
- It is hard to evaluate a few of the social SSC indicators because of their subjective nature.
- The methodology provides a measure for the quantitative analysis of the indicators.

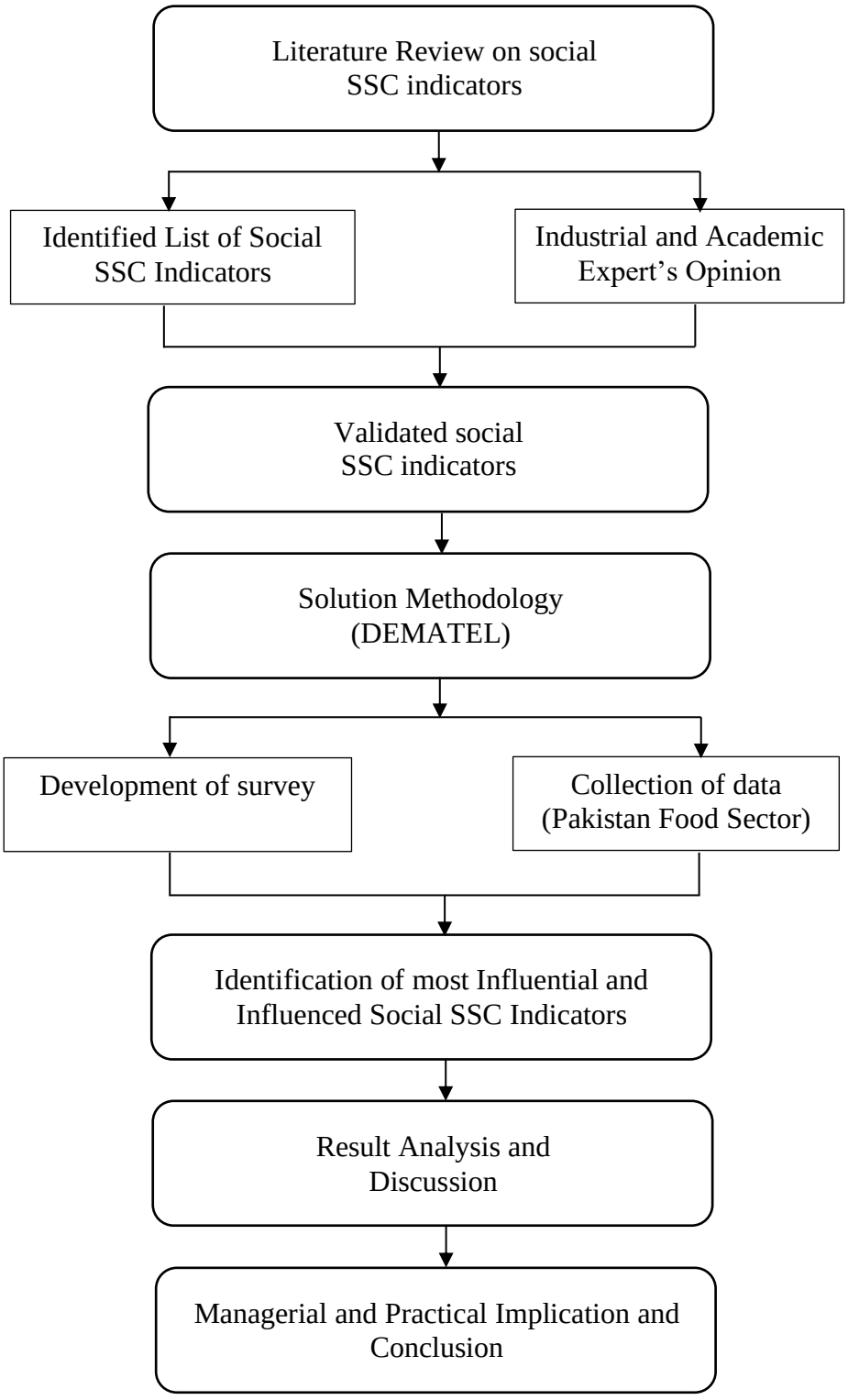

Figure 1: Proposed Research Methodology

The steps for the DEMATEL procedure are discussed below (Altuntas & Dereli, 2015; Li & Mathiyazhagan, 2018):

Step 1: In the first step, the average initial matrix will be developed using the experts' opinion. Experts give their opinion based on a linguistic scale (0-4), as mentioned in appendix 1. They perform pair-wise comparisons between the indicators and develop the relationship among them.

Step 2: In the second step, by normalizing the initial average matrix obtained in step 1 the initial influence matrix will be developed.

Step 3: In third step, the total relationship matrix is developed using equation 1 below.

$$T = N\,(I-N)^{-1} \qquad (1)$$

Where, 'I' denotes the identity matrix

Step 4: In the fourth and final step, the casual diagram is developed. The Sum of columns (cj) and the sum of rows (ri) represent the vectors of the total relationship matrix. The vector (ri+cj) on the horizontal axis is named as prominence and shows the overall effect exhibits by indicator "I" and similarly, the vertical axis (ri-cj) named as relation and divide indicators into two different groups which are cause group and effect group. If (ri-cj) is negative, then indicators are grouped into effect group. Similarly, if (ri-cj) is positive, then indicators are grouped into cause group.

4. Case study

4.1 Case background and problem description

The study selected and used Pakistan and its food sector for many reasons, some of which are discussed in the following paragraphs and sentences.

Pakistan is the 43rd biggest economy in the world and the 6th most populated nation. Currently, in the international economic and financial scenario, Pakistan, through quick industrialization and rapid development, is being viewed as a leading developing business sector economy in South Asia that is headed for a further development phase (Wing & Finance, 2018). Pakistan is being categorized as one of the Next Eleven (N-11) nations that can develop into one of the world's more significant economies in the 21st century (Club, 2019). There is a growing white-collar base and home to globally 6th largest population with an increasing working-class in

Pakistan. Starting in 2018, there are around 17 million white-collar family units and 102 million working-class people (Bashir, Arshad, Asif, & Khalid, 2020).

The processed food sector is the second biggest sector of Pakistan after the textile sector, representing 16% of jobs in the manufacturing industry and 27% of the total value-added production. The food processing industry contains all the agrarian food produce. This industry alone records for 21% of the GDP of Pakistan and incorporates the principal processing of grains, flour, pulses, organic products, vegetables, and sugar. In excess to 22 assortments of vegetables are yielded in Pakistan and there are roughly 1400 flour plants. In the world, Pakistan is positioned fifth for acreage of sugarcane and ninth in the production of sugarcane. The most significant wellspring of vegetable protein in Pakistan is Pulses, which are nurtured on 5% of the entire harvested area (Prime Minister Office, 2020). The territory integrates all the foodstuff that is agriculturally produced. This includes the processing of grains, pulses, flour, fresh food, vegetables and fruits.

Most reliable food processing units incorporate both national and global brands. The food business represents value addition of 3-5%, which can simply be improved up to 10% owing to farmer's capacity building and research-based innovation, traders, entrepreneurs, processors, and service providers (Mahmood et al., 2020). For significant food-related produces, Pakistan is among the world's 15 top nations. An assortment of animal breeds, vegetables, fruits and essential food crops is supplied inside the state, which is adequate for household needs in addition to international trade. With more than 220 million customers, the position of the eighth biggest global market is also held by Pakistan. Customers spend an average of 42% of their salary on food-related products. The manufacturing sector of Pakistan employs 16% of all employment (Khurshid, 2019).

