UNDERSTANDING OF SUPPLY CHAIN: A LITERATURE REVIEW

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Abstract:

Supply Chain Management is a network of facilities that produce raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system. The management of the supply chain and the roles of various actors involved differ from industry to industry and company to company. As a result Supply Chain Management (SCM) has become a vital issue for manufacturers, professionals and researchers. It is felt that to manage the supply chain effectively entire structure of supply chain must be understood properly.
This paper attempts to provide the reader a complete picture of supply chain management through a systematic literature review. It presents main activities of supply chain and the step-by-step approach for understanding a complete picture of supply chain.

Key Words: Supply Chain, Supply chain activities, Supply chain management, Implementation strategy, performance measurement.

1. Introduction:

Organizations adopt numerous business improvement methodologies to improve the business performance. Manufacturers and researchers have noted a number of problems regarding supply chain activities in their research and practice (Sridharan et al., 2005). It is observed that usually either a system (Integrated approach) or a subcomponent in supply chain (Disintegrated approach) is focused and discussed in the literature but fails to answer the rational (why, what, how) behind supply chain activities (Spens & Bask, 2002). This paper addresses these questions with the help of structured literature review, which not only helps to understand the management of supply chain but also provide the a six step approach to manage the supply chain.

2. Review of Literature:

Supply Chain Management is a network of facilities that produce raw materials, transform them into intermediate goods and then final products, and deliver the products to customers through a distribution system. It spans procurement, manufacturing and distribution (Lee & Billington 1995) the basic objective of supply chain management is to "optimize performance of the chain to add as much value as possible for the least cost possible". In other words, it aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties (Finch 2006).
Adoption of Supply chain management practices in industries has steadily increased since the 1980s. A number of definitions are proposed and the concept is discussed from many perspectives. However Cousins et al. (2006); Sachan and Datta (2005); Storey et al. (2006) provided excellent review on supply chain management literature. These papers define the concept, principals, nature, and development of SCM and indicate that there is an intense research being conducted around the world in this field they critically assessed developments in the theory and practice of supply management.

Gunasekaran and McGaughey (2003) extended the scope of SCM beyond material management, partnership, information technology to the Total Quality Management areas like management commitment, organizational structure, training and behavioural issues. As firms' survival lies on integration, a good understanding of the integration process is a key aspect in SCM. Mouritsen et al. (2003) discussed that basic hypothesis "the more integration (wider the scope) – the better the management of the chain" is not always true and proved that it depends very much on the "environment" of the supply chain and the power relations between the participants in the supply chain. Authors proposed a set of management techniques and tools to analyze successful SCM strategies.

It is also observed that research is not limited to hypothesis testing and data analysis, but more advanced techniques like simulation, Artificial Neural Network, and Fuzzy logic are also used for optimization and decision making in SCM. Koh and Tan (2006) used the principles of fuzzy logic for analyzing and monitoring performance of suppliers based on the criteria of product quality and delivery time where as Chiu and Lin (2004) showed how the concepts of collaborative agents and artificial neural networks (ANNs) can work together to enable collaborative supply chain planning (SCP).

It appears from literature review that researchers have studied supply chain management from a system perspective, or the systemic natures of interactions between the participants of supply chain are observed. Although numerous studies views SCM from different perspectives, this paper gives the better understanding of supply chain activities.

3. Supply Chain Management:

Supply Chain Management is management of material, money, men, and information within and across the supply chain to maximize customer satisfaction and to get an edge over competitors.

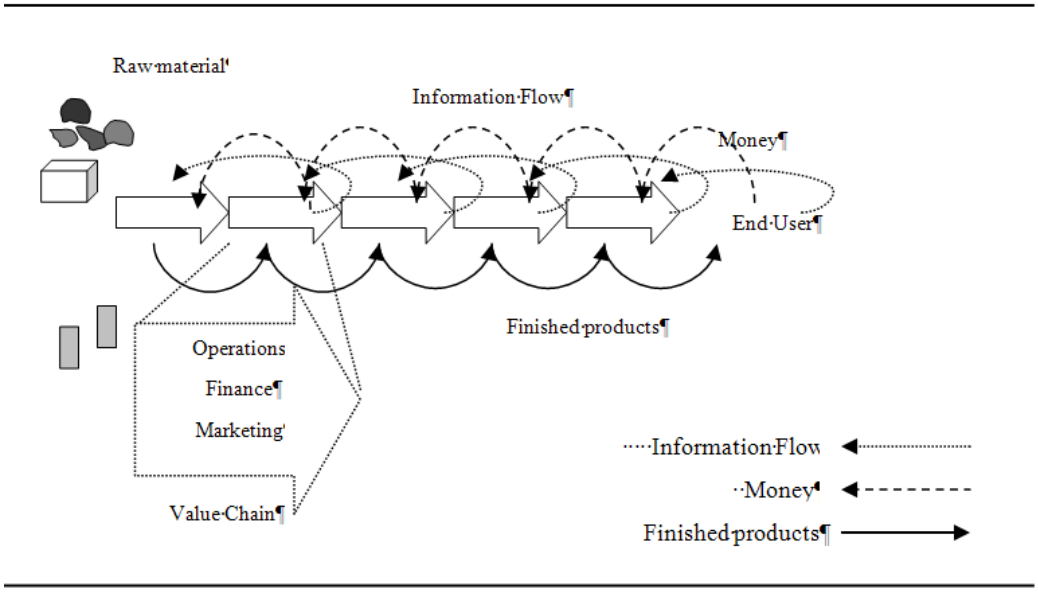

Figure 1: Supply Chain (New and Payne, 1995)

