CHAPTER – 2
LITERATURE REVIEW

This chapter reviews the literature relevant to the subject matter of this present research. The literature review is presented in seven sections with each section reviewing pertinent empirical studies conducted earlier by researchers. The review primarily focuses on the variables subsequently used in the study for model development and hypothesis testing.

The study takes the resource based view (RBV) of the firm, as its theoretical foundation. According to Barney (1991) firm resources includes “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive and implement strategies that improve its efficiency and effectiveness”. Adapting Barney’s (1991) definition in the current study context, this study defines IT resources as various firm specific IT technologies invested and used by firms in their downstream supply chain that provide them some unique benefits which give them a competitive advantage.

According to RBV, resources can be classified into three types; physical capital resources, human capital resources and organizational capital resources (Barney 1991). Not all capital contributes to competitive advantages of the firm (Barney 1991). Hence it is important to understand the conditions under which IT resources in the downstream supply chain can serve as a source of competitive advantage in order to receive the full benefits the resources can create.

Supporting this framework, Barney (1991) further argues that a firm's resources lead to competitive advantage while Collis (1994) claims that various firm capabilities are a source of competitive advantage. Amit and Schoemaker (1993) also endorse this view and maintain that “capabilities are often developed in functional areas (e.g., brand management in marketing) or by combining physical, human, and technological resources at the corporate level”. They state further that “resources, information and people are combined and sequenced over time in order to evolve specific capabilities”.

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In accordance with RBV, this study postulates that firm internal IT resources enhance internal supply chain capabilities and the enhanced capabilities in turn influence firm performance (Amit and Schoemaker, 1993; Barney, 1991; Barney et al., 2001; Collis, 1994).

The primary aim of this study is to understand the business environment leading to the current status of the usage of IT in the supply chain by organizations, assess the contribution of IT to the creation of supply chain capabilities and the impact of such usage and capabilities on operational and strategic marketing benefits and ultimately its impact on competitive marketing performance.

2.1 Competitive Business environment

Global competition, economic conditions, accelerated advancement in communication, transportation and production leading to shorter product cycles have made the business environment more turbulent and demanding. Businesses today are facing unforeseeable changes, great diversity in their markets, increased complexity and intensified competitive pressures. Given the increasing challenges in the business environment, it is evident that successful firms must strive to perform better than their competitors. As a means of competing, organizations are becoming strategically focused, customer directed and technology oriented (Walton, 1994).

The business environmental uncertainties usually affect the supply chain performance and determine which competitive factors should be emphasized and evaluated to help formulate a winning strategy (Fisher, 1997; Lee, 2002; Paulraj and Chen, 2007). Many studies have indicated that the implementation of IT is a vital facet of supply chain strategy (Sanders, 2005; Dehning et al., 2007 and Fawcett et al., 2007). Competitive pressures have driven companies to employ newer ways of using IT to achieve better supply chain solutions.

One key area to develop competitive advantage is overall customer satisfaction, which translates into the ability to deliver what is promised at all times to the consumer. This involves managing a highly volatile demand from the channel partners and end consumers. In order to respond to consumer demand with product availability at precise
delivery dates and offer it competitively priced by lowering inventories, organizations need to shift from a Make to stock (MTS) to a Made to order (MTO) scenario. The success of the MTO paradigm particularly in the B2B environment requires robust and efficient supply chain integration and implementation (Chopra et al., 2007), which creates the need to access and share information across the supply chain. Investments in IT have been made to facilitate information sharing and achieve customer responsiveness in the supply chain.

Several researchers have done empirical studies on the role of business environment in the decision to make IT investments in the supply chain. Walton (1994) has done a study on the adoption and usage of Electronic Data Interchange (EDI) within marketing and logistics channels to understand what influence firms to adopt (EDI) with external channel members, such as shippers, carriers, suppliers, and customers. His findings suggest that demand uncertainty in the marketplace leads to adoption of EDI. EDI enables both the company and customers to reduce demand uncertainty because the channel becomes electronically tied. Channel members were able to look into their orders, production schedule and inventory levels at the company and later track the despatch of their orders online. This immediate access reduces time and uncertainty.

Lavallee (1998) has presented a case study of how a chemical organization was able to increase its Working Capital Productivity Index and simultaneously increase the level of service to their customers through enhanced investment in IT to support supply chain decision making. The company faced seasonality problems, large SKU varieties and risks of spoilage and obsolescence. Customers were not brand loyal and switched brands if same day/next day delivery was not executed. In the light of this business environment the company invested in IT decision support systems to forecast demand and was able to make the supply chain forecast driven. This led to significant reduction in costs and improvements in customer service which transmits into higher revenue.

Li and Ye (1999) have stressed the need to take into account the key contextual factors that lead to the performance impact of IT on firm performance. They proposed that a firm's external environment (depicted primarily by the degree of environmental change or dynamism), would influence the business value of IT investment and their
analysis is supportive of this hypothesis. It was found that in firms operating in a more 
dynamic environment, greater IT investment will lead to better profitability.

