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Critical Success Factors of Sustainable Supply Chain Management and Organizational Performance: An Exploratory Study

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Abstract

Indian organisations have started adopting sustainable supply chain management (SSCM) practices but their effectiveness and maturity depends on various factors such as external pressures and organisational internal environment. The research available, as on date, on the factors affecting the adoption of SSCM practices in Indian context is inadequate. This article presents a holistic view of the critical success factors (CSFs) impacting the SSCM process as well as the performance outcome. A conceptual model has been proposed which has been empirically tested by survey data collected from 145 industry practitioners through online and offline survey. The items for the survey were developed based on the literature and inputs received from industry experts. Using structural equation modelling (SEM) technique, the study finds that organisations' internal environment is very positively associated with SSCM practices in the Indian steel sector. These findings can help the managers to create an awareness as well as favourable conditions within the organisation which facilitates the effective adoption of SSCM practices.

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Keywords: SSCM, CSFs, SEM, India steel sector

1. Introduction

Organisations are paying heightened attention to sustainable supply chain management (SSCM)[2] (Carter and Carter, 1998). SSCM is a broad concept and has received a great deal of attention from both practitioners and scholars (Esfahbodi et al., 2016, 2017; Beske et al., 2014; Ageron et al., 2012). Recent researches have examined sustainable development in supply chains, particularly

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[2]The sustainability of supply chains relies on the sustainable supply management considering the fact that even manufacturing has become more of a service in which various resources are treated as commodities. Hence, sustainability in supply chain management is crucial for the success of whole supply chain management (Ageron et al., 2012).

in terms of antecedents, practices and performance implications of sustainable supply chain management (see, *inter alia*, Zhu et al., 2013; Zailani et al., 2012; Paulraj, 2011; Krause et al., 2009). Environment is constantly evolving and implementing sustainable supply chain management (SSCM) practices becomes increasingly challenging as complexities surge in supply chain (Sarkis et al., 2011). The motivation and driving forces of SSCM have been studied in various literature (see, *inter alia*, Rehman and Shrivastava, 2011; Bacallan, 2000). The role of institutional pressures, particularly from government, market, society, customers and stakeholders, in forcing organisations to pursue SSCM practices has been one such study (Zhu et al., 2013; Sarkis et al., 2010). The SSCM practices have been linked with organisation's performance (Rao and Holt, 2005; Zhu and Sarkis, 2004).

There are debates on what actually drives the adoption of SSCM practices. An organization is either compliance driven (reactive) or self-driven (pro-active or voluntary) [see, for instance, Matten and Moon, 2008]. The external forces push to a reactive and compliance driven strategy or the organization on its own may choose to adopt a pro-active strategy and improve the competitiveness. While exploring the drivers for sustainability practice adoption, the intra-organisational factors have been highlighted, such as top leadership commitment (Luthra et al., 2015), financial resources (Rauer and Kaufmann, 2015), human resource practices (Jackson et al., 2014), etc. Henceforth, there is a need to examine whether external pressures or internal organisational environment have a causal impact on SSCM adoption, which in turn influences the sustainability performance outcome, particularly from the holistic perspective.

This may explain why SSCM implementation is more successful in some organisations than others despite both being in same industry sector. Currently, there is a dearth of studies in SSCM area which empirically examine such relationships. However, in the context of emerging countries like India, there is scarcity of this research. In India, the legislation (government regulation) has been one visible driving force for SSCM implementation. The legislation is also, so far, not all inclusive, but is fast catching up. This study intends to correlate that external pressures have moderation effect on the organisation. Ultimately, it is organisation's own vision, internal structures and systems which drive SSCM adoption through SSCM practices and their resultant influence on organisation's economic, environmental and social performance. Our research seeks to explore an integrated external pressures-internal pressures-SSCM practices-performance outcome relationship in the context of Indian steel sector.

1.1. Objectives of the Study

On the basis of above discussions, we set the following objectives:

- To study the external and internal organizational factors that impact the sustainable supply chain management implementation and the related performance outcome.
- To provide a framework to facilitate an analysis of existing interdependencies among these factors.
- To discuss the practical utility of such a framework for decision makers and practitioners in industry.

2. Identification of Critical Success Factors

Sustainable supply chain management can be defined as "management of material, information, and capital flows as well as cooperation among companies along the supply chain while taking goals of all three dimensions of sustainable development, i.e. economic, environmental and social, into account which are derived from customer and stakeholder requirements (Mariadoss et al., 2016; Grimm et al., 2014; Seuring and Mueller, 2008)." This definition emphasizes three essential things (Beske et al., 2014):

- ❖ Cooperation from all the partners in the supply chain (Sharfman et al., 2009).
- ❖ Equal consideration of all three dimensions of sustainability, i.e., what we call Triple Bottom Line (TBL) approach (Gimenez and Sierra, 2013).
- ❖ Special attention to the stakeholders of a supply chain, which have to be recognized as having legitimate requirements to the supply chain's activities (Mueller et al., 2009; Emmelhainz and Adams, 1999).

This section highlights various critical success factors (CSFs[3]) that can affect the successful implementation of SSCM practices in the organizations. The CSF theory finds widespread usage in SCM literature in general but has scarcely been implemented in a holistic manner (El Khouli et al., 2009). Some of the notable works in this domain are: CSFs for reverse logistics implementation (Luthra et al., 2017), green supply chain management (GSCM) practice in mining industry (Luthra et al., 2014), automobile industry (Luthra et al., 2015), SSCM in manufacturing sector (Dubey et al., 2015a,b,c), SSCM practices in textile sector (Diabat et al., 2014), and SSCM practices in oil and gas sector (Raut et al. 2017).

This study identifies twenty critical success factors associated with sustainable supply chain management implementation, based on literature review and inputs from industry experts (see Table 1). Factor analysis has been subsequently deployed to identify the most important critical success factors for the successful implementation of SSCM. These CSFs are then grouped into four main clusters, namely-external pressures, organisational environment, sustainable supply chain management practices and organizational sustainability performance. These CSFs, related to the successful implementation of SSCM, are summarized and presented in Table 2.

<Table 1 here>
<Table 2 here>

3. Development of Conceptual Model and Research Hypotheses

On the basis of above identified CSFs, this section tries to justify the interrelationships among external pressures, organisational internal environment, SSCM practices and organizational sustainability performance. We examine these dimensions in the following section.

3.1. External Pressures

According to Scott (2008), institutional theory suggests that external pressures motivate the firms to take strategic actions. External stakeholders who exert pressure on supply chains to be more responsible are governmental agencies, regulations, key customers/suppliers, competitors, trade associations, special interest group and media (Delmas and Toffel, 2004). These external pressures trigger firms to take sustainable approaches to supply chain strategy. There are three different types of external pressures: normative (market), mimetic (competitive) and coercive (regulatory) [DiMaggio and Powell, 1983; Sarkis et al., 2011]. Among these pressures, coercive pressure, which refers to the conformity occurring through influence exerted by those in power, is the most important factor that drives environmental initiatives among manufacturing firms (Zailani et al., 2012). From a practical perspective, government agencies, as powerful groups, can influence the actions of an organisation by enacting environmental regulations (Rivera, 2004). For a developing country like India which is in transition from agrarian economy to an industrialised society, the legislation, so far, is not all inclusive and binding, but stricter norms for environmental and social compliances are fast catching up, forcing organisations to gear up to meet challenges of sustainability. In situations where buyers are strong and supply market strength is low, an organisation can exercise coercion to serve its own interest by demanding that partners adopt its favourable operational practices (Kraljic, 1983; Liu et al., 2010).