3.1 Evolution of SCM:

In the 1950s and 1960s, most manufacturers emphasized mass production to minimize unit production cost as the primary operations strategy, with little product or process flexibility. In the 1970s, material requirements planning (MRP) was developed and managers realized the impact of huge WIP inventories on manufacturing cost, quality, product development, and delivery lead-time. The intense global competition of the 1980s forced world-class organizations to offer low-cost, high-quality, and reliable products with greater design flexibility.

Manufacturers utilized Just-In-Time (JIT) and other management programs to improve manufacturing efficiency and cycle time. The evolution of SCM continued into the 1990s as organizations further extended best practices in managing corporate resources to include strategic suppliers and the logistics function. Many manufacturers and retailers are embracing the concept of SCM to improve efficiency and effectiveness across the supply chain. The following table explain the evolution of supply chain management.

Table 1: Evolution eras of supply chain management (Jain et. al. 2010)

S.No.	Era	Description
1	Creation Era	The term supply chain management was first coined by an American industry consultant in the early 1980s. However the concept of supply chain in management, was of great importance long before in the early 20th century, especially by the creation of the assembly line.
2	Integration Era	This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems in the 1960sand developed through the 1990s by the introduction of Enterprise Resource Planning (ERP) systems.
3	Globalization Era	This era is characterized by the globalization of supply chain management in organizations with the goal of increasing competitive advantage, creating more value-added, and reducing costs through global sourcing
4	Specialization Era Phase One-Outsourced Manufacturing& Distribution	In the 1990s industries began to focus on "core competencies" and adopted a specialization model. Companies abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies.
5	Specialization Era Phase Two - Supply Chain Management as A Service	Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management, and non asset based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution and performance management.
6	Supply Chain Management 2. 0 (SCM 2. 0)	Web 2. 0 is defined as a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users.

3.2 Definitions and key ideas of SCM: Researchers found that the lack of commonly accepted definition of supply chain management and the problems associated with supply chain activities makes the understanding of supply chain management difficult. Let us try to understand what SCM is? There are numerous definitions of SCM; few definitions discussed here would give an understanding of SCM.

Table 2: Definitions and key ideas of SCM

Authors	Definition of SCM	Key ideas
Scott and Brook, (1991)	The chain linking each element of the manufacturing and supply process from raw materials to the end user, encompassing several organizational boundaries.	Highlights the significance of coordination among constituent members.
Ellaram, (1991)	The integration of the processes, systems, and organizations that control the movement of goods from the supplier to a satisfied customer without waste.	Highlights the necessity of integration among the organizations, physical \movement and the waste reduction principal of JIT.
Lee and Billington, (1992)	Networks of manufacturing and distribution sites that procure raw materials, transform them into intermediate and finished products, and distribute them to customers.	Attempts to show conventional functions of supply chain.
Christopher, (1992,1998)	The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole.	Signifies the importance of relationships, customer focus and cost reduction
Ellrarn Cooper, (1993)	An integrating philosophy to manage the total flow of a distribution channel from supplier to ultimate customer.	Identifies the importance of integration within supply chain.
Berry *et al.*, (1994)	SCM aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to particular original equipment manufacturer so as to release management resources for developing meaningful, long term relationship.	Highlights the importance of supplier relationships in achieving supply chain objectives.
Cox *et al.*, (1995)	The functions within and outside a company that enable value chain to make and provide products to the customer.	Attempts to identify strategic partners within supply chain.
Saunders, (1997)	Supply Chain is the total chain of exchange from original source of raw material, through various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing, and retailing to end customers.	Network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery.
Patricia *et al.*, (1996)	The physical network that begins with the supplier and ends with the customer.	Traces all the organizations with within a supply chain including all tiers of suppliers and distribution.
Monczka and Morgan, (1997)	Integrated SCM is about going from the external customer and then managing all the processes that are needed to provide the customer with value in a horizontal way.	Highlights the necessity of flat organizational structure and customer focus.
Tan *et al.*, (1998)	It is management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency.	Focuses on how firms utilize their suppliers' processes, technology and capability to enhance competitive advantage.
Houlihan and Houlihan, (1999)	The integration of various functional areas within an organization to enhance the flow of goods from immediate strategic suppliers through manufacturing and distribution chain to the end user.	Considers strategically important suppliers and integration among constituent members

According to these definitions, SCM encompasses the entire value chain and addresses materials and supply management from the extraction of raw materials to the end of useful life.

