

# Investigating the Influence of Organizational Factors on Supply Chain Awareness

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## ABSTRACT

Organizations have improved customer service and witnessed a reduction in their overall costs of operations by implementing supply chain (SC) practices. But many research studies reveal that only the large size companies due to their size and financial ability to invest in innovative practices have been able to visualize these benefits of SCM and many medium size manufacturing companies (MSMCs) have not yet been able to fully reap the positive outcomes of SCM. Organizational factors like size, experience, capital investment and product variety influence this degree of SC awareness and adoption. Studies related to this aspect of SCM are found to be less focused on MSMCs. This paper therefore studies empirically the influence of these organizational factors the degree of SC awareness, identifies the SC practices and analyzes whether degree of SC awareness has any influence on the degree of adoption of SC practices in MSMCs. The results of this study provide value to the SC practitioners and researchers.

**Keywords:** *supply chain strategies and practices, supply chain awareness, degree of adoption, medium sized manufacturing companies, information sharing*

## 1. INTRODUCTION

Supply Chain Management (SCM) has become an important strategy in the recent past for business organizations in achieving competitive advantage (Gorane and Ravikant, 2016; Wisner *et al.*, 2016; Coyle *et al.*, 2017; Kwak *et al.*, 2018). Defined as management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at a lesser cost to the chain as a whole (Ellram and Cooper, 1990; Salam *et al.*, 2016), implementation of SCM practices is found to decrease costs and improve profits in business organizations (Al-Shboul *et al.*, 2017).

SCM is found to influence the initiatives related to sustainability and scalability in many large size organizations, both in manufacturing and service sector and enable organizations to enhance their competitive advantage (Quayle, 2003; Martin and Matthias, 2011; Kwak *et al.*, 2018; Hariharan *et al.*, 2019). At the same time, several authors opined that SCM can also play a similar role in medium size manufacturing companies (MSMCs) by plugging many gaps related to communication among the members of the chain, resulting in a decrease of overall costs (James and Ashraful, 1997; Al-Shboul *et al.*, 2017), enabling an innovation culture (Didonet and Diaz, 2012) and

providing competitive advantage (Alhourani and Saxena, 2014; Thoo *et al.*, 2017; Kwak *et al.* 2018).

But, inspite of its benefits, studies reveal that the practices of SCM are mostly limited to mainly the large scale manufacturing and service sector companies (Paul and Jeong, 2006; Kot *et al.*, 2018). Its implementation in MSMCs is not as similar to the one in large scale companies (Stonkute, 2015; Ramakrishna, 2016; Kot *et al.*, 2018). MSMCs face challenges and issues such as lack of complete awareness, lack of interest and expertise, confusion over which practices of SCM have to be implemented, scarcity of funds, lack of innovation and myths about benefits of implementation of SCM (Rajesh *et al.*, 2008; Stonkute, 2015; Kot *et al.*, 2018). They focus more on mere survival of their businesses rather on understanding and implementing concepts like SCM for long-term survival and sustainability (Thoo *et al.*, 2017; Usman and Koseoglu, 2019).

It is found that implementation of SCM depends on an important organizational factor like Supply Chain Awareness (SCA). This awareness, in turn is significantly influenced by the size of the organization (Youqin *et al.*, 2013; Juliana *et al.*, 2013; Mishra, 2019), capital investment, length of existence of the company (experience), and product variety (Afande *et al.*, 2015; Huddiniah and ER, 2019). Moreover, the degree of SCA is found to differ across diverse industry sectors of MSMCs (Kwan, 1999; Ulusoy, 2003; Jharkharia and Shankar, 2006; Gorane and Ravikant, 2016).

In order to analyze the adoption of SCM in MSMCs, it is essential to understand the degree of SCA and various organizational factors influencing its implementation (Youqin *et al.*, 2013) and this awareness is crucial as it enables the managers to understand the significance of SCM in achieving competitive advantage through innovative strategies (Kwak *et al.* 2018; Mishra, 2019). Increased degree of SCA influences top management's commitment towards SCM (Larry and Richard, 1996; Pagell and Krause, 2004; Hariharan *et al.*, 2019) and improves its willingness and interest to implement SCM by investing money through the allocation of an exclusive budget for various initiatives related to SCM (Higginson and Alam, 1997).

Studies related to SCA and its influence on degree of adoption of SC practices and strategies in MSMCs are found to be very limited, inspite of many studies related to SCM in MSMCs (Arend and Wisner, 2005; Valand and Heides, 2007; Thoo *et al.*, 2017). Moreover, number of empirical studies related to SCA and its influence on adoption of SCM practices are limited (Niranjan, 2012). Influence of

organizational factors like size, experience, capital investment and product variety on the degree of SC awareness have not been studied in MSMCs in detail. Therefore, considering this research gap, the present research identifies the influence of organizational factors on the degree of SCA and in turn studies the influence of this SCA on the degree of adoption of supply chain practices in MSMCs. The organizational factors considered for this purpose are size, experience, capital investment and product variety, based on a systematic literature review. Also, the later part of the paper focuses on identifying the SC practices in MSMCs and the influence of degree of SC awareness on the adoption of SC practices, a necessity also identified by Gorane and Ravikant (2016).