Karthik Iyer et al (2004) have empirically investigated the relationships among 
supply chain B2B e-commerce, environmental uncertainty, organizational structure, and 
time-based delivery performance. They find that the process turbulence component of 
environmental uncertainty has a positive effect on time-based delivery performance, 
whereas demand unpredictability has no effect. They opine that conditions of demand 
unpredictability imply firms are not able to develop accurate forecasts. Even historical 
sales data inputs may be unreliable due to fluctuations in demand. Since demand 
conditions drive downstream operations, firms may be less likely to make investments 
in technologies when they do not expect significant improvement in predicting demand 
and therefore may streamline demand-initiated operations.

Fynes et al (2005) sought to find out to what extent relationship between supply 
chain relationship quality and supply chain performance was moderated by the 
competitive environment. They listed short product life cycles, product design 
sophistication, consistent high quality, cost reductions and customization as 
characteristics of competitive environment. Their findings provide support for the 
hypothesis that the greater the competitive intensity, the stronger the relationship 
between SC relationship quality and SC performance. Businesses operating in highly 
competitive intensive markets were likely to have a greater need for effective SC 
relationship quality based on interactive communications and cooperation and this 
could be achieved though IT implementation in supply chain processes.

Dai et al. (2007) through an analytical model based on real options have derived 
managerial implications for the evaluation of IT infrastructure investments, and their 
main findings were that the flexibility provided by IT infrastructure investment was 
more valuable when uncertainty is higher. They recommend that when facing high 
demand uncertainty, management should take the strategy of developing the underlying 
IT infrastructure capabilities and build IT applications later when the uncertainties have 
been sorted out.
Germain et al. (2008) have defined supply chain process variability as the level of inconsistency, or volatility, in the flow of goods into, through, and out of a firm. Their research investigated the links among organizational structure (formalization and integration), supply chain process variability, and firm performance as moderated by environmental uncertainty. They found that in an unpredictable demand environment, only cross-functional integration affects supply chain process variability, leading to improved financial performance and in an unpredictable demand environment, supply chain process variability partially mediates the relationship between integration and performance.

Sun and Hsu (2009) have done an empirical study on the impact of alignment between Supply chain (SC) strategy and environmental uncertainty on SCM performance, based on Lee’s (2002) uncertainty framework which was expanded from that of Fisher’s (1997) demand framework to include supply uncertainties. Lee have formulated four types of uncertainties - low demand and low supply, high demand and low supply, low demand and high supply, and high demand and high supply uncertainties. Based on the different environmental nature of demand and supply uncertainties within a supply chain, Lee (2002) proposed four viable SC strategies: efficient, responsive, risk-hedging, and agile SC strategy.

The results of their study have suggested to practitioners that it was not enough to simply form a SC strategy without considering the alignment between SC strategies and environmental uncertainties. SC strategies that are appropriate for the four different environmental uncertainties were identified. For example, a firm within a low demand and low supply environmental uncertainty would find it more profitable to deploy and use an efficient SC strategy rather than responsive, risk-hedging and agile SC strategies.

Researchers have thus through their studies recognized the competitive business environment has led to IT investments and they have studied the impact of such investments on firm performance in the context of a competitive business environment.

2.2 IT Advancement

IT advancement is defined as the extent to which a firm adopts the most sophisticated available technology (Wu et al., 2006). IT advancement is likely to be an
important firm resource as the literature argues that firms with advanced technology outperform their competitors (Rogers et al., 1993).

The backbone of the Supply Chain Management (SCM) processes in companies is Information Technology, (IT) which is used to acquire process and transmit information among supply chain partners for more effective decision making. Managements today have adopted a wide variety of IT applications which are costly and rapidly changing with the anticipation that such usage will directly lead to measurable benefits.

This study focuses on the use of SCM systems in the downstream supply chain, from the viewpoint of a communication system for electronic Interfirm interactions. The IT enabled SCM helps the firm to gain a competitive position in the market by increasing efficiency in information and product flow across channel members, from the inception to distribution of the product (Bowersox et al., 2002).

In this study the IT usage studied is the SCM system which is an information system that is involved in a firm’s interaction with channel partners in order to carry out transactions and collaborative forecasting and planning (Stank et al., 1999 and Tang et al., 2001). It incorporates elements of and interfaces with various systems such as Enterprise Resource Planning(ERP) Systems, Customer relationship management (CRM) systems, Advanced planning systems (APS), Electronic Data Interchange (EDI), Transportation management systems (TMS), Warehouse Management systems (WMS), Electronic linkages with branches and distributors, and Point of Sales (POS) terminals. Researchers have studied the impact of some of these specific technologies on firm performance.

Evans et al. (1993) have studied the benefits of using EDI in organizations. They identify reduced handling costs, reduced cycle lead times, reduction in stock, reduced risk of errors and closer relationship with suppliers and consumers as benefits from EDI implementation. They have observed that implementation of EDI has produced a 73 per cent reduction in on-costs apart from a 50 per cent reduction in manufacturing lead time. The strategy of feeding forward the actual customer demand to all players in the chain provided greater benefits in on-costs, with an 88 per cent
reduction being achieved. They recommend that organizations have to increase integration through the supply chain to create better information for all, which will result in reduced inventory and ultimately a better investment on working capital for the firm.