3.3 Supply Chain Management - Issues and Challenges:

Successful implementation of SCM is seen as closely dependent upon the need for breaking down barriers not only between internal departments and business processes, but also across companies within the whole supply chain (Vollman et al., 1997). Its success is also associated with the challenging development of a new culture based on empowerment and on-going and shared learning and continuous improvement. Another challenging

and difficult feature of SCM is linked with the emergence of the network organization, which can lead to a complex web of linkages to be coordinated and managed. This can imply difficulties which include lack of common purpose, multiple and hidden goals, power imbalances, culture and procedures, conflict over autonomy and accountability, over-dependence and a continuing lack of openness and opportunistic behaviour (Cox and Townsend, 1998).

3.4 Supply chain management objectives:

The main reason and objective of SCM is to provide a strategic weapon to build up and enhance sustainable competitive advantage by cost reduction without compromising customer satisfaction (Mentzer et al. 2001). Moreover, the ability to understand the environment pressures that drive the SCM and clearly note the barriers and implement solutions or bridges enables supply chain performance to maintain competitive advantage (Fawcett et al, 2008, 37). The main goal and important aspect of SC is leveraging the expertise, experience, skills and capabilities of the SCP who comprise this competitive network (Mentzer et al., 2001).

3.5 Barriers, Bridges and Benefits to effective SCM:

There are a number of hurdles that block the path of firms implementing an integrated SC practices and processes. Fawcett et al. (2008) reviewed recent scientific literature on the potential barriers to SCM. They classified the barriers into two categories namely inter-firm rivalry and managerial complexity. They noted the following barriers under inter-firm rivalry category, in order of significance; internal and external turf wars, poor SCM planning, lack of vision of SCM, lack of trust, executive commitment and poor SCM understanding. All these barriers work against agility in SC and management should reduce their impact. However the worst barrier, internal and external turf wars needs urgent attention by SCPs as its negative impact is fast and severe leading to the disruption of the SC. Poor planning and lack of vision are symptoms of failure by SCs, though their effects may be slow to appear their eventual impact is disastrous.

Managerial complexity includes misaligned SC processes, structures and major differences in SCPs' business culture (Fawcett et al., 2008). And in the managerial complexity category Fawcett et al. (2008) noted the following barriers in order of significance; IS/IT deficiencies, organizational structure/culture, lack SC measurement and lack of alliance guidelines. These problems are both at enterprise level and SC level and hence the need to tackle them at both fronts. The worst barrier IS/IT deficiencies mean loss in competitive advantage by the whole SC.

Fawcett et al. (2008) reviewed solutions to the SCM barriers proposed in the scientific literature. They noted the following plausible solutions in order of importance; information transparency, CFT/CF collaboration, collaborative planning, IT architecture/internet, formal performance tracking, adopt strategies SCM vision, attention to human factors, supplier certification/reduction, target segmented customers and shared investment/benefits.

Fawcett et al. (2008) reviewed key benefits of SCM proposed in literature and noted the following in the order of their importance; increased inventory turnover, increased revenues, SCM cost reduction, product availability, decreased order cycle time, responsiveness, economic value added, capital utilization, decreased time to market and reducing logistics costs.

3.6 Need for Managing Supply Chain:

The next important issue is why the firms should consciously manage the supply chain. Supply chain involves the cost to convey the information, produce components, store them, transport them, and transfer funds and so on. The total cost of supply chain tends to increase due to many parameters like huge capital cost required for running global businesses, mounting real estate costs and fright charges (Koch, 2006). However the perfect planning in SCM regarding material arrival, production schedule and distribution not only reduces the inventory and inventory cost but also reduces the wasted time and energy (Verma et al., 2006). Supply chain management drastically alters inventory investment across a range of industries, and helps to tackle economic fluctuations (Heng et al., 2005).

4. Issues in Supply Chain:

It is found that SCM encompasses planning, manufacturing and operations management necessary to bring a product to the market place, from the sourcing of materials to the delivery of the completed product. This section would provide insights on the aspects and the issues that are to be managed in supply chain.

4.1 Information Technology and Information Management:

The advent of the Internet and electronic communication has enabled companies to be more responsive to their customers than ever. Sanchez and Perez (2003); Tarn et al. (2002); Wieder et al. (2006) examined functions,

current developments and the rationale for IT integration by analyzing the problems of enterprise resource planning (ERP), electronic data interchange (EDI) and presented the solutions of SCM. The rich experience of firms with ERPs tends to deliver higher overall performance, but no evidence was found of a similar effect on supply chain performance. On the contrary EDI adopters perceived more operational benefits, more external pressure and mutual understanding, and fewer technical and organizational difficulties than non-adopters of EDI.

Information sharing practices such as vendor-managed inventory (VMI) give manufacturers access to more accurate demand information. Småros et al. (2003) used discrete-event simulation to examine how a manufacturer can combine traditional order data available from non-VMI customers with sales data available from VMI customers in its production and inventory control and what impact this has on the manufacturer's operational efficiency. The key finding was that even for products with stable demand a partial improvement of demand visibility could improve production and inventory control efficiency. Other finding was that the value of visibility greatly depends on the target products' replenishment frequencies and the production planning cycle employed by the manufacturer.

