

QUALITY MANAGEMENT IN SUPPLY CHAINS: THE LITERATURE REVIEW

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Abstract: Supply chain management is used by most of the organizations worldwide, therefore the large number of studies has been done to explore this field. Moreover, its interlinking with the quality management perspective is still very limited. It is worth mentioning here that, in the present competitive world, the dynamics of market does not allow any deviation in quality of end product. Therefore, the importance of quality management is universally espoused by the researchers and practicing managers working in this area. It has been found by the authors that the focused approaches in evaluating quality management issues within inter and intra organization supply chain contexts are indispensable. During review of the open literature available in this area, the authors investigated that in present scenario there are number of quality related issues (either at the suppliers end or at manufacturers end) in supply chain management which needs immediate attention of the researchers. In this context the quality of supply chain itself can provide a path breaking solution at different levels of supply chain management. Moreover, this concept may be applied to address the problems such as product recall, delay in delivery of products etc. regardless of type of industry. In this paper, the authors have reported intensive studies based on the work carried out by various researchers in the area of supply chain management. Further, an attempt has also been made to identify conceptual interlinking between Supply chain management and Quality management through literature review.

Keywords: Supply chain management, Quality, Quality management, Gap analysis

1. INTRODUCTION

Alexander the Great based his strategies and campaigns on his army's unique capabilities and these were made possible by effective supply chain management. His strategy and tactics had very closely tied to his ability to get supplies and to run a lean, efficient organization.

Several hundred years ago, Napoleon made the remark, "An army marches on its stomach." Napoleon was a master strategist and a skilful general and this remark shows that he clearly understood the importance of what we now call an

efficient supply chain.

Supply chain term was first coined in the early 1980s to describe the range of activities coordinated by an organization to procure and manage supplies (Oliver and Webber, 1982).

Supply chains encompass the companies and the business activities needed to design, make, deliver, and use a product or service. Businesses depend on their supply chains to provide them with what they need to survive and thrive. Every business fits into one or more supply chains and has a role to play in each of them.



Figure 1: Supply Chain Structure

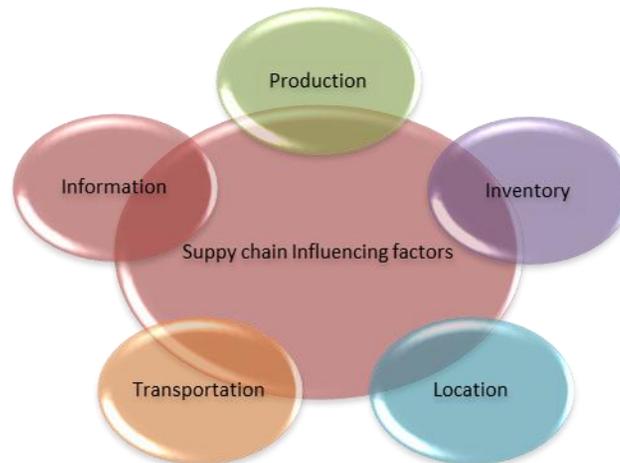


Figure 2: Factors influencing the supply chain

Initially the term referred to an internal focus bounded by a single organization and how they sourced and procured supplies managed their internal inventory and moved goods onto their customers (Harland, 1995; Macbeth and Ferguson, 1990).

“A supply chain consists of all stages involved, directly or indirectly, in fulfilling a customer request. The supply chain not only includes the manufacturer and suppliers, but also transporters, warehouses, retailers, and customers themselves” (Chopra and Meindl, 2006). Customers have so much choice nowadays from an enormous field of competitors that delays in supply mean delays for the customers who are probably not willing to wait when they can obtain the same or similar substitute product elsewhere. Based on the above facts it is observed that the supply chain management has become important and critical aspect to the profit making of any organization. But, the quality management issues have also impacted the performance of supply chain in one way or other. Therefore, one must understand the meaning of quality management.

The quality definition as specified by Joseph Juran, “Quality is the fitness of use” i.e. it is the value of the goods and services as perceived by the supplier, producer and customer. The measure also pertains to the degree to which products and services conform to specifications, requirements and standards at an acceptable price.