Customer demands have provided normative pressures to firms to implement SSCM practices (Ball and Craig, 2010; Sarkis et al., 2011). There are instances where customers are willing to pay up to 20 per cent premium for socially responsible products because of their increased awareness of and concern for environmental issues (Goose, 2013). However, in India, currently, steel being in demand-supply gap scenario, the customer and market pressures are not so significant for domestic market but those dealing in exports have to remain sensitive to sustainability compliance.

[3] The theory of CSFs has its foundation within research strategy by Daniel (1961) and Rockart (1979). It is simply defined as “the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance of the organization” (Dinter, 2013; El Khouli et al., 2009; Kim and Rhee, 2012; Trkman, 2010).

The mimetic pressures to keep pace with competitors are another important driver to adopt SSCM practices (Zhu et al., 2012). In this research, we explore the impact of external pressures on organisation's working and on its SSCM practices. This study limits the scope of our research within organisation's scope and as such, customers and external supply chains have not been included in current scope of study. In light of the above, the study hypothesizes the following:

H_1: External pressures positively influence organizational internal environment.
H_2: External pressures positively influence sustainable supply chain management practices.
H_3: External pressures positively influence organizational sustainability performance.

3.2. Organisational Internal Environment

Previous studies have focussed mostly on the external pressures as drivers for implementing SSCM. However, the internal organisational environment is more likely to proactively support the adoption of SSCM (Fu et al., 2012). The intra-organisational issues, in parts, have been studied by Luthra et al. (2015) and Yang et al. (2010). An organisation's internal environment, if supportive and proactive, helps in effective implementation of SSCM practices and the consequent improved sustainability performance outcomes. A good financial condition helps the pace and extent of implementation. The role of top leadership commitment has been highlighted in several recent researches (see, *inter alia*, Faisal, 2010; Wolf, 2011; Luthra et al., 2015). The top leadership creates a vision and nurtures organisational values. These include creating governance structure for sustainability, setting policies, goals and directions, allocating funds and resources, monitoring compliances, and so forth (Hart, 1995). The success of such endeavours largely depends on how employees integrate them in their working and their involvement through training and preparedness facilitates smooth and glitch-free implementation.

Internal organisational environment is the differentiator which explains why some firms have been more successful than others in SSCM practices, though they share similar external pressures (Kumar et al., 2012). In line with above, we propose the following hypotheses:

H_4: Organizational internal environment positively influences sustainable supply chain management practices.
H_5: Organizational internal environment positively influences organizational sustainability performance.

3.3. Sustainable Supply Chain Management Practices

Sustainable supply chain management is a vibrant topic in operations and supply chain management literature, owing to various factors supporting its acceptance and favouring its adoption, such as social pressures, heightened customer expectations, corporate image, tighter government regulations, competitive pressures, scarcity of natural resources and so forth (Govindan et al., 2014). In essence, a supply chain is a set of business actions that directly involves the upstream or downstream flows of information, products and services from a point of origin to a point of consumption (Lambert et al., 1998). Unlike traditional models, a sustainable supply chain considers the environmental and social impacts on the production process as the goods flow through supply chain (Hsu et al., 2013). Existing literature offers insights into potential patterns of sustainable supply chain initiatives for improving environmental and economic performances (Rao and Holt, 2005; Zhu et al., 2012). We explore the relationship at operating level to examine the availability of sustainable procurement policy, supplier selection strategy, and defined metrics for sustainability initiatives. In view of the above, we hypothesize that:

H_6: Sustainable supply chain management practices positively influence organizational sustainability performance.

3.4. Organizational Sustainability Performance

In literature, the term performance has been used broadly with a variety of measurements and there is no consistency. Some of the previous researches (Zhu and Sarkis, 2007; Green et al., 2012; Yu and Ramanathan, 2015) explore the relationship between adoption of SSCM practices and performance outcomes, including environmental, operational and economic performance. According to them, improved environment performance, such as reduced generation of waste and decreased consumption of energy, is a potential source of competitive advantage (Hart, 1995; Porter and van der Linde, 1995a,b; Wagner et al., 2001). Reduced material wastages and energy consumption result in greater productivity and higher profit margin (Klassen and McLaughlin, 1996). Rao and Holt (2005) justify the interrelationship between operational competitiveness and economic performance from ISO 14001 certified companies. Social performance has been added in due course by Zailani et al. (2012) and Ashby et al. (2012).

The quantification of performance metrics is not standardised and uniformly reported by organisations making inter-organisation comparison difficult. Based on similar studies and availability and familiarity with such data at organisational level, we have considered in our research scope only contribution to profit and cost reduction, energy savings, resource savings (water/material), carbon foot print reduction, compliance to environmental standard (ISO 14001), and compliance to social accountability standard (SA 8000) as quantified outcomes. The third-party certifications for compliances, included in our list, help in directing the organisations to operate in a focussed and disciplined way to meet the stringent safety considerations and in the process, improve performance.

The metrics for measuring SSCM processes and related sustainable performance outcome in organisations vary and no common standards are available (see, for instance, Searcy, 2009). In our research, we have been constrained to use only the most commonly recorded SSCM practices and performance indicators. A brief summary of literature relating to these commonly recorded SSCM practices and performance indicators is shown in Table 2.

<Table2 here>

4. Conceptual Model

We believe that the organisations are motivated for adopting SSCM either due to external pressures from government, stakeholders or customers or due to internal organisational culture, vision, system and practices. In the context of Indian steel sector, the legislation so far is not all inclusive and binding, and due to demand supply gap, the customer and market pressures are somewhat muted; the organisation may take cognisance of external pressures or adopt a pro-active strategy. The organization may, thus, gain the first mover advantage, improve its competitiveness and display its commitment for economic, environmental and social concerns.

This push varies from organisation to organisation and accordingly affects extent and pace of implementation of SSCM. The organisation's sustainability performance outcome finally depends on organisation's internal structures and systems and its supply chain practices. Based on the literature review and above discussion, we propose a conceptual model to examine the factors affecting SSCM implementation and their interrelations with performance outcomes. This model consists of four pillars that can produce these interrelationships: (1) external pressures, (2) organizational internal environment, (3) SSCM practices, and (4) organization's sustainability performance outcome.

On the basis of above discussion, Figure 1 presents a conceptual model along with proposed hypotheses.

<Figure 1 here>

5. Research Methodology

The aim of this paper is to identify the critical success factors and determine their interrelationships for the implementation of sustainable supply chain management practices in the context of Indian steel industry. To achieve this objective, a comprehensive research methodology has been developed. The detailed description of steps involved in this research process are presented in Figure 2. Our research methodology covers research design, survey design, and the techniques used for data analysis, namely, factor analysis and structural equation modelling.