Pakistani researchers and scholars pay attention to food industries and food component manufacturing industries regarding their social SSC indicators. It is difficult for them to identify the influential indicator of improvement in social SSC performance. In this study, 14 social SSC Indicators are considered from previous literature, and identified indicators were validated by industrial experts. Demographics of industrial and academic experts participated in the validation of identified social SSC indicators are mentioned in Table 1 below.

Table 1: Experts Demographics

	n=43	%
Experience		
3 to 5 years	4	9
6 to 10 years	13	30
11 to 15 years	21	49
16 years +	5	12
Education		
PhD	2	5
MS	15	35
MBA	17	40
BE	9	21
Designations		
Dy Manager	4	9
Manager	16	37
Senior Manager	18	42
Dy General Manager	3	7
General Manager	2	5
Departments		
Supply Chain	12	28
Production	9	21
Planning	7	16
HSE	8	19
Compliance (HSE)	7	16

The finalized indicators for social SSC Indicators are shown in Table 2 below.

Table 2: Social SSC Indicators

S. No.	Key	Social SSC Indicator	Reference
1	SSSCI 1	Rate of complaints against sustainability	Azapagic, Millington, and Collett (2006); Kylili, Fokaides, and Jimenez (2016)
2	SSSCI 2	Balance between work and life	Markley and Davis (2007); Ni, Li, and Tang (2010)
3	SSSCI 3	Education and public awareness about sustainability	Wright (2002); Hopkins and McKeown (2002)
4	SSSCI 4	Employer rights	Van Bommel (2011); Wilding et al. (2012)
5	SSSCI 5	Safe and healthy working environment	Closs, Speier, and Meacham (2011); De Brito, Carbone, and Blanquart (2008); Smith (2008)
6	SSSCI 6	Rate of employee turnover	Veleva and Ellenbecker (2001)
7	SSSCI 7	Complaints management system against sustainability	Dasgupta and Wheeler (1997)
8	SSSCI 8	Working conditions	Hutchins and Sutherland (2008); Eltayeb, Zailani, and Ramayah (2011)

9	SSSCI 9	Customer feedback system	E. Innes and Booher (2000)
10	SSSCI 10	Rate of child labor and human rights complains	Azapagic et al. (2006); MacNaughton and Frey
11	SSSCI 11	Social welfare development	De Brito et al. (2008); Smith (2008)
12	SSSCI 12	Employee education and career development	Matos and Hall (2007); Hutchins and Sutherland (2008)
13	SSSCI 13	Transparency and ethics	Olorunniwo and Li (2010); Keating, Quazi, Kriz, and Coltman (2008)
14	SSSCI 14	Community connection and support	Eltayeb et al. (2011); Closs et al. (2011)

4.2 Design of Questionnaire and Data Collection

A survey questionnaire, as shown in appendix 1, was developed to gather experts' opinions. This questionnaire was sent to 43 experts who are working in leading food sectors in Pakistan. Experts were chosen based on their experience and involvement in sustainability-related decision making in their organizations. All the experts have more than 8 years of experience, and their minimum education was graduation. The selection of experts was also based on their interest in our study participation, and one of the authors visited the selected companies and got their consent to participate in this study. Experts were selected using the expert sampling technique; a non-probability sampling technique. This technique is a sub-case of purposive sampling in which the researcher relies on his own expertise to select the sampling unit. It involves the consolidation of a sample of individuals with some definitive experience and expertise in a particular field. The first step in expert sampling is define the criteria of expert. For the purpose of this study we define experts as the individual working in the supply chain or related departments for the minimum of last three years at the position of deputy manager or above. Various studies (e.g. Mubarik 2015, Mubarik et al., 2016) have followed this approach. We have selected 43 experts to get their expert opinions about socially sustainable supply chain. Owing to the nature and architecture of multi-attribute data management approaches including DEMATEL, sample size around 30 is considered highly appropriate. A vast majority of the multi attribute decision making studies take sample size of between 10 and 15 (Mujahid et al., 2019). In this context, the sample size of 43 is deemed adequate. Before data collection, the objective, purpose, and aim of the study was briefed. The importance of the research was also highlighted to the experts and their initial queries were clarified at the beginning. After initial discussion and clarification of a few queries, all experts received questionaries' via email. Within the specified time allocated to them, all the completed questionnaires were received.

4.3 DEMATEL calculation process

Step 1: In this step, each selected expert was given a one - 14 X 14 matrix comprising of the social SSC indicators to perform pairwise comparisons using a 5-point linguistic scale ranging from (N) 'no influence' to (VL) 'very high influence'. The direct relationship matrix was obtained from all experts from the food sector and overaged to obtain an integrated response. Results of direct relationship matrix showed in Table 3 below.

Table 3: Direct relationship matrix (average)

	SSSCI 1	**SSSCI 2**	**SSSCI 3**	**SSSCI 4**	**SSSCI 5**	**SSSCI 6**	**SSSCI 7**	**SSSCI 8**	**SSSCI 9**	**SSSCI 10**	**SSSCI 11**	**SSSCI 12**	**SSSCI 13**	**SSSCI 14**
SSSCI 1	0.00	3.50	3.25	1.93	3.00	2.00	2.50	2.70	2.00	1.50	3.00	2.85	3.50	2.50
SSSCI 2	4.00	0.00	3.57	3.00	4.50	4.00	3.00	2.50	2.00	2.50	3.00	3.71	3.50	4.25
SSSCI 3	2.50	2.50	0.00	2.43	2.93	4.00	2.21	2.43	2.57	5.00	2.50	3.00	2.79	2.93
SSSCI 4	3.00	2.50	3.00	0.00	2.71	4.00	2.21	2.50	2.64	2.57	2.64	2.36	2.86	2.79
SSSCI 5	3.50	2.86	2.57	2.29	0.00	3.29	2.57	3.00	2.36	2.71	2.79	2.50	2.79	2.71
SSSCI 6	4.00	2.79	2.43	2.43	2.79	0.00	2.36	2.71	2.71	1.79	2.29	2.36	2.50	2.64
SSSCI 7	3.14	2.29	2.00	2.00	2.43	1.86	0.00	2.36	2.00	1.86	2.29	1.93	2.14	2.57
SSSCI 8	3.50	4.50	2.07	3.00	2.86	2.71	1.93	0.00	2.21	1.93	2.21	2.36	2.29	2.50
SSSCI 9	2.50	1.95	2.00	1.79	2.14	2.36	2.14	1.93	0.00	1.64	2.50	2.07	2.50	2.57
SSSCI 10	4.00	2.50	4.00	2.43	2.50	2.36	2.21	2.14	2.00	0.00	2.71	2.21	2.71	2.86
SSSCI 11	2.36	2.00	2.36	2.14	2.79	2.14	2.14	2.57	2.36	2.64	0.00	2.79	2.64	2.93
SSSCI 12	3.00	2.93	2.64	2.93	2.93	2.64	2.43	2.64	2.43	2.86	2.86	0.00	2.93	2.86
SSSCI 13	3.50	2.00	2.36	2.21	2.79	3.14	2.43	2.50	2.50	2.64	2.64	2.50	0.00	2.79
SSSCI 14	4.50	2.50	3.50	3.00	2.36	2.00	2.50	3.00	2.00	3.25	3.50	2.50	3.75	0.00

Step 2: In this step, the initial influence matrix was normalized, and it is shown in Table 4.