Tarn et al. (2002) have tracked the evolution and listed the functions of ERP and SCM. ERP systems assist enterprises in automating and integrating corporate cross-functions such as inventory control, procurement, distribution, finance, and project management. Through information sharing, SCM enables supply-chain partners to work in close coordination to facilitate supplier-customer interactions and minimize transaction cost. They predicted that the future demands of industry would be the integration of supply chain capabilities with ERP systems, since cross-enterprise integration would be the goal of firms whose success depend on the success of their supply chains.

Hausman and Stock (2003) have studied and developed a model for the adoption and implementation of EDI in hospitals and identified adoption and implementation as a function of influence, dependence, and relational variables.

Jaiswal and Kaushik (2005) have done a case study on the effectiveness of ERP systems at Hindustan Lever Ltd. (HLL) Network in India. They have observed that HLL has achieved significant reductions in inventory, improvements in cash management and a negative working capital due to improved information flows across the network and the implementation of policies such as vendor-managed inventory. They suggested that such enterprise systems implementation must be preceded by a re-engineering of business processes and introduction of innovative business policies to create value from IT investment.

Craighead et al. (2006) have done an empirical analysis of the potential benefits from EDI implementation and analysed the difference in benefit variations across firms. The study showed evidence that the use of EDI systems led to an increase in customer responsiveness and product quality and a decrease to costs, the number of data errors and amount of data entry. Their study found the level of internal integration, ability to phase in the system, level of top management support/use, reliability and the ability to
control the factors leading to variation, resulting in benefits from EDI usage across firms.

Fasanghari et al (2007) have reviewed the literature and specified the areas that IT should be deployed by developing a framework for impact of IT in SCM. They have identified procurement, operations, customer relationships, vendor relationships and logistics as areas for IT implementation in the supply chain. They opine that the benefits from IT in SCM will be much larger as it facilitates inter-organizational communication and develops collaborative work among firms.

Through a case study approach, Dai (2008) has developed a model that exemplifies supply chain transformation by implementing ERP for enhancing firm performance. They have found that the firm performance has increased through implementation of ERP by studying Tobin’s-q measures for a company between 1992 and 2002. Notably the q value jumped from 8.2351 for 1999 to 29.5820 and 19.8968 for 2000 and 2001 respectively when the company was implementing SAP to integrate its supply chain. They conclude that ERP was a strategic enabler for the company’s supply chain which has improved the company’s performance and that ERP ultimately creates competitive advantage.

Setia et al. (2008) have developed an organizational framework for business value creation from using agile IT applications like APS. Two case studies were used to identify the pre-requisites for the framework. Xuhua (2008) has described the technologies – barcode, RFID, GIS, GPS, e-commerce based on Internet/Intranet – to be exploited for realizing benefits from IT in SCM. They have identified that such technologies would lead to newer types of client relationships, develop marketing channels and expand market occupancy, integrate distribution and logistics with the supply chain and re-establish the value chain between enterprises.

Zhang and Dhaliwal (2009) have empirically tested the adoption of IT-enabled supply chain operations and the benefits that have been achieved through IT implementation. They have shown that firms can benefit by incorporating the technology within their internal operations processes and by using the technology externally with partners in their supply chain trading community.
Kumar and Keshan (2009) have presented a case study on the implementation of ERP in a major steel plant in India. They document the benefits arising from the ERP implementation as reduction in customer payments overdue, finished goods inventory reduction, improved gross margins, working capital reduction and improved maintenance- reduction in breakdowns. The ROI calculations justified the approval of additional investment in the SCM modules and further upgradation of the ERP software.

The research literature has thus identified the usage and implementation of Information Technology in the supply chains of organizations and the focus has been on implementation of such technologies and subsequently, their impact on business performance, to evaluate such investments.

2.3 IT Alignment

IT alignment in this study is defined as the extent to which a firm’s IT investment is made to ensure compatibility with that of its channel partners. IT alignment reflects the degree of embeddedness of IT across the supply chain, and it requires channel partners to coordinate and align their business processes with each other in order to achieve efficiency (Powell, 1992). Investment in IT by the organization and the channel partners is needed to maintain this alignment as new technological investments are made.

From a strategic viewpoint, Powell (1992) has in an empirical study in two manufacturing industries, tested the financial performance consequences of organizational alignments and proved that some organizational alignments do produce supernormal profits, independent of the profits produced by traditional industry and strategy variables. IT alignment therefore requires channel partners to coordinate and align their business processes with each other in order to achieve efficiency.

Kent and Mentzer (2003) have studied the impact of investment in inter-organizational information systems in a retail supply chain and have included retailer investment in IT and supplier investment in IT in their operational variables thus
recognizing that investments in IT need to be made by the firm and its channel members to align with each other.

Sanders (2005) has done an empirical research to investigate the benefits received by suppliers through IT alignment in the supply chain. The study has confirmed that buyer-supplier IT alignment led to buyer supplier integration which created a positive impact on the strategic and operational performance measures of the supplier organization. IT alignment improved information and data sharing and hence coordination by facilitating these activities. It has resulted in increased sales, profitability and improvements in the current and new processes operationally. This coordination has also affected the strategic dimensions such as creation of new products, learning about new markets and creating new business opportunities. Value was gained by suppliers since they invested in IT applications that were aligned with their primary buyer.