<Figure 2 here>

5.1. Sample Instrument

To test the research hypothesis, a survey questionnaire was developed based on extensive literature review and further refined through various stages of pre-tests and modifications based on feedback from experts and practitioners. The questionnaire for this study included 20 items reflecting four constructs, namely, external factors, organisation's internal factors, SSCM factors and performance factors. Table 2 presents the measurement items of the construct and their source.

5.2 Data Collection

The study focusses on Indian steel industry. This industry is justified for a variety of reasons. India is fast emerging to be the second largest steel producer in the world with production estimated at 104 million tonnes and there is even a rising demand of steel for infrastructure development as well as for automobiles and housing; thus making steel critical for economy. Steel consumes large raw material resources, the mining activities cause environmental degradation and social unrests and is one of the highest consumers of electricity and water (WEO, 2016; Benn et al., 2014). A key driver for implementation of SSCM is the perception of the stakeholders that steel products are as much a part of the problem in relation to environment as part of the solution. It is critical that steel industry supply chain implements SSCM solutions and thereby improves its sustainability performance. The steel plants are investing large sums in technological upgradations in order to meet the newer stricter environmental regulations and customer expectations.

A proposed questionnaire was administered to 30 practising professionals. Based on the feedbacks received, multiple refinements were made and the final questionnaire was developed. This questionnaire was developed on twenty critical success factors, which were identified on the basis of industry experts' inputs and literature survey (see, for instance, Zhu et al., 2005). The twenty (20) critical success factors which had earlier been identified based on literature survey and inputs from industry experts were incorporated in the finalised survey questionnaire which asked the respondents to give their response on a five-point Likert-type scale (1 being very low/strongly disagree and 5 being very high/strongly agree).

The selected population for this study involved professionals working in supply chain, production, marketing and human resources as well as management and finance. External suppliers and customers were excluded from this study. The questionnaires were first e-mailed/distributed to approx. 400 industry professionals selected randomly based on available industry directory as well as membership list of Indian Institute of Materials Management (IIMM), the professional body of supply chain professionals in India. Reminders were sent and follow up done on phone to expedite their responses. Understanding the difficulties of mail surveys and possibility of our target respondents to misunderstand the questionnaire items, we completed some convenience samplings through site visits and group meetings. Finally, a total of 145 responses from 12 organisations were finalized. The respondents were found to be evenly distributed from senior/middle and junior level groups and over 95% were from steel sector. Though the response rate is lower (36.25%), we proceeded ahead as such response rates are considered adequate in sustainability related studies (Carter and Jennings, 2002). Also, this is in view of higher data reliability due to their industry experience and the fact that the responses were from organizations of repute. Biases associated with different groups were checked (using t-test) and no statistical difference at 5% level of significance was found between different groups.

To identify non-response bias, the responses 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 and late respondents.

5.3 Structural Equation Modeling

In the study of subjects such as social sciences, causal models generate interest because of their ability to explain theoretical relationships among the variables. Since these models usually use concepts that are difficult to quantify (George and Kaplan, 1998), researchers associate observed variables with these hypothetical constructs, which are called latent variables (MacLean and Gray, 1998). Structural equation modeling (SEM) is a vital tool used to reveal linear relationships and effects among observed and latent variables (Koc and Ceylan, 2007; MacCallum and Austin, 2000). In other words, SEM[4] is a tool to test the aforementioned relationships, as it allows for modeling relationships among several dependent variables simultaneously, capturing their interdependencies (e Silva and Alho, 2016). We use SEM to examine the above-stated objectives, i.e., the interrelationships between the identified CSFs for successful implementation of SSCM practices in the Indian steel industry.

[4]It is a simultaneous equation system consisting of both measurement and structural components.

6. Results and Analysis

This section presents the descriptive statistics for CSFs and the results of structural equation modelling. Descriptive statistics and item-total correlation were used to initially analyse the survey data. Exploratory factor analysis, as given in Hair (2007) and Hair et al. (2010), was then used to summarize the identified CSFs of sustainable supply chain management into a new, smaller set of uncorrelated dimensions with a minimum loss of information.

6.1. Descriptive Statistics and the Correlation Matrix

The descriptive statistics of 20 CSFs and their correlation matrix are presented in Tables 3 and 4. All CSFs are sufficiently normally distributed with skewness and kurtosis coefficients within the range[5] of -2.00 and +2.00 (see Table 3). Additionally, correlation coefficients are positive and significant at 0.01 level for all CSF couplings (see Table 4).

<Table 3 here>
<Table 4 here>

6.2 Exploratory Factor Analysis

On the basis of expert interview and literature review, we observed that external variables could have an impact on both organizational internal environment and SSCM practices. Further, organizational internal environment and SSCM practices also impact organisational sustainability performance. Exploratory factor analysis was conducted for reducing dimensions of observation and to group them into related clusters. Principal component analysis with orthogonal varimax rotation was used to perform exploratory factor analysis. Tables 5 and 6 present a summary of results of this factor analysis. From the results, we find that the value of Kaiser-Meyer-Olkin (KMO) is 0.882 (see Table 5) and Bartlett's test of sphericity is significant ($p<0.001$) which indicate that sample is adequate for factor analysis (Kaiser, 1974). Items which have a loading of more than 0.5 have been retained for further study (Fornell and Larcker, 1981a,b). Seven items are measuring organisational internal environment with explaining variance of 38.93% and SSCM practices are measured by four items with variance of 8.7%. Organizational sustainability performance has been explained by six items with a variance of 7.5% and three items are measuring external pressures with variance of 6.56% (see Table 6). Results indicate that the value of cumulative percentage of variance is 61.70 which is adequately explaining variance (Hair et al., 2010).

<Table 5 here>
<Table 6 here>

6.3 Reliability and Validity Analysis

For assessment of any estimated model, reliability and validity is the criterion that has to be fulfilled. In this model, internal consistency analysis has been measured by calculating Cronbach’s Alpha values to check reliability of the observations. Results indicate that the Cronbach’s Alpha value of constructs vary between 0.733 and 0.829 (see Table 7). Hence, Cronbach’s Alpha value of each construct is more than 0.7, which indicates adequate reliability (Nunnally, 1978). Validity of the constructs was measured by convergent and discriminant validity analysis. In order to verify the convergent validity, assessment of factor loadings (>0.5) and statistical significance of construct item loadings are recommended (Falk and Miller, 1992). Additionally, the value of

[5] This validation is as per the recommendation of Field (2009).

average variance extracted (AVE) should also exceed the threshold value of 0.50 (Barclay et al., 1995). Our results (see Table 8) indicate that all the constructs are more than 0.5 and the value of composite reliability (CR) is greater than 0.7. That means all these criteria are met and exceeded with a good margin and hence support the convergent validity (Kline, 2010).

<Table 7 here>

<Table 8 here>

Discriminant validity has been evaluated by comparing the square root of latent variable AVE with latent variable correlation (Table 9). The correlation matrix shows that the square root of AVE is larger than the off-diagonal values (see Table 10), which is an indicator of discriminant validity (Kline, 2010; Hulland, 1999). So, all the constructs are reliable as well as valid for further analysis.