The study attempts to answer the following three research questions based on the above discussion.

- **RQ1.** Does the degree of SCA differs across different industry sectors of MSMCs?
- **RQ2.** Do organizational factors like size of the organization (in terms of number of employees), capital investment, length of existence of company (in terms of number of years since its establishment) and product variety of MSMCs influence the degree of SCA?
- **RQ3.** Does the degree of SCA influence the degree of adoption of SCM practices in MSMCs?

These research questions are addressed by validating six relevant hypotheses developed based on a literature review.

This paper aims to provide new insights to the supply chain managers of MSMCs through an analysis of results obtained through an empirical survey conducted in four leading MSMC industry sectors such as engineering, electrical and electronics, chemical and pharmaceutical sector. The Directory of Industries of an authorized local industries' body in India has been used for this purpose.

The next section of the paper presents a systematic literature review conducted to identify the organizational factors and their influence on the degree of SCA. Based on this literature review, a research framework with six research hypotheses is developed. At the end, the results are discussed to arrive at the conclusions and implications for future research.

## 2. THEORETICAL BACKGROUND AND HYPOTHESES

A review of literature reveals that there are many definitions of SCM (Stock and Boyer, 2009). Due to its wide and diverse nature, the researchers have not been able to arrive at a consensus (Mentzer, 2001; Burgess *et al.*, 2006) on a single definition of it. This ambiguity may influence its adoption in MSMCs too (Thoo *et al.*, 2017).

Ellram and Cooper (1990), defined SCM as a management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at a lesser cost to the chain as a whole. Council of Supply Chain Management Professional (CSCMP, 2019) defines SCM as a process which encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers,

intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.

The definition of SCM took different forms based on different theories related to other disciplines of management. For instance, definitions of SCM originated from the popular theory of Resource-Based View (RBV) were mostly focused on assets and resources of organizations with special reference to manufacturing sector. Therefore, this view is considered for literature review of the present study. Halldorsson *et al.*, (2007) is of the view that there is no such thing as "unified theory of SCM". Different situations of managers and organizations lead to the selection of a convenient definition of SCM and then it is complemented with one or several of the other theoretical perspectives.

The resources of SCM using RBV approach are found to contribute to the overall efficiency of organization (Lewis, 2000; Pandza *et al.*, 2003; Rungtusanatham *et al.*, 2003; Yang *et al.*, 2019). These resources are related to different functional areas of the organization (Grant, 1991; Prahalad and Hamel, 1990). An organization's supply chain is influenced by its core competencies achieved through these resources and thus it secures the competitive advantage. Based on the changes in the business environment, these resources enable the organizations to enhance their competencies by quickly reacting to these changes (Prahalad and Hamel, 1990; Halldorsoon *et al.*, 2007; Yang *et al.*, 2019)

Most of the practices of SCM were dealt from the perspective of large size manufacturing companies and not by focusing on MSMCs specifically (Valand and Heides, 2007; Thoo *et al.*, 2017). This paper fills this gap in the body of knowledge and identifies SCM practices which are adopted and implemented by specifically by MSMCs.

SCM is found to play a very vital role in sustainability and scalability of MSMCs and it has the potential to improve their competitive advantage (Quayle, 2003; Martin and Matthias, 2011; Kwak *et al.*, 2018). Importance of SCM in MSMCs can also be attributed to several factors like opportunities provided by globalization, vertical integration of firm's activities, minimization of international trade barriers, availability of abundant information due to the tremendous growth of information systems and technology, and growing awareness towards environmental protection (Bala, 2007). Sharing of information is needed in this increased global network of organizations with mutual trust as the main focal area in business (Ahlstedt and Hameri, 2004).

Therefore, effective adoption and implementation of SCM can resolve many issues in MSMCs related to communication and it has the ability to decrease overall costs (Rouhollah and Shivraj, 2011; Al-Shboul *et al.*, 2017). Aspects such as, supplier relationship management, development of high-quality products and services, sharing of information across the SC entities are found to be adopted by some of the MSMCs (Higginson and Alam, 1997; Gorane and Ravikant, 2016) and SC strategy, SC integration, inventory management and information technology are found to be the four major pillars of SCM in some other MSMCs (Sahay and Mohan, 2003; Li *et al.*, 2017).

However, many authors opined that the degree of adoption of SCM in MSMCs is at a minimum level as these

companies encounter challenges in its implementation (Stonkute, 2015; Usman and Koseoglu, 2019). Some of these are inappropriate clarity, lack of top management support and commitment (Hariharan *et al.*, 2019), a traditional and conservative approach by focusing only on localized benefits, outdated technology, lack of expert supply chain manpower, scarcity of financial resources, and inadequate support of government (Pagell and Krause, 2004; Thakkar *et al.*, 2009; Juliana, 2013; Kot *et al.*, 2018). Also, MSMCs are found to be at disadvantageous side as they can't adapt quickly to the dynamic nature of globalization due their limited capacity to bargain with the members of the chain (Defee, 2006; Usman and Koseoglu, 2019).