4.2 Knowledge Management:

Knowledge is critical for organizations to satisfy customer needs for customized products and services, and speedier and improved service (Davenport and Klahr, 1998). Knowledge indicates a firm's intellectual capital: including work-related experience, expertise, know-how, and best practices, that can be acquired and shared. Global competition and accelerating technological changes, especially in information communication and Internet technologies makes competition knowledge-based thereby affecting supply chain management across firms (Lang, 2001). Desouza et al. (2003) linked the impact of organizational structure in knowledge transfer and utilization among the different participating functions in the perspective of systems theory.

Knowledge management (KM) involves individuals and groups, both within and between firms, managing tacit and explicit knowledge to make better decisions, take actions and deliver results to support the underlying business strategy (Horwitch and Armacost, 2002). Alavi and Leidner, (1999) defined knowledge management as the systematic and organizationally specified process of acquiring, organizing, and communicating knowledge so that employees can use it to become more effective and productive in their work. Numerous attempts have been made to define KM processes; some significant and relevant contributions are shown in the Table 3.

Table 3: Knowledge Management definitions:

Expert	**Definition**	**Focus**
Grey, (1996)	KM is a collaborative and integrated approach to the creation, capture, organization, access and use of an enterprise intellectual asset.	Business perspective
O'Dell and Grayson, (1998)	KM is a conscience strategy for moving the right knowledge to the right people at the right time to assist sharing and enabling the information to be translated into action to improve the organizational performance.	Process based
Bair, (1997)	KM aims to capture the knowledge that employees really need in a central repository and filter out the surplus. Use of technology to capture the knowledge residing in the minds of the employees so that it can be easily shared across the enterprise.	Need based
Lytras *et al*., (2002)	The cumulative ability to utilize the value incorporated in the various stakeholders in of an organization. KM is the integration of knowledge assets in reusable formats that sets a win-win relation for all the parts of the knowledge Web.	Holistic nature
Information Week, (2003)	KM is the concept under which information is turned into actionable knowledge and made available effortlessly in a usable form to the people who can apply it.	Process based
Kimiz & Dalkir, (2005)	KM is the deliberate and systematic coordination of an organization's people, technology, processes, and organizational structure in order to add value through reuse and innovation.	Holistic nature

It is observed that establishing internal knowledge management systems for organization creates opportunities to minimize knowledge isolation in functional departments and creates a greater base for learning.

4.3 Customers - Supplier Relationship Issues:

Customer satisfaction is absolute for staying abreast in competitive environment that can be achieved only by quickly responding to customer needs. Efficient consumer response (ECR) is a supply chain management strategy that attempts to address the inefficiencies in the supply chain. Hoffman and Mehra (2000); Harries et al. (1999); Sparks and Wagner (2003) discussed efficient consumer response (ECR) as a supply chain strategy by analyzing the adoption of ECR strategy in some industries. Jonsson and Zineldin (2003) proposed conceptual model including behavioural dimensions of supplier-dealer relationships and presented hypotheses about how to achieve satisfactory inter-organizational relationships. Lambert and Pohlen (2001) provided a framework for developing supply chain metrics that translates performance into shareholder value. The framework emphasized on managing the interface between customer relationship management and supplier relationship management at each link in the supply chain. It is concluded that long-term relationships between customer and supplier can lead to higher satisfaction.

4.4 Customer relations Issue:

A company's customer relations practices can affect its success in managing the supply base as well as its performance (Scott and Westbrook, 1991; Ellram, 1991; Turner, 1993). A key element of successful supply base management involves downstream integration of customers as well as the management of upstream suppliers. Each entity in the supply chain is a supplier as well as a customer. When a customer driven corporate vision is implemented simultaneously with effective TQM and supply base management practices, it can produce a competitive edge in a number of different ways. These include increases in productivity, reductions in inventory and cycle time, increased customer satisfaction, market share and profits. However, there is little empirical evidence in the literature linking customer relations practices and performance to support the conceptual foundation of customer driven corporate policy.

4.5 Issue of Supply chain Design:

Manufacturing firm’s supply chain design is based on effective integration. Braganza (2002) and Power (2005) examined different perspectives on integration and suggested that integration of several functions at different organizational levels achieve above average financial and performance results. It is observed that current static approaches and theoretical models are ineffective in considering all variables and constraints for designing supply chain. Manson- Jones et al. (2000) demonstrated how the “lean" and “agile" paradigms might be integrated. They designed a total performance metric and developed a route map for integration of lean production and agile supply in the total chain. Lalwani et al. (2006) suggested that one of the reasons for this might be the difficulty of grasping the full dynamic complexity of the processes and systems encountered. Authors proposed that current developments in systems thinking and continuous system simulation, when applied within the context of an operations management framework, may offer the good design of SC and improve in supply chain performance.