Table 4: The normalized direct-influence matrix X for indicators

	SSSCI 1	**SSSCI 2**	**SSSCI 3**	**SSSCI 4**	**SSSCI 5**	**SSSCI 6**	**SSSCI 7**	**SSSCI 8**	**SSSCI 9**	**SSSCI 10**	**SSSCI 11**	**SSSCI 12**	**SSSCI 13**	**SSSCI 14**
SSSCI 1	0.00	0.08	0.07	0.04	0.07	0.05	0.06	0.06	0.05	0.03	0.07	0.07	0.08	0.06
SSSCI 2	0.09	0.00	0.08	0.07	0.10	0.09	0.07	0.06	0.05	0.06	0.07	0.09	0.08	0.10
SSSCI 3	0.06	0.06	0.00	0.06	0.07	0.09	0.05	0.06	0.06	0.11	0.06	0.07	0.06	0.07
SSSCI 4	0.07	0.06	0.07	0.00	0.06	0.09	0.05	0.06	0.06	0.06	0.06	0.05	0.07	0.06
SSSCI 5	0.08	0.07	0.06	0.05	0.00	0.08	0.06	0.07	0.05	0.06	0.06	0.06	0.06	0.06
SSSCI 6	0.09	0.06	0.06	0.06	0.06	0.00	0.05	0.06	0.06	0.04	0.05	0.05	0.06	0.06
SSSCI 7	0.07	0.05	0.05	0.05	0.06	0.04	0.00	0.05	0.05	0.04	0.05	0.04	0.05	0.06
SSSCI 8	0.08	0.10	0.05	0.07	0.07	0.06	0.04	0.00	0.05	0.04	0.05	0.05	0.05	0.06
SSSCI 9	0.06	0.04	0.05	0.04	0.05	0.05	0.05	0.04	0.00	0.04	0.06	0.05	0.06	0.06
SSSCI 10	0.09	0.06	0.09	0.06	0.06	0.05	0.05	0.05	0.05	0.00	0.06	0.05	0.06	0.07
SSSCI 11	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.06	0.05	0.06	0.00	0.06	0.06	0.07
SSSCI 12	0.07	0.07	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.07	0.07	0.00	0.07	0.07
SSSCI 13	0.08	0.05	0.05	0.05	0.06	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.00	0.06
SSSCI 14	0.10	0.06	0.08	0.07	0.05	0.05	0.06	0.07	0.05	0.07	0.08	0.06	0.09	0.00

Step 3: In this step, the total relationship matrix was obtained by using equation 1 and shown in Table 5.

Table 5: Total Influence matrix T for indicators

	SSSCI 1	**SSSCI 2**	**SSSCI 3**	**SSSCI 4**	**SSSCI 5**	**SSSCI 6**	**SSSCI 7**	**SSSCI 8**	**SSSCI 9**	**SSSCI 10**	**SSSCI 11**	**SSSCI 12**	**SSSCI 13**	**SSSCI 14**
SSSCI 1	0.29	0.31	0.31	0.25	0.31	0.29	0.26	0.28	0.24	0.25	0.30	0.28	0.32	0.30
SSSCI 2	0.44	0.29	0.38	0.33	0.40	0.39	0.32	0.33	0.29	0.33	0.36	0.36	0.38	0.40
SSSCI 3	0.37	0.31	0.26	0.28	0.33	0.35	0.27	0.29	0.27	0.35	0.31	0.31	0.33	0.33
SSSCI 4	0.36	0.29	0.31	0.22	0.31	0.34	0.26	0.28	0.26	0.28	0.30	0.28	0.32	0.31
SSSCI 5	0.37	0.30	0.30	0.27	0.25	0.32	0.27	0.29	0.26	0.29	0.30	0.29	0.32	0.31
SSSCI 6	0.37	0.29	0.29	0.26	0.30	0.24	0.25	0.28	0.25	0.25	0.28	0.27	0.30	0.30
SSSCI 7	0.31	0.25	0.25	0.22	0.26	0.24	0.17	0.24	0.21	0.23	0.25	0.23	0.26	0.26
SSSCI 8	0.36	0.33	0.29	0.28	0.31	0.30	0.25	0.22	0.25	0.26	0.28	0.28	0.30	0.30
SSSCI 9	0.29	0.23	0.24	0.21	0.25	0.25	0.22	0.22	0.16	0.22	0.25	0.23	0.26	0.26
SSSCI 10	0.37	0.29	0.33	0.27	0.30	0.30	0.26	0.27	0.25	0.22	0.29	0.27	0.31	0.31
SSSCI 11	0.32	0.26	0.27	0.24	0.29	0.27	0.24	0.26	0.24	0.26	0.22	0.27	0.29	0.29
SSSCI 12	0.36	0.31	0.31	0.28	0.32	0.31	0.27	0.29	0.26	0.29	0.31	0.23	0.32	0.32
SSSCI 13	0.36	0.27	0.29	0.26	0.30	0.30	0.25	0.27	0.25	0.27	0.29	0.27	0.24	0.30
SSSCI 14	0.41	0.31	0.34	0.30	0.32	0.31	0.28	0.31	0.26	0.31	0.33	0.30	0.35	0.27

Step 4: In this step, the casual diagram is determined based on the sum of rows (ri), the sum of columns (cj), as shown in Table 6 below.

Table 6: Sum of influences given and received on the indicator of social SSC indicators

Social sustainable supply chain indicators	**ri**	**cj**	**ri + cj**	**ri - cj**
Rate of complaints against sustainability (SSSCI1)	3.99	4.98	8.97	-0.98
Balance between work and life (SSSCI2)	5.00	4.04	9.04	0.96
Education and public awareness about sustainability (SSSCI3)	4.35	4.15	8.50	0.21
Employer rights (SSSCI4)	4.13	3.67	7.80	0.46
Safe and healthy working environment (SSSCI5)	4.15	4.25	8.40	-0.10
Rate of employee turnover (SSSCI6)	3.92	4.20	8.12	-0.29
Complaints management system against sustainability (SSSCI7)	3.37	3.58	6.95	-0.20
Working conditions (SSSCI8)	4.00	3.84	7.84	0.15
Customer feedback system (SSSCI9)	3.28	3.47	6.75	-0.19
Rate of child labor and human rights complains (SSSCI10)	4.03	3.82	7.85	0.21
Social welfare development (SSSCI11)	3.70	4.05	7.76	-0.35
Employee education and career development (SSSCI2)	4.17	3.86	8.04	0.31
Transparency and ethics (SSSCI13)	3.92	4.28	8.20	-0.36
Community connection and support (SSSCI14)	4.42	4.25	8.67	0.17

Based on the above-mentioned Table 6, prominence indicator (ri + cj) and relative indicators (ri – cj) rankings are mentioned in Table 7 and Table 8, respectively.