6.4 Structural Model Assessment

The theoretical framework illustrated in Figure 1 has six hypotheses among the variables external pressures, organizational internal environment, SSCM practices and organisational sustainability performance. The structural equation modelling, using smartPLS[6], has been deployed to validate these six hypotheses. Partial least squares (PLS) regression is advantageous, as it does not require normally distributed data, is stable against multicollinearity, and performs well under circumstances where the number of indicator variables is large in comparison with the sample size (Abdi, 2003). Being a components-based structural equations modelling technique, PLS is similar to regression, but simultaneously models the structural paths and measurement paths. Rather than assuming equal weights for all indicators of a scale, the PLS algorithm allows each indicator to vary in how much it contributes to the composite score of the latent variable. Hence, indicators with weaker relationships to related indicators and the latent construct are given lower weightings. In this sense, PLS is preferable to techniques such as regression, which assume error free measurement (see, *inter alia*, Wold, 1989; Lohmoeller, 1989).

<Table 11 here>

Measurement significance of any assessment model depends on explained variance of the dependent construct (Chin, 1998). Here, results exhibit that value of R^2 is 0.603 (see Figure 3) which means independent variables are explaining 60.3% of the dependent variable. Value of R^2 more than 0.5is adequate for model fit[7] in social science research (Hair et al., 2010). Results exhibit that five out of six path coefficients are statistically significant (see Table 11). Results also indicate that external pressures have significant positive impact on organisational internal environment (β=0.51, $p<0.001$) and sustainable supply chain management practices (β=0.281, $p<0.001$). However, external pressures have no impact on organisational sustainability performance (β=0.012, $p<0.856$). Organisational internal environment have significant positive impact on sustainable supply chain management practices (β=0.604, $p<0.001$) and organisational sustainability performance (β=0.271, $p<0.05$). Results also exhibit that sustainable supply chain management practices have significant positive impact on organisational sustainability performance (β=0.546, $p<0.001$).

In sum, five out of six hypotheses postulated were accepted. With this in mind, the overall validity of the model can be considered satisfactory. A graphic illustration of the structural model can be seen in Figure 3.

<Figure 3 here>

Overall, the implementation of SSCM practices has improved the organizational sustainability performance as defined by path model and hence provides the support for the predictive validity of SSCM practices construct.

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[6]*SmartPLS* is a software with graphical user interface for covariance-based structural equation modelling (SEM) using the partial least squares (PLS) method (Ringle, 2006).

[7]In terms of minimum sample size, the approach suggested by Cohen (1983) was applied. This implies that calculating the minimum sample size for each construct in isolation, by considering their respective squared multiple correlations (R^2) and the corresponding number of paths lead to each one of them. By selecting a desired significance level of 0.05 and a desired statistical power level of 0.8, the minimum sample size is given the largest of this set of numbers generated. In retrospect, the minimum sample size turned out to be 75, which is well accomplished with an actual sample size of 145 in this case.

7. Managerial Implications

Sustainability is a new thought process for Indian corporates and many of the Indian experiences are the same as found in studies from China and Iran by Zhu and Sarkis (2007). It is a fact that organisations started SSCM adoption more due to external threat from market, customers and regulation. The study confirms that, external forces exert significant impact on organisation's structure and systems. However, their impact on SSCM practices is not so significant and they do not influence performance outcome of the organisation. We had consciously kept customers and suppliers out of the study purview to make it more organisation-centric. They do play a very important role in supply chain network and need to be included in future research. Domestic steel customers, being in demand supply gap scenario, may not be insisting for sustainability considerations today; but the way market is moving, organisations need to prepare themselves for the days ahead when such demands would be more vocal. In similar such positioning, Mitra and Datta (2014) also opine that globalisation would create a market pressure to adopt SSCM practices. The suppliers also need to be brought under collaborative working for SSCM implementation. While supplier selection strategy had been included as a critical success factor in our study, the implementation challenges vary among the public sector units than the private sector ones where the latter has much flexibility in their decision making.

Realising the benefits expected in due course as well as the impending fear of stricter legislation, the organisations proactively took upon themselves to integrate sustainability considerations in their decision making. Results of data analysis showed that organization's structures and systems have greater impact than external pressures, on SSCM practices which in turn were very positively related to organizational sustainability performance outcomes. This can be the motivating factor for Indian supply chain managers for adopting SSCM.

Our study brings its unique contribution due to the fact that almost all studies so far in India have excluded social sustainability from their model and they were mainly in the context of green supply chain management. Even though quantification of social sustainability and common measure was proving to be difficult, we included it in the form of compliance to SA8000 to begin with. Their impact, however, is low. The various third party certifications (ISO 14001, ISO 18001 and SA8000) are proving to be a helping hand in SSCM implementation with organisational working oriented specifically on sustainability compliances. The top leadership commitment, as with previous studies, has emerged as a significant driving force for the effective implementation of SSCM practices. The issue of employee preparedness and training, though pointed by experts as important enabler, is found to have lower contribution leading us to summarise that once leadership is committed, employees fall in line themselves and work for the success of SSCM implementation. As the model depicts, SSCM practice initiatives lead to focussed action in decreasing energy and material cost and thus, contributing to cost reduction and profitability for the organisation. SSCM justifies the statement that "it pays to be green".

8. Contributions, Limitations and Scope of Future Research

This study examined the critical success factors of sustainable supply chain management and their interrelationships with organizational sustainability performance in the Indian steel sector. The results from the study support a sizable number of causal linkages among these four constructs. The results were in line with expectations to a large extent, where five out of six hypotheses were confirmed. The causal linkages that were supported were: H_1 (external pressures→ organizational internal environment), H_2 (external pressures→ organizational sustainability performance), H_4 (organizational internal environment→ sustainable supply chain management practices), H_5 (organizational internal environment→ organizational sustainability performance), and H_6 (sustainable supply chain management practices→ organizational sustainability performance). One can postulate the reasons for the acceptance of these hypotheses, but the most plausible ones are as follows.

- Organisational factors emerge at a higher order of significance compared to external pressures. The study findings clearly indicate that it is the organisational internal factors which greatly affect sustainable supply chain practices and consequently leads to higher levels of sustainability performances. Internal organizational factors are thus the differentiators which explain why some firms are more successful than others in implementing SSCM, even though they share similar external pressures (see, *inter alia*, Kumar et al., 2012.)
- Organisations need to have a documented sustainable procurement policy and working guidelines. Success lies in identifying what specific initiatives to take and how to measure them. Such initiatives currently relate to green procurement, carbon footprint reduction, energy savings, resource savings, social and affirmative action initiatives and finally contribution to profit and cost savings. These activities can only be taken, if suppliers are also selected based on their commitment to sustainability.
- The metrics for measuring SSCM processes and related sustainability related performance outcome in organisations vary and no common standards are available; thus inter-organisational comparisons are difficult. This has also been found in other studies like Searcy et al. (2009). All organizations have not yet adopted GRI reporting and we had been constrained to use only the most commonly recorded SSCM practices and performance indicators.