4.6 Logistics management*:*

Many years practitioners and professionals were confused between “logistics" and “supply chain management", the usage of each term varied according to the industry. Lummus et al. (2001) examined the historical definitions of both terms, and proposed a hierarchy for the relationship between logistics and supply chain management. Srivastava and Srivastava (2006); Meade and Sarkis (2002) presented a framework to manage product returns in reverse logistics by focusing on product ownership data, average life cycle of products, past sales, forecasted demand and likely impact of environmental policy measures .It is observed that reverse logistics is one of the toughest supply chain challenges. Once the product has been manufactured it is very important that there should be an adequate structure to distribute it to the customers. Neves et al. (2001); Ma and Davidrajuh (2005) proposed distribution channels planning model. Authors explored the use of an iterative approach for designing distribution chain in an agile virtual environment; and proved that quick adaptation to changing market situation and automation of supply chain management processes are essential.

4.7 Global Issues:

Shortened product life cycles and increasing global competition has tempted traditional manufacturers to contemplate on their competencies, such as product design and development, and a decision to outsource. Jennings (2002) and Zeng (2003) projected strategic benefits and problems relating to the outsourcing decision. These include issues of cost, quality, flexibility, strategic focus, and diversification, the potential loss of critical skills and knowledge, and appropriation of final product value. A model was developed, structuring the contextual factors: capability, cost, technology, supply and product market conditions, to enable a consideration

of the outsourcing decision. Buxey (2005) and Svensson (2001) explored the linkage between firms' outsourcing activities and the occurrence of supply chain disruptions. Blowfield (2005) discussed the experience of employing global social and environmental standards, in terms of a global ethic. It was concluded that strategic development of SCM capabilities such as efficient inbound and outbound transportation, warehousing, inventory control, production support, packaging, purchasing, order processing, and information dissemination enables a manufacturing firm to identify key performance measures.

4.8 Partnership Issues:

As global markets grow increasingly efficient, competition no longer takes place between individual businesses, but between entire value chains. Therefore executives are developing supply chain partnerships/collaboration in an attempt to reduce costs, improve service and to gain competitive advantage. Horvath (2001) proposed that Collaboration through intelligent e-business networks would provide the competitive edge to all the participants in a value chain to prevail and grow. It is found that collaborative partnerships can be achieved both via trust and through electronically mediated exchange. Frankel et al. (2002) showed that one of the most common usages of partnerships is in the provision of transport and distribution services. Authors recommended that rather than devoting effort and resources to build an in-house supply chain it can often be much more cost-effective to form a partnership with a shipping company, and allow them to perform the job of distribution at a lower cost than the enterprise could manage itself.

4.9 Environmental issues:

Power (2005) presented a conceptual framework to investigate supplier relations, lean manufacturing, environmental management practices; and their relationship to one another. It is found that efforts to improve a supplier's environmental management practice raise critical issues of transaction costs and efficacy of approach for the buyer. It is recommended that an environmental bias is to be introduced into the decision making process which would allows more environmentally conscious decisions to be made.

4.10 Trust & Commitment:

The two fundamentals components of improving the relationship are trust & commitment (De Ruyter *et al.* 2001). The cooperation arises directly from both relationship trust & commitment (Morgan & Hunt 1994). According to past research, trust has two dimensions: "honesty" & "benevolence" (Kumar *et al.* 1995). There are several dimensions of trust in fresh produce supply chain performance such as confidence in preferred trading partner, always keeps promises, always honest, good reputation, trust in preferred trading partner, believe information provided, close personal friendship, trading partner always consider best interests (Batt 2003). Trust is the belief that the partners will act in ways that will bring positive outcomes for the firms & does not want to take unexpected actions that may bring a negative outcome (Anderson & Narus 1990). Trust (Moorman *et al.* 1993) is the willingness to rely on an exchange partner in whom one has confidence. Or trust as a belief, a sentiment or an expectation about an exchange partner and results from the partner's expertise, reliability & intentionality. Trust is the extent to which the buyer believes that the supplier has the necessary expertise to perform the activity effectively & reliably (Ganeshan 1994)

5. Performance Measurement in Supply Chain:

Performance measurement is very important as a strategic tool and also provides means to achieve the objectives required, fulfilling a firm's mission/strategy statement. Many firms have been observed to evaluate performance, primarily on the basis of cost and efficiency (Skinner, 1971). This has resulted in most measures focusing on financial data such as return on investment, return on sales, price variances, sales per employee, productivity and profit per unit production etc. As a result of globalization and competition the organizations have started adopting innovative business practices and performance improvement initiatives such as TQM, JIT and SCM. Following are the various supply chain performance evaluation criteria.

