Supply Chain Integration and Management: Classification and Mapping of the Literature

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Abstract **- The objective of this paper is to do the systematic review of the articles published over a period of last 20 years from 2000 to 2020 in the area of Supply Chain.**

Design & Methodology- Literature is searched by using appropriate keywords like: Supply Chain, Supply Chain Integration and Supply Chain Variables. In total, 91 scholarly and peer reviewed articles from 63 journals are scanned to understand the nature of work done and to document the accumulated knowledge in the research articles. The literature is examined and classified according to the nature of work, methodologies applied in their study and sources of data collection.

Findings- In the literature, the highest number of articles totaling 31.42% of articles is under the classification of Supply Chain Variables. This is followed by: 23.8% of articles under the classification of Supply Chain Integration, 8.57 % of articles related to supply chain collaboration. In the last 20 years, few researchers have done the comprehensive survey of articles in the area of Supply Chain. Overall, 9.52% of articles under the category of "literature survey or literature review papers" are scanned in this article.

Interpretive Structural Modeling(ISM) seems to be the most popular tool among the researchers in the area of SCM. 46.80% of researchers are using ISM in their study for modeling the variables of SCM. This is followed by 9.37% Structural Equation Modeling (SEM), 3.125 % TOPSIS and AHP. Various statistical tools like Average, Means, Standard Deviation; ANOVA etc is being used by 37.50% of researchers. Total 58.00% of researchers have collected required data for the study from the literature and remaining 34.00 % from Survey and 8% from mixed.

Research implications– This study classifies the literature based on the nature of the work in the area of supply chain and provides the guidelines for further research.

Originality/Value– There have been some literature review papers related to supply chain management in general; but little attempts in recent years to review literature. This literature is first of its kind in which review of literature is spread over two decades. Thus, this literature review of the last two decades documents the accumulated knowledge of supply chain and provides opportunities for further research.

Index Terms **- Information Technology (IT), Organisational Integration, Original Equipment Manufacturers (OEM), Supply Chain Integration (SCI), Supply Chain Management (SCM).**

I.INTRODUCTION

A supply chain is a network of companies [1]. Supply chains consist of geographically dispersed industries, facilities and capabilities [2].Supply chain integration is considered a key for achieving the seamless and boundary less flows [3].

If the firms can benefit from implementing the SCM then what the researchers in the past 20 years contributed to the knowledge of supply chain? There have been some literature review papers related to supply chain management in general; but little attempts in recent years. Thus, this literature review documents the accumulated knowledge of the supply chain and provides opportunities for further research.

Objectives of this study are:

Objective 1 – To scan the literature to understand the nature of work done and to document the accumulated knowledge in the research articles.

Objective 2 – To examine the literature and classify according to the nature of work, methodologies applied in their study and sources of data collection.

Flow of the paper is: next section discusses the Design & Methodology of literature review followed by detailed review of the research papers finally key

findings of review and directions for the future research.

II. DESIGN AND METHODOLOGY OF LITERATURE REVIEW

Literature reviews help to understand the present level of study and to set an agenda and guidelines for future research. Systematic and structured reviews by using appropriate search keywords using an iterative cycle reduce the bias [4].

A. Literature Review Framework

The digital library of an engineering college is used for the literature search. Through digital library users can access full text journal papers and is having E-resources like: IEEE, ASME, ASCE, Elsevier (Science Direct), ACM Digital Library, J-Gate, DELNET, NDL (National Digital Library of India), Springer. Framework for this literature review is as detailed in Figure 1.

B. Search Results: In the digital library, we used 'Supply Chain Management', 'Supply Chain' as keywords to search the Journal Papers from 2000-2020 for Scholarly Peer Reviewed research papers.