Some of the definitions of Quality, provided by quality gurus are as follows:

- Quality is conformance to requirements (CROSBY)
- The efficient production of the quality that the market expects (DEMING)
- Quality is what the customer says it is (FEIGENBAUM)
- Quality is the loss that a product costs to the society after being shipped to the customer (TAGUCHI)
- The totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied needs of the customers (ASQC)

- A quality system is the agreed on companywide and plant wide operating work structure, documented in effective, integrated, technical and managerial procedures for guiding the coordinated actions of people, the machines, or the information of company in the best and most practical ways to assume customer quality satisfaction and economical costs of quality. (FEIGENBAUM)
- BSI EN ISO 9001: 2000 defines the term “quality” as the “degree to which a set of inherent characteristics (distinguishing features) fulfils requirements” (BSI, 2000) whereas Crosby (Oakland, 1993) described quality as “conformance to customer requirements”.

As per the above definitions for quality, Quality management in supply chain can be defined as conformance to requirements.

Therefore, we can say that the quality requirements from the supplier’s point of view may be an efficient and seamless flow of activities and resources to the manufacturer so that the optimum gains in terms of profit and highest rating from the manufacturer can be achieved for maximum possible time.

The quality requirements from the manufacturer’s point of view may be the optimum integration and utilization of resources to satisfy the internal as well as the external customers in terms of goods and services offered.

2. LITERATURE REVIEW

SCM was initially related to the management of inventory within a supply chain. This concept was later broadened to include the management of all functions within a supply chain. According to Chopra and Meindl (2001), supply chain management involves the management of flows between and among stages in a supply chain to maximize total profitability”. This definition suggests that SCM involves management of the flows of products, information, and funds upstream and downstream in the supply chain. SCM also entails making decisions about the locations of production facilities, which products to produce, how to produce them, and finally, how to distribute these products (Sila et al., 2006).

In the quest for competitive advantage,

organizations, consultants, practitioners and academics have attempted to organize and integrate supply chain management (SCM) concepts and practices. The areas of Supply chain which has been researched predominantly includes Supply chain Performance, Supply chain collaboration, Supply chain Integration, Supply chain agility, Supply chain Network design etc. As a result, it has been discovered that this subject requires radical thinking because the vastness of the topics is neither well defined nor easily implemented. SCM involves challenges such as developing trust and collaboration among supply chain partners, identifying best practices that can facilitate supply chain process alignment and integration, and successfully implementing the latest collaborative information systems and Internet technologies that drive efficiencies, performance, and quality throughout the supply chain (Carol J. Robinson, Manoj K. Malhotra, 2005).

Empirical quality management (QM) research has evolved over the last 20 years. Empirical research has defined and measured QM practices (e.g., Ahire et al., 1996; Flynn et al., 1994; Nair, 2006; Saraph et al., 1989; Sila and Ebrahimpour, 2005). Numerous studies have investigated the relationships among QM practices and various aspects of a firm’s performance (e.g., Adam et al., 1997; Ahire and O’Shaughnessy, 1998; Dow et al., 1999; Kaynak, 2003; Samson and Terziovski, 1999). As competition moves beyond a single firm into the supply network of multi firms, focus is shifting from management of internal practices alone to the management of external firms. Quality managers must integrate their firms’ practices with those of customers and suppliers (e.g., Flynn and Flynn, 2005; Kannan and Tan, 2005; Robinson and Malhotra, 2005; Sila et al., 2006). Integrating QM and supply chain management (SCM) will be important for future competitiveness (Flynn and Flynn, 2005; Matthews, 2006; Robinson and Malhotra, 2005).

Quality assurance in supply chain management related to different kinds of goods and services have been researched by (Manning et al. 2007; V. John Peters 1999; Braglia and Petroni, 2000; Sroufe and Curkovic, 2008) in order to align the supply chain with quality assurance to derive the models which can be adopted by the organisations to assure the quality.