So far as limitation is concerned, the twenty critical success factors, as included in our study, may not fully represent all aspects of SSCM implementation. The justifiable inclusion of additional factors can contribute to future scope of research. Further, many of the critical factors, such as customers, suppliers, top leadership, sustainable procurement initiatives, etc., can be developed and taken as independent constructs, leading to detailed analysis and deliberations. Inter-organisational and sector-wise comparison are also expected to uncover new dimensions and are worth exploring.

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Table 1. Summary of Literature Review

Study	Country/Sector	Subject	Method	Major Findings
Raut et al. (2017)	India/ Oil and Gas	Identifying and prioritizing SSCM Practices	ISM	32 CSFs identified and environmental factors are the key drivers
Luthra et al. (2017)	India/ Automobile	CSFs for green supply chain management	SEM	competitiveness is the most CSFs
Mani et al. (2016)	India/ Manufacturing	Social Sustainability in Supply Chain	EFA, CFA	Validation of six distinguishable dimensions and measures of social sustainability
Esfahbodi et al. (2016)	China and Iran/ . Manufacturing	SSCM Practices and their impacts on performance implications within emerging economies	CFA, RA	Positive impact of SSCM on environmental performance. Linkage to cost performance differs in the two countries
Luthra et al. (2016)	India/ Automobile	Impact of CSFs for GSCM Implementation	CFA, RA	Regulatory CSFs most important. Customer-oriented factors are poor
Mariadoss et al. (2016)	USA/ Mfg. and Service	Influences of firm orientations on SSCM	SEM	Top Mgmt. leadership as significant driver. Cultural & societal orientations work together to positively affect sustainable purchasing practices
Esfahbodi et al. (2017)	UK/ Manufacturing	Governance Pressure & Performance Outcome of SSCM	CFA, SEM	SSCM practices lead to improved environmental performance. Coercive pressures directly impact all of SSCM practices. Impact of SSCM implementation on economic performance less clear cut
Kuei et al. (2013)	China/ Manufacturing	Determinants & Performance Improvements of GSCM	PLS-SEM	Identified the determinants of green practices and their nature of association with green practice adoption

Note 1: RA is regression analysis, CFA is confirmatory factor analysis, EFA is exploratory factor analysis, ISM is interpretative structural modelling; PLS is partial least squares, and SEM is structural equation modelling.

Note 2: CSFs is critical success factors, SSCM is sustainable supply chain management, and GSCM is green supply chain management.

Table 2. Identified CSFs from Literature Review

Dimensions	CSFs	References
External	Government Pressure	Walker and Jones (2012)
	Market and Social Pressure	Expert Opinion
	Consumer Concern	Faisal (2010)
Organization	Top Leadership Commitment and Support	Faisal (2010), Luthra et al. (2015)
	Organization Culture for Proactive Adoption of SSCM	Luthra et al. (2015)
	Organization Financial Health	Mohanty and Deshmukh (1997)
	Employee Training and Preparation	Expert Opinion
	Safety and Health Focus (OHSAS: 18001)	Diabat et al. (2014), Expert Opinion Dubey et al. (2015a)
	Investment in Technology and Resources	Luthra et al. (2015), Mudgal et al. (2009)
	Governance Structure for Sustainability	Expert Opinion
SSCM	Sustainable Procurement Policy	Expert Opinion
	Supplier Selection Strategy	Luthra et al. (2015), Grimm et al. (2014)
	Well-defined Metrics for Sustainability Tracking	Luthra et al. (2015), Rao and Holt (2005)
	Identified SP Initiatives (Green Purchasing, Reverse Logistics)	Dubey et al. (2015c)
Performance	Contribution to Profit and Resource	Zhu et al. (2012)
	Energy Savings	Dubey et al. (2015a)
	Resource Savings (Water/Materials)	Dubey et al. (2015b)
	Compliance to Social Accountability etc.	Dubey et al. (2015c)
	Carbon Footprint Reduction	Expert Opinion
	Compliance to Environment Standard	Diabat et al. (2014)

***Note*:** CSFs is critical success factors, SSCM is sustainable supply chain management, and OHSAS is occupational health and safety assessment series.

Table 3: Summary Statistics of Critical Success Factors

CSFs	N	Min	Max	Mea	SD	Ske	Kur	JB
E1	145	1.00	5.00	3.386	0.987	0.037	-0.493	4.64***
E2	145	1.00	5.00	3.800	0.894	-0.184	-0.551	4.79***
E3	145	1.00	5.00	3.738	0.905	-0.252	-0.447	8.60*
O1	145	2.00	5.00	4.366	0.695	-0.763	-0.095	13.9*
O2	145	1.00	5.00	4.124	0.781	-0.754	0.896	17.6*
O3	145	1.00	5.00	3.862	0.847	-0.358	-0.118	5.19**
O4	145	1.00	5.00	3.944	0.848	-0.587	0.225	8.34*
O5	145	1.00	5.00	4.421	0.822	-1.605	3.024	111.0*
O6	145	1.00	5.00	3.959	0.934	-0.797	0.368	15.6*
O7	145	1.00	5.00	4.248	0.804	-0.888	0.683	20.9*
PS1	145	2.00	5.00	4.221	0.672	-0.431	-0.178	4.68***
PS2	145	1.00	5.00	4.228	0.743	-1.073	1.964	45.1*
PS3	145	2.00	5.00	4.186	0.736	-0.521	-0.284	7.03**
PS4	145	1.00	5.00	3.952	1.089	-0.722	-0.161	12.6*
PS5	145	2.00	5.00	4.021	0.777	-0.396	-0.343	5.33***
PS6	145	3.00	5.00	4.441	0.706	-0.870	-0.515	4.56***
S1	145	1.00	5.00	4.138	0.769	-1.262	3.202	93.9*
S2	145	1.00	5.00	4.028	0.833	-0.710	0.517	13.2*
S3	145	2.00	5.00	4.248	0.693	-0.756	0.818	16.9*
S4	145	2.00	5.00	4.034	0.777	-0.331	-0.566	4.68***

***Note 1*:** CSFs is critical success factors, E1 is government pressure, E2 is market and social pressure, E3 is consumer concern, O1 is top leadership commitment and support, O2 is proactive adoption of sustainable supply chain management, O3 is organization financial health, O4 is employee training and preparedness, O5 is safety and health focus, O6 is investment in technology and resources, O7 is governance structure for sustainability, S1 is sustainable procurement policy, S2 is supplier selection strategy, S3 is well defined metrics for sustainability tracking, S4 identified strategic procurement initiative, PS1 is contribution to profit and resources, PS2 is energy savings, PS3 is contribution to resource savings (water), PS4 is compliance to social accountability, PS5 is carbon foot print reduction, and PS6 is compliance to environment standard.

***Note 2*:** N is sample size, Min is minimum, Max is maximum, Mea is mean, SD is standard deviation, Ske is skewness, Kur is kurtosis, and JB is Jarque Bera statistics.

***Note 3*:** *, **, and *** indicate that estimates are statistically significant at the 1%, 5%, and 10% levels, respectively.