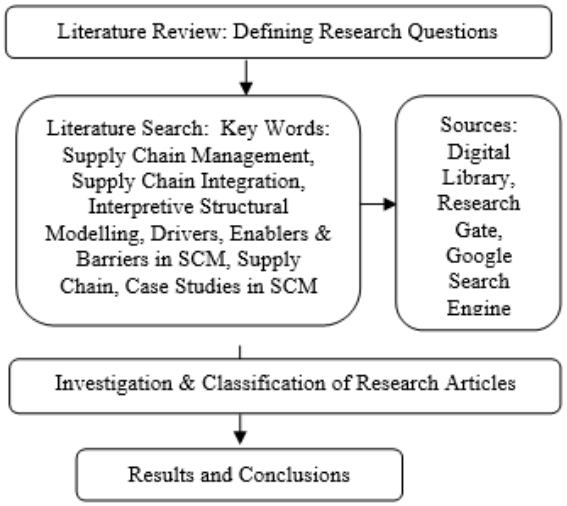

Figure 1: Framework of the Study

This initial search resulted in 300 articles from various sources like Books, Publications and Conference papers. To restrict our search to scope of our study, we included the search subjects like: Material & Supply Chain Management, Operations Research, Production Technology and Industrial Engineering. This resulted in 175 articles. Search was further refined for excelingtech publishers, Association of European Operational Research Societies, John Wiley and Sons, Ltd, Taylor and Francis Ltd, Springer Nature and Reed Business Information Publishers. Search was further refined for: Supply Chain Drivers, ISM in SCM, Enablers of SCM, Supply Chain Integration and Barriers for SCM, Supply Chain Modeling Techniques.

C. Data Statistics

Figure 3 shows the percentage of year wise publication of articles reviewed in this paper published over the period of the last two decades. Maximum number of articles is of the year 2015 and 2018 contributing 10.11% of overall articles of this study.

Literature search resulted in 91 articles from 63 journals. List of journals detailed in Table 2 and assigned numbers from J1 to J63. Maximum number of articles that is 12.08% is from Journal of Supply Chain Management, followed by International Journal Supply Chain Management at 7.69% and Business Process Management Journal at 3 positions with 4.39%.International Journal of Physical Distribution & Logistics Management, Journal of Business and Management (IOSR-JBM), Journal of Operations Management are jointly at four positions with 3.29 %. Journals and the percentage of articles from where the articles are reviewed in this study are

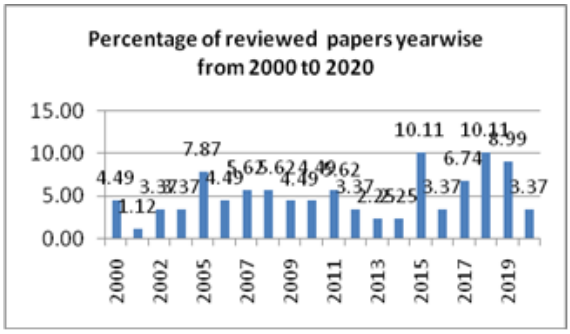

Figure 2: Year wise Percentage of articles

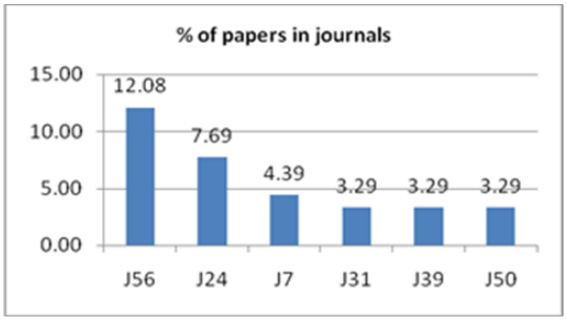

Figure 3: Highest Percentage of articles in the Journals reviewed

shown in Figure 4. Only six journals having more percentage of articles are shown in Figure 4. Abstracts of these 91 articles are thoroughly studied. In the following sections contribution of researchers, area of work and methodology applied for the study are explained in detail.

III. DISCUSSION ON LITERATURE SURVEY

A. Classification of Literature

Total 91 scholarly research papers are classified into six categories based on their area of work. Researchers have studied the variables like: enablers, barriers, drivers etc for improving the supply chain performance.