Seggie et al. (2006) have explored the association between brand equity, interfirm systems integration and IT alignment and the results have shown that they are significantly associated. They found that the relationship between IT appropriability and interfirm system integration appeared to be mediated by IT alignment. This reinforces the importance of IT alignment and shows the necessity of IT alignment for interfirm system integration to take place. Interfirm system integration and IT alignment affected brand equity positively.

2.4 Supply chain capabilities

The research literature on supply chain management has consistently identified four dimensions that have been positively affecting firm performance viz. information sharing, coordination, collaboration and responsiveness. These four dimensions have been discussed individually in past literature (e.g., Frohlich, 2002; Leek et al., 2003; Sahin and Robinson, 2002; Sriram and Stump, 2004). Wu et al. (2006) proposed to refer to these four dimensions together as supply chain capabilities- a higher order construct, for analyzing its impact on firm performance.
Tracey et al. (2005) have empirically tested the impact of supply chain management capabilities on business performance. In their research they have used three types of SCM capabilities – outside-in capabilities (e.g. inbound transportation, warehousing), inside-out capabilities (e.g. packaging, outbound transportation) and spanning capabilities (e.g. customer order processing, information dissemination) and have thus typically used logistic capabilities. Their findings indicate significant positive relationships among the three capabilities and business performance.

Since the capabilities identified by Tracey et al. (2005) are too narrow in their focus – mainly a logistics perspective, it is proposed to go with the four capability dimensions identified by Wu et al. (2006) – Information sharing, Coordination, Collaboration and Supply chain responsiveness - for the present research. The following sections present the previous research on these four independent dimensions done by researchers.

### 2.4.1 Information sharing

It refers to the ability of a firm to share knowledge with its supply chain partners in an effective and efficient manner (Wu et al., 2006). An effective information exchange has been identified as one of the most fundamental abilities in the supply chain process (Clemens and Row, 1993; Shore and Venkatachalam, 2003). Effective information sharing between supply chain partners enhances most supply chain initiatives, including vendor managed inventory, continuous replenishment program, collaborative forecasting and replenishment, and efficient customer response (Chen and Chen, 1997; Lummus and Vokurka, 1999; Lee and Whang, 2000). The main premise of SCM is that sharing of information and the coordination of strategies among firms in a supply chain can both reduce logistics costs and enhance value delivered to the customer (Brewer and Speh, 2000; Cooper et al., 1997) which can lead to competitive advantage for the firm (Mentzer et al., 2001).

Seidmann and Sundararajan (1998) have identified four levels of information sharing – order information exchanging, operation information sharing, strategic information sharing and strategic and competition information sharing. The previous research on supply chain consistently mentions the exchange of information among supply chain partners as an antecedent to supply chain effectiveness and firm
The previous research in the area of information sharing is presented below.

Mohr and Sohi (1995) have done an empirical research on communication flows in distribution channels and have established that norms for information sharing within a channel relationship were related to the communication flows within that relationship. In turn, the flows of communication between channel members were significantly related to the channel member’s perceived quality of communication and satisfaction with communication. Their model suggests that three aspects of communication flows (frequency, bi-directionality and formality) would be significantly related to the dealers’ summary judgments regarding the quality of that communication. When such norms existed, manufacturers and dealers communicated more often with each other and it also facilitated greater levels of feedback.

Moberg et al. (2000) have identified the antecedents to information sharing in supply chains. In their study they have found that information quality and relationship commitment are significantly related to strategic information exchange. These findings underline the importance of building strong relationships with channel members and improving the accuracy, timeliness and format of information shared within the supply chain.

Sahin and Robinson (2002) have set out that information sharing can occur at several levels. Under “no information sharing,” the only demand data the supplier received were actual orders from his immediate customer. At the “full information sharing” level, complete information was available to support the specific decision-making environment. They reviewed the existing literature on information sharing research and have suggested that technological advancements and the emergence of ERP systems and Point of sale (POS) sales data would enable full information sharing and coordinated decision making and that further research was needed in the area.

Kemppainen and Vepsalainen (2003) have studied the trends in industrial supply chains in Finland and have found that typically companies shared information on lead times, order status, production plans and schedules, inventory levels, production capacity availability, sales figures and new product and production capabilities with
their supply chain partners. They have opined that supply chains are becoming networks, and inter-enterprise IT systems would be a prerequisite for the next decade as it enabled and created transparency through information sharing.

Kaipa and Hartiala (2006) have done a case study on the demand-supply network of a manufacturing company focusing on supply chain visibility in practice and have suggested ways to improve the supply chain performance through information sharing. They suggest that companies should share only information that improves supply chain performance, simplify, synchronize, and stabilize their demand-supply planning processes, use a combination of different demand data sources, benefit from collaborative relationships with customers and understand suppliers’ real needs for demand information.

Zhou and Benton (2007) have done an empirical study to investigate the integration of information sharing and supply chain practice. Their study shows that effective information sharing significantly enhances effective supply chain practice in the area of delivery performance of the supply chain.

Fawcett et al. (2007) have undertaken a survey to understand how IT was used to enhance supply chain performance. They have identified two distinctive dimensions to information sharing – connectivity and willingness and found both dimensions to have an impact on operational performance and critical for the development of real information sharing capability.