Another important reason for low levels of SC implementation in MSMCs may be that many authors focused on SCM practices of large firms, while MSMCs are treated mostly from the viewpoint of larger firms (Lambert and Cooper, 2000; Chopra and Meindl, 2013). Also, authors did not focus on the applicability of SCM practices which are appropriate for large size organizations equally in case of MSMCs (Chen *et al.*, 2004; Sahay *et al.*, 2006; Paul and Jeong, 2006; Kot *et al.*, 2018). Therefore, there is a clear need to identify and establish the SCM practices adopted by MSMCs exclusively (Gorane and Ravikant, 2016).

Lack of top management support (Maguire and Magrys, 2001; Pagell and Krause, 2004; Hariharan *et al.*, 2019) and lack of long-term vision (Gunasekaran *et al.*, 1996; Thoo *et al.*, 2017) are also found to be the main reasons for moderate implementation of SCM in SMEs. This emphasizes that the SCM adoption can improve in MSMCs if the top managements are aware of SCM, which is known as Supply Chain Awareness (SCA) and provide direction for implementing the SCM practices at all levels (Premkumar and Ramamurthy, 1995; Teo *et al.*, 2004; Juliana *et al.*, 2013).

SCA is defined as the degree to which an individual and organization completely understands all the aspects of the SCM (Forman and Lipper, 2005). It is found that managers with high levels of SCA tend to support the implementation of SC practices and they focus on integration of all the functions to improve the overall organizational performance. Whereas managers with less or little SCA may not focus on overall SC integration and would only limit their attention to their individual firms, defeating the objective of SCM (Forman and Lipper, 2005; Paik *et al.*, 2011). The degree of SCA is found to vary based on type of industry sector of MSMC (Kwan, 1999; Ulusoy, 2003; Jharkharia and Shankar, 2006; Gorane and Ravikant, 2016). It is essential to understand the degree of SCA and the organizational factors influencing it (Youqin *et al.*, 2013) to understand the overall scenario of SC adoption in MSMCs.

Therefore, to identify this influence the following hypothesis is developed.

**H1:** Degree of SC awareness differs across different industry sectors of MSMCs.

SCA is also found to be influenced by several organizational factors. Among these factors, size of the business, measured in terms of number of full-time employees, is found to significantly influence the degree of

supply chain awareness (Paik *et al.*, 2011; Youqin *et al.*, 2013; Juliana *et al.*, 2013). Therefore, in order to investigate the influence of this organizational factor, i.e., size of the business, on SCA, the following hypothesis is developed.

**H2:** Size of MSMC has a positive influence on the degree of SC awareness.

The other organizational factors which are found to influence SCA are capital investment, product variety (Afande *et al.*, 2015; Huddiniah and ER, 2019) and length of existence of the company (measured as the number of years of existence of MSMC since its establishment) Juliana *et al.* (2013). Therefore, in order to investigate the influence these organizational factors on SCA, the following three hypotheses are developed.

**H3:** Capital Investment of MSMC has a positive influence on degree of SC awareness.

**H4:** Product Variety has a positive influence on degree of awareness of SCM.

**H5:** Length of Existence of the company has a positive influence on degree of SC awareness.

Validation of these hypotheses lead to the answers for first two research questions mentioned in the earlier section of the paper.

Degree of SCA significantly influences the adoption of supply chain practices in MSMCs. It is also crucial in achieving competitive advantage through innovative strategies related to SCM (Mishra, 2019). Degree of SCA influences top management's commitment towards SCM (Larry and Richard, 1996; Hariharan *et al.*, 2019), willingness and interest to implement SCM and investment and allocation of an exclusive budget for the initiatives related to SCM (Higginson and Alam, 1997). As indicated by Lepoutre and Heene (2006), small and large businesses basically possess different resources and capabilities such as: financial turnover; assets, market share; numbers employed; and ownership. They have less access to resources and are less powerful than their larger counterparts (Juliana *et al.*, 2013). SCM provides positive outcomes only when the practices associated with it are properly and effectively adopted and implemented (Metilda and Vivekanandan, 2011). In order to understand the degree of adoption of supply chain, it is essential to identify and investigate practices which are considered to be part of supply chain.

Supply chain practices (SCPs) range from diverse initiatives and activities of an organization and they are defined as a set of activities adopted by an organization to integrate the upstream and downstream processes of supply chain (Li *et al.*, 2006). Implementation of these practices results in reduction of costs associated with inventory and build mutual coordination among the members of SC (Sujatha, 2011; Al-Shboul *et al.*, 2017). But in spite of its benefits, SCPs are not properly understood by organizations (Cook *et al.*, 2011). There is no generalized consensus on what exactly is included in SCPs (Harrison *et al.*, 2002), though it is mentioned that SC strategy should be a part of business strategy by many authors. Moreover, the scenario of SCM implementation in MSMCs is different when

compared to that of large size companies in manufacturing sector (Rajesh *et al.*, 2008). Therefore, this section of literature review identifies which practices of MSMCs are considered as part of SCM practices.