S No	Journal	Number of papers
J1	Academy of Strategic Management Journal	1
J2	African Journal of Business Management	1
J3	American Based Research Journal	1
J4	Applied Mathematics in Engineering, Management and Technology	1
J5	Asian Journal of Business Management	1
J6	Benchmarking An International Journal	1
J7	Business Process Management Journal	4
J8	Business Process Management Journal	1
J9	California management review	1
J10	Procedia Manufacturing	1
J11	European Jour. of Business and Mgt.	1
J12	European Jour. of Operation Research	1
J13	European Journal of Advances in Eng. & Tech.	1
J14	European Management Journal	1
J15	Gavesana Journal of Management	1
J16	Growing Science Ltd.	1
J17	Growing Science Ltd. All rights reserved	1
J18	Independent Research Journal in the Management Sciences	1
J19	Industrial Marketing Management	1
J20	Information and Knowledge Management	1
J21	Information Management and Computer Security	1
J22	International Journal Production Economics	1
J23	International Journal of Shipping and Transport Logistics	1
J24	International Journal Supply Chain Management	7
J25	International Journal of Academic Research in Business and Social Sciences	1
J26	International Journal of Business and Management	1
J27	International Journal of Business Research and Management (IJBRM)	1
J28	International Journal of Logistics Management	1
J29	International Journal of Management Innovation Systems	1
J30	International Journal of Operations and Production Management	1
J31	International Journal of Physical Distribution & Logistics Management	3
J32	International Journal of Productivity and Performance Management	1
J33	International Journal of Technology Management	1
J34	International Journal off Industrial Engineering & Production Research	1
J35	International Journal's Research Journal of Social Science & Management	1
J36	John Wiley & Sons, Inc, New York	1
J37	Journal of Manufacturing Technology Management	2
J38	Journal of Advances in Management Research	1
J39	Journal of Business and Management (IOSR-JBM)	3
J40	Journal of Business Logistics	1
J41	Journal of Critical Thinking in e-governance	1
J42	Journal of Enterprise Information	1
J43	Journal of Enterprise Information Management	1
J44	Journal of Industrial Engineering and Management	1
J45	Journal of Industrial Engineering and Management and Data Systems	1
J46	Journal of Management (JOM)	1
J47	Journal of Management and Strategy	1
J48	Journal of Manufacturing Technology Management	1
J49	Journal of Modeling in Management	1
J50	Journal of Operations Management	3
J51	Journal of Small Business and Enterprise Development	1
J52	Journal of Supply Chain Management	1
J53	Management Research News	1
J54	Open Journal of Social Sciences	1
J55	Productivity volume	1
J56	Supply Chain Management	11
J57	Technological Forecasting and Social Change	1
J58	Technology exports	1
J59	The International Journal of Organizational Innovation	3
J60	The Journal of Enterprise Information Management	1
J61	The Journal of Social Sciences Research	1
J62	Uncertain Supply Chain Management	1
J63	Work-study	1

Table 1: Article Resources: List of Journals

Systematic classification and mapping of the articles is shown in Table 2. Total 31.42% of articles are documented under the classification of Supply Chain Variables. Developments in the IT infrastructure enhance the supply chain integration. A synchronized supply chain enhances the productivity of the company and reduces the idle time in the area of logistics and transportation. Total 23.8% of articles are studied in this article under the classification of Supply Chain Integration. Collaboration means working with

various partners of the supply chain for mutual benefits. Collaboration greatly reduces logistics and transportations costs. Training of mutual manpower, sharing of critical information and resources among the supply chain partners are the few areas of collaboration. Total 8.57 % of articles related to supply chain collaboration are reviewed in this paper. In the last 20 years, few researchers the comprehensive review of articles in the area of Supply Chain. Overall, 9.52% of articles under the category of "Review articles in SCM" are scanned in this paper. Detailed classification of literature and the percentage of papers reviewed in this paper under each classification are shown in Figure 4.