Table 4: Supply chain performance evaluation criteria:

Authors	Criteria	Key ideas
Lambert and Cooper, 2000	Process-based	Successful SCM requires a change from managing individual functions to integrated activities within key supply chain business processes.
Coyle et al., 2003; Keebler et al. 1999	Strategic alignment	The performance measurement system must be consistent with the overall strategy of the supply chain. For instance, if the overall supply chain objective is short delivery times, logistic strategies that emphasize low cost could be in conflict.
Coyle et al., 2003;	Tool for improvement	The performance measurement system should focus on improvement.
Lambert and Pohlen, 2001	Handling conflicting objectives	The performance measurement system should assess the different trade-offs within a supply chain and visualize the results to prevent sub-optimization.
Busi, 2005; Lapide, 2000; Neely et al., 1997	Simplicity	The performance measurement system should be easy to understand at all levels in the organizations and it should contain a limited number of relevant measures
Gunasekaran et al., 2004; Coyle et al., 2003	Comparability	The performance measurement system should enable the supply chain to benchmark its performance to a set of standards.

Agarwal and Shankar (2002) proposed an analytic network process (ANP)-based model for analyzing the alternatives affecting supply chain performance. It also provides the decision methodology to prioritize these alternatives, so that supply chain performance can be improved. A process-based systematic perspective was employed to build an effective model to measure the holistic performance of complex supply chains. Fuzzy set theory was introduced to address the real situation in judgment and evaluation processes. Fynes at al. (2005), Gunasekaran et al. (2001) developed a conceptual framework to link up SC relationship dynamics and manufacturing performance and found out the less evidence of SC relationship dynamics on manufacturing performance.

5.1 Significance of Performance Evaluation:

Performance evaluation is very important as a strategic tool and also provides means to achieve the objectives required, fulfilling a firm's mission/strategy statement. As highlighted in the earlier section, major task in performance measurement is to identify, evaluate and select the performance measures, which are appropriate to assess inter-organizational performance. A general tendency in many firms has been to evaluate performance, primarily on the basis of cost and efficiency (Skinner, 1971). This has resulted in most measures focusing on financial data such as return on investment, return on sales, price variances, sales per employee, productivity and profit per unit production etc. The literature reviewed so far highlights the importance of managing the design and development of performance measurement systems to ensure that they continue to reflect the environment and objectives of the organization. The literature also suggests that the factors affecting evolutionary change within organizations, and hence the evolution of performance measures, are many and complex.

Effectively measuring and managing of supply chain performance is a complex and difficult task. If performance measurement is to lead to long-term and continuous performance improvement, then different stages of the performance measurement and management processes such as design of measurement systems, their implementation, and identification of appropriate measures to be used are to be successfully implemented. Organizational support in terms of knowledge sharing, leadership, structure and learning is immensely required for successful implementation.

5.2 Performance measures Classification:

De Toni and Tonchia (2001) conceptually classified the performances of the operations into two broad categories of ‘Cost performances’ and 'Non - Cost performances', which have further divisions as shown in Figure 2.

Non-financial performances include measures related to time, flexibility and quality. It is an important move towards a multi criteria approach, which can correspond to the need of holistic and strategic approach. Non-monetary units of measures generally measure the non-cost performances and as far as they influence the economic and financial performances (net income and profitability), the link with them cannot be calculated in a precise manner as for the cost performances. Non-cost measures are divided into three categories, namely quality, time and flexibility related measures. Time element has strategic importance in business and hence

'time' has to be used as a strategic metric in performance measurement (Stack et al, 1990). These authors argue that measuring, controlling and compressing time shall improve quality, reduce costs, improve responsiveness to customer orders, enhance delivery, increase productivity, increase market share and increase profits.