Integration of supply chain for real time information sharing, quality of information shared (Hariharan *et al.*, 2019; Mathu, 2019), Just-in-Time (JIT), production and quick delivery of product, supplier relationship management, customer relationship management, and postponement are identified as strategies and practices of upstream and downstream areas of SCM by Tan *et al.*, (2002). Sahay and Mohan, (2003) found a linkage between SC practices and overall business strategy in MSMCs and identified that providing customer service, managing demand and inventory, order processing and fulfilment management system, manufacturing technology and process, development of product, transportation and logistics management, management of distribution, export and import management, and warehouse management system as major SC practices and also found that there is no major difference in their implementation in different industry sectors of MSMCs. Information sharing with suppliers, early supplier involvement (ESI), creating awareness among suppliers by providing training to them and integrating the activities of suppliers and distributors are identified as practices of SCM (Higginson and Alam, 1997; Hariharan *et al.*, 2019; Mathu, 2019). Supplier development, achieved through information sharing with the suppliers is identified as one of the important SC practice (Mentzer, 2001; Gorane and Ravikant, 2016). This practice is enabled through internet (Frohlich and Westbrook, 2002; Mishra, 2019) to achieve reduced inventory levels (Kwan, 1999; Hariharan *et al.*, 2019).

Another most popular SC practice is supply chain integration which is achieved through internal integration (coordination among the various management functions) and external integration which is achieved through the coordination of activities related to suppliers, distributors, dealers, retailers, warehouse managers and customers (Ellram 1995; Thakkar *et al.*, 2012; Li *et al.*, 2017; Khan and Wisner, 2019; Porter, 2019). This integration is also achieved through supply contracts between the buyer and supplier in areas of pricing, volume, lead time, quality, and product return policies. Supply contracts are also among the popular SC practices (Wang, 2002; Simchi Levi and Kaminsky, 2009; Li *et al.*, 2017).

Strategic alliances, another key SC practice, is achieved through supply contracts to obtain better supply chain outcomes (Dyer and Singh, 1998; Chen *et al.*, 2004; Defee, 2006; Cousins *et al.*, 2008; Zhaofu and Xiaolong, 2019). Collaborative Planning, Forecasting and Research (CPFR), a web-based technique which improves the forecasting of demand and increases the smooth flow of SC activities (Udin *et al.*, 2006; Chopra and Meindl, 2013; Singhry and Rahman, 2019) is another highly popular SC practice. Enterprise Resource Planning (ERP), one more practice of SC is found to be extensively used in areas like logistics and transportation, vendor, and order management along with Material Requirement Planning (MRP) and Warehouse Management System (WMS) to improve operational efficiency and productivity (Gorane and Ravikant, 2016; Baruffaldi *et al.*, 2019). ERP can be successfully implemented if four critical success factors such as education

and training, strategic decision-making, communication, and business process alignment will be successful if user's perspective is considered (Reitsma *et al.*, 2018).

Similarly, Radio frequency identification (RFID) (Koh *et al.*, 2007; Ting and Tsang, 2012; Gorane and Ravi Kant, 2016), e-procurement (Koh *et al.*, 2007; Mathu, 2019), Electronic Data Interchange (EDI) (Atul *et al.*, 2010; Atnafu and Balda, 2018), Vendor Managed Inventory (VMI) (Holweg *et al.*, 2005; Gorane and Ravi Kant, 2016), Outsourcing and Subcontracting (Na, 2011; Kabiraj and Sinha, 2017) are also widely mentioned as SC practices. Practices related to lean manufacturing and skill development of employees, especially the behavioral soft skills such as communication and initiative skills to implement SCM are also considered as SC practices (Burgess *et al.*, 2006; Lewis, 2000; Ghosh, 2012; Bak *et al.*, 2019). An integrated lean supply chain framework was developed by Chakraborty and Gonzalez (2018) considering technology integration and supplier relationship management and lean orientation to improve the patient care quality which is also relevant for SMEs.

Therefore, based on the above discussion, the paper finalizes nineteen practices as a part of supply chain practices. These are, Information Sharing with Suppliers (ISS), Training the Suppliers (TS), Early Supplier Involvement (ESI), Supply Chain Integration (SCI), Supply Contracts (SC), Strategic Alliances (SA), Collaborative Planning, Forecasting and Replenishment (CPFR), Enterprise Resource Planning (ERP), Material Requirement Planning (MRP), Warehouse Management System (WMS), Radio Frequency Identification (RFID), e-Procurement (EP), Electronic Data Interchange (EDI), Vendor Managed Inventory (VMI), Just-in-Time (JIT), Outsourcing (OS), Subcontracting (SC), Lean Manufacturing Practices (LMP), and Developing Supply Chain Skills among Employees (DSCSAE).

Therefore, in order to validate the influence of SCA on the degree of adoption of SCM in MSMCs, hypothesis (H6) is developed as below.