Table 7: Prominence vector (ri + cj)

Rank	**Indicator**	**ri + cj**
1	SSSCI 2	9.04

2	SSSCI 1	8.97
3	SSSCI 14	8.67
4	SSSCI 3	8.50
5	SSSCI 5	8.40
6	SSSCI 13	8.20
7	SSSCI 6	8.12
8	SSSCI 12	8.04
9	SSSCI 10	7.85
10	SSSCI 8	7.84
11	SSSCI 4	7.80
12	SSSCI 11	7.76
13	SSSCI 7	6.95
14	SSSCI 9	6.75

Table 8: Relative vector (ri - cj).

Rank	**Cause group - Indicators**	**ri - cj**
1	SSSCI 2	0.96
2	SSSCI 4	0.46
3	SSSCI 12	0.31
4	SSSCI 10	0.21
5	SSSCI 3	0.21
6	SSSCI 14	0.17
7	SSSCI 8	0.15
Rank	**Effect group - Indicators**	**ri - cj**
8	SSSCI 5	-0.10
9	SSSCI 9	-0.19
10	SSSCI 7	-0.20
11	SSSCI 6	-0.29
12	SSSCI 11	-0.35
13	SSSCI 13	-0.36
14	SSSCI 1	-0.98

Figure 2 below shows the casual diagram for social SSC indicators

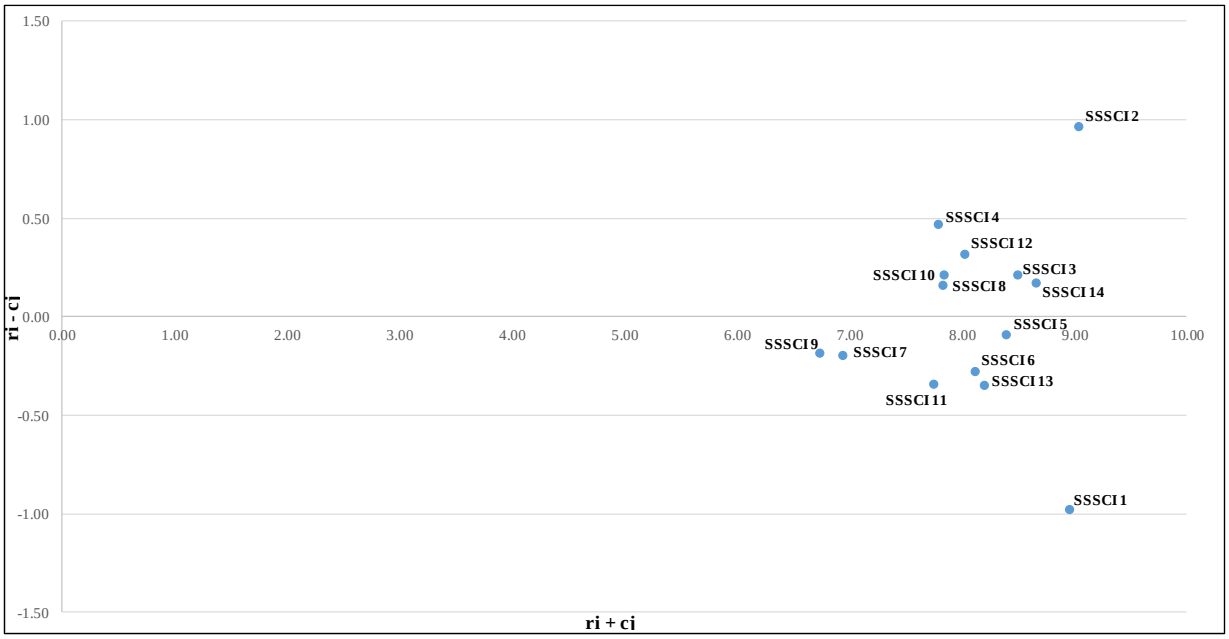

Figure 2: Casual diagram for social SSC indicators

5. Result Analysis and Discussion

In this study, we utilized DEMATEL approach and the results can be found in Tables 7 & 8 and Figure 2. Table 7 provides the prominence vector (ri + cj) while Table 8 provides the relative vector (ri - cj), and Figure 2 depicts the casual diagram for social SSC indicators. From Table 8, seven indicators were found to be in the cause group and these include "Balance between work and life" (SSSCI 2), "Education and public awareness about sustainability" (SSSCI 3), "Employer rights" (SSSCI 4), "Working conditions" (SSSCI 8), "Rate of child labor and human rights complains" (SSSCI 10), "Employee education and career development" (SSSCI 12), and "Community connection and support" (SSSCI 14). Similarly, from Table 8, seven indicators including "Rate of complaints against sustainability" (SSSCI 1), "Safe and healthy working environment" (SSSCI 5), "Rate of employee turnover" (SSSCI 6), "Complaints management system against sustainability" (SSSCI 7), "Customer feedback system" (SSSCI 9), "Social welfare development" (SSSCI 11), and "Transparency and ethics" (SSSCI 13), are listed as part of the effect group.

Several studies highlight the importance of work and life balance and did several analyses such as on job satisfaction, satisfaction in working etc. (De Clercq, Brieger, and Welzel, 2019; Laishram, Singh, and Konwar, 2020; Håkansson et al. 2019). Out of fourteen social SSC indicators, "Balance between work and life" (SSSCI 2) indicator is the most essential indicator and plays a vital role in Pakistan's food industry. The results of this study show that Pakistan's food sector must pay greater attention to how they can help their workforce to balance work

and life to aid in achieving higher social sustainability. This means that, the greater initiative to improved overall social sustainability among Pakistan food companies in the sector comes from inside of the organizations. This finding is in line with Stupar, Jovanović, and Vojvodić, 2020; Cardillo and Longo (2020) study that concluded that, work and life balance is essential in achieving overall social sustainability. The ri + ci values of each social SSC indicator and its relative importance are shown in Table 7. According to prominence vector (ri + ci) values in Table 7, "Balance between work and life" (SSSCI 2), "Rate of complaints against sustainability" (SSSCI 1), and "Community connection and support" (SSSCI 4) are the top three social SSC indicators out of fourteen indicators. The "customer feedback system" (SSSCI 9) indicator is the least prominence. It can be noted that organizations usually have an excellent customer feedback system for their products, but they have a lack of customer feedback in terms of social sustainability feedback.

Indicators that are part of the cause group indicators have an impact on overall social SSC indicators. Therefore, organizations need to pay more attention to positive (ri – ci) values, which means that the degree of influential impact (ri) is greater than the degree of influenced impact (ci). In the cause group, "Balance between work and life" (SSSCI 2) is ranked the topmost based on highest score of (0.96) followed by "Employer rights" (SSSCI4) with score 0.46 and "Employee education and career development" (SSSCI2) with score 0.31. Similarly, from the casual diagram (figure 2), the rate of complaints against sustainability (SSSCI 1) has the lowest priority with the least points (-0.98). Here it is essential to highlight that based on our study results, Pakistan's food sector indicators such as "Transparency and ethics" (SSSCI 13) and "Social welfare development" (SSSCI11) are not given much attention as these indicators are ranked second last and third last with according to ri – cj values of -0.36 and -0.35 respectively.