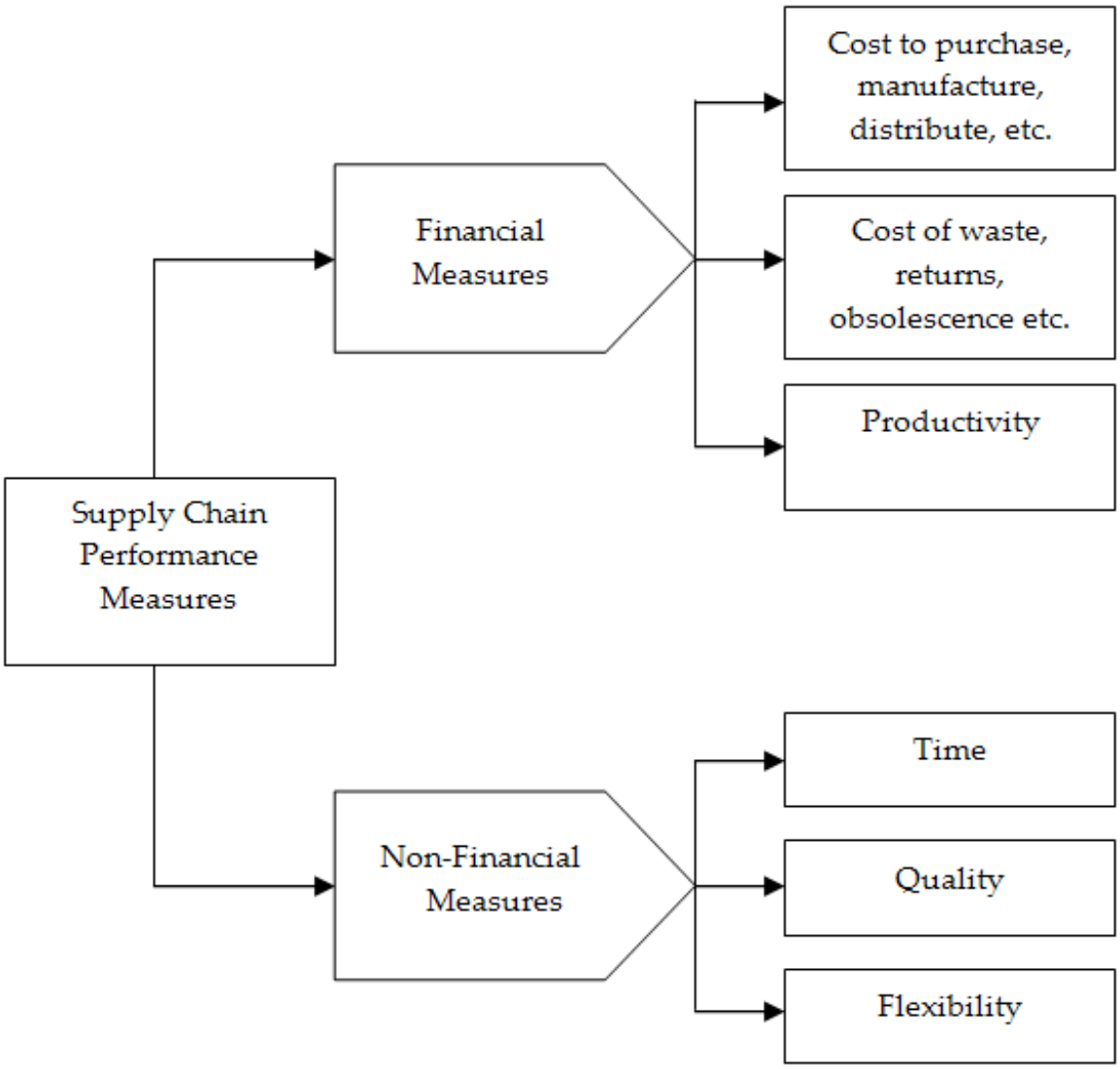

Figure 2: Classification of performance measures (De Toni and Tonchia, 2001)

Flexibility (to measure the ability to deal with the dynamic nature of the business) is a performance apart, since it is an ability to change something (for example, the production volume or mix) in relation to all the three performances of cost, time and quality (De Toni and Tonchia, 1998). Gunasekaran et al. (2001) outlined six sets of performance metrics. The emphasis is also on the importance of measuring the non-financial aspects and the non-quantifiable and intangible aspects of performance. These parameters and metrics include the measures at strategic, operational and tactical level and these metrics are aligned to the four basic links that constitute the supply chain: plan, source, make and deliver. The measure sets incorporate measures for the issues related to supplier's relations.

6. **Supply Chain Management Practices:**

SCM practices are defined as a set of activities undertaken in an organization to promote effective management of its supply chain. Supply base management refers to how firms utilize their suppliers' processes, technologies, and capabilities to enhance competitive advantage (Farley, 1997), and how the manufacturing, logistics, materials, distribution and transportation functions are coordinated within organizations (Lee and Billington, 1992). Many firms have reduced their supply base so they can more effectively manage relationships with strategic suppliers (Tully, 1995). Companies encountering problems due to increased reliance on suppliers use a

variety of approaches to address the problems. They may reverse their downsizing emphasis and bring outsourced products and services back in-house, secure alternative sources of supply, or work with existing suppliers to increase their performance and capabilities (Watts and Hahn, 1993). Supplier development efforts vary in terms of the effort expended by the buying firm and in the variety of tools used.

A recent study found that firms often use supplier evaluation or performance measurement to identify specific supplier deficiencies and to develop plans to address them (Krause, 1997). Such efforts may involve the measurement of suppliers' delivery, quality, and cost performance, site visits, certification of suppliers' products and processes, and the setting of performance goals.

Practices used to effectively manage the supply base and increase supplier performance include the use of quality assurance programs for monitoring supplier's processes and products, the use of site visits, and the sharing of information with suppliers.

Table 5. Supply Chain Practice:

Author	Description
(Donlon 1996)	Supply chain practice includes supplier partnership, outsourcing, cycle time compression, continuous process flow and information sharing
(Tan *et al*. 1998)	Supply chain practice includes purchasing, quality, and customer relations
(Alvarado & Kotzab 2001)	Using inter-organizational systems in supply chain practice such as EDI, and elimination of excess stock levels by postponing customization toward the end of the supply chain
(Tan *et al*. 2002)	Six elements of supply chain practice (using factor analysis): supply chain integration, information sharing, supply chain characteristics, customer service management, geographical proximity and JIT capability
(Chen & Paulraj 2004)	Using supplier base reduction, long-term relationship, communication, cross-functional teams and supplier involvement to measure buyer-supplier relationships
(Min & Mentzer 2004)	There are seven elements of supply chain practice such as agreed vision and goals, information sharing, risk and award sharing, cooperation, process integration, long-term relationship and agreed supply chain leadership

7. Managing Supply Chain:

For successful SCM implementation managers must understand the issues concerned with planning the supply chain. While developing supply chain they will have to analyze the critical factors for external and integration. The totality of SCM would be incomplete without the distribution and return management of goods. In this section highlights necessary stages required for adoption and implementation of SCM practice. These six stages are: Plan, Analyze, Develop, Integrate, Deliver, and Return.