#### **H6: Degree of SC awareness has a positive influence on the degree of adoption of SCM**

Thus, the study investigates initially the variation in the degree of SCA across different industry sectors, then it investigates the influence of four organizational factors like size, capital investment, length of existence and product variety on the degree of SCA and finally, it investigates the influence of degree of SCA on degree of adoption of supply chain management practices in medium sized manufacturing companies (MSMCs). Validation of H6 answered the third research question proposed.

### **3. METHODOLOGY**

An empirical study was conducted in MSMCs across four sectors, electrical and electronics, engineering, chemical and pharmaceutical sectors in the industrial clusters in India from May, 2019 to Dec, 2019. The framework of hypotheses is presented in **Figure 1**.

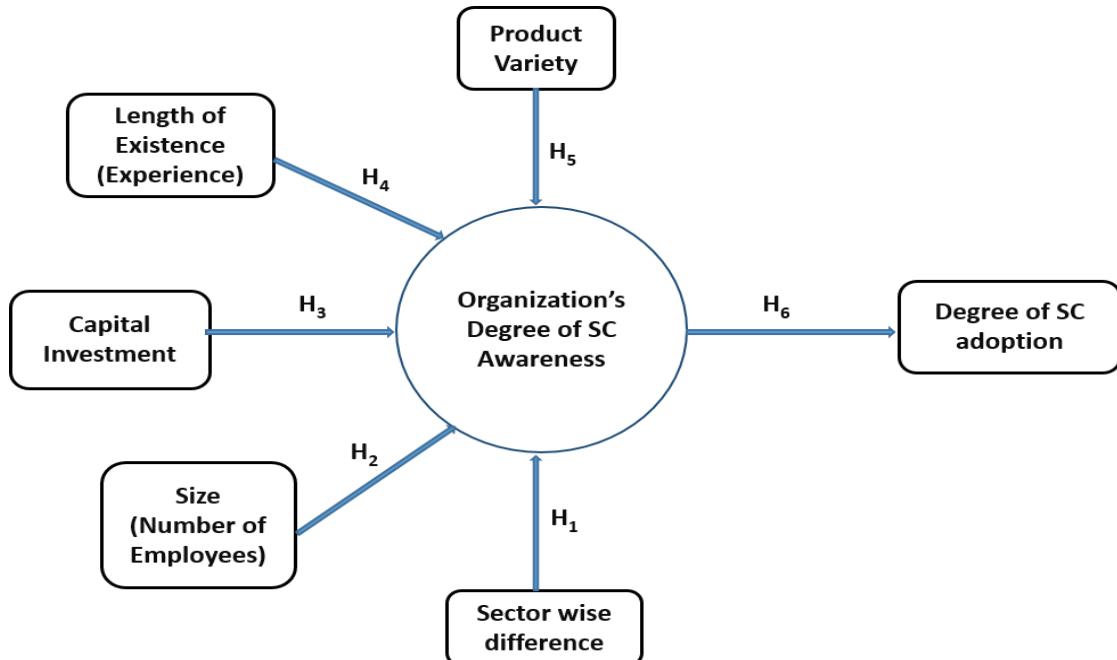


Figure 1 Framework of Hypotheses

A sample of MSMCs was selected using Proportionate Stratified Random Sampling technique. The most popular industry membership directory of Federation of Telangana and Andhra Pradesh Chamber of Commerce and Industries (FTAPPCCI) was considered as the basis for selection of MSMCs whose capital investment is between 5 crores to less than or equal to ten crore Indian rupees as per the definition of MSMEs by Government of India. The directory has a total membership of 388 MSMCs as per this definition. Out of them, a total of 276 companies in the selected four sectors were found to be meeting the capital investment criteria. Fifty percent of MSMCs from each industry sector mentioned above were considered as a sample of study, which is fairly a good representation of the total population. Therefore, the total sample size is 138 MSMCs, out of the eligible 276. Among these, 23 belong to electrical/electronic sector, 59 belong to engineering sector, 27 belong to chemical and 29 belong to pharmaceutical sector. The Primary Data was collected using a survey instrument (Questionnaire). The questionnaire consisted questions related to sector of company, number of employees (size), length of existence (experience), capital investment, type of product manufactured (industrial or consumer), number of products manufactured (product variety), organization's awareness about SCM, investment in SCM related aspects by the top management (Pagell and Krause, 2004; Hariharan et al., 2019), role of SCM in reducing costs in the first and second sections.

In the third section of the questionnaire, nineteen SC practices were listed. The SC managers were asked to provide their opinion on the degree of adoption of each practice by their MSMC on a 5-point Likert Scale (1 – Not adopted to 5 – Very highly adopted). The respondents for the questionnaire were senior level managers who are well aware of SCM adoption and implementation. A reliability test of initial data from 28 companies, whose results are

provided in **Table 1**, indicate that the lower bound of true reliability is 0.979. Hence, it was decided to continue further with the additional data collection and further analysis.

