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SOCIAL SUSTAINABILITY IN THE SUPPLY CHAIN: CONSTRUCT DEVELOPMENT AND MEASUREMENT VALIDATION

Mani V
Post Graduate Department of Management Studies
Siddaganga Institute of Technology, Tumkur, Bangalore
India
E-mail: maniv.iitr@gmail.com

Rajat Agarwal
Department of Management Studies
Indian Institute of Technology, Roorkee, Uttarakhand
India
E-mail:rajatfdm@iitr.ac.in

Angappa Gunasekaran*
Charlton College of Business
University of Massachusetts Dartmouth
North Dartmouth, MA 02747-2300
USA
Tel: (508) 999-9187
Fax: (508) 999-8646
E-mail: agunasekaran@umassd.edu
*Corresponding Author

Thanos Papadopoulos
Kent Business School, University of Kent.
Sail and Colour Loft, The Historic Dockyard, Chatham, Kent ME4 4TE
United Kingdom
Tel: +44 1634 88 8494
E-mail: A.Papadopoulos@kent.ac.uk

Rameshwar Dubey
Symbiosis Institute of Operations Management
(Constituent of Symbiosis International University)
Plot No. A-23, Shravan Sector
CIDCO
New Nashik-422008
India
Cell. No. +918600417738
Tel. No. +91-253-2379960 Ext. No.39
E-mail: rameshwardubey@gmail.com

Steve Childe
Plymouth Business School
Plymouth University
Room 207, Mast House, 24 Sutton Road
Plymouth, Devon, PL4 0HJ
United Kingdom
E-mail: stephen.childe@plymouth.ac.uk

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Abstract

Research on social sustainability in developing countries has recently gained importance for both academics and practitioners. Studies in the supply chain management field take either a supplier or a manufacturer perspective that address predominantly corporate social responsibility (CSR) issues referring to the internal stakeholders. Our research integrates the literature on supplier, manufacturer, and customer responsibility and proposes the concept of supply chain social sustainability (SCSS) that refers to addressing social issues within the overall (upstream and downstream) supply chain. Furthermore, we develop and empirically validate scales for measuring SCSS using in-depth interviews and a survey in the Indian manufacturing industry. Our results suggest that SCSS consists of six underlying dimensions, namely equity, safety, health and welfare, philanthropy, ethics, human rights, in a 20-item valid and reliable scale. We discuss the implications of the findings for research and practice and suggest future research avenues.

Keywords: Sustainability, Social sustainability, supply chain social sustainability, supply chain, India, manufacturing.

1. Introduction

Sustainability refers to meeting today's needs without compromising the future generations' needs (Brundtland, 1987). Understanding the three distinct dimensions namely economic, environment and social, and their inter-relationships is crucial (Elkington, 1999; Pagell and Wu, 2009; Gallengo et al., 2015). However, the social dimension has received little attention in the literature (Ashby et al., 2012; Seuring and Muller, 2008; Ahi and Searcy, 2015a), whereas the majority of studies refer to developed countries (Carter and Jennings, 2002, 2004; Gunasekaran and Spalanzani, 2012; Pinar et al., 2014). In developing countries and emerging economies, apart from few studies (Zhu et al., 2005; Delai and Takahashi, 2013; Chand et al., 2015; Silvestre, 2015a; 2015b; Gurtu et al., 2015), research on supply chain social sustainability (SCSS) is

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scarce. In India for instance, media reports concerning social sustainability highlight issues including, inter alia, child and bonded labour, diversity issues, ethics, gender discrimination, and product recalls from manufacturing units (Ministry of Labour, 2013). Firms, hence, need to recognize supply chain related social issues as a strategically important concern.

To address the paucity of SCSS literature on developing countries, this paper (i) identifies social issues related to manufacturing supply chain, and (ii) uses interviews and quantitative data from the Indian manufacturing sector to construct and validate constructs for measuring SCSS. Our contribution lies in: (i) identifying the social issues related to Indian manufacturing supply chains; (ii) offering a new conceptualization of social sustainability as SCSS focusing on developing countries; and (iii) developing and validating SCSS scales.

In the section that follows, we provide a literature review on SCSS. In the third section, we present our methodology whereas in the fourth section we analyze the results of qualitative and quantitative measures used to develop and validate the scales. We then discuss the findings of our research in light of the literature on SCSS as well as the managerial implications of our work. The last section summarizes our findings, provides the limitations, and suggests future research directions.

2. Conceptual background

2.1 Supply chain social sustainability and dimensions

The sustainability framework, first developed by Carroll (1979), advocates four different responsibilities of the corporates, including economic, legal, ethical, and voluntary or discretionary responsibilities. In an earlier research, Sethi (1975) introduced a taxonomy in which he described the social obligations and responsibilities of the corporates, including voluntary social responsibilities. Social sustainability is of paramount importance in the manufacturing supply chain because of the need for increased stakeholder awareness regarding not only 'where' the products are made but also 'how' and 'in what conditions' they are produced (McCarthy et al., 2010).

In this paper we are interested in the social dimension of sustainability. Scholars (Lafferty and Langhelle, 1999; Sharma and Ruud, 2003) define social sustainability as an "ethical code of conduct for human survival and outgrowth that needs to be accomplished in a mutually inclusive and prudent way".

In the supply chain literature, social sustainability has been defined from a CSR perspective (Carter and Jennings, 2002, 2004; Ciliberti et al., 2008; Carter and Easton, 2011; Lu et al., 2012). In manufacturing in particular, socially sustainable practices can be defined as the product and process aspects that determine human safety, welfare and wellness (Wood, 1991).

Social sustainability issues relate to stakeholders including suppliers, manufacturers, customers, and society (Freeman, 1984; 2004). Addressing social issues in supplier locations can help achieve social sustainability in the upstream (Krause, 1999; Krause et al., 2000, 2007; Bai and Sarkis, 2010; Mani et al., 2014). In the downstream, socially responsible buying can help achieve sustainability and efficiency (Drumwright, 1996; Carter et al., 1999; Cruz, 2013; Martínez-Jurado and Moyano-Fuentes, 2014), including for instance, the adoption of fair trade principles and good governing mechanisms (Formentini and Taticchi, 2015).