The Supply chain performance measurement (Bongsug Chae, 2009; Verma et al., 2008; Rick Hoole, 2005; Khan et al., 2009; Hong et al., 2010; Kannana and Tan, 2005; Wickramatillake et al., 2007; Theeranuphattana and Tang, 2008; Sun et al., 2009; Chris Morgan, 2004; Yeung, 2008; Burgess and Singh, 2006; Fantazy et al., 2009; Hervani et al., 2005; Soo Wook Kim, 2006) models, methods and frameworks related to supply chain partnership (kim et al., 2010), supply chain integration (Flynn et al., 2010), supply chain interaction (Salvador et al., Salvador), Supplier relations (Giannakis, 2007; Ou et al., 2010; Simpson and Power, 2005; Mihalis Giannakis, 2007; Cox et al., 2004) Supply chain Information (Forslund and Jonsson, 2007; Visich et al., 2009; Fawcett et al., 2007; Kaipia and Hartiala, 2006; Sezen, 2008), supplier selection (Weber, 1996), Quality improvement (kuei et al., 2001; Cagnazzo et al., 2010; Mangiameli and Roethlein, 2001), Supply chain effectiveness (Zokaei and Hines, 2007), Supply chain collaboration (Papakiriakopoulos and Pramadari, 2010; Wiengarten et al., 2010) for different types of goods and services such as FMCG, perishable goods (aramyan et al., 2007), services etc. have been researched for increasing the performance of supply chain at different cross sections of it to derive the profit as well as sustained market position and growth for organisations.

Supply chain quality management has been explored by researchers where six hypotheses related to Supply chain quality management developed through literature review and tested using survey data from US manufacturing companies (Sila et al., 2006). Relationship between supply chain quality management practices and organisational performance have been researched and it was found that organizational performance could be enhanced through improved supply chain quality management (Chu-Hua kuei et al. 2001). (Robinson and Malhotra, 2005) defined the concept of supply chain quality management as the formal coordination and integration of business processes involving all partner organizations in the supply channel to measure, analyze and continually improve products, services, and processes in order to create value and achieve satisfaction of intermediate and final customers in the marketplace. They also found out

its relevance to academic and industrial practice and proposed a Quality-SCM framework. (Taticchi and Brun, 2010) identified role of performance measurement systems to support quality improvement initiatives at supply chain level. (Gionata Carmignani, 2009) modified interpretation of ISO 9001:2000 norm and introduced a research to determine a standard to implement a management system for a whole supply chain through the identification of the main supply chain processes and drivers. (Vanichchinchai and Igel, 2009) found that TQM and SCM have same ultimate goal which is customer satisfaction. TQM emphasizes internal (employee) participation and SCM focuses on external (business partners) partnerships but there is a need to emphasize both internal and external partnerships to further strengthen the emphasis on “total” TQM and the entire supply chain in SCM. (Peters, 1999) discussed service quality and total quality management as a business strategy designed to add value to customers. (Lo et al., 2006) in their work on managing quality effectively in supply chain extracted ten critical factors for describing a Supply Quality Management system. These factors could be clustered into three major groups namely supplier selection, supplier development and supplier integration. This study has not covered the relationship among supply quality management, supplier quality and buyer quality. (Chu-Hua kuei et al., 2002) in their work developed a two stage frame work on supply chain quality and technology relate to only upstream of supply chain. Foster Jr. S. T. (2008) defined supply chain quality management (SCQM) to operationalize and understand the effect of increased emphasis on supply chain management on the practice of quality management. Reviewed current research in quality management and identified common themes found in the literature. Key quality management content variables identified are customer focus, quality practices, supplier relations, leadership, HR practices, business results, and safety. Based on these variables he proposed areas for future research in the field of supply chain quality management. (Fynesa et al., 2005) in their work on the impact of supply chain relationship quality on quality performance developed a conceptual framework incorporating dimensions of SC relationships and quality

performance. (Kaynak and Hartley, 2008) found that the inclusion of customer focus and supplier quality management in the QM model supports the importance of internal and external integration for quality performance. (Beamon et al., 1998) proposed a process quality model for the analysis, improvement and control of supply chain and concluded that the coordination of logistics functions into integrated supply chain systems has increased the need for improved process quality. Improving the quality of all supply chain processes results in reduced costs, improved resource utilization, and improved process efficiency. (Seth et al., 2006) devised a conceptual model for quality of service in the supply chain and found that majority of studies on service quality have focused on service industries, not supply chain as a whole. On finding that there are certain service quality domains that have not been investigated sufficiently, they proposed a model for assessing the quality of service at various interfaces of supply chain using 3PL.