Table 4: Correlation Matrix

CSF	**E1**	**E2**	**E3**	**O1**	**O2**	**O3**	**O4**	**O5**	**O6**	**O7**	**S1**	**S2**	**S3**	**S4**	**PS1**	**PS2**	**PS3**	**PS4**	**PS6**	**PS7**
E1	1.00	0.41	0.46	0.07	0.14	0.04	0.19	0.05	0.18	0.11	0.21	0.22	0.17	0.26	0.12	0.24	0.15	0.19	0.24	0.15
E2		1.00	0.56	0.36	0.41	0.30	0.40	0.17	0.47	0.40	0.49	0.42	0.32	0.35	0.31	0.27	0.33	0.35	0.36	0.28
E3			1.00	0.30	0.40	0.25	0.39	0.06	0.43	0.28	0.41	0.50	0.38	0.32	0.31	0.28	0.38	0.14	0.35	0.18
O1				1.00	0.57	0.37	0.36	0.34	0.61	0.64	0.46	0.58	0.36	0.31	0.41	0.40	0.50	0.37	0.45	0.38
O2					1.00	0.39	0.31	0.15	0.58	0.60	0.63	0.58	0.33	0.36	0.49	0.37	0.38	0.28	0.43	0.27
O3						1.00	0.45	0.20	0.50	0.43	0.37	0.32	0.34	0.44	0.38	0.33	0.38	0.11	0.39	0.15
O4							1.00	0.20	0.51	0.38	0.30	0.32	0.37	0.36	0.34	0.39	0.38	0.23	0.42	0.19
O5								1.00	0.28	0.23	0.18	0.21	0.22	0.28	0.17	0.30	0.35	0.44	0.25	0.62
O6									1.00	0.48	0.57	0.52	0.39	0.47	0.45	0.50	0.55	0.29	0.55	0.29
O7										1.00	0.45	0.53	0.33	0.28	0.37	0.31	0.32	0.38	0.34	0.28
S1											1.00	0.49	0.42	0.35	0.49	0.38	0.47	0.31	0.38	0.37
S2												1.00	0.53	0.32	0.40	0.42	0.43	0.25	0.43	0.31
S3													1.00	0.40	0.52	0.44	0.51	0.14	0.47	0.40
S4														1.00	0.44	0.50	0.64	0.11	0.59	0.28
PS1															1.00	0.46	0.48	0.16	0.47	0.38
PS2																1.00	0.67	0.19	0.68	0.28
PS3																	1.00	0.20	0.59	0.48
PS4																		1.00	0.12	0.54
PS5																			1.00	0.31
PS6																				1.00

***Note 1*:** CSFs is critical success factors, E1 is government pressure, E2 is market and social pressure, E3 is consumer concern, O1 is top leadership commitment and support, O2 is proactive adoption of sustainable supply chain management, O3 is organization financial health, O4 is employee training and preparedness, O5 is safety and health focus, O6 is investment in technology and resources, O7 is governance structure for sustainability, S1 is sustainable procurement policy, S2 is supplier selection strategy, S3 is well defined metrics for sustainability tracking, S4 identified strategic procurement initiative, PS1 is contribution to profit and resources, PS2 is energy savings, PS3 is contribution to resource savings (water), PS4 is compliance to social accountability, PS5 is carbon foot print reduction, and PS6 is compliance to environment standard.

***Note 2*:** All the coefficients are statistically significant at 1% probability level of significance.

Table 5. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.882
Bartlett's Test of Sphericity	Approx. Chi-Square	1528.6*
	DF	144
	Significance level	0.000

Note: DF is degrees of freedom; and * is statistically significant at 1% probability level.

Table 6. Pattern Matrix with Component Loadings

Principal Components	**1**	**2**	**3**	**4**
E1				0.837
E2				0.658
E3				0.721
O1	0.709			
O2	0.802			
O3	0.550			
O4	0.410			
O5	0.772			
O6	0.652			
O7	0.810			
S1		0.608		
S2		0.626		
S3		0.575		
S4		0.791		
PS1			0.510	
PS2			0.705	
PS3			0.791	
PS4			0.745	
PS5			0.718	
PS6			0.808	

Note 1**:** E1 is government pressure, E2 is market and social pressure, E3 is consumer concern, O1 is top leadership commitment and support, O2 is proactive adoption of sustainable supply chain management, O3 is organization financial health, O4 is employee training and preparedness, O5 is safety and health focus, O6 is investment in technology and resources, O7 is governance structure for sustainability, S1 is sustainable procurement policy, S2 is supplier selection strategy, S3 is well defined metrics for sustainability tracking, S4 identified strategic procurement initiative, PS1 is contribution to profit and resources, PS2 is energy savings, PS3 is contribution to resource savings (water), PS4 is compliance to social accountability, PS5 is carbon foot print reduction, and PS6 is compliance to environment standard.

Note 2**:** All the factor loadings are statistically significant at 1% probability level of significance.

Note 3**:** Extraction method is principal axis factoring, Rotation method is equamax with Kaiser normalization, and rotation coverage is 20 iterations.

Table 7: Measurement Model Specification

Codes	Attributes	FL	CA	AVE	CR
E1	Governments Pressure	0.664	0.733	0.843	0.645
E2	Market & social Pressure	0.864			
E3	Consumer Concern	0.864			
O1	Top Leadership commitment & support	0.802	0.829	0.874	0.506
O2	Organization Culture for pro-active adoption of SSCM	0.766			
O3	Organization financial health	0.666			
O4	Employee training and preparation	0.646			
O5	Safety & Health Focus OHSAS 18001	0.416			
O6	Investment of Technical & Resources	0.829			
O7	Governance Structure for sustainability	0.770			
PS1	Contribute to Profit & Resource	0.693	0.742	0.838	0.565
PS2	Energy Savings	0.804			
PS3	Contribute to Resource Savings (Water)	0.846			
PS4	Compliance to social accountability etc.	0.440			
PS5	Carbon foot print reduction	0.791			
PS6	Compliance to environment standard	0.629			
S1	Sustainability Procurement Policy	0.766	0.798	0.857	0.509
S2	Supplier selection strategy	0.787			
S3	Well define practice for sustainability tracking	0.771			
S4	Identified SP Initiative	0.678			

Note 1**:** E1 is government pressure, E2 is market and social pressure, E3 is consumer concern, O1 is top leadership commitment and support, O2 is proactive adoption of sustainable supply chain management, O3 is organization financial health, O4 is employee training and preparedness, O5 is safety and health focus, O6 is investment in technology and resources, O7 is governance structure for sustainability, S1 is sustainable procurement policy, S2 is supplier selection strategy, S3 is well defined metrics for sustainability tracking, S4 identified strategic procurement initiative, PS1 is contribution to profit and resources, PS2 is energy savings, PS3 is contribution to resource savings (water), PS4 is compliance to social accountability, PS5 is carbon foot print reduction, and PS6 is compliance to environment standard.

Note 2**:** FL is factor loadings, CA is Cronbach's alpha, AVE is average variance extracted, and CR is composite reliability.

Note 3**:** All the outputs are statistically significant at 1% probability level of significance.