Studies in social sustainability investigate, in their majority, critical factors and enablers (antecedents) (Clarkson, 1995; McWilliams and Siegel, 2000; Ehrgott et al., 2011; Searcy and Buslovich, 2014); and the impact of social sustainability on performance (Kolk et al., 2010; Gunasekaran and Spalanzani, 2012; Delai and Takahashi, 2013; Sebastiani et al., 2014). However, social issues and antecedents of social sustainability vary across geographic locations (Gugler and Shi, 2009; Huq et al., 2014). Although studies have been carried out on suppliers and SCSS (Gimenez and Tishikawa, 2012), few if any, studies focus on both upstream and downstream in developing countries.

Scholars have proposed different measures of SCSS (Carter and Jennings, 2002; 2004; Corbiere-Nicollier et al. 2011; Kozlowski et al., 2015; Domingues et al., 2015), both quantitative and qualitative (Andersen and Larsen, 2009; Tate et al., 2010; Yusuf et al.,

2013). These measures differ across countries and contexts (Gugler and Shi, 2009; Huq et al., 2014), whereas their majority is supplier performance oriented (Carter and Jennings, 2002; 2004; Lu et al., 2012; Ahi and Searcy, 2015b; Silvestre, 2015a). In India safety, wages and labour practices were identified as dimensions (Kumar et al., 2014; Mani et al., 2015a; Mani et al., 2016).

Nevertheless, there are no measures of overall supply chain social sustainability for developing countries, such as India (Mani et al., 2015b). To address this literature gap, we attempt to generate the scale items to measure social sustainability as discussed below.

To identify, develop, and validate SCSS measures we used both qualitative and quantitative methods (Churchill's, 1979; Linderbaum and Levy, 2010). Firstly, we reviewed the literature (Rowley and Slack, 2004; Chen et al., 2014; Gunasekaran et al., 2015) on sustainability, social sustainability, operations management, sustainable development and CSR. We conducted searches in ScienceDirect, Emerald Insight, Inderscience, and Taylor and Francis, based on their provision of a comprehensive coverage of high-ranked journals. Our keywords were 'social sustainability and supply chain', 'social sustainability and measurement', 'social sustainability and emerging economy', 'social sustainability and developing countries'. We looked for these keywords and their combination in the title, abstract, and full text. We then made notes on the articles, structured the literature review, built the bibliography and wrote the review. The authors collaborated in all stages of the literature review, acting as reviewers, and discussing when there was disagreement on the inclusion of particular articles. Following Esposito and Evangelista (2014) and Gunasekaran et al. (2015), we limited the search to peer-reviewed articles to maintain the level of quality. The review consisted of 36 articles; their full details are given in the reference section. The articles enabled us to build relevant SCSS measures (Table 1).

Next, we formed an expert panel to solicit experts' insights and refine our scales (Yeung, 2008), based on two criteria. First, the members should be knowledgeable in the supply chain sustainability and operations in India. Second, the members would have diverse backgrounds to ensure their insights are diverse (Bryman, 2008). The expert panel consisted of 27 supply chain managers from manufacturing industries, representing, *inter alia,* petrochemical, pharmaceuticals, cement, FMCG, Automotive, Electrical and

Electronics and IT companies. Two senior professors from supply chain operations from a premier business school and a scholar from operations management were also included.

Table 1. Scale items and measures for social sustainability

Measures	***Source***
Gender non-discrimination (suppliers manufacturer's and customer's)	UNDSD (2001), Hutchins and Sutherland (2008), Yakovleva et al. (2012), Chardine-Baumann and Botta-Genoulaz (2014)
Workplace diversity (Distributor and dealer)	Clair et al. (1997), Chin and Tat (2015)
Workplace diversity (Manufacturer)	Dollinger et al. (1991), Carter and Jennings (2000),Clair et al. (1997), Ciliberti et al.(2008), Chin and Tat (2015)
Workplace diversity (Supplier's)	Carter and Jennings (2000), Chin and Tat(2015)
Safety measures (Supplier's)	Carter and Jennings (2000), Ciliberti et al. (2008), Rajak and Vinodh (2015).
Safe incoming movement of product (Manufacturers)	Carter and Jennings (2000), Ciliberti et al. (2008)
Safety(Manufacturing facility)	Amaral and Rovere (2003), Sharma and Vredenburg (1998), Halme et al (2004), Ciliberti et al.(2008), Chardine-Baumann and Botta-Genoulaz (2014), Diabat et al. (2014), Ahi and Searcy (2015b).
Women's safety(Manufacturing)	Honeyman and Goodman (1991), Jamieson (2004), Neumayer and De Soysa (2007), Pearson (2007), Preuss (2009)

Women's safety(Supplier's and customer's)	Author/panel developed
Health(Supplier's)	Hutchins and Sutherland (2008), Tate et al. (2010), Rajak and Vinodh (2015).
Welfare (Customer locations)	Hutchins and Sutherland (2008)
Health (Manufacturer's)	Hutchins and Sutherland (2008), Chow and Chen (2012), Chardine-Baumann and Botta-Genoulaz (2014)
Wages (Supplier's, manufacture's and customers)	Hutchins and Sutherland (2008), Yakovleva et al. (2012)
Philanthropy(Manufacturer's)	Clarkson (1995), Chow and Chen (2012), Carter and Jennings (2000), Hutchins and Sutherland (2008), Lu et al. (2012), Chardine-Baumann and Botta-Genoulaz (2014)
Philanthropic activities(Supplier's)	Hutchins and Sutherland (2008), Clarkson (1995)
Philanthropic activities(Customers)	Clarkson (1995)
Human rights (Supplier's and manufacturer's)	Sharma and Vredenburg (1998), Jennings and Entine (1999), Labuschagne et al. (2005), Chow and Chen (2012), Carter and Jennings (2000), Ciliberti et al. (2008), Chardine-Baumann and Botta-Genoulaz (2014), Sancha et al. (2015)
Human rights(Customer's)	Chow and Chen (2012), Kleindorfer et al. (2005), Awaysheh and Klassen (2010), Sancha et al. (2015), Geibler et al. (2006), Collins et al. (2007)

Ethical issues (Manufacturer's and customers)	Lu et al. (2012)
Ethical issues(Supplier's)	Carter (2000a, 2000b), Chardine-Baumann and Botta-Genoulaz (2014)