6. Theoretical and Practical Implications

The findings of the study offer some critical managerial implications. Before explaining how a firm can attain social sustainability, it is imperative to emphasize that a socially sustainable supply chains can assist organizations to attain sustainable competitive advantage and to better compete in the market. Hence, SSC is a critical intangible resource that requires serious attention by the management of organisations. The findings demonstrate that a firm in the food industry can adopt the SSC in two stages. At the first stage, the firm needs to focus on the three critical aspects of SSC. Those are *maintaining a balance between work and life, enhancing education and public awareness about sustainability, and working on employer rights*. The

need to attain work-life balance has not only been stressed in sustainability-related studies but also a number of studies on Green HR practices and management considers it a critical factor for effective management (Jermsittiparsert, Siriattakul, and Wattanapongphasuk, 2019; Luu, 2019; Ahmed et al. 2019). By adopting the strict office timings and discouraging unnecessary overtime and late sittings, a firm can help to promote the work-life balance. Likewise, the elimination of redundant work through proper business process re-engineering and adequate staffing can also help a firm to attain work-life balance. Secondly, firms in the food industry are suggested to adopt a comprehensive policy to raise education and awareness related to sustainability. The first focus of the policy may be the employees of the organization. Through sustainability training, short courses, and on the job training, employees can become receptive to the sustainable supply chains. Likewise, including the sustainability-related knowledge/education in the employee's hiring criteria can also help a firm to hire the employees with sufficient education and awareness about sustainability (Adjei-Bamfo et al., 2019). This should not be limited to the firm's employees but also should be extended to the suppliers, customers, and society.

Through collaborative efforts with suppliers, company can significantly enhance the awareness about the sustainable supply chain. These efforts can substantially contribute to building the socially sustainable supply chain of a firm in the food sector of Pakistan. In addition to these points, the firm should also look into the "employer rights" concerning SSC and its responsibilities. Knowing such rights can help a firm to avail specific incentives, appreciations, etc. provided by the governments to promote sustainability. After incorporating the above three dimensions, in stage 2, the firm can proceed to work on the incorporation of the key points as follows. These include establishing a culture of "suitability whistleblowing"—to raise the voice against a person or department who is not following the SSC practices. It can be done through the establishment of a proper complaint management system dedicated to deal with complaints related to sustainability. It can be supplemented by improving the working conditions, employee's education and career development, and maintain a close connection with the community. Putting together, working on a balance between work and life, education, and awareness about sustainability, community connections, and managing complaints against sustainability can help a firm to adopt SSC. In addition to the above, an adequately mapped supply chains can greatly benefit a firm to attain social sustainability in particular and sustainability in general. A well-mapped supply chains can not only help also promote a firm to better connect with the suppliers, customers and community. Likewise, the adoption of

sustainable sourcing can also help a firm to be socially sustainable. Sustainable sourcing of the suppliers greatly helps the firm to adopt sustainability throughout the value chain.

7. Conclusion and Future Research Directions

7.1 Conclusion

The emphasis of this study was to assess the role of socially sustainable supply chains in organizations. A considerable amount of work is done in many sectors and on the broader sustainability, but social sustainability is given relatively less attention generally in emerging economies and particularly in food sector. Thus, current study addresses the recent calls for understanding complex phenomenon of social sustainability by adopting a multi-criteria data management approach. In this context this study had three overarching objectives. First objective was to identify the social SSC indicator from literature and validate through expert's judgment of food sector of an emerging economy of Pakistan. The second objective was to identify the most influential and influenced social SSC indicator. The third objective was to develop the casual diagram for social SSC indicator. Finally, in this study, DEMATEL approach was adopted to analyze the data collected from food sector experts.

The findings of the study highlight the critical role of three factors, namely maintaining a balance between work and life, enhancing the education and public awareness about sustainability and working on the employer rights in attaining the socially sustainable supply chain. The findings also reveal that consumers are likely to have assurance in food related brands, are more willing to purchase the brand's green products, and identifying 'green action' as an initiative directed towards consumers. Our findings also reveal that social welfare development does not captivate the attention of experts in regard to establishing a socially sustainable supply chain. It is also significant to observe that all the social SSC indicators in the decision-making process are usually interdependent and involve cautious planning while outlining strategies for socially sustainable supply chain. The results of this research can be instrumental for researcher, decision makers, and consultants to identify the most influential factors that has an influence on overall performance of SSSC. Findings also provides strategies to emerging market food industries to adopt the social dimension of SSC in a more operative and skilled manner. From fourteen SSSC indicators, Balance between work and life indicator is the most essential indicators and plays an important role in considering emerging market food businesses. Outcomes of this study shows that considered Pakistan's food sector should

pay attention to the balance between work and life of their work force to achieve the aspect of sustainable social sustainability.

7.2 Limitation and future research directions

As in all research works, this study also comes with some limitations and these provide some opportunities for future research. One key limitation of this study is the use few experts from a single emerging economy nation and subjective approach of the study. This can be overcome by combining both domestic and foreign experts from the food sector of other emerging economies with statistical equation modeling on a larger sample size of experts. Also, this work can be directed to tackle different problems from other sectors or industries utilizing diverse MCDM techniques For example, the work can be used in the energy and transport sector of Pakistan to understand the issues of low productivity and efficiency.

References:

Adjei-Bamfo, P., Bempong, B., Osei, J., & Kusi-Sarpong, S. (2019). Green candidate selection for organizational environmental management. *International Journal of Manpower*. 10.1108/IJM-10-2019-0480.

Ahmadi, H. B., Kusi-Sarpong, S., & Rezaei, J. (2017). Assessing the social sustainability of supply chains using Best Worst Method. *Resources, Conservation and Recycling*, *126*, 99-106.

Ahmed, U., AlZgool, M. R. H., & Shah, S. M. M. (2019). The impact of green human resource practices on environmental sustainability. Polish Journal of Management Studies, 20.

Ala-Harja, H., & Helo, P. (2016). Food supply chain sustainable performance in plant decision. *International Journal of Advanced Logistics*, *5*(1), 1-18.Altuntas, S., & Dereli, T. (2015). A novel approach based on DEMATEL method and patent citation analysis for prioritizing a portfolio of investment projects. *Expert Systems with Applications*, *42*(3), 1003-1012.

Azapagic, A., Millington, A., & Collett, A. (2006). A methodology for integrating sustainability considerations into process design. *Chemical Engineering Research and Design*, *84*(6), 439-452.

Bai, C., Kusi-Sarpong, S., Badri Ahmadi, H., & Sarkis, J. (2019). Social sustainable supplier evaluation and selection: a group decision-support approach. *International Journal of Production Research*, *57*(22), 7046-7067.

Bashir, Z., Arshad, M. U., Asif, M., & Khalid, N. (2020). Driving Factors of Growth Evidence in the Food and Textile Sectors of Pakistan. *e-Finanse*, *16*(1), 11-19.

Beccali, M., Cellura, M., Iudicello, M., & Mistretta, M. (2009). Resource consumption and environmental impacts of the agrofood sector: life cycle assessment of Italian citrus-based products. *Environmental management*, *43*(4), 707-724.

Blanc, S., Massaglia, S., Brun, F., Peano, C., Mosso, A., & Giuggioli, N. R. (2019). Use of Bio-Based Plastics in the Fruit Supply Chain: An Integrated Approach to Assess Environmental, Economic, and Social Sustainability. *Sustainability*, *11*(9), 2475.

Brandão, F., & Schoneveld, G. (2015). *The state of oil palm development in the Brazilian Amazon: Trends, value chain dynamics, and business models* (Vol. 198): CIFOR.