Sezen (2008) has done a study on the relative effects of design, integration and information sharing on supply chain performance and found that supply chain design alone has significant effect on output performance although there was correlation between information sharing and performance.

Earlier Zhao et al. (2002) have reported that information sharing influenced supply chain performance in terms of total cost and service level. Lin et al. (2002) have reported that information sharing was associated with lower total cost and shorter order cycle time. Therefore the effect of information sharing on firm performance depends on
what is shared, how it is shared and with whom it is shared (Holmberg, 2000; Byrne and Heavey 2006; Li and Lin, 2006).

Speier et al. (2008) have used a strategy-structure-performance paradigm and have proposed a framework for firm performance in the supply chain. They have developed a model that sets out the theory that a supply chain orientation (goal alignment across firms) facilitated by Information systems integration (information exchange with a performance focus) would lead to agility in the supply chain and to financial performance.

Madlberger (2009) has observed that, with the growing use of inter-organizational systems, the scope of interfir collaboration has increased considerably in the supply chain context. An important prerequisite of interfir collaboration is information sharing. His research has identified three factors – internal factors, inter-organizational factors and economic factors as antecedents for two types of information sharing behaviour – strategic information sharing and operational information sharing behaviour.

Yu et al. (2010) have studied the cross-efficiency of information sharing in supply chains through a simulation model and find that contrary to the previous research findings suggesting sharing as much as information possible to increase benefits, the results of this study shows that the scenario of demand information sharing is the most efficient one. In addition, sharing information on capacity and demand, and full information sharing in general are good practices. Sharing only information on capacity and/or inventory information, without sharing information on demand, interferes with production at manufacturers, and causes misunderstandings.

Hartono et al. (2010) have developed and tested a three-stage model that examined the role of the quality of shared information in interorganizational systems (IOS) use. Their results indicate that the quality of shared information positively impacts operational supply chain performance, which, in turn, leads to improvements in overall firm performance. Overall, their results highlight the importance of high quality of shared information in IOS use.
The empirical study reveals that the key drivers of information sharing were internal factors, that is, an active information policy as well as top-management commitment (for strategic information sharing) and internal technical readiness (for operational information sharing), but also perceived benefits. However, none of the inter-organizational variables he has identified can be confirmed as antecedents of information sharing in this study. The impact of perceived benefits was confirmed in this study. Firms were ready to share information if they were sure that they would benefit from the decision. This finding provides a positive indication for potential future information sharing activities in the supply chain.

2.4.2 Coordination

Coordination in this study is about the inter-firm coordination that is the ability of a firm to coordinate transaction-related activities with supply chain partners. The manufacturer and the downstream supply chain members need to coordinate their actions to ensure that they respond to the customer demand at all times. Clemens and Row (1992) have reported that IT can decrease the costs of coordination, that is, the costs of accumulating, communicating, and processing information.

If the downstream channel members act independently and do not convey information on their actions to the manufacturer, they cause the supply chain to become inefficient by causing excessive inventory investment, poor customer service, lost revenues, misguided capacity plans, ineffective transportation, and missed production schedules and this has been termed as the bull-whip effect by Lee et al. (1997). Prompt and visible action that is visible to all members of the supply chain is required to bring about supply chain coordination.

Coordination is needed to be brought about in the areas of production planning, forecasting, replenishment, ordering management, inventory management and operations management with sharing data (inventory, point of sales, end customer demand, capacity, and production schedule) to achieve mutually defined goals (Kanda and Deshmukh, 2007). Accordingly supply chain coordination is seen as an effective way to increase supply chain performance. Research has therefore been carried out on the importance of co-ordination and its effect on the performance of supply chains and the reviews are presented below.
Shin (1999) has departed from earlier research on IT and firm performance that consider the relationship directly, failing to recognize the contextual or moderating factors on firm performance. Shin has therefore investigated the relationship between IT and coordination empirically and concluded that IT has led to intangible and intermediate benefits, e.g. better coordination, quality improvement, increased variety, and innovation which have led to a substantial reduction in coordination costs. The findings imply that IT enhances the coordination of economic activities (intangible benefit) by reducing coordination costs, and thereby can improve firm performance and productivity (tangible benefit).

Ross (2002) has done a multi-dimensional empirical exploration of technology investment, coordination and firm performance. His findings suggest that IT investment has a positive effect on market performance as a result of better coordination in the value chain.

Kim et al. (2005) have explored how IT adoption by a firm in the context of supply chain communication systems, influences its market performance. They have observed how IT contributed to the firm’s and its partner’s coordination activities. Criticality of the firm’s channel partner was used as the moderating variable. The findings suggest that a firm’s own coordination mediates the influence of IT adoption on market performance only when the partner being coordinated was critical to its success. If the partner was not critical to the success of the firm, the benefits of IT adoption can materialize only through enhancements in the coordination activities of the partner. The study has helped to clarify the reasons for inconsistent benefits from IT investments in the supply chain.