The expert panel discussed issues related to safety, health, child labour, bonded labour, equity, labour working conditions and women safety. Additionally, the SCSS dimensions of poverty, education and housing dimensions were dropped, although they have been identified in the academic and practitioner literature (UNDSD, 2001; Hutchins and Sutherland, 2008), as they were irrelevant to Indian manufacturing industries. The dimensions of equity, safety, health, philanthropy, ethics, and labour rights were identified as relevant. The panel also proposed that the scales that included diversity, safety, philanthropy, human rights, and ethics (Carter and Jennings, 2002, 2004) fit with small modifications. Regarding ethics, the expert panel advised that the scales by Lu et al. (2012) were appropriate with small modifications. For supply chain, supplier, and customer performance the expert panel further suggested adapting the scales by Carter and Jennings (2000) and Chin and Tat (2015) and offered suggestions for customer and operational performance constructs. The items 'women safety in supplier locations' and 'women safety in customer locations', were also proposed. The final social sustainability scale included 41 items and was developed by modifying the scale items wherever necessary. Our methodology is extrapolated in Figure 1.

3. Methodology

3.1 Scale purification-pilot test

After generating the 41-item scale, a pilot test was conducted with 45 supply chain manufacturing managers and experts for face validity and readability (Heeler and Ray, 1972) including General Managers, AGM, Senior Managers, CEOs, and VPs (Sustainability), who participated in the bi-annual supply chain management IIMB conference in December 2014. Their majority belonged to 'Fortune 500' companies from automotive, pharmaceuticals, FMCG, chemical, petrochemical, energy, electrical and electronics, cement, and IT. Based on the pilot results, the item 'Inspect supplier and customer locations and 'audit the safety measures' was removed and 'gender

discrimination' was rephrased to 'gender non-discrimination', bringing the number of items to 40. Each was assessed by a 5-point Likert scale (1-Stongly disagree, 5-Strongly agree). Likert scales have been previously used in several sustainability measurement studies (Zhu et al., 2008; Carter and Jennings, 2002, 2004; Miao et al., 2012).

Development of social sustainability concept in the supply chain

- Extensive literature review
- Understanding the social sustainability issues from Indian supply chain managers through in-depth interviews

Development of measurement items for social sustainability

- Picking up existing items wherever available, and construct the new items based on expert panel opinion.
- Development of survey questionnaire with the write up on social sustainability
- Final opinion from practitioners and academicians on questionnaire

Method of data collection

- Pilot testing
- Convenience sampling

Study-1

- Random Survey -1
- Exploratory factor analysis (EFA)
- Obtaining the factor structure
- Reliability and validity of the factors

Study 2 (Random survey-2)

- Confirmatory factor analysis for measurement model
- Testing of factors reliability and validity
- Construction of second order measurement model through CFA-efficacy testing
- Structure equation modeling for predictive validity
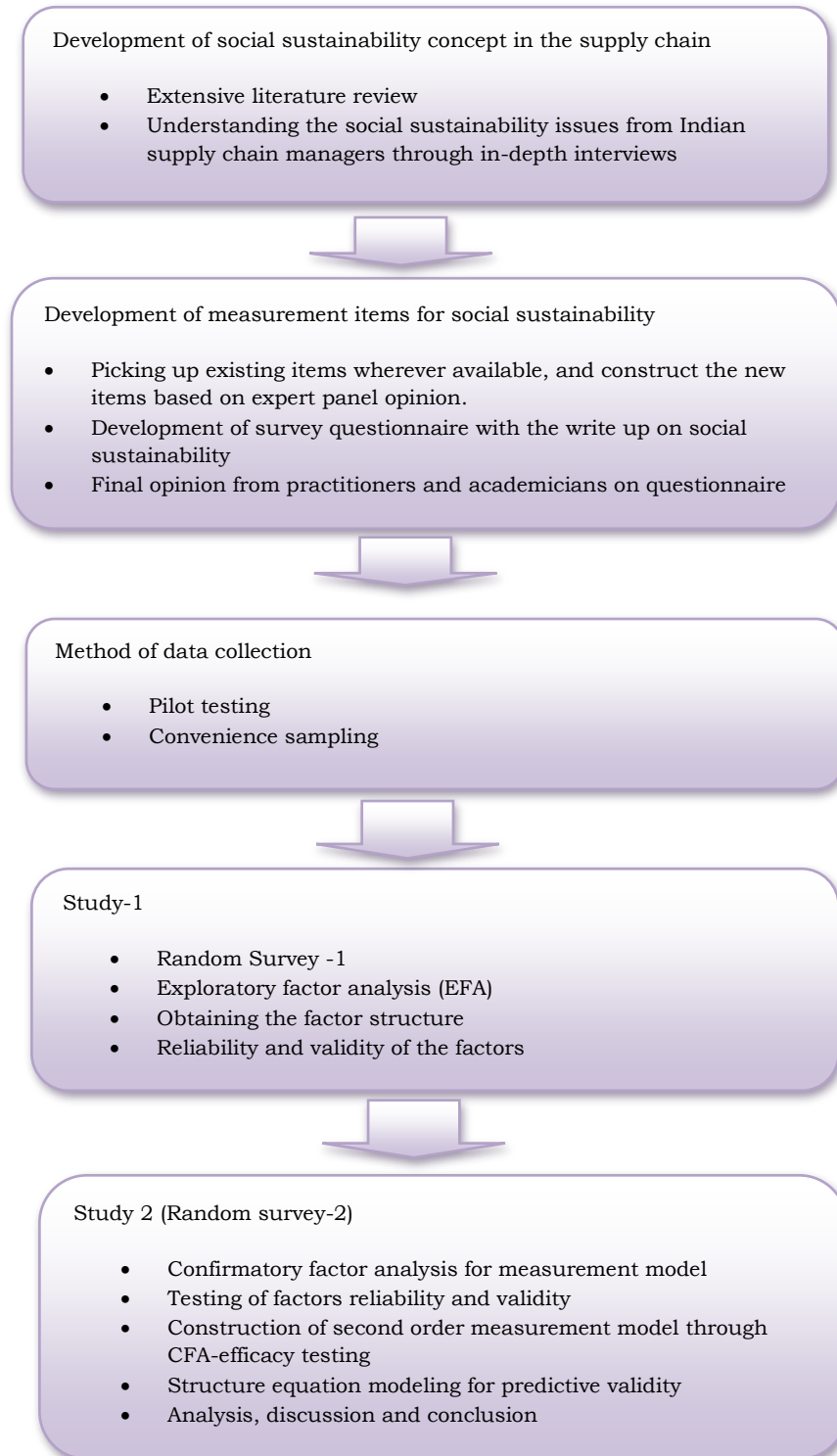- Analysis, discussion and conclusion