Bubicz, M. E., Barbosa-Póvoa, A. P. F. D., & Carvalho, A. (2019). Incorporating social aspects in sustainable supply chains: Trends and future directions. *Journal of cleaner production*.

Bourlakis, M., Maglaras, G., Aktas, E., Gallear, D., & Fotopoulos, C. (2014). Firm size and sustainable performance in food supply chains: Insights from Greek SMEs. International Journal of Production Economics, 152, 112-130.

Carter, C. R. (2005). Purchasing social responsibility and firm performance: The key mediating roles of organizational learning and supplier performance. *International Journal of Physical Distribution \& Logistics Management, 35*(3), 177--194. doi:10.1108/09600030510594567

Cardillo, E., & Longo, M. C. (2020). Managerial Reporting Tools for Social Sustainability: Insights from a Local Government Experience. Sustainability, 12(9), 3675.

Chen, L., Zhao, X., Tang, O., Price, L., Zhang, S., & Zhu, W. (2017). Supply chain collaboration for sustainability: A literature review and future research agenda. *International Journal of Production Economics, 194*, 73-87.

Chin, T. A., & Tat, H. H. (2015). Does gender diversity moderate the relationship between supply chain management practice and performance in the electronic manufacturing services industry? *International Journal of Logistics Research and Applications, 18*(1), 35-45.

Closs, D. J., Speier, C., & Meacham, N. (2011). Sustainability to support end-to-end value chains: the role of supply chain management. *Journal of the Academy of Marketing Science, 39*(1), 101-116.

Club, B. M. E. I. (2019). FOOD PROCESSING SECTOR IN PAKISTAN. Retrieved from https://investorsclubs.org/food-processing-sector-in-pakistan/

D'Eusanio, M., Zamagni, A., & Petti, L. (2019). Social sustainability and supply chain management: Methods and tools. *Journal of cleaner production*.

Dasgupta, S., & Wheeler, D. (1997). *Citizen complaints as environmental indicators: evidence from China*: The World Bank.

De Brito, M. P., Carbone, V., & Blanquart, C. M. (2008). Towards a sustainable fashion retail supply chain in Europe: Organisation and performance. *International Journal of Production Economics, 114*(2), 534-553.

De Clercq, D., Brieger, S. A., & Welzel, C. (2019). Leveraging the macro-level environment to balance work and life: an analysis of female entrepreneurs' job satisfaction. Small Business Economics, 1-24.

Donaldson, T., & Preston, L. E. (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *Academy of management review, 20*(1), 65--91. doi:10.5465/amr.1995.9503271992

Dubey, R., Gunasekaran, A., Childe, S. J., Papadopoulos, T., Hazen, B., Giannakis, M., & Roubaud, D. (2017). Examining the effect of external pressures and organizational culture on shaping performance measurement systems (PMS) for sustainability benchmarking: Some empirical findings. *International Journal of Production Economics, 193*, 63-76.

E. Innes, J., & Booher, D. E. (2000). Indicators for sustainable communities: a strategy building on complexity theory and distributed intelligence. *Planning theory & practice, 1*(2), 173-186.

Eltayeb, T. K., Zailani, S., & Ramayah, T. (2011). Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources, Conservation and Recycling, 55*(5), 495-506.

Emamisaleh, K., & Rahmani, K. (2017). Sustainable supply chain in food industries: Drivers and strategic sustainability orientation. *Cogent Business & Management, 4*(1), 1345296.

Escobar, A. (2018). *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds*: Duke University Press.

Fernández-Gago, R., Cabeza-García, L., & Godos-Díez, J. L. (2020). How significant is corporate social responsibility to business research?. *Corporate Social Responsibility and Environmental Management*, 27(4), 1809-1817.

Ferramosca, S., & Verona, R. (2020). Framing the evolution of corporate social responsibility as a discipline (1973–2018): A large-scale scientometric analysis. *Corporate Social Responsibility and Environmental Management*, 27(1), 178-203.

Fu, X., Zhu, Q., & Sarkis, J. (2012). Evaluating green supplier development programs at a telecommunications systems provider. *International Journal of Production Economics, 140*(1), 357-367.

Håkansson, C., Milevi, S., Eek, F., Oudin, A., & Wagman, P. (2019). Occupational balance, work and life satisfaction in working cohabiting parents in Sweden. Scandinavian journal of public health, 47(3), 366-374.

Homma, A., de MENEZES, A., Monteiro, K., dos SANTOS, J., Rebello, F., Costa, D., . . . da MOTA JUNIOR, K. (2014). Integração grande empresa e pequenos produtores de dendezeiro: o caso da comunidade de Arauaí, município de Moju, Pará. *Embrapa Amazônia Oriental-Boletim de Pesquisa e Desenvolvimento (INFOTECA-E)*.

Hopkins, C., & McKeown, R. (2002). Education for sustainable development: an international perspective. *Education and sustainability: Responding to the global challenge, 13*.

Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: mapping different approaches. *Sustainable Development, 13*(1), 38-52.

Hrynaszkiewicz, I., & Acuto, M. (2015). Palgrave Communications–Connecting research in the humanities, social sciences and business. *Palgrave Communications, 1*(1), 1-3.

Husgafvel, R., Pajunen, N., Virtanen, K., Paavola, I.-L., Päällysaho, M., Inkinen, V., . . . Ekroos, A. (2015). Social sustainability performance indicators–experiences from process industry. *International Journal of Sustainable Engineering, 8*(1), 14-25.

Hussain, M., Ajmal, M. M., Gunasekaran, A., & Khan, M. (2018). Exploration of social sustainability in healthcare supply chain. Journal of Cleaner Production, 203, 977-989.

Hutchins, M. J., & Sutherland, J. W. (2008). An exploration of measures of social sustainability and their application to supply chain decisions. *Journal of cleaner production, 16*(15), 1688-1698.

INCRA. (2010). Superintendências sem atendimento presencial. Retrieved from http://www.incra.gov.br/pt/governo-federal-lanca-programa-de-producao-sustentavel-de-oleo-depalma.

Jabbour, C. J. C., Neto, A. S., Gobbo Jr, J. A., de Souza Ribeiro, M., & de Sousa Jabbour, A. B. L. (2015). Eco-innovations in more sustainable supply chains for a low-carbon economy: A multiple case study of human critical success factors in Brazilian leading companies. *International Journal of Production Economics, 164*, 245-257.

Jermsittiparsert, K., Siriattakul, P., & Wattanapongphasuk, S. (2019). Determining the environmental performance of Indonesian SMEs influence by green supply chain practices with moderating role of green HR practices. International Journal of Supply Chain Management, 8(3), 59-70.

Keating, B., Quazi, A., Kriz, A., & Coltman, T. (2008). In pursuit of a sustainable supply chain: insights from Westpac Banking Corporation. *Supply chain management: an international journal*.

Khan, S. A., Chaabane, A., & Dweiri, F. (2019). A knowledge-based system for overall supply chain performance evaluation: a multi-criteria decision making approach. *Supply chain management: an international journal*.

Khan, S. A., Chaabane, A., & Dweiri, F. (2020). Supply chain performance measurement systems: a qualitative review and proposed conceptual framework. *International Journal of Industrial and Systems Engineering, 34*(1), 43-64.