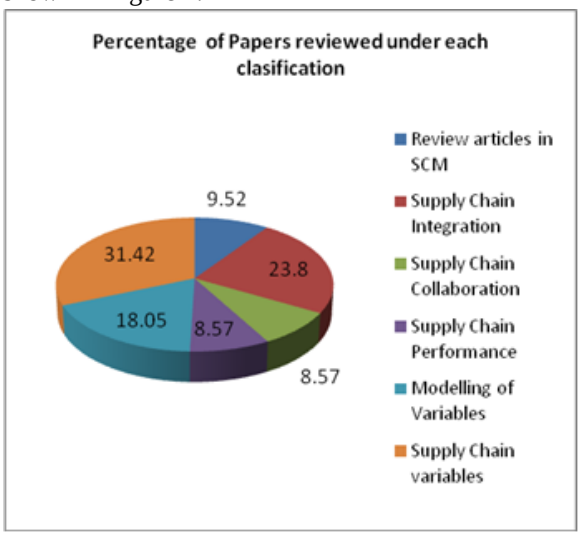

Figure 4: Percentage of papers reviewed in each classification

A.1. Review of Articles SCM

Lot of research is being carried out by academicians in the last decade in the area of SCM. These review articles will help in knowing the present pool of knowledge and guide researchers in identifying the research gaps there by defining research agenda [5]. [6], [4]have used systematic literature review for defining their research agenda. [7] To understand the current practices in sustainable supply chain management investigates systematic literature review. [4] Scanned the literature for supply chain collaboration and research gaps are identified in the area of collaboration among the supply chain partners.[8]Reviewed the articles related to SCM and Integration. Supply Chain Models, Supply Chain Clusters and Supply Chain Collaborations of the last 25 years are discussed by Mark Johnson (2016). Stevens' 1989 integration model is extended by adding new Supply Chain Integration Models.

A.2. Supply Chain Integration

Supply Chain Integration (SCI) creates value to the organization [9]. [10] investigated the relationship between Organizational integration and its Performance. Supply Chain Integration and Financial Performance are studied by [11]. Supply Chain Integration will be helpful to all types of industries irrespective of their scale of operation. Benefits of IT in managing the Supply Chains of SMEs[12].

Recently agility in managing the supply chain is gaining a lot of importance. [13]developed a model for agile supply chain for providing the quality and fast delivery products to Iranian Deference Industries. Quality of the information and information at the right time among the supply chain partners will enhance supply chain performance[14]. [15]Studied the Importance Information in SCM. Developments in IT tools are an important driver for integrating the supply chain partners. IT tools for supply chain integration (SCI) are studied by [5], [16]. Effect of digital technology in managing the supply chains is studied by Dani R (2018).

Supply chain integration involves a lot of planning and is having the many challenges for its implementation[17]. Proper frameworks will help the industries in integrating their supply chains. [18], [19], [20], [21]have documented various SCI frameworks in their articles.

A.3. Supply Chain Collaboration

Relationship and trust [2] among the Supply chain partners will enhance the Sustainability[22]. Size of the company and number of various partners is the key for the supply chain collaboration. [23]Conducted the studies in Brazil's Electronics Industries to investigate the relationship between Size of the Company, Production Systems and Supply Chains. [24]documented the relationship between Communication & Cooperation among Supply Chain Partners. Hierarchical Regression Analysis and Statistical variance is used to study the effect of Supply Chain Partners on Performance [25]Sharing of expert knowledge and managerial skills will greatly help the SMEs. Collaboration and Information Sharing in SMEs is studied by[26]. Supply Chain Collaboration and Supply Chain Performance are

modeled by using Structural Equation Modeling (SEM) through random sampling of auto manufacturers.[27]Argued the effective coordination among the supply chain partners and developed an optimization algorithm for single supplier and multi-buyer supply chain for multi products.

A.4. Supply Chain Performance

SCM provided the competitive edge[28] and is being used as a Competitive Tool in 21st Century Business [29]. Relationship between supply chain strategies, large scale industries and performance is documented by Albert W (2018). Jeffery (2000) compared the supply chains of Japanese and US Automakers. Supply Chain Drivers and their effect on Performance were studied by Asrin (2020) for Pharmaceutical Industries. Study reveals Positive relationship between supply chain cooperation and firm performance. Paul Hong (2006) studied the SMEs & SCM for business perspective.