Fugate and Sahin (2006) have done a consolidation of research findings on existing coordination mechanisms and tried to explore how practitioners viewed these findings through a qualitative research. They have used the three classifications of mechanisms – price, non-price and flow coordination mechanisms adapted from Sahin and Robinson (2002).
Their interview respondents contended that price and non-price coordination mechanisms have a negative impact on both their firms’ and channel partner’s performance but accepted that flow coordination mechanisms (Vendor Managed Inventory, Quick Response, Collaborative Planning Forecasting and Replenishment, Efficient Consumer Response and Postponement) have led to improved supply chain performance. The respondents however have pointed out, the complexity of designing and implementing flow control mechanisms, as well as the multi-functional involvement of making these mechanisms to work.

Silveira and Arkader (2007) have explored the paths by which coordination investments with suppliers and customers relate to improvements in delivery speed, delivery reliability, and manufacturing lead-time. Their results provide evidence of direct relationships between supplier coordination investment and manufacturing lead-time, and between customer coordination investment and delivery speed and delivery reliability. Moreover, the results suggest that customer investment mediates the relationship between supplier investment and delivery reliability, and that supplier investment mediates the relationship between customer investment and manufacturing lead-time. The implications of the study lead us to understand that, to achieve sustainable improvements in multiple aspects of performance, management might need to invest in coordination with partners both upstream and downstream in the supply chain.

2.4.3 Collaboration

Academics and practitioners have emphasized the importance of collaboration for the significant inter-organizational gains that can be realized from such collaborative efforts. Mentzer et al. (2000) define supply chain collaboration as a long term relationship among organizations actively working together towards common objectives. Within a supply chain setting, collaboration therefore involves two or more companies working together to achieve synergy through their joint planning and actions.

Collaboration between organizations can facilitate strategic and operational foci, allowing individual members supply chain members to exploit their core competencies. Each collaborating partner focuses on its unique competency and, working together, the
partners can achieve operational excellence that synergistically creates value (Bowersox et al., 2005). Greatest success is likely when collaborative partners integrate human, financial and technical resources to create a better business model (Bowersox et al., 2003). Researchers have therefore concentrated on areas for collaboration, identified drivers to collaboration and investigated whether there is a pay-off from collaborative efforts of supply chain partners and reviews in these areas are presented below.

Collaborative processes involve building of an ‘esprit de corps’ across departments internally and across organizations externally through information sharing and process integration. Stank et al. (2001) have developed measures for internal and external collaboration and have empirically found that internal and external collaboration together lead to improved logistical service performance.

Barratt (2004) has theoretically proposed where and with whom organizations can collaborate and identified the elements of collaboration. They have proposed that collaboration can be of two types – vertical and horizontal. Vertical collaboration happens with customers, internally (across functions) and with suppliers. Horizontal collaboration includes collaboration with competitors and with non-competitors, for instance, sharing manufacturing capacity. They have advised that given the resource intensive nature of collaboration, organizations need to externally collaborate with a small number of strategically important suppliers and customers. They have also identified a collaborative ‘culture’ comprised of trust, mutuality, information exchange, openness and communication as the major supporting elements of collaboration.

Corsten and Felde (2005) have examined the conditions under which benefits of collaboration between a firm and its suppliers would occur and the effects of such collaboration. Using relationship factors of trust and dependence for collaboration their results demonstrate that supplier collaboration has a positive effect on buyer performance both in terms of innovative capabilities and financial results.

Sanders and Premus (2005) have modeled the relationship between firm IT capability, collaboration and firm performance. Their results suggest that firm IT capability has a positive impact on internal and external collaboration and that internal
and external collaboration has a positive impact on firm performance. Their research has thus underscored the important role that IT plays in organizations.

Wadhwa et al. (2006) have done a simulation with two parallel supply chains and have run it in independent and horizontal collaboration modes. They have found substantial reduction in inventory and reduced working capital requirement in the horizontal collaboration mode. It has also improved fill rates leading to improved service levels. They also found that under conditions of increased demand uncertainty, the benefits from collaboration rose significantly.

Chen et al. (2007) have also done a simulation to evaluate the supply chain performance of inter-enterprise collaboration and investigated the effect of CPFR on firms. They have concluded that a manufacturer (supplier) driven approach than a retailer (buyer) driven approach was suitable for CPFR programs.

Leeuw and Fransoo (2009) have presented a conceptual model of market product and partner characteristics that influence supply chain collaboration. They have listed demand and supply uncertainty (market characteristics), product criticality and customization level (product characteristic) and partner capabilities, partner power and dependence (partner characteristics) as drivers leading to the need for close supply chain collaboration.

Ryu et al. (2009) have investigated the effect of collaborative relationships between buyers and sellers in the supply chain and examined the antecedents of such partnerships. The results of their study imply that both strategic (strategy fit, dependence) and operational variables (operational compatibility and communication) are viewed as crucial factors in building commitment and trust which lead to collaboration, and that collaboration exerts an impact on supply chain performance.

Zachariah et al. (2009) have done an analysis of supply chain collaborations and their effect on performance outcomes. Their results indicate that interdependence of knowledge and process among supply chain partners along with supply chain partner insight influences the level of collaboration significantly. Collaboration leads to operational and relational outcomes that influence business performance.
Sridharan and Simatupang (2009) have empirically examined the managerial perceptions on the relationship between supply chain collaboration practice and operational performance. Their survey results show significant positive impacts of key factors of collaborative practice on operational performance. Their findings suggest that three factors: (1) decision synchronisation, (2) information sharing, and (3) incentive alignment are important determinants of operational performance which enable the supply chain members to effectively match supply with customer demand.