Figure 1. Steps involved in the research process

3.2 Sample and method of data collection

We created a database of the manufacturing companies from Centre for Monitoring Indian Economy (CMIE) known as 'Prowess' database (https://prowess.cmie.com), which is a well-known database for providing authentic information on listed Indian companies. Prowess provides a list of companies, their promoters, and corporate information along with financials (revenue) and allows users to sort information-based on custom queries. Since sustainability and social sustainability issues are more likely to be considered in large organizations, we identified those companies with annual total revenues exceeding 100 million Indian Rupees (INR). Consequently, a database of randomly selected 1200 manufacturing companies evenly distributed among manufacturing sectors was created.

We used survey method for data collection. A questionnaire was sent through email to 1200 supply chain managers in three lots, following Dillman's (2007) procedure for questionnaire formatting, distribution and collection. We performed Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) test to check whether the samples meet the minimum specified level, and the result showed the obtained samples are adequate for the analysis (0.844).

3.3 Survey response

In the first lot of 500 mails to supply chain managers, 88 mails were returned because of incorrect email ID, or the manager was no longer working in the company. In a second set of 500 questionnaires, 99 mails were returned back. Out of the third lot of 200 mails, 41 were returned. Hence, a total of 228 mails returned for the aforementioned reasons. We received 308 usable surveys and all these were reviewed for errors including missing data and miscoding. We found 9 questionnaires with missing data and despite our efforts to follow up, we succeeded in getting one reply since the other executives were either busy or on business outside India. Our response rate was 25.66%, which is

considered adequate in sustainability related studies (Carter and Jennings, 2002, Zhu et al., 2008). 40% of the respondents were from manufacturing companies with annual revenues exceeding 5 billion INR and over 30% of the organizations revenues exceeded 10 billion INR. Another 30% of the respondents were from the companies whose revenues were between 1-5 billion INR. We used two measures for checking the respondents' knowledge (Campbell, 1955): number of years in SCM function, and current designation. Three respondents were below Senior Executive level that is needed for responding to sustainability topics (John and Reve, 1982) and were excluded. The characteristics of the sample are shown in Table 2.

Table 2 Sample characteristics

Measure	Industry	Freq	Percent
Type of industry	Automobile industry	39	13
	Architectural/Construction/Cement Industries/Infrastructure	35	11.6
	Apparel manufacturer/Dying/Textiles/Spinning	49	16.3
	Chemical industry	26	8.6
	Consumer durable manufacturer	4	1.3
	Mechanical equipment/Mechanical industries	9	3
	Electrical and Electronics/IT products manufacturer	32	10.7
	Fast moving consumer goods (FMCG)	9	3
	Food and beverages	32	10.7

	Iron and steel /Mining/Steel drum	5	1.7
	Oil and natural gas industry	3	1
	Packaging solutions/Paper	9	3
	Pharmaceuticals companies	23	7.7
	Ship building companies	2	0.7
	Sugar manufacturers	16	5.3
	Others (Footwear/Jewelers/Cycle)	7	2.3
Annual revenues	Below 100 crores rupees (1 Billion)	1	0.3
	100 to 500 crores rupees (1 to 5 Billion)	90	30
	500 to 1000 crores rupees (5 to 10 Billion)	119	39.6
	More than 1000 crores rupees (Over 10 Billion)	90	30
Location of the company	Andhra Pradesh	24	8
	Karnataka	57	19
	Kerala	13	4.3
	Tamilnadu	137	45.6
	Telangana	66	22
	Missing	3	1
Position of respondents	Lower Management (Executive, Sr. Executive, Asst. Manager)	81	27.0
	Middle Management (Sr. Manager, DGM, AGM)	189	63.0

	Upper Management (Director, ED, President, VP, CEO, MD)	30	10.0
	Below lower management(Asst. Executive)	0	0.0
Experience of respondents	1-5 Years	14	4.7
	5-10 Years	114	38.0
	More than 10 years	171	57.0
	Missing	1	0.3

3.4 Non response bias

To identify non-response bias, the answers of early respondents were compared with those of late respondents (Armstrong and Overton, 1977; Lambert and Harrington, 1990) using a multivariate t-test. The results indicate that there is no significant difference between early respondents to late respondents group (P= 0.842). Further, we tested for non-response bias by randomly selecting 20 non-respondents and by sending an abbreviated form of questionnaire to these respondents and following up with phone calls to ensure that all the 20 non-respondents completed and returned the abbreviated questionnaire (Lohr, 1999). The t-test revealed no significant difference between respondents and non-respondents (P=0.412).

4. Data analysis and results

To check reliability and validity of our constructs, we conducted exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA) (Churchill, 1979).

4.1 Study 1: Exploratory factor analysis

We have performed EFA on 300 samples collected in the first phase to examine the dimensionality of the SS scale and ensure that all the measures loaded into SS dimensions only. We used principal component analysis with promax rotation (Gorsuch, 1988). To identify the factors underlying the SS dimension, we applied three commonly used decision criteria (Hair et al., 2010). First, the items loading with less than 0.40 are excluded. Second, the items that are cross-loaded on to two or more factors are excluded. Finally, the factors with eigenvalue of 1 and more were considered for cutoff value for extraction. There were 6 factors explaining 62.23 % of total variance. Table 1A (Appendix) results shows the factor loadings for 22 item scale with all the item loadings are exceeding 0.50 and above. All the items loading significantly onto one factor indicate uni-dimensionality. The table also shows that no item had multiple cross loadings, this implies that preliminary discriminant validity of the scale. Finally, all factors' reliability value (Cronbach's alpha) are in excess of 0.70, indicating acceptable reliability (Nunnally, 1978).