Table 8. Reliability Statistics: Cronbach's Alpha Test

Component	CA	rho-A	CR	AVE
L1	0.733	0.796	0.843	0.645
L2	0.829	0.856	0.874	0.506
L3	0.742	0.744	0.838	0.565
L4	0.798	0.825	0.857	0.509

Note 1: CA is Cronbach Alpha, CR is composite reliability, AVE is average variance extracted; and L1-L4 are latent variables.

Note 2**:** All the outputs are statistically significant at 1% probability level of significance.

Table 9: Correlation Matrix of Constructs

	EF	**OSS**	**SSCMP**	**OSS**
EF	1.00			
OSS	0.45*	1.00		
SSCMP	0.56*	0.71*	1.00	
OSS	0.46*	0.68*	0.71*	1.00

Note 1: EF is external factor, OSS is organizational structure and system, SSCMP is sustainable supply chain management practices, and PF is performance factor.

Note 2**:** * indicates the linkage is statistically significant at 1% probability level of significance.

Table 10: Results of Discriminate Validity

	EF	OSS	SSCMP	OSS
EF	0.645			
OSS	0.200*	0.506		
SSCMP	0.310*	0.504*	0.565	
OSS	0.210*	0.470*	0.504*	0.509

Note 1: Diagonal elements in the correlation matrix of constructs are the AVE values and off diagonal are the squared inter-construct correlations. For discriminate validity to be present the diagonal elements should be greater than the off diagonal.

Note 1: AVE is average variance extracted, EF is external factor, OSS is organizational structure and system, SSCMP is sustainable supply chain management practices, and PF is performance factor.

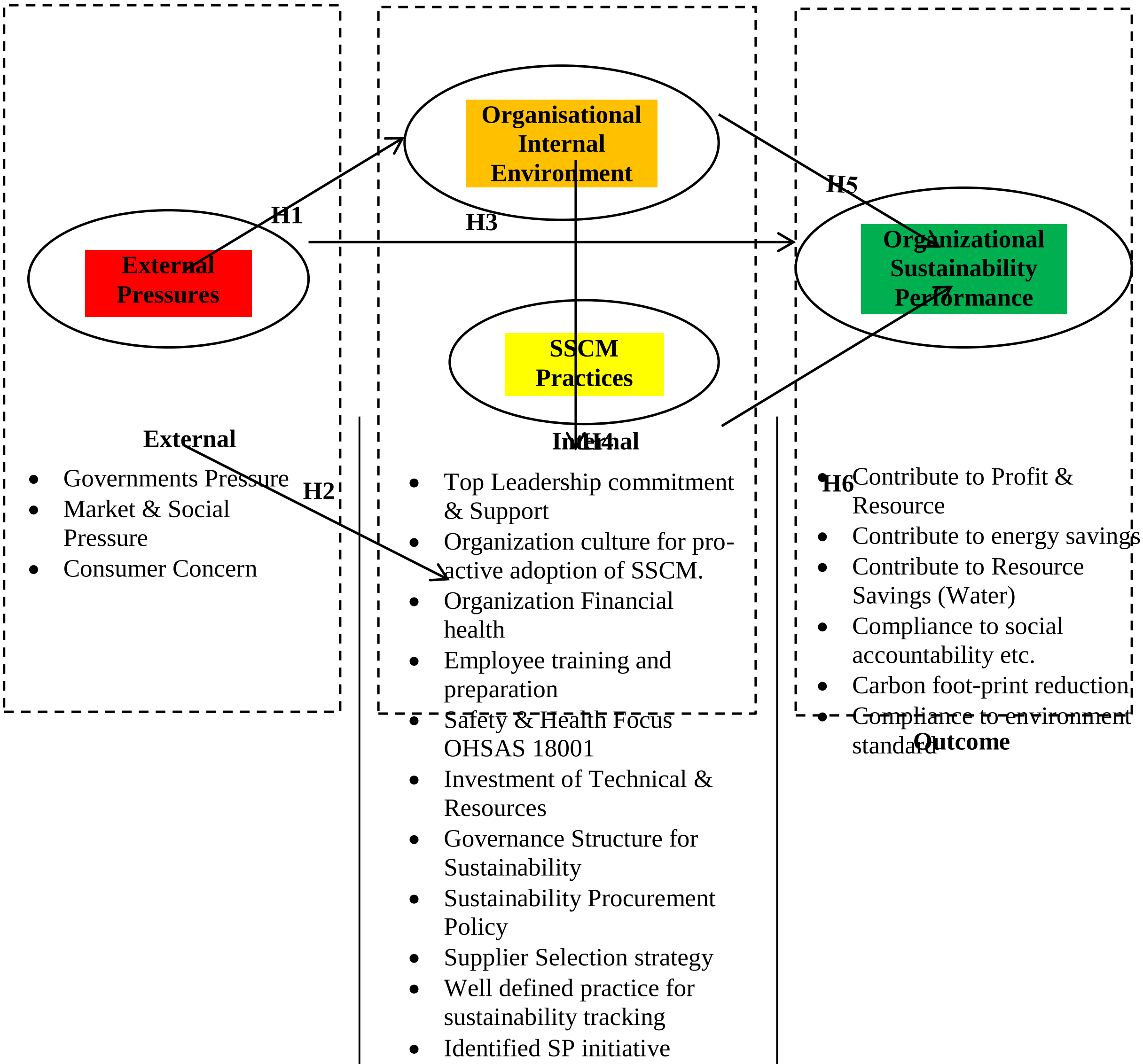
***Note 2*:** * indicates the linkage is statistically significant at 1% probability level of significance.

Table 11: Path Coefficients of SEM

Path	Loadings	t-statistics	P-values
EF => OSS	0.510	9.206*	0.000
EF => SSCMP	0.281	5.515*	0.000
EF => PF	0.012	0.181	0.856
OSS => SSCMP	0.604	13.87*	0.000
OSS => PF	0.271	2.808*	0.005
SSCMP => PF	0.546	5.092*	0.000

Note 1: SEM is structural equation modelling, EF is external factor, OSS is organizational structure and system, SSCMP is sustainable supply chain management practices, and PF is performance factor.