A.5. Modeling Techniques in SCM

Structural Equation Modeling (SEM), Interpretive Structural Modeling (ISM), Analytical Hierarchical Processes (AHP) and ANP are being used by the researchers to understand the supply chain of industries. [30][31]studied the criteria for vendor selection for properly managing the supply chains.

S. No	Authors	Classification of Literature: Area of Work						Methodology Applied						Data Collected for the Study		
		Literature Review	Supply Chain Integration	Supply Chain Collaboration	Supply Chain Performance	Modeling of Variables	Supply Chain variables	ISM	SEM	TOPSIS	AHP	ANP	Statistical Tools	Literature Survey	Industrial Survey	Mixed Literature & Industrial Survey
A1	Abhijit M (2018)						√									√
A2	Adarsha M (2014)						√							√		
A3	Akbar R (2019)		√												√	
A4	Albert W (2018)				√									√		
A5	Alina S, (2020)						√								√	
A6	Ana B(2011)			√											√	
A7	Anne T (2005)	√												√		
A8	Anukul M (1994)					√	√	√								
A9	Ashish A(2002)				√											
A10	Ashutosh S (2016)						√							√		
A11	Asrin (2020)				√										√	
A12	Bagchi P (2005)		√													
A13	BaofengHuo (2012)		√			√			√						√	
A14	Barbara B (2009)			√									√			
A15	Bender P (2000)	√												√		
A16	Benjamin S (2017)						√							√		
A17	Borys K (2019)						√						√			√
A18	C M Harland (2007)						√									
A19	Charan P(2008)						√						√			√
A20	Christina Wong (2009)		√													
A21	Christos T (2010)		√													
A22	Claudine A (2015)	√												√		

S. No	Authors	Classification of Literature: Area of Work						Methodology Applied						Data Collected for the Study		
		Literature Review	Supply Chain Integration	Supply Chain Collaboration	Supply Chain Performance	Modeling of Variables	Supply Chain variables	ISM	SEM	TOPSIS	AHP	ANP	Statistical Tools	Literature Survey	Industrial Survey	Mixed Literature & Industrial Survey
A23	Damien Power (2005)	√												√		
A24	Dani R (2018)		√												√	
A25	Devendra Kumar (2015)					√	√	√							√	
A26	Dirk P (2005)		√												√	
A27	Ellram L (2007)				√											
A28	Eyaa S (2010)				√											
A29	Faisal I (2018)						√							√		
A30	Faisal M N (2006)					√	√	√						√		
A31	Gunasekaran A (1997)	√												√		
A32	Gunashekharan A (2004)		√													
A33	Handfield R (2002)			√												
A34	Harjit Singh (2018)	√												√		
A35	Harland C (2007)		√										√			
A36	Hefu L (2010)		√										√			
A37	Hemant V (2005)		√										√			
A38	IdisemiApulu (2011)						√							√		
A39	Ifeyinwa J (2014)		√			√				√						
A40	Jagdish R (2014)					√	√	√						√		
A41	Jayanth J (2010)		√													
A42	Jeffery (2000)				√								√			
A43	Jesca (2018)						√						√			
A44	Jharkharia S (2004)		√			√		√								√
A45	Jitesh T (2008)		√			√		√						√		
A46	JiteshThakkar (2008)			√		√		√						√		
A47	JiteshThakkar (2009)	√												√		
A48	John T Mentzer (2001)	√												√		
A49	K S VeeraPandiyan (2015)		√												√	
A50	Koh S (2006)				√											
A51	Lambert D, (2005)		√													
A52	Lambert D (1998)	√												√		
A53	Lee C W (2007)		√										√			
A54	Lee H (2000)		√													√
A55	Lee H (2002)		√													