Khurshid, D. M. (2019). Food processing and value addition – a missed opportunity. Retrieved from https://tribune.com.pk/story/1998840/2-food-processing-value-addition-missed-opportunity/

Klassen, R. D., & Vereecke, A. (2012). Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance. *International Journal of Production Economics, 140*(1), 103--115. doi:10.1016/j.ijpe.2012.01.021

Kumar, A., & Dixit, G. (2018). Evaluating critical barriers to implementation of WEEE management using DEMATEL approach. *Resources, Conservation and Recycling, 131*, 101-121.

Kumar, D., & Garg, C. P. (2017). Evaluating sustainable supply chain indicators using fuzzy AHP. *Benchmarking: An International Journal*.

Kusi-Sarpong, S., Gupta, H., Khan, S. A., Chiappetta Jabbour, C. J., Rehman, S. T., & Kusi-Sarpong, H. (2019). Sustainable supplier selection based on industry 4.0 initiatives within the context of circular economy implementation in supply chain operations. *Production Planning & Control*.

Kylili, A., Fokaides, P. A., & Jimenez, P. A. L. (2016). Key Performance Indicators (KPIs) approach in buildings renovation for the sustainability of the built environment: A review. *Renewable and Sustainable Energy Reviews, 56*, 906-915.

Laishram, L. Y., Singh, H. R., & Konwar, J. (2020). Comparative Study of Work-Life Balance between Women and Men Teachers of Private Colleges of Manipur. Studies in Indian Place Names, 40(74), 1060-1069.

Laurin, F., & Fantazy, K. (2017). Sustainable supply chain management: a case study at IKEA. *Transnational Corporations Review, 9*(4), 309-318.

Levitt, T., & Araujo, H. (2017). The Amazon's new danger: Brazil sets sights on palm oil. *The Guardian, 6*, 1-6.

Li, Y., & Mathiyazhagan, K. (2018). Application of DEMATEL approach to identify the influential indicators towards sustainable supply chain adoption in the auto components manufacturing sector. *Journal of cleaner production, 172*, 2931-2941.

Lin, Y.-T., Yang, Y.-H., Kang, J.-S., & Yu, H.-C. (2011). Using DEMATEL method to explore the core competences and causal effect of the IC design service company: An empirical case study. *Expert Systems with Applications, 38*(5), 6262-6268.

Lindgreen, A., Swaen, V., Maon, F., Andersen, M., & Skjoett-Larsen, T. (2009). Corporate social responsibility in global supply chains. *Supply chain management: an international journal*.

Lozano, R. (2015). A holistic perspective on corporate sustainability drivers. *Corporate Social Responsibility and Environmental Management, 22*(1), 32-44.

Luu, T. T. (2019). Green human resource practices and organizational citizenship behavior for the environment: the roles of collective green crafting and environmentally specific servant leadership. Journal of Sustainable Tourism, 27(8), 1167-1196.

MacNaughton, G., & Frey, D. Decent Work, Human Rights and the Sustainable Development Goals'(2016). *Georgetown Journal of International Law, 47*, 607.

Mahmood, N., Arshad, M., Kaechele, H., Shahzad, M. F., Ullah, A., & Mueller, K. (2020). Fatalism, Climate Resiliency Training and Farmers' Adaptation Responses:

Implications for Sustainable Rainfed-Wheat Production in Pakistan. *Sustainability, 12*(4), 1650.

Mahmood, T., & Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change, 160*, 120248.

Mani, V., Agarwal, R., Gunasekaran, A., Papadopoulos, T., Dubey, R., & Childe, S. J. (2016). Social sustainability in the supply chain: Construct development and measurement validation. *Ecological Indicators, 71*, 270-279.

Mani, V., Agrawal, R., & Sharma, V. (2014). Supplier selection using social sustainability: AHP based approach in India. *International strategic management review, 2*(2), 98-112.

Mani, V., Agrawal, R., & Sharma, V. (2015). Social sustainability in the supply chain: analysis of enablers. *Management Research Review*.

Mani, V., Gunasekaran, A., & Delgado, C. (2018). Enhancing supply chain performance through supplier social sustainability: An emerging economy perspective. *International Journal of Production Economics, 195*, 259-272.

Mani, V., Gunasekaran, A., Papadopoulos, T., Hazen, B., & Dubey, R. (2016). Supply chain social sustainability for developing nations: Evidence from India. *Resources, Conservation and Recycling, 111*, 42-52.

Mani, V., Jabbour, C. J. C., & Mani, K. T. (2020). Supply chain social sustainability in small and medium manufacturing enterprises and firms' performance: Empirical evidence from an emerging Asian economy. *International Journal of Production Economics, 227*, 107656.

Markley, M. J., & Davis, L. (2007). Exploring future competitive advantage through sustainable supply chains. *International journal of physical distribution & logistics management*.

Matos, S., & Hall, J. (2007). Integrating sustainable development in the supply chain: The case of life cycle assessment in oil and gas and agricultural biotechnology. *Journal of Operations Management, 25*(6), 1083-1102.

Mokhtar, M. F., Omar, B., Nor, N. H. M., Pauzi, N. F. M., Hasan, S., & Mohamed, W. W. (2017). *Environmental concerns of supply chain sustainability (SCS)*. Paper presented at the AIP Conference Proceedings.

Mubarik, M. S. (2015). Human capital and performance of small & medium manufacturing enterprises: a study of Pakistan (Doctoral dissertation, University of Malaya). Retrieved frm: http://studentsrepo.um.edu.my/6573/.

Mubarik, M. S., Chandran, V. G. R., & Devadason, E. S. (2018). Measuring human capital in small and medium manufacturing enterprises: What matters?. *Social Indicators Research*, 137(2), 605-623.

Mujahid, S., Mubarik, S., & Naghavi, N. (2019). Prioritizing dimensions of entrepreneurial ecosystem: a proposed framework. *Journal of Global Entrepreneurship Research*, 9(1), 51-72.

Munasinghe, M., Deraniyagala, Y., Dassanayake, N., & Karunarathna, H. (2017). Economic, social and environmental impacts and overall sustainability of the tea sector in Sri Lanka. *Sustainable Production and Consumption, 12*, 155-169.

Munasinghe, M., Jayasinghe, P., Ralapanawe, V., & Gajanayake, A. (2016). Supply/value chain analysis of carbon and energy footprint of garment manufacturing in Sri Lanka. *Sustainable Production and Consumption, 5*, 51-64.

Munny, A. A., Ali, S. M., Kabir, G., Moktadir, M. A., Rahman, T., & Mahtab, Z. (2019). Enablers of social sustainability in the supply chain: An example of footwear industry from an emerging economy. *Sustainable Production and Consumption, 20*, 230-242.

Ndubisi, N., Zhai, X., & Lai, K. (2019). Small and medium manufacturing enterprises and Asia's sustainable economic development. *Int. J. Prod. Econ.*

Neimark, B., Osterhoudt, S., Alter, H., & Gradinar, A. (2019). A new sustainability model for measuring changes in power and access in global commodity chains: through a smallholder lens. *Palgrave Communications, 5*(1), 1-11.

Ni, D., Li, K. W., & Tang, X. (2010). Social responsibility allocation in two-echelon supply chains: Insights from wholesale price contracts. *European Journal of Operational Research, 207*(3), 1269-1279.