4.2 Confirmatory Factor Analysis

To conduct CFA, the second phase of samples was collected, where another set of 1400 manufacturing companies from Centre for Monitoring Indian Economy (CMIE) database were identified randomly (Prowess) and were sent the questionnaire with reduced scale items (23 items) along with a write up on social sustainability. Although previous sustainability studies used a single sample for EFA and CFA (Chow and Chen, 2012; Zhu et al., 2008), it is desirable to use the different set of samples to test the uni-dimensionality of the scales. (Hinkin, 1998). Out of 1400 questionnaires forwarded 359 questionnaires were returned in the first phase, and with telephone follow-ups and two mail remainders, another 98 filled up questionnaires were returned. A total of 457 responses were received. 8 questionnaires contained missing information and despite following this up with managers, only one questionnaire was filled, and 7 were discarded. The response rate stands at 32.2 % and considered to be reasonably good in studies pertaining to sustainability. We checked for common method bias by using Harmon's single factor method in SPSS and no such problem existed (Total variance extracted = 18.59). Furthermore, we have performed CFA to create a measurement model and evaluate the measurement efficiency directly (Bentler, 1990) using Amos 20.0

software with maximum likelihood estimation procedure (MLE). We test the convergent validity and uni-dimensionality in the subsequent sections.

4.3 Uni-dimensionality

To test the uni-dimensionality of the scales CFA was performed. We constructed in total 2 measurement models to analyze 6 dimensions of SS. In measurement model-1, all social dimensions pertinent to SS dimension were considered as first order latent variables. In the measurement model-2 the SS dimension was considered as second order latent construct, measured by first order latent variables such as EQ, HR, PH, ET, SA, and HW (Carter and Jennings, 2000). The results of each measurement model with respect to Goodness of fit index (GFI), Adjusted goodness of fit index(AGFI), Comparitive fit index(CFI), Bentler-Bonett normed fit index(NFI), and Non-normed fit index are listed in Figure 2. All the models with respect to results exhibit fit indices with the score of 0.90 or greater, that implies that both the models have a satisfactory fit indices and all the items are valid in measuring their corresponding constructs (Wheaton et al., 1977; Hair et al., 2010; Marcoulides and Schumacker, 2013). The standardized item loadings and composite reliability and Cronbach's alpha values are extrapolated in Table 2A (Appendix).

Following Sethi and Kings (1994) we deleted few measurement items with the highest value of standardized residuals and retained the lower value of squared multiple correlation for better fit. Further, we analyze substantive reasons for removing any measurement items (Shi et al., 2005). Therefore, item loadings for the items EQ1, S3, were below .50 and were removed from our measurement model.

4.4 Convergent validity

To establish convergent validity we examined factor loadings, average variance extracted (AVE), and composite reliability (CR) (Hair et al., 2010). Table 2A (Appendix) indicates the standardized path loadings of all the items that are highly significantly related to their corresponding factors. All constructs in the model (Table 5) are more than the threshold levels for AVE and CR (more than 0.5 and 0.7 respectively) (Hair et al., 2010), indicating high convergent validity.

4.5 Reliability test

We tested our scales using Cronbach's alpha and CR (Hair et al., 2010; Fornell and Larcker, 1981). All the scales (Table 1A -Appendix) demonstrate Cronbach's alpha and CR greater than 0.7 and hence exhibit great reliability (Kline, 1998).

4.6 Discriminant validity

To check for discriminant validity (Churchill, 1979; Hair et al., 2010) maximum shared variance (MSV), average shared variance (AVE), and square root of AVE should be greater than inter-construct correlations (Kling, 2001; Hair et al, 2010). All six factor correlations (Table 4A -Appendix) were below 0.80, confirming the discriminate validity of the scale (Bhattacherjee, 2002). The MSV was found lesser than the average shared variance of the factors (Table 3A -Appendix). The average shared variance (ASV) values are less than the average variance extracted (ASV<AVE). The values in Table 3A also suggest that square root of AVE is greater than inter-construct correlations. Therefore, all six dimensions passed the discriminant validity test.