Six stages of managing supply chain management:

Plan: The first stage in supply chain management is known as a Plan. Sadler and Hines (2002) investigated how a team of managers from the companies in a supply chain can help to formulate strategic plans for operating the whole chain, to benefit each company and to benefit the whole chain. Huan et al. (2004) introduced the SCOR model, analyzed its strength and weakness, and discussed how it can be used to assist managers for strategic decision-making.
Analyze: The second stage would be to analyze the various factors involved in supply chain. The analysis would be useful for the practicing managers in developing strategies for their supply chains. Prater et al (2001); Koh and Gunasekaran (2006) provided a new approach for understanding the different types of uncertainties that can impact supply chains and information systems. The approach presented allows researchers and practitioners to analyze the exact problems encountered in the management of supply chains and the tools that are needed to address these problems. Customer requirements and supply chain relationships are identified as key criteria in SCM for selecting the most appropriate method of target costing for supply chains.
Develop: This phase not only identifies reliable suppliers but also includes development of mutual trust, information system and cordial relations between the various partners in supply chain. In this stage SCM concepts are applied for developing methods of payments, shipping, and delivery to provide better customer services. Claro et al. (2006) discussed the value of trust and the effects of transaction specific investments for the relative degree of collaborative joint efforts, and also to assess the moderating effect of the information network on such

joint efforts. It has been concluded that supply chain collaboration is difficult to implement; when there is over-reliance on technology, and fundamentally a lack of trust between trading partners.

Integrate:

The next stage in supply chain management is to integrate. SCM needs integration of all activities like sourcing, procurement, production scheduling, order processing, inventory management, transportation, manufacturing, warehousing, and customer services. Zailani and Rajagopal (2005) presented a model of an integrated business process, which highlights the importance of communication between processes and between partners in the supply chain. It is urged that though there is a wide acceptance of the strategic importance of integrating operations with suppliers and customers in the supply chain, many questions remain unanswered for supply chain strategies. Research suggests that integration of several functions at different organizational levels could give above average financial and performance results.

Deliver:

At the logistics phase, customer orders are received and delivery of the goods is planned, this stage of supply chain management stage is aptly named Deliver. Johnson and Anderson (2000) suggested both the repositioning of final manufacturing into the distribution channel and the move towards customization-on-order are related to the implementation of postponed manufacturing.

Smith (2005) suggested that such technologies with the appropriate IT infrastructure could help major distributors, manufacturers; to deal complex and global supply chains. Because of cost, or security, or safety, or because parts are subject to corrosion, or food/medicine is subject to quality degradation, or products and product shipments must be traced and identified in a non-contact, wireless fashion is used in computer network. Radio frequency identification (RFID) is currently used in many industries in transportation, distribution, manufacturing, processing and security.

Return:

The final stage of supply chain management is called Return. Returns management is the supply chain management process by which problems associated with returns, reverse logistics, gate keeping, are managed within the firm and across key members of the supply chain. Rogers et al. (2002); Mukhopadhyay and Setoputro (2004) developed a profit-maximization model to obtain optimal policies for price and the return policy in terms of certain market reaction parameters. Remanufacturing of used products is an innovative way in return management from economic and environmental point of view. Inderfurth (2005) studied a product recovery system where a manufacturer of original products is engaged in remanufacturing used products taken back from its customers, in the context of extended product responsibility.

8. Discussion and Conclusion:

Organizations have multiple objectives like enhanced competitiveness, better customer service and increased profitability etc. To seek these objectives organizations employ various defensive as well as offensive business performance improvement approaches. Approach we have discussed (SCM) covers all functional areas of organization. It is the network of customers, suppliers, manufacturers, and distributors concentrating the flows of material, information, and finance through physical and human resources.

In this paper we have suggested that managers must probe why to manage, what to manage and how to manage the supply chain. We discussed the concept of supply chain management along with the need of SCM from organization point of view. This provides deeper insights for those managers investigating the concept of supply chain management. In order to explore the domain of supply chain management we have argued that one must examine the nature, interrelations and dependency among business operations .We interrogated the theory and research practice to find what are the various supply chain activities.

Next big challenge for organizations is to make a suitable roadmap for adoption and implementation .We have suggested a six- step approach to meet this challenge. This step-by-step assessment of business operations would certainly assist organizations to completely understand the concept of supply chain management.

Current trends like outsourcing, information technology adoption and third party logistics presents an opportunity for development of SCM. It is felt that in future all organizations will have to adopt partnership information sharing initiative with suppliers. Therefore establishment of mutual trust within supply chain to share the vital information for effective SCM practice; and development of suitable mathematical model for the same would be the greatest challenge for researchers and practitioners

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