Olorunniwo, F. O., & Li, X. (2010). Information sharing and collaboration practices in reverse logistics. *Supply chain management: an international journal*.

Porteous, A. H., Rammohan, S. V., & Lee, H. L. (2015). Carrots or sticks? Improving social and environmental compliance at suppliers through incentives and penalties. *Production and Operations Management, 24*(9), 1402-1413.

Prime Minister Office, B. o. I. (2020). Food processing. Retrieved from https://invest.gov.pk/food-processing#:~:text=Agri%20food%20processing%20(Primary%20process%20foods)&text=This%20sector%20alone%20accounts%20for,are%20approximately%201%2C400%20flour%20mills.

Qorri, A., Mujkić, Z., & Kraslawski, A. (2018). A conceptual framework for measuring sustainability performance of supply chains. *Journal of cleaner production, 189*, 570-584.

Rogerson, M., & Parry, G. C. (2020). Blockchain: case studies in food supply chain visibility. Supply Chain Management: An International Journal.

Sánchez-Torné, I., Morán-Álvarez, J. C., & Pérez-López, J. A. (2020). The importance of corporate social responsibility in achieving high corporate reputation. *Corporate Social Responsibility and Environmental Management*. (in press) **https://doi.org/10.1002/csr.2016**

Sanusi, F. A., & Johl, S. K. (2020). A proposed framework for assessing the influence of internal corporate social responsibility belief on employee intention to job continuity. *Corporate Social Responsibility and Environmental Management*. (in press). **https://doi.org/10.1002/csr.2025**

Scarpato, D., Civero, G., Rusciano, V., & Risitano, M. (2020). Sustainable strategies and corporate social responsibility in the Italian fisheries companies. *Corporate Social Responsibility and Environmental Management*. (in press) **https://doi.org/10.1002/csr.1993**

Schönborn, G., Berlin, C., Pinzone, M., Hanisch, C., Georgoulias, K., & Lanz, M. (2019). Why social sustainability counts: The impact of corporate social sustainability culture on financial success. *Sustainable Production and Consumption, 17*, 1-10.

Silvestre, B. S. (2015). Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories. *International Journal of Production Economics, 167*, 156-169.

Smith, B. G. (2008). Developing sustainable food supply chains. *Philosophical Transactions of the Royal Society B: Biological Sciences, 363*(1492), 849-861.

Stupar, A., Jovanović, P., & Vojvodić, J. I. (2020). Strengthening the Social Sustainability of Super-Blocks: Belgrade's Emerging Urban Hubs. Sustainability, 12(3), 903.

Tsalis, T. A., Malamateniou, K. E., Koulouriotis, D., & Nikolaou, I. E. (2020). New challenges for corporate sustainability reporting: United Nations' 2030 Agenda for sustainable development and the sustainable development goals. *Corporate Social Responsibility and Environmental Management*. 27(4), 1617-1629.

Van Bommel, H. W. (2011). A conceptual framework for analyzing sustainability strategies in industrial supply networks from an innovation perspective. *Journal of cleaner production, 19*(8), 895-904.

Veleva, V., & Ellenbecker, M. (2001). Indicators of sustainable production: framework and methodology. *Journal of cleaner production, 9*(6), 519-549.

Vinyes, E., Asin, L., Alegre, S., Muñoz, P., Boschmonart, J., & Gasol, C. M. (2017). Life Cycle Assessment of apple and peach production, distribution and consumption in Mediterranean fruit sector. *Journal of cleaner production, 149*, 313-320.

Wang, F., Huisman, J., Meskers, C. E., Schluep, M., Stevels, A., & Hagelüken, C. (2012). The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies. *Waste Management, 32*(11), 2134-2146.

Wilding, R., Wagner, B., Ashby, A., Leat, M., & Hudson-Smith, M. (2012). Making connections: a review of supply chain management and sustainability literature. *Supply chain management: an international journal*.

Wing, E. A. s., & Finance, D. (2018). Economic Sur. *Economic Survey, 2015*, 16.

Wright, T. S. (2002). Definitions and frameworks for environmental sustainability in higher education. *Higher education policy, 15*(2), 105-120.

Yadlapalli, A., Rahman, S., & Gunasekaran, A. (2018). Socially responsible governance mechanisms for manufacturing firms in apparel supply chains. *International Journal of Production Economics, 196*, 135--149. doi:10.1016/j.ijpe.2017.11.016

Yakovleva, N., Sarkis, J., & Sloan, T. (2012). Sustainable benchmarking of supply chains: the case of the food industry. International journal of production research, 50(5), 1297-1317.

Zameer, H., Wang, Y., Yasmeen, H., & Mubarak, S. (2020). Green innovation as a mediator in the impact of business analytics and environmental orientation on green competitive advantage. *Management Decision*. Ahead-of-print. https://doi.org/10.1108/MD-01-2020-0065

Zhang, M., Pawar, K. S., & Bhardwaj, S. (2017). Improving supply chain social responsibility through supplier development. *Production Planning & Control, 28*(6-8), 500-511.

Zhang, Y., You, L., Lee, D., & Block, P. (2020). Integrating climate prediction and regionalization into an agro-economic model to guide agricultural planning. *Climatic Change, 158*(3), 435-451.

Zorzini, M., Hendry, L. C., Huq, F. A., & Stevenson, M. (2015). Socially responsible sourcing: reviewing the literature and its use of theory. *International Journal of Operations & Production Management*.

Appendix

Survey Questionnaire

Position in company: _____ Experience (yrs.): _____

Education level: _____ Organization type: _____

We are conducting a research study to identify the influential social sustainable supply chain (SSC) indicators and rank them in the food sector of Pakistan. SSC indicators are those which are essential for organization to measure social sustainability. These indicators help organizations to achieve social dimension of sustainability in their way of doing business. Below table shows 14 indicators that were identified from literature. You are required to use the below comparison table to compare each indicators and their influence of indicator i on indicator j.

Comparison Scale Table

Numeral	Definition
0	No influence
1	Low influence
2	Medium influence
3	High influence
4	Very high influence

Key Table for Indicator

Key	Criteria
SSSCI 1	Rate of complaints against sustainability
SSSCI 2	Balance between work and life
SSSCI 3	Education and public awareness about sustainability
SSSCI 4	Employer rights
SSSCI 5	Safe and healthy working environment
SSSCI 6	Rate of employee turnover
SSSCI 7	Complaints management system against sustainability
SSSCI 8	Working conditions
SSSCI 9	Customer feedback system
SSSCI 10	Rate of child labor and human rights complains
SSSCI 11	Social welfare development
SSSCI 12	Employee education and career development
SSSCI 13	Transparency and ethics
SSSCI 14	Community connection and support

i/*j*	SSSCI 1	SSSCI 2	SSSCI 3	SSSCI 4	SSSCI 5	SSSCI 6	SSSCI 7	SSSCI 8	SSSCI 9	SSSCI 10	SSSCI 11	SSSCI 12	SSSCI 13	SSSCI 14
SSSCI 1														
SSSCI 2														
SSSCI 3														
SSSCI 4														
SSSCI 5														
SSSCI 6														
SSSCI 7														
SSSCI 8														
SSSCI 9														
SSSCI 10														
SSSCI 11														
SSSCI 12														
SSSCI 13														
SSSCI 14														