4.7 First order confirmatory factor analysis

Based on the analysis using Amos 20, the first order correlated model for SS was constructed (Figure 2). The first-order model suggests that there are six dimensions (constructs) (i.e., EQ, PH, SA, HW, ET, HR), which are independent in their prediction of social sustainability. The constructs such as EQ, SA, HW, ET, and HR are measured by three items, whereas the construct PH is measured by 5 items (Figure 2). The first-order model for testing social sustainability in the supply chain passed all the required tests: Chi-Squared Test: $\chi 2$/df(CMIN)= 1.810, Goodness of fit index (GFI)=0.94, Non-normed fit index (NFI) = 0.880, Confirmatory fit Index (CFI)=0.941, and Root Mean Square Error Aproximation (RMSEA)=0.042. Hence, the first order model is an accurate representation for SCSS. Furthermore, our results suggest the factor loadings for first order constructs of EQ, PH, SA, HW, ET, HR ranged from 0.80 to 0.70, 0.77 to .60, and 0.90 to .67, 0.75 to .64, 0.74 to .62, 0.79 to 0.66 respectively. In addition, the correlation between HR and ET stands at 0.48 followed by SA and HR at 0.30, finally HR to HW at 0.23 and rest were insignificant.
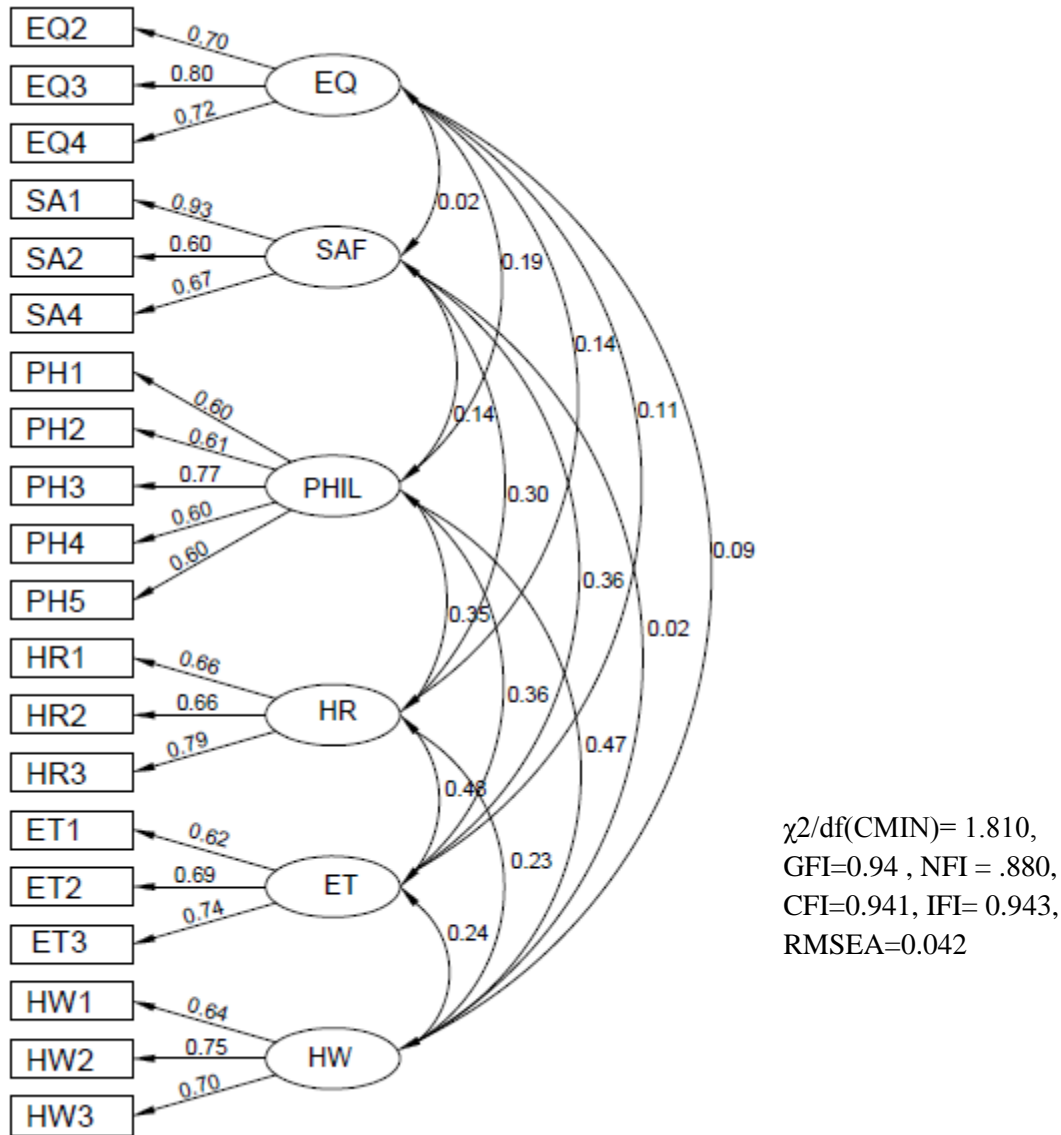
Figure 2 First-order confirmatory factor analysis (measurement model)

4.8 Second order confirmatory factor analysis

To test for second-order model of SS we performed second order confirmatory factor analysis using Amos 20 (Figure 3). The second-order model postulated a latent factor governing the correlations among EQ, PH, SA, HW, ET, and HR. The path leading from the second order construct (SS) to all six social dimensions (constructs) was significant. The second order loadings on social sustainability (SS), were 0.65 for ET, 0.62 for PH, 0.20 for EQ, 0.35 for SA, 0.48 for HS, and 0.59 for HR. Furthermore, the second order

model for SCSS passed all goodness of fit parameters: Chi-Squared Test: $\chi 2/df$ (CMIN)= 1.997, Goodness of fit index (GFI)=0.937, Non-normed fit index (NFI) = 0.860, Confirmatory fit index (CFI)=0.923, and Root Mean Square Error Approximation (RMSEA)=0.047. To justify the existence of social sustainability as a second order factor (Bollen, 1989; Doll et al., 1994) we have performed efficacy testing and predictive validity testing, which are described next.

4.9 Efficacy testing

We measured efficacy by computing the target (T) coefficient that demonstrates the chi-square ratio of the first and second order models (March and Hocevar, 1985). The T coefficient value above 1.0 indicates more effective representation. The chi-square value for model-1 and model-2, shows that both the models are identical. The T coefficient value close to 1.0 implies that our second order construct perfectly explained the first order construct model. Hence, both the models explain parsimonious representation of the relationship among them (March, 1987; Smith et al., 2009). This result also indicates that both the models are equivalent and the second order construct perfectly represents the first order construct. Furthermore, the model reveals that ET had highest path loading (r=0.65), followed by PH (r=0.62), HR (r=0.59), SA (r= 0.35), HW (r=0.48) and EQ (r=0.20). These results suggest that SA, EQ, PH, ET, HR, and HW are most likely to be the dimensions of social sustainability in India.
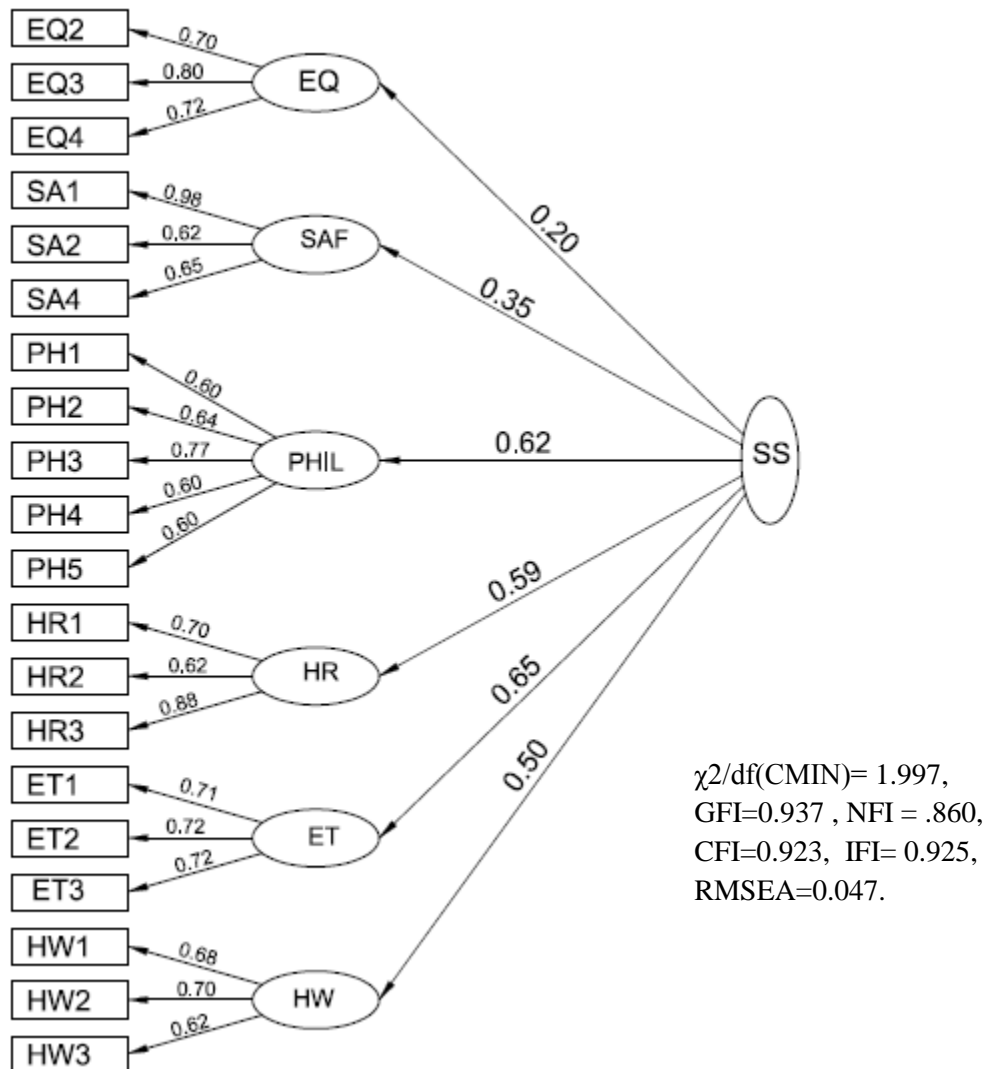
Figure 3 Second order confirmatory factor analysis model