**Table 1** Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.979	.980	28

## 4. RESULTS AND DISCUSSION

The responses related to degree of SC awareness were collected through three questions, i.e., i) Organization's level of awareness about SCM, ii) Investment by the top management in SCM related aspects and iii) Perception on role of SCM in reducing costs on a 5-point Likert Scale (1-Very Low to 5-Very High). An Optimal Scaling Technique (OST) (Jacqueline, 1998), was employed using Categorical Principal Components Analysis (CATPCA) to discretize the scores based on the responses for each individual variable. Overall Component score (Object Score) integrating the responses of all questions related to SC awareness variable was computed and was assigned to a variable titled 'Awareness Score'. This awareness score is statistically tested differentiated by each sector, size, capital investment, product variety and length of existence of MSMC.

The frequency table, quantification related to these three questions, model summary and component loadings are presented in **Table 2**, **Table 3** and **Table 4**. The quantification values in these tables are the normalized values of responses, obtained through CATPCA technique (Jon and Richard, 2014). Cronbach's Alpha of 0.904 in **Table 3** suggests the appropriateness of the technique to transform the variables into a single component. **Table 3** also indicates high component loading for each variable and the importance associated with each of the variable. It is

observed that one single component captures approximately 84% of the variability of the individual variables. The object score based on the component loading computed for each case is used for comparison purposes.

**Table 2** Results of Organization's Degree of SC Awareness

1. Organization's Awareness about SCM		
	Frequency	Quantification
Very Low	1	-4.462
Low	34	-1.505
Medium	46	0.206
High	53	0.761
Very High	4	1.454
Total	138	
2. Investment by top Management in SCM related aspects		
Very Low	3	-3.363
Low	52	-1.000
Medium	56	0.580
High	26	1.061
Very High	1	1.987
Total	138	
3. Role of SCM in Cost Reduction		
Very Low	5	-2.915
Low	59	-0.817
Medium	52	0.737
High	20	1.049
Very High	2	1.716
Total	138	

**Table 3** Model Summary of Organization's Degree of Awareness

Component	Cronbach's Alpha	Variance Accounted For	
		Total (Eigenvalue)	% of Variance
1	.904	2.518	83.942
Total	.904	2.518	83.942
Component Loading			
		Component	
		1	
Organization's Awareness about SCM by the top management		.868	
Investment by Top Management in SCM related aspects		.950	
Role of SCM in reducing costs		.928	

A one-way ANOVA with Post Hoc tests for pair wise differences in the Awareness Score was performed and these results are presented in **Table 4**. It indicates that the Average Awareness Score is slightly positive for electrical/electronic and pharmaceutical sectors, while it is marginally negative for engineering and chemical Sectors. The significance value  $> 0.05$  reveals that there is not much deviation in the variance too. The significance value ( $p$ -value  $> 0.05$ ) of one-way ANOVA test does not indicate significant difference in the degree of SC awareness score levels across different sectors of MSMCs. The robust tests for equality of means also carry

a significance value of  $> 0.05$ , indicating no statistically significant differences between the means across the sectors. Therefore, it is interpreted that the degree of SC awareness across select Industry sectors of MSMCs is uniform validating the first hypothesis (H1). These results significantly differ with the results of Kwan, (1999) and Jharkharia and Shankar, (2006), who identified a significant difference in degree of SC awareness between electronic and chemical industries of MSMCs. This deviation may be due to the consideration of four sectors of MSMCs in the present study rather than just two sectors.

**Table 4** Mean and Standard Deviation values for Sector-Wise Degree of Awareness

Industry Sector	N	Mean	Std. Deviation
Engineering	59	-.0726	1.00247
Chemical	27	-.1536	1.06599
Electrical/Electronics	23	.0168	1.02612
Pharmaceutical	29	.2774	.92231
Total	138	.0000	1.00364

#### Test of Homogeneity of Variance (HoV)

Levene Statistic	df1	df2	Sig.
1.115	3	134	.345

#### Results of One-Way ANOVA test for Sector-wise degree of awareness about SCM

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	3.185	3	1.062	1.055	.370
Within	134.815	134	1.006		
Total	138.000	137			

#### Robust Tests for Equality of Means

Test	Statistic <sup>a</sup>	df1	df2	Sig.
Welch	1.132	3	59.079	.344
Brown-Forsythe	1.048	3	103.797	.375

a. Asymptotically F distributed.

Similarly, a one-way ANOVA with Post Hoc tests for pair wise differences in the Awareness Score was done to study the influence of size (number of employees), capital investment (5 to 10 crore in Indian rupees), and product variety (a minimum of 3 to maximum of 12 products), whereas, a bivariate correlation is conducted for length of existence. These results are presented in **Table 5**, **Table 6**, **Table 7**. The results of **Table 5** indicate that MSMCs with employees more than 200 have more degree of SC awareness in comparison with other MSMCs whose number of employees is less than 200. Therefore, it is interpreted that the degree of SC awareness is more in companies which have more number of employees (size). This interpretation corroborates with the results of Juliana *et al.*, (2013) and Hariharan *et al.*, (2019). Also, the results from **Table 6** indicate that the degree of SC awareness of companies with 9 to 10 crore (Indian Rupees) capital investment is much higher compared to companies with lower categories of

capital investments. Therefore, it is interpreted that the degree of SC awareness varies with respect to the capital investment in MSMCs. It appears that

higher the capital investment, the higher is the company's degree of SC awareness. These results corroborate with the results of Afande *et al.*, (2015). Analysis of results in **Table 7** reveals that the degree of SC awareness

is significantly higher in MSMCs which manufacture more product varieties (greater than nine) compared to those manufacturing fewer varieties (less than nine) and thus the second (H2), third (H3) and fourth (H4) hypotheses are validated.