(Mowat and Collins, 2006) worked on consumer behavior and fruit quality and found in their survey that 124 consumers revealed that 46 percent ranked price as the most important attribute influencing the purchase decision, followed by taste (25 percent), size (13 percent) and skin color (3 percent). Taste was the attribute most frequently associated with disappointment (84 percent of responses), followed by price (10 percent) and texture (6 percent). Supply chains in new and emerging agricultural industries typically lack information linking product quality with consumer behavior. (Ramudhin et al., 2008) worked on incorporating cost of quality in supply chain network design to ensure the lowest overall cost, because it reduces the probability of defects and hence the probability of additional cost which might be due to corrective action but further research could model cost of quality (COQ) at both supplier and plants simultaneously. In industries such as the aerospace industry, the variable production cost is high; hence producing extra parts to compensate for defectives would be a costly option. (Sengupta, 2010) worked on placing a quality-oriented coordination process between the supply and receiving partners by following the mathematical model which supports the development of an effective supply chain network that maximizes profit. (Romano and

Vinelli, 2001) worked towards understanding how quality can be managed using a supply chain which reports a case study conducted on Marzotto, an important Italian textile and Apparel Company, and its supply chain relationships. The study compares the quality practices in the two different kinds of supply network of which Marzotto is the focal firm. One is managed using a traditional customer-supplier approach and the other a broader and more coordinated perspective. In the latter case, it was found that the whole supply network could improve its ability to meet the expectations of the final consumer in terms of quality through the joint definition and co-management of quality practices/procedures. (Yang et al., 2007) carried out a case study in Samsung, where they found that the effort and investment in synthesizing SCM and six sigma, and developing a unique six-sigma-based methodology to improve its SCM operation, have turned out to be fruitful. The Black Belt program has produced highly qualified and talented SCM specialists, who are currently training the methodology to members in their organizations and leading SCM projects. (Braglia and Petroni, 2010) describes a multiple attribute utility theory based on the use of data envelopment analysis (DEA), aimed at helping purchasing managers to formulate viable sourcing strategies in the changing market place. DEA has proved to be capable of handling multiple conflicting attributes inherent in supplier selection while simultaneously trading-off key supplier selection criteria.

Burgess and et al. (2006) found that the supply chain field is a relatively “new” one; several disciplines claim ownership of the field; consensus is lacking on the definition of the term; contextual focus is mostly on the manufacturing industry; predominantly “process” conceptual framing prevails; research methods employed are mostly analytical conceptual, empirical surveys or case studies; the positivist research paradigmatic stance is prevalent; and theories related to transaction cost economics and competitive advantage dominate. (Das et al., 2008) found that with a few notable exceptions, there is no guidance in the literature for operations managers trying to understand the role that employee safety at their own or a supplier could play in quality outcomes. Empirical tests of these propositions provide initial evidence that safety does indeed

contribute to quality outcomes in the supply chain.

clearly shows that there are ample opportunities in quality management in supply chain. Figure 3 shows the papers reviewed for supply chain related areas in which majority of papers are related to Supply chain performance.

3. RESULTS OF STUDY

The literature which has been reviewed

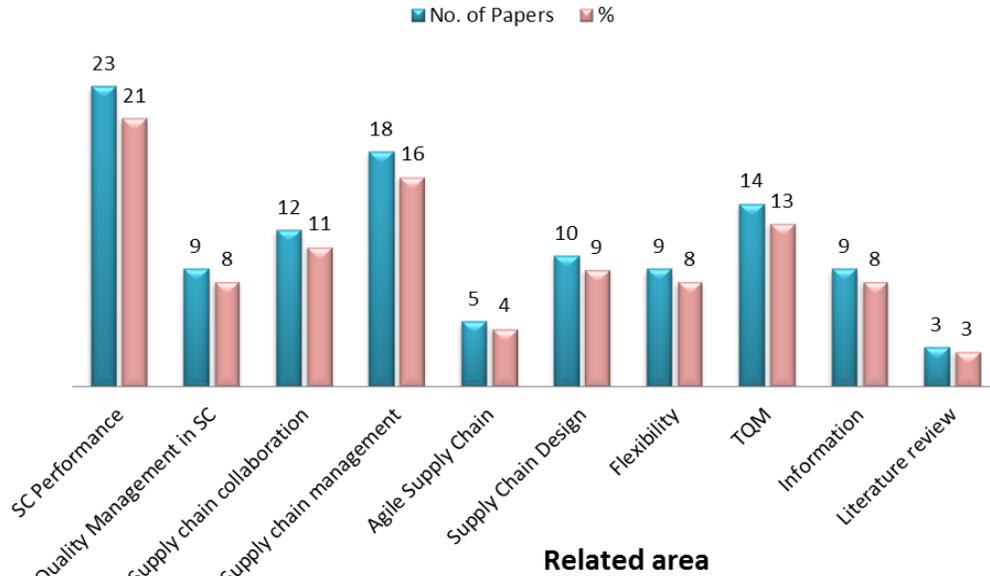


Figure 3: Papers reviewed in Supply Chain related area

Figure 4 shows the different methodologies

adopted by the researchers for the research.