Flynn et al. (2010) have described supply chain integration (SCI) as the extent to which a manufacturer strategically collaborates with supply chain partners and collaboratively manages intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer. They have extended the research on SCI by including internal integration along with customer and supplier integration using a contingency and configuration perspective. The findings of both the approaches indicate that SCI was related to both operational and business performance. The results further indicate that internal integration and customer integration are more strongly related to improving performance than supplier integration.

2.4.4 Supply chain responsiveness

Today’s complicated marketplace requires reliable, efficient, and collaborative response from the entire supply chain (Rogers et al., 1993). Supply chain responsiveness is defined as the extent to which channel members react cooperatively to new inquiries that stem from environmental changes or market developments (Wu et al., 2006). It has also been defined as the capability of promptness and the degree to which the supply chain can address changes in customer demand (Lummus et al., 2001 and Holweg, 2005).

Markets today are highly competitive and volatile making demand forecasting a difficult exercise. In such an environment if a product is unavailable in the market, it means the sales opportunity is lost. Consequently the focus of supply chain management has to shift, from the idea of cost as the order winner, to responsiveness as the market winner (Christopher and Towill, 2002).
According to Towill and Christopher (2002), the end customer in the marketplace determines the success or failure of supply chains. They further state that “getting the right product at the right price, at the right time to the consumer is not only the linchpin to success but also the key to survival”. Accordingly companies these days are focusing on their downstream supply chain processes to maximize the speed of response to consumer demand.

Responsiveness indicates the ability of the supply chain to react quickly to changes in market demand – change in volume, variety or mix. Developing a supply chain that allows organisations to meet the variations in demand at an acceptable level of cost is now a major focus of many leading organisations (Fisher, 1997; Christopher and Towill, 2002). Such supply chains are referred to as agile/responsive supply chains (Gunasekaran et al., 2008) by researchers in previous research. Researchers have also referred to it as market orientation (Dawes, 2000), demand chain management (Heikkila, 2002), marketing logistics (Christopher and Peck, 2003) and customer responsiveness (Godsell and Harrison, 2002).

Researchers have done studies to develop the concept of responsiveness, developed a framework for responsiveness, analyzed the factors influencing responsiveness and studied its impact on performance. The research relating to responsiveness in previous studies presented below.

Van Hoek et al. (2001) have identified four components of supply chain agility: customer sensitivity, virtual integration, process integration and network integration, all of which rely on the ability to easily and quickly form deeply integrated information systems linkages with trading partners.

Catalan and Kotzab (2003) have developed a responsiveness assessment model based on four indicators – lead time, postponement strategy, bull whip effect and information exchange – which would lead to time effective flow of goods and information and demand transparency which causes the creation of responsiveness in the supply chain.
Randall et al. (2003) have done an empirical examination of the influential factors that lead to responsive supply chains. They characterize responsive supply chains as having short production lead-times, low set-up costs, and small batch sizes that allow it to adapt quickly to market demand, but often at a higher unit cost. Their findings suggest that lower industry growth rates, higher contribution margins, higher product variety, higher demand and technological uncertainty are drivers of supply chain responsiveness.

Harrison and Godsell (2003) have adopted a case study design approach to explore how four different organizations have developed performance measurement metrics for customer responsiveness. Their study reveals that organizations were using ‘easy to measure’ metrics like order fill rate, percentage of orders available for delivery, on time shipments, customer complaints and percentage of complaints against number of orders processed. The researchers were not happy with the current measures which they felt were only measuring operational measures related to their supply chain customers and opine that research to identify specific responsive metrics were needed.

Holweg (2005) has developed a conceptual model that has identified the key factors that determine the responsiveness of a supply chain system. He has identified three dimensions of responsiveness – (1) product i.e. the impact of product variety and customization, (2) process i.e. the production and supply chain lead times and decoupling points in the system and (3) volume i.e. customer expectation and nature of demand, to provide a fuller understanding of the concept.

Reichhart and Holweg (2007) have developed the concept of responsiveness and have identified four types of responsiveness – product, volume, mix and delivery. They have split responsiveness into short- and medium-term responsiveness. A supply chain’s short-term or operational responsiveness is its ability to adjust its output to short-term demand changes. These changes can be due to changes in the product mix (mix responsiveness), the volumes required (volume responsiveness), or the delivery sequence or timing (delivery responsiveness).

Further they have presented a consolidated framework for the creation of supply chain responsiveness based on internal determinants such as operational factors and
supply chain integration and external requirements such as demand uncertainty and variability, external product variety and lead time and also included relational factors such as trust/commitment and contracts/agreements.

Gunasekaran et al. (2008) have compared lean supply chains and agile manufacturing with the objective of developing a framework for the responsive supply chain. They suggest that strategic planning involving alliances and outsourcing, usage of Knowledge and IT management and creation of Virtual Enterprises through a distributed network of partners can lead to a responsive supply chain that delivers with increased speed, flexibility and at a reduced cost.