**Table 5** Results related to Number of Employees (Size of the organization) and Degree of Awareness about SCM (Mean, SD, Test of Homogeneity of Variance, One way ANOVA, Test of Equality of Means and Post-hoc Tests of pairwise differences)

No. of Employees	N	Mean	Std. Deviation	Std. Error	
51-100	5	-.0496	.93732	.41918	
101-150	17	-.8200	1.30302	.31603	
151-200	45	-.2095	.89462	.13336	
>200	70	.3294	.85784	.10253	
Total	137	-.0041	1.00617	.08596	
<b>Test of Homogeneity of Variance (HoV)</b>					
Levene Statistic	df1	df2	Sig.		
1.698	3	133	.171		
<b>Results of One-Way ANOVA test for Size of Company (Number of Employees) and its Degree of Awareness about SCM</b>					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	21.010	3	7.003	7.983	.000
Within Groups	116.672	133	.877		
Total	137.682	136			
<b>Robust Test for Equality of Means</b>					
	Statistic <sup>a</sup>	df1	df2	Sig.	
Welch	5.801	3	16.601	.007	
Brown-Forsythe	6.503	3	32.042	.001	
a. Asymptotically F distributed					
<b>Post-Hoc Tests for pairwise differences</b>					
(I) Number of Employees	(J) Number of Employees	Mean Difference (I-J)	Std. Error	Sig.	
51-100	101-150	.77040	.47650	.373	
	151-200	.15996	.44152	.984	
	>200	-.37895	.43357	.818	
101-150	51-100	-.77040	.47650	.373	
	151-200	-.61044	.26664	.106	
	>200	-.14935*	.25325	.000	
151-200	51-100	-.15996	.44152	.984	
	101-150	.61044	.26664	.106	
	>200	-.53891*	.17896	.016	
>200	51-100	.37895	.43357	.818	
	101-150	1.14935*	.25325	.000	
	151-200	.53891*	.17896	.016	

**Table 6** Results related to Capital Investment and Degree of Awareness about SCM (Mean, SD, Test of Homogeneity of Variance, One-way ANOVA, Test of Equality of Means and Post-hoc Tests of pairwise differences)

Capital Investment (in Indian Rupees in Crores)	N	Mean	Std. Deviation		
5-6	31	-.6007	1.19356		
6-7	12	.0404	.70067		
7-8	14	-.3412	1.11708		
8-9	23	-.2677	.81660		
9-10	58	.5012	.72443		
Total	138	.0000	1.00364		
<b>Test of Homogeneity of Variance (HoV)</b>					
Levene Statistic	df1	df2	Sig.		
4.244	4	133	.003		
<b>Results of One-Way ANOVA test</b>					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	29.055	4	7.264	8.868	.000
Within Groups	108.945	133	.819		
Total	138.000	137			
<b>Robust Tests for Equality of Means</b>					
	Statistic <sup>a</sup>	df1	df2	Sig.	
Welch	8.312	4	39.927	.000	
Brown-Forsythe	8.221	4	72.906	.000	
a. Asymptotically F distributed.					
<b>Post Hoc Tests</b>					
(I) Capital Investment (Indian Rupees in Crores)	(J) Capital Investment (In Indian rupees in Crores)	Mean Difference (I-J)		Sig.	
5-6 Crores	6-7	-.64111	.233		
	7-8	-.25946	.900		
	8-9	-.33297	.669		
	9-10	-1.10191*	.000		
6-7 Crores	5-6	.64111	.233		
	7-8	.38165	.821		
	8-9	.30814	.874		
	9-10	-.46080	.497		
7-8 Crores	5-6	.25946	.900		
	6-7	-.38165	.821		
	8-9	-.07351	.999		
	9-10	-.84245*	.018		
8-9 Crores	5-6	.33297	.669		
	6-7	-.30814	.874		
	7-8	.07351	.999		
	9-10	-.76894*	.007		
9-10 Crores	5-6	1.10191*	.000		
	6-7	.46080	.497		
	7-8	.84245*	.018		
	8-9	.76894*	.007		

**Table 7** Results related to Product Variety and Degree of Awareness about SCM (Mean, SD, Test of Homogeneity of Variance, One way ANOVA, Robust Test of Equality of Means)

No. of Product Variety	N	Mean	Std. Deviation		
3-6	23	-.1569	.95188		
6-9	55	-.2649	1.03321		
9-12	31	.0153	.97838		
>12	28	.5988	.77837		
Total	137	-.0068	1.00411		
<b>Test of Homogeneity of Variance (HoV)</b>					
Levene Statistic	df1	df2	Sig.		
2.184	3	133	.093		
<b>Results of One-Way ANOVA test between Organization's SCM Awareness and No. of Product Varieties</b>					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.464	3	4.821	5.228	.002
Within Groups	122.656	133	.922		
Total	137.120	136			
<b>Robust Tests for Equality of Means</b>					
	Statistic <sup>a</sup>	df1	df2	Sig.	
Welch	6.562	3	63.055	.001	
Brown-Forsythe	5.530	3	113.473	.001	