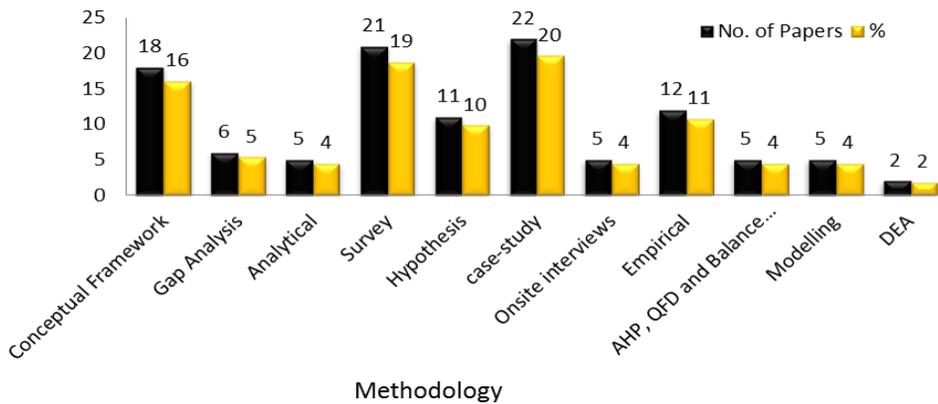


Figure 4: Methodologies adopted by researchers

In order to categorize outcome of the literature review as above, international journals have been referred and the related papers were found predominantly in Journal of manufacturing technology (11%), Supply chain management: an

international journal (21%), International journal of operation and production management (14%), Journal of operation management (21%), Supply chain management (11%) (Figure 5).