***Note 2*:** * indicates the linkage is statistically significant at 1% probability level of significance.

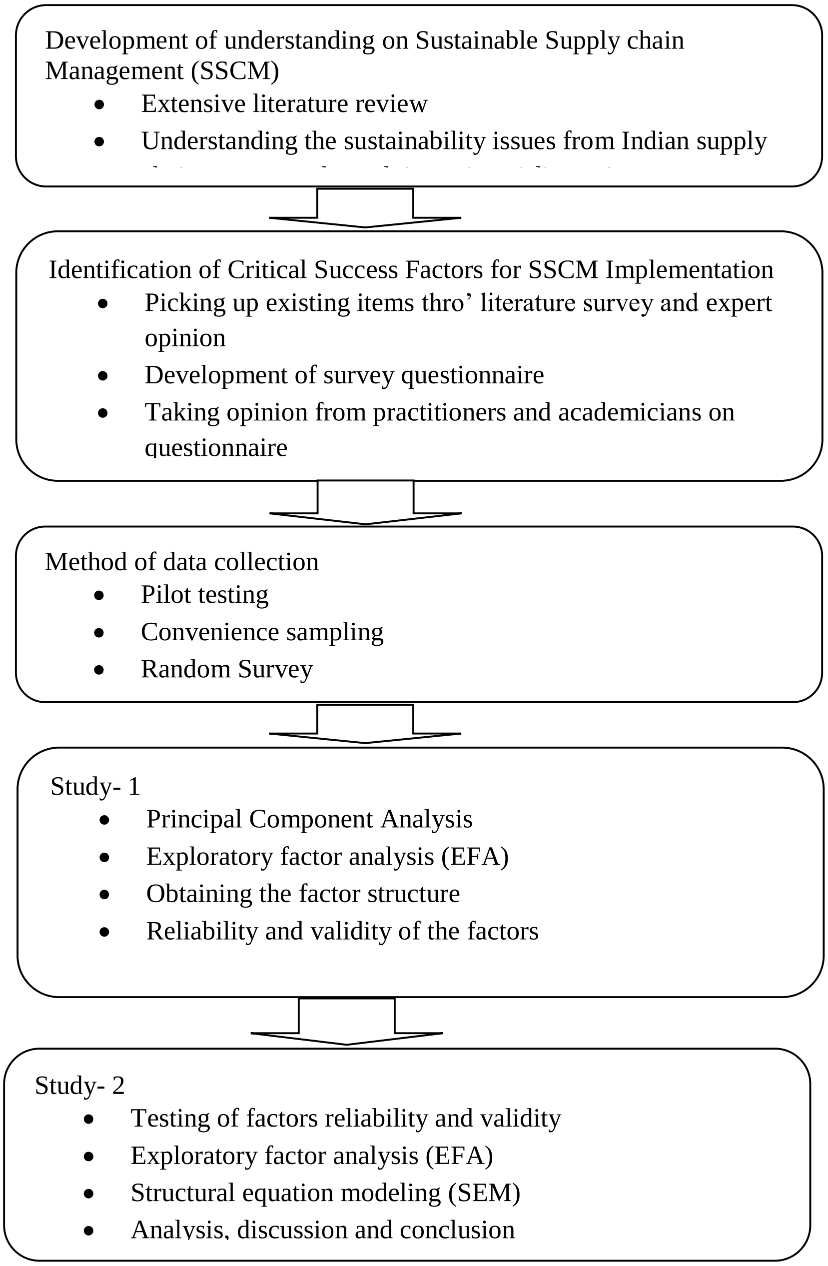


Note 1: SSCM is sustainable supply chain management.

Note 2:

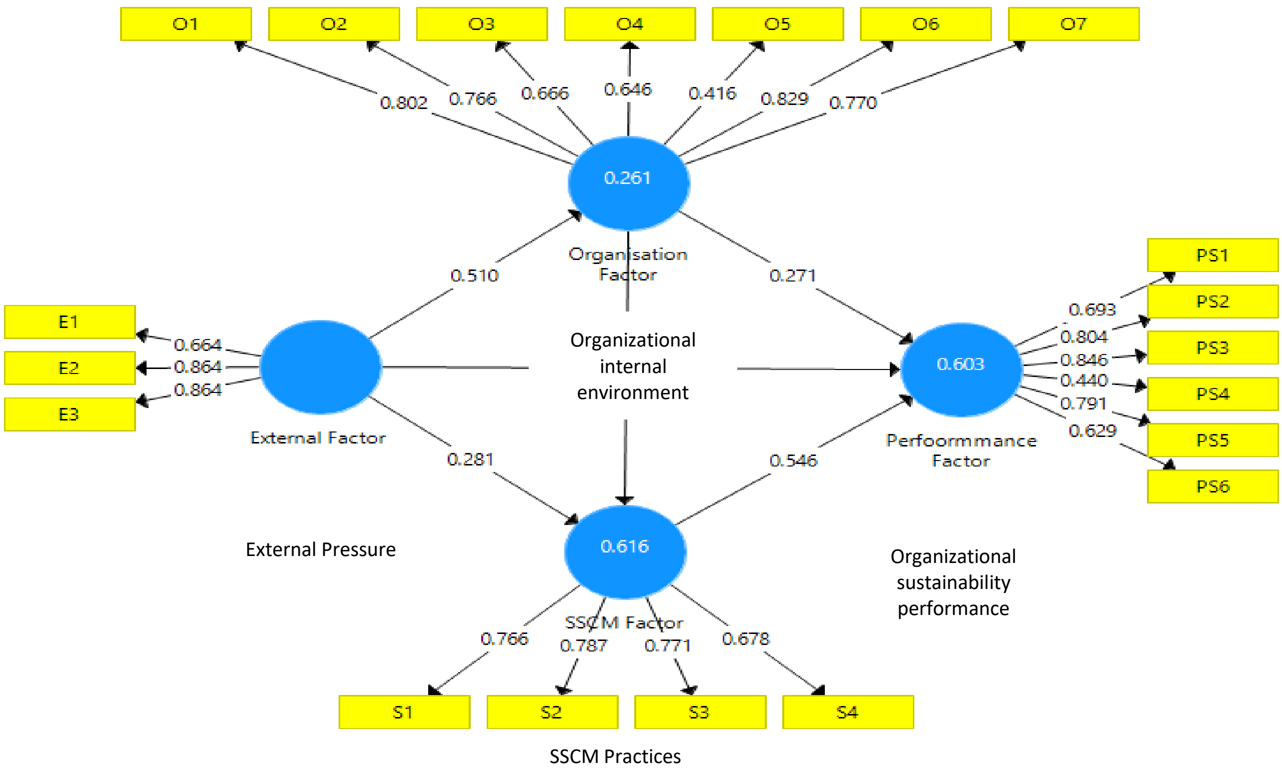
H_1: External pressures influence organizational internal environment.
H_2: External pressures influence SSCM practices.
H_3: External pressures influence organizational sustainability performance.
H_4: Organizational internal environment influences SSCM practices.
H_5: Organizational internal environment influences organizational sustainability performance.
H_6: SSCM practices influence organizational sustainability performance.

Figure 1: Proposed Research Model and Hypotheses



Note: Adapted with modification from Mani et al. (2016)

Figure 2: Steps Involved in the Research Process



***Note 1*:** E1 is government pressure, E2 is market and social pressure, E3 is consumer concern, O1 is top leadership commitment and support, O2 is proactive adoption of sustainable supply chain management, O3 is organization financial health, O4 is employee training and preparedness, O5 is safety and health focus, O6 is investment of technical and resources, O7 is governance structure for sustainability, S1 is sustainable procurement policy, S2 is supplier selection strategy, S3 is well defined metrics for sustainability tracking, S4 identified strategic procurement initiative, PS1 is contribution to profit and resources, PS2 is energy savings, PS3 is contribution to resource savings (water), PS4 is compliance to social accountability, PS5 is carbon foot print reduction, and PS6 is compliance environment standard.

***Note 2*:** All the outputs are statistically significant at 1% probability level of significance.

Figure 3: Structural Model with Path Coefficients and Construct Variance Explained