To interpret the results related to length of existence (experience), a Bivariate Correlation test between length of existence of MSMC and Average Awareness Score was conducted. Length of existence of MSMC was calculated as the number of years of existence of MSMC till end of June, 2019 from its year of establishment. The results presented in **Table 8** indicate that there is a significant relationship between length of existence and degree of SC awareness, though it is little weak (correlation is 0.175 with a significance of 0.04). Therefore, it is interpreted that higher the length of existence, the higher is the degree of awareness of SCM which validates the fourth hypothesis (H5). These results corroborate with the results of Juliana *et al.* (2013), who also found that there is a significant difference between experience of organization and degree of SC awareness.

The influence of degree of SC awareness on the degree of adoption of SC practices is interpreted by integrating the responses related to the degree of adoption of nineteen SC practices to arrive at a new variable named as "NumAspects". A Bivariate Correlation test (**Table 9**) between the Average Awareness Score and this new variable NumAspects indicates that there is a significant positive correlation relationship between degree of SC awareness and degree of adoption of SC practices. This validates the sixth hypothesis and these findings corroborate with the findings of (Juliana *et al.*, 2013; Gorane and Ravikant, 2014; Youqin *et al.*, 2013; Mishra, 2019).

**Table 8** Results of Bivariate Correlation between Awareness Score and Length of Existence (Experience) of the Company

		Awareness	Length of Existence
Awareness	Pearson Correlation	1	.675*
	Sig. (2-tailed)		.040
	N	138	138
Length of Existence	Pearson Correlation	.675*	1
	Sig. (2-tailed)	.040	
	N	138	138

\*. Correlation is significant at the 0.05 level (2-tailed).

## 5. CONCLUSIONS AND SCOPE FOR FUTURE RESEARCH

The analysis and interpretation of this research revealed some interesting findings related to the influence of organizational factors on degree of SC awareness in MSMCs. The degree of SC awareness is uniform across the four sectors considered for this study. Organizational factors of MSMCs such as size, length of existence, capital investment and variety of products manufactured influence the degree of SCA positively. The degree of SCA is significantly higher in those companies which have more

than two hundred number of employees. The degree of SC awareness is higher in companies whose capital investment is greater than 9 crores and less than 10 crores (Indian Rupees) and less in MSMCs whose capital investment is less than 9 crores. MSMCs which have more years of existence are found to be having higher levels of degree of SC awareness. It can also be concluded that higher the product variety, higher is the degree of SC awareness in MSMCs in the select sectors. Thus, companies which are manufacturing more variety (greater than 12 in the present study) of products are found to be having more awareness about SCM. The degree of SC awareness in the MSMCs which manufacture less number of product variety is found to be less. Nineteen SC practices were identified to be the most popular ones among the MSMCs based on the systematic literature. Adoption of these practices by the MSMCs is found to get influenced due to degree of SC awareness. Higher the degree of SC awareness, higher is the adoption of SC practices. These conclusions are corroborated with the conclusions of various authors as mentioned in the above section.

**Table 9** Pearson Correlation between Average Awareness Score and NumAspects

	NumAspects
Pearson Correlation (Awareness Score)	.676**
Sig. (2-tailed)	.000
N	138

The present research is limited to MSMCs from four popular industry sectors. An empirical study by considering more number of industry sectors with the inclusion of many other SC practices will be the topic for future research. Also, the geographical scope of the study can be expanded by including more number of regions in future.

## 6. IMPLICATIONS AND RECOMMENDATIONS

Supply chain awareness (SCA) is an important prerequisite for adoption of SC practices and for successful implementation of SCM (Youqin et al., 2013; Juliana et al., 2013; Thoo et al., 2017). The findings of this research develop an awareness among supply chain managers of MSMCs. It also provides a menu of nineteen highly popular SC practices in MSMCs which can be adopted for achieving positive outcomes. MSMCs can gain competitive advantage in the globalized business environment by implementing these SC practices. Outcomes of this paper will also enable the organizations to identify and direct their focus on the areas that require improvement. Also, the MSMCs will become more aware of the SCPs that will help to increase their performance and competitiveness. With best SCPs, MSMCs will be able to improve their business performance and expand their assets, providing work opportunities and indirectly boosting the growth and contribute to economic development of country. Also, the present research fills the gaps in the existing body of knowledge related to SCM in MSMCs and it will enable researchers to dwell more into SC practices.

Top management awareness and commitment towards SCM initiatives and practices is essential for successful

implementation of SCM. It is recommended that the managers of MSMCs commence the implementation of SC practices by considering the influence of various organizational factors. Also, there is an urgent need to develop supply chain awareness among the owners and managers of these enterprises.

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