χ2/df(CMIN)= 1.997, GFI=0.937 , NFI = .860, CFI=0.923, IFI= 0.925, RMSEA=0.047.

4.10 Predictive Validity

Predictive validity test is used to identify how well the enabling constructs predict the hypothesized dependent variable (Stratman and Roth, 2002). Following the literature suggesting a link between implementation of SCSS practices and overall SC performance, we used data on supply chain performance, supplier performance, operational performance and consumer performance to assess the predictive validity of the SCSS scales. Cronbach alpha of supply chain performance (SCP1, SCP2, SCP3,

SCP4) was 0.812, and implies that all these four items were reliable. Furthermore, Cronbach alpha for supplier performance (SP1, SP2, SP3, SP4) was at 0.730 and all items were reliable. To validate the predictive validity, structural equation modeling was performed and results suggest the better fit with Chi-Square Test: $\chi 2/df$ (CMIN) = 1.901, Goodness of fit index (GFI) =0.906, Adjusted Goodness of fit index (AGFI) = 0.880, Confirmatory fit index (CFI) =0.909, Incremental fit index (IFI) =0.911 and Root Mean Square Error Approximation (RMSEA)=0.045.The correlation result stands at r=0.55 for supplier performance, and r=0.55 n=450, p<0.01 for supply chain performance. Thus, our second order social sustainability model cleared the predictive validity test.

5. Discussion and managerial implications

5.1 Theoretical contributions

This study discussed the social dimension of sustainability within developing countries. It proposed 20 SCSS measures (Table 5 -Appendix) under six social dimensions, that is, Equity (EQ), Philanthropy (PH), Safety (SA), Health and Welfare (HW), Ethics (ET), Human rights (HR). Our study results are in line with earlier studies (Carter and Jennings, 2000) that have identified dimensions such as diversity, philanthropy, safety and human rights in suppliers and their relationship to supply chain social sustainability. We extend these studies in that we focus on both upstream and downstream and highlight the importance of the ethical dimension (Lu et al., 2012) Our findings acknowledge Jorgensen and Knudsen (2006), Hutchins and Sutherland (2008), and Chow and Chen (2012) who proposed various measures including health and safety, labor rights, human rights and corruption practices as social dimensions from buyers' perspective, but extend these studies in that these requirements were neither passed on to their lower level suppliers nor customers. Contrary to some scholars (Chin and Tat, 2015), our results confirm the importance of equality practices in developing countries' manufacturing supply chains.

5.2 Managerial implications

Our proposed dimensions and measures could be used as guiding principles by managers who proactively think and act upon the SCSS and would like to devise SCSS strategies. Furthermore, since our proposed instrument has been developed using the experience of supply chain managers in India, it provides insights to those supply chain managers in developing countries and emerging economies who aim at measuring the social performance of the overall supply chain. Finally, firms can also benchmark existing social sustainability policies by applying our proposed social sustainability dimensions.

6. Conclusion

This paper identified, modeled, and tested SCSS dimensions and measures pertinent to manufacturing, based on the experiences and responses of Indian supply chain managers, and a 20-item social sustainability scale has emerged. We contribute to the literature on supply chain sustainability in that we propose, test, and validate six distinguishable dimensions and measures that provide a better understanding of the SCSS within developing countries.