S. No	Authors	Classification of Literature: Area of Work						Methodology Applied						Data Collected for the Study		
		Literature Review	Supply Chain Integration	Supply Chain Collaboration	Supply Chain Performance	Modeling of Variables	Supply Chain variables	ISM	SEM	TOPSIS	AHP	ANP	Statistical Tools	Literature Survey	Industrial Survey	Mixed Literature & Industrial Survey
A56	Lin Huang (2015)						√							√		
A57	ManijehTeimori (2014)		√												√	
A58	Mark Johnson (2016)	√												√		
A59	Mohd N (2007)		√										√			
A60	Nanik L (2017)						√							√		
A61	Obsatar S (2019)						√								√	
A62	Pawar P J (2018)			√												√
A63	P T Kale (2011)		√													
A64	Pankaj S (2015)					√	√	√							√	
A65	Parajiat U (2009)		√													
A66	Parakshit C (2008)				√											
A67	Paul Cragg (2011)		√													
A68	Paul Hong (2006)				√											
A69	Pramod(2012)	√												√		
A70	Pratima M (2019)		√			√		√								
A71	Pravin K (2008)					√	√	√						√		
A72	Rakesh K (2015)					√	√	√						√		
A73	Rameshwar Dubey					√	√	√						√		
A74	Ravinder Kumar, (2016)			√												
A75	S.Wadhwa (2004)		√													
A76	Sanjay J (2005)					√	√	√							√	
A77	Seyed H (2017)					√	√	√			√					
A78	Simamora, (2017)				√	√			√							
A79	SohelRana ,(2018)						√								√	
A80	Spudnik S(2013)						√							√		
A81	Sujan P(2017)						√							√		
A82	Sunil D (2016)					√	√	√						√		
A83	Sunil L(2011)						√								√	
A84	Themari E (2019)						√								√	
A85	Tony Cragg (2019)			√												
A86	Valliappan (2019)			√										√		
A87	Venkatesh (2018)						√									
A88	Wellington e S (2019)						√								√	
A89	Wissawa A(2020)			√		√			√						√	

S. No	Authors	Classification of Literature: Area of Work						Methodology Applied						Data Collected for the Study		
		Literature Review	Supply Chain Integration	Supply Chain Collaboration	Supply Chain Performance	Modeling of Variables	Supply Chain variables	ISM	SEM	TOPSIS	AHP	ANP	Statistical Tools	Literature Survey	Industrial Survey	Mixed Literature & Industrial Survey
A90	Woojung Chang(2015)		√										√			
A91	YaserJebrilA (2017)						√						√			

Table 2: Mapping of the Literature

Green Supply Chain Management is gaining the lot of attention by academicians in their research[32]. [33]modeled the barriers by using ISM for implementing green supply chain in Indian SMEs. [34]Studied flexibility enablers in the green supply chain. Innovation enablers for enhancing supply chain competitiveness are documented by [35]. Lean implementation variables in the supply chain are studied by [36]. [29] Studied the Contextual Framework for SCM Practices.

A-6. Supply Chain Variable

Various supply chain variables like: barriers, drivers, enablers etc have been studied in understanding the supply chain integration. [37]identified16 Barriers and 22 Drivers of green supply chain management. Abhijit M (2018) studied the supply chain of textile industries located in South-East Asian countries and identified 12 barriers for green supply chain and a model is prepared by using ISM. Alina S, (2020), identified main drivers of supply chain for enhancing the organizational performance. Borys K (2019) identified 16 barriers and 22 drivers for manufacturing industries located in Ukraine and statistical tools are used to prioritize the drivers. Jesca (2018) studied the constraints for implementing the SCM. Retail industries are the main partners in the supply chain. SohelRana (2018). Drivers of retails supply chain is documented by SohelRana (2018). Faisal 2018 reviewed 60 articles to identify the drivers for digital supply chain. IT tools in integrating the supply chains of SMEs and identification of drivers for adopting the Information Communication tools is documented by IdisemiApulu (2011).