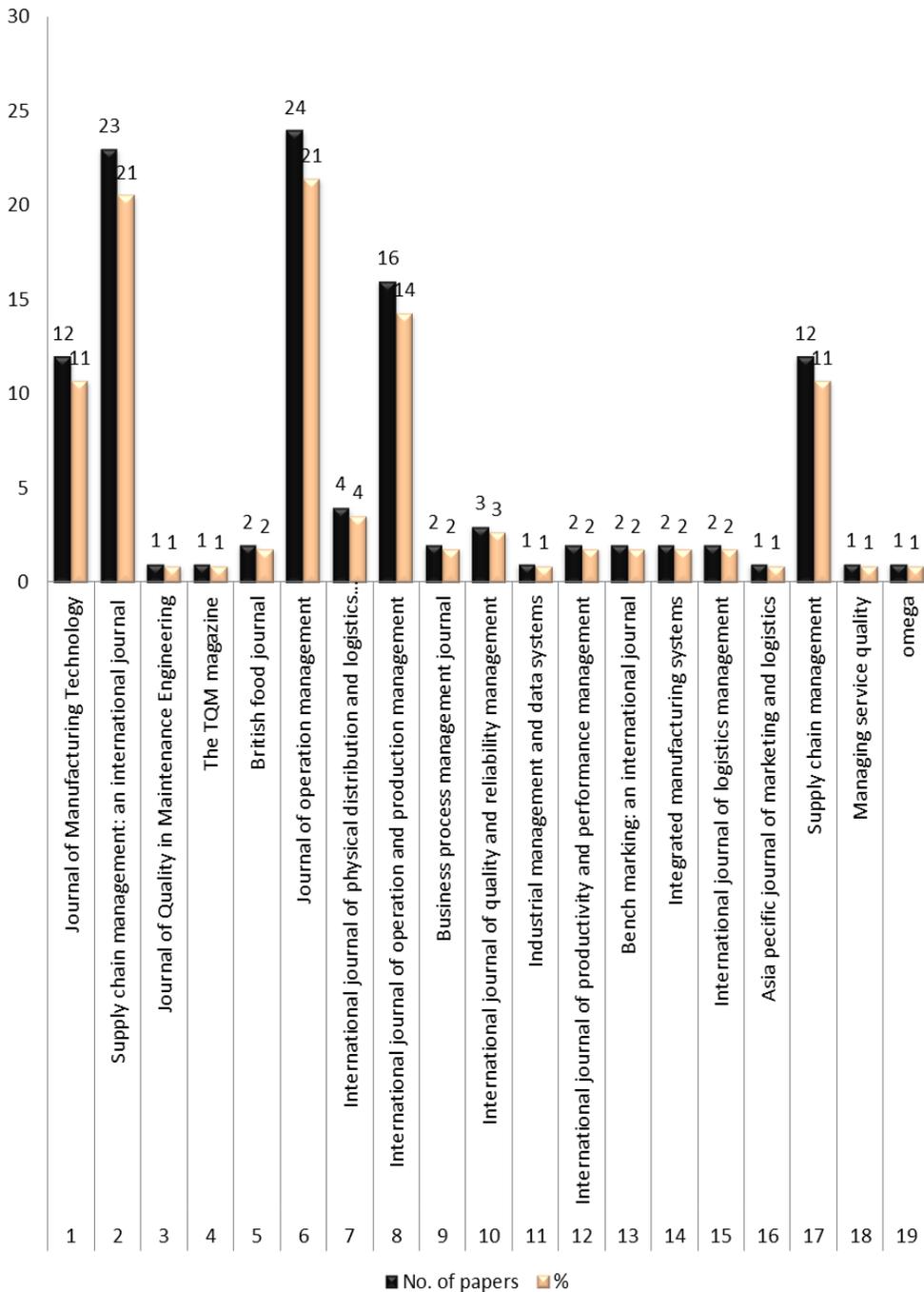


Figure 5: Papers reviewed from Various International Journals

Out of the total 112 papers reviewed the related areas covered in the supply chain management field in terms of percentage of papers found to be SC Performance (21%), Quality

Management in SC (8 %), Supply chain collaboration (11 %), Supply chain management (16%), Agile Supply Chain (4%), Supply Chain Design (9%), Flexibility (8%), TQM (13%),

Information (8%), Literature review (3%).

The methodologies adopted by the researchers in the different areas of supply chain management literature review are Conceptual framework (16%), Gap Analysis (5%), Analytical (4%), Survey (19%), Hypothesis (10%), Case-study (20%), Onsite interviews (4%), Empirical (11%), AHP, QFD and Balance Score Card (4%), Modelling (4%), DEA (2%).

Out of total papers reviewed 8% of the papers are based on quality management in supply chain where the main focus was the improvement in quality of product and merely 2 papers are on the supply chain quality.

4. GAPS IN LITERATURE

The different aspects of Supply chain have been studied and emphasized by the researchers at different cross section of the industries over the years such as supply chain performance, SC coordination, SC Integration, SC Communication and information sharing, SC Leadership, SC best practices etc. but there is a huge gap existing for the comprehensive research on quality aspects of supply chain (Carol J. Robinson, Manoj K. Malhotra). Most of the research and studies done on quality aspects of supply chain have focused on the management of quality of products in the supply chain. Many research articles in supply chain context are found to be on performance of supply chain but the question arises that what about Quality of supply chain itself. Does it imply that performance of the SC is same as quality of supply chain? If yes then why the definition is different for both and if not, what can be the

quality of supply chain? The qualities aspects of supply chain are not dealt specifically as do supply chains have the quality? If yes, then what are these quality parameters? How do these parameters affect the quality? How do supply chain quality practices affect performance? How is quality managed in the context of the supply chain? How is management integrated with customers and suppliers to improve supply chain performance? How do these changing relationships influence quality results in firms? Therefore, the above can be considered as the future scope of research in this field.

5. CONCLUSION

Supply chain management is key focus area in the current scenario of global competitive market. In this market the company or organization having the quality in supply chain will only survive. It has been observed that quality in supply chain has not been focused in the literature related to supply chain management.

The 8% of the papers reviewed have focused on quality management in supply chain. Here the main focus was the improvement in quality of product and not on the supply chain quality. In this paper the authors have attempted to study the existing literature on supply chain management and quality management. Analysis has been carried out to categorize the research papers published in international journals on the basis of different areas of supply chain management. This paper will be useful for the researchers in their study.

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