Our study has the following limitations. Our sample stemmed from the manufacturing industry, and hence future studies can focus on other industries to further test and inform our measures. Furthermore, future studies can be carried out using more representative or different sample sizes from other industries and other developing countries. Moreover, our study focused on SCSS in forward supply chains, and therefore future studies can explore SCSS in reverse supply chains. Finally, our model and measurements could be further refined through interviewing practitioners in other industries to understand the reasons why some measurements were received better and rated higher than others, as well as the different uses of measurements

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Appendix:

Table 1A: Results from exploratory factor analysis for social sustainability (SS) items

		Component					
		1	2	3	4	5	6
Philanthropy	PH1	**.756**	-.039	-.003	-.014	-.023	.021
	PH2	**.717**	.100	-.140	.098	.085	-.053
	PH3	**.691**	-.073	.136	-.023	.119	-.017
	PH4	**.657**	-.214	.129	-.232	-.110	.300
	PH5	**.616**	.216	-.043	.239	-.062	-.203
Safety	SA1	.071	**.794**	-.086	.139	-.182	.113
	SA2	-.082	**.793**	.000	.104	.019	-.048
	SA3	.028	**.779**	.059	-.207	.056	.041
	SA4	-.029	**.625**	.197	-.236	.154	.081
Equity	EQ1	-.018	.010	**.766**	-.026	.066	.045
	EQ2	.005	.138	**.765**	.082	-.119	-.031
	EQ3	.113	-.012	**.734**	.041	.077	-.183
	EQ4	-.069	-.028	**.680**	.075	-.025	.112
Health and Welfare	HW1	-.077	.005	.049	**.841**	.009	.158
	HW2	-.028	-.080	.095	**.806**	.074	-.030
	HW3	.197	-.052	.002	**.676**	.027	.070
Ethics	ET1	-.061	.000	-.076	.015	**.826**	.164
	ET2	-.021	-.084	.113	.115	**.760**	-.058
	ET3	.140	.083	-.044	-.013	**.725**	-.035
Human Rights	HR1	-.162	.063	-.022	.030	.075	**.812**
	HR2	.044	.011	.158	.159	-.115	**.707**
	HR3	.185	.100	-.176	.029	.114	**.618**

Cronbach's alpha	0.752	0.879	0.763	0.894	0.724	0.811
Eigen value(Sum of squares)	5.97	2.73	1.42	1.28	1.14	1.12
Cumulative variance explained	27.17	39.59	46.07	51.89	57.1	62.23

Highest loading values are marked in bold

Table 2A: Final CFA results for the constructs

Construct in the model	Measurement Item	Items loading (Standardized)	t-value	Composite reliability(CR)	Cronbach's alpha
Equity	EQ2	0.70	12.066[a]	0.78	0.82
	EQ3	0.80	12.218[a]		
	EQ4	0.72	*		
Safety	SA1	0.98	4.464[a]	0.78	0.71
	SA2	0.62	*		
	SA4	0.65	5.412[a]		
Philanthropy	PH1	0.60	7.917[a]	0.75	0.80
	PH2	0.64	7.513[a]		
	PH3	0.77	8.851[a]		
	PH4	0.60	7.431[a]		
	PH5	0.60	*		
Human Rights	HR1	0.70	6.645[a]	0.74	0.82
	HR2	0.62	*		
	HR3	0.88	6.651[a]		
Ethics	ET1	0.71	7.501[a]	0.72	0.76
	ET2	0.72	6.734[a]		
	ET3	0.72	*		
Health and Welfare	HW1	0.68	5.531[a]	0.73	0.75
	HW2	0.70	5.774[a]		
	HW3	0.62	*		

[a] Standardized estimated factor loading significant at P<0.05, *Fixed at 1.0 for estimation purpose.

Table 3A: Convergent *and discriminant validity of the constructs*

	CR	AVE	MSV	ASV	Ethics	Equity	Safety	Philanthropy	HR	HW
Ethics	0.725	0.500	0.233	0.114	0.707					
Equity	0.784	0.548	0.035	0.015	0.110	0.740				
Safety	0.787	0.561	0.132	0.048	0.364	0.024	0.749			
Philanthropy	0.752	0.521	0.216	0.105	0.363	0.187	0.141	0.721		
HR	0.749	0.502	0.233	0.103	0.483	0.141	0.297	0.346	0.708	
HW	0.730	0.501	0.216	0.068	0.244	0.087	0.023	0.465	0.232	0.707

Table 4A: *Evaluation of discriminant validity of the factors using factor correlations*

Component	Mean (SD)	1	2	3	4	5	6
Philanthropy	2.80(0.70)	1.000					
Safety	3.39(0.92)	0.170	1.000				
Equity	2.91(0.75)	0.134	-.007	1.000			
Health and Welfare	3.01(0.84)	0.246	0.141	0.224	1.000		
Ethics	3.08(0.68)	0.389	0.145	0.081	0.187	1.000	
Human Rights	3.14(0.70)	0.190	0.065	0.277	0.330	0.125	1.000

Table 5A: *Social sustainability scale items and their measures (After refinement)*

(5-point Likert scale; 1=strongly disagree to 5=strongly agree)

Dimensions	Items	Item Loading	Measures
Philanthropy	PH1	0.60	Ensures our manufacturing unit to donate to religious organizations
	PH2	0.64	Ensures our manufacturing unit to volunteer at local charities
	PH3	0.77	Encourage suppliers in philanthropic activities
	PH4	0.60	Ensures our manufacturing unit to donate to NGO's for societal development
	PH5	0.60	Conducts health related camps for the society surrounding to our manufacturing facilities
Safety	SA1	0.98	Ensures women's safety in our own manufacturing units
	SA2	0.62	Ensures our manufacturing facilities adhere to strict safety regulations
	*SA3	**	Ensures non -usage of hazardous materials in our products
	SA4	0.65	Ensures the safe, incoming movement of product to our facilities
Equity	*EQ1	**	Ensures diversity at supplier locations
	EQ2	0.70	Ensures strict adherence of gender non-discrimination policy in customer locations
	EQ3	0.80	Ensure workplace diversity at customer locations
	EQ4	0.72	Ensures gender non-discrimination policy in our suppliers
Health & Welfare (Partners)	HW1	0.68	Periodically audit supplier's and ensure adherence of occupational health policy
	HW2	0.70	Ensures women's safety at customer locations
	HW3	0.62	Ensures availability of minimum health care facilities in supplier locations

Ethics	ET1	0.71	Established an ethical compliance team, department or division in our manufacturing facilities
	ET2	0.72	Audits the customer place for strict compliance of ethical code of conduct
	ET3	0.72	Has established a set of transparent, comprehensive and stringent ethical codes of conduct in our manufacturing units
Human Rights	HR1	0.70	Has human rights policy for our manufacturing facilities
	HR2	0.62	Audits supplier locations and ensures non employment of child and bonded labour
	HR3	0.88	Ensure non-employment of sweatshop labours in supplier locations

* Items were removed for poor loading and fit in the measurement model.