B. Methodology and Data Collection by the Researchers

Methodology assesses the reliability of the research. The Methodology section in the research paper allows the reader to critically evaluate and provides the reliability of the study. In this section, various methodologies used by the supply chain researchers are documented.

Case study is systematic investigation of activities in the organization or in a group of organizations. Various researchers have conducted the case studies to understand the present practices of supply chain in the industries. Various modeling and statistical tools are being used by the researchers to analyze the data related to the supply chain. Interpretive Structural Modeling(ISM) seems to be the most popular tool among the researchers in the area of SCM. 46.80% of researchers are using ISM in their study for modeling the variables of SCM. This is followed by 9.37% Structural Equation Modeling (SEM), 3.125 % TOPSIS and AHP. Various statistical tools like Average, Means, Standard Deviation; ANOVA etc is being used by 37.50% of researchers. Percentage of researchers used various methodologies in their research is shown in Figure 5. Total 58.00% of researchers have collected required data for the study from the literature and remaining 34.00 % from Survey and 8% from mixed. Details researchers used various sources for collection of data in their study is shown in Figure 6.

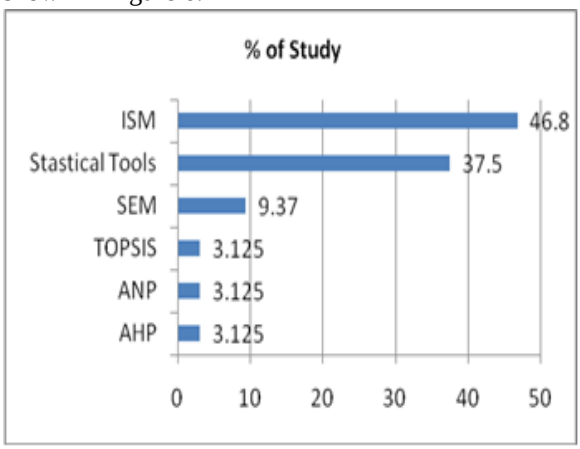

Figure 5: Various Methodologies used by researchers

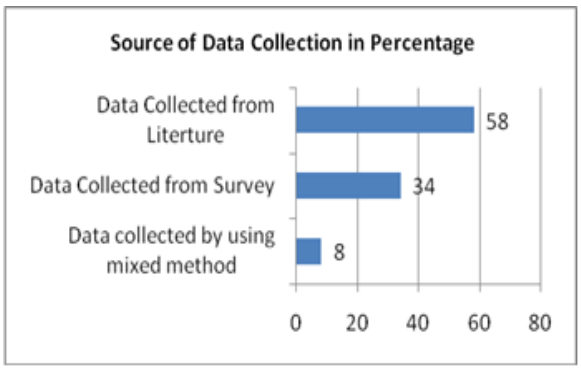

Figure 6: Various Sources of Data used by researchers

IV. CONCLUSION AND FUTURE SCOPE

The objective of this paper is to scan the literature of the last two decades, so the systematic investigation and mapping of the articles is done to classify the pooled knowledge of papers based on their areas of work. Further, various methodologies adopted by the researchers in the area of SCM are also documented in Figure 3. This paper ad on to the group of Review articles in SCM of Gunashekharan A (1997), Lambert D (1998), John T Mentzer (2001), Anne T (2005), Damien Power (2005), JiteshThakkar (2009), Pramod(2012), Claudine A (2015), Mark Johnson (2016)

Lot of researchers have studied the drivers for implementing the SCM. Maximum drivers considered so far are around 22[37] . Few researchers have done the study in the area of supply chain collaboration or cooperation. But this is limited to only 8.57% of articles. Majority of work in the green supply chain management is restricted to Auto Manufacturing [38]and few case studies in textile industries[39]and in SME's. Few papers are documented in the literature for lean, agility and innovation in supply chain. Interpretive Structural Modeling methodology seems to be popular in the area of SCM. Many researchers have used this for modeling the variables in their research. By considering its usefulness, future study should address the computerization of ISM models. This computerization will help the researchers for modeling the variables in their study.

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