Swafford et al. (2008) have empirically analyzed how achieving supply chain agility is a function of IT integration and supply chain flexibility. Results from their study indicate that IT integration enables a firm to tap its supply chain flexibility, which in turn results in higher supply chain agility and ultimately higher competitive business performance. They recommend that firms should first invest in IT for integrating information, before investing in flexible processes.

Kim and Cavusgil (2009) have examined the impact of supply chain integration on brand equity and the results of their study indicate that both interfirm system integration and supply chain responsiveness can have a direct positive effect on brand equity. They have observed that the effect of interfirm system integration on brand equity is totally mediated by supply chain responsiveness. The research highlights the importance of supply chain activities in creating brand equity. Effective supply chain activities can help to cultivate a favourable attitude among customers towards the brand, thus enhancing its brand equity.

Together these four supply chain capabilities—information sharing, coordination, collaboration and responsiveness - form a mediating role between IT usage and firm performance (Wu et al., 2006).
2.5 Operational benefits

In recent years, a number of organizations have realized the potential of using IT in SCM in their day to day operations and have made investments in Information Technology in the supply chain operational practice. Researchers have therefore focused their attention on this aspect of supply chain management as their area of interest.

According to Gunasekaran and Ngai (2004), research that has been conducted relating to IT and SCM can be classified as:

- Strategic planning for IT in SCM.
- Virtual enterprises and SCM.
- E-commerce and SCM.
- Infrastructure for IT in SCM.
- Knowledge and IT management in SCM.
- Implementation of IT in SCM.

Motivated by the belief that benefits are bound to follow successful implementation, researchers have over the years been tracking IT implementation issues in supply chain management (for e.g. Cooper and Zmud, 1990; Angeles and Nath, 2000; McLaughlin and Motwani, 2003) and the literature on developing supply chain benefits as metrics for measurement has also emerged along with IT implementation. Since most organizations have made massive investments in IT, evaluating companies’ performance against their IT investments has become an important theme not only among researchers but also in business practices (Kwon, 2003).

According to Melnyk et al. (2004) metrics fulfill the fundamental activities of measuring (evaluating how they are doing), educating (since what they measure is what is important; what they measure indicates how they intend to deliver value to their customers), and directing (potential problems are brought to the attention of management by the size of the gaps between the metrics and the standard).

The development of suitable metrics is however becoming a tough task as the list of potential benefits appear to be inexhaustible ((Lapide, 2000; Hoffman, 2004;
Gunasekaran et al., 2001; Shepherd and Gunter, 2006; Sambasivan et al., 2009). For example, an AMR research report contains about forty five supply chain metrics, a report from Achieving Supply Chain Excellence through Technology (ASCET-ascet.com) lists almost a hundred metrics, and academic papers also suggest a large number of metrics. Sambasivam et al. (2009) in their paper on consolidation of performance measures start out with 839 performance metrics of which they discover 159 considered important and 135 very important by practitioners. Chae (2009) recommends that companies should focus only on a small number or metrics critical for their operations management, customer service and financial viability.

Cai et al. (2009) have identified thirty four metrics across five categories – resource, output, flexibility, innovativeness and information. They emphasize the need to have a comprehensive framework of performance measurement across the entire supply chain in a systematic manner. They emphasise that identifying Key Performance Indicators improves the performance management cycle (especially between strategy and planning) by better supporting right resource planning for achieving the supply chain's strategic goals.

According to Neely (2005) a process cannot be managed if its performance cannot be measured. Many researchers have stressed the importance of using the right metrics to manage a supply chain efficiently and effectively (Gunasekaran et al., 2001; Lambert and Pohlen, 2001; Neely et al., 2005). In the last decade, much has been written about the need to have a balanced approach in developing supply chain metrics (Kaplan and Norton, 1992; Beamon, 1999; Gunasekaran et al., 2001; Lambert and Pohlen, 2001 and Bhagwat and Sharma, 2007). Yet, the empirical research on supply chain performance, in recent times, has focused mainly on the financial performance impact on the supply chain due to IT investments (Bharadwaj et al., 1999; D’Avanzo et al., 2003; Dehning et al., 2003; Chen et al., 2004; Jin, 2006 and Blankley, 2008).

Financial metrics seem to be inadequate to measure supply chain performance. Since they are historical measures they do not provide a forward-looking view and they can be very difficult to tie to operational effectiveness (Camerinelli and Cantu, 2006). Nor do they provide an insight into marketing performance and customer satisfaction levels. The need to measure the operational and marketing benefits arising from IT
investments in the downstream supply chain has emerged. The prior literature on operational benefit measures are detailed below.

Emerson and Grimm (1996) have stated that the interface between logistics and marketing is critical for the delivery of customer service. Using the Mentzer, Gomes and Krapfel (1989) model of customer service framework, they have identified three service dimensions that need to be measured: availability (fill rate and minimum back orders), timeliness and delivery quality (order cycle time and delivery performance).

Sethi and King (1999) have summarized five widely recognized benefits of IT investment; they are operational efficiency, operational functionality, improved positions in competitive environments by fending-off threats, preemptiveness, or being the first mover and thus having timing advantage, and synergy.

Li and Ye (1999) have drawn on their classification and suggested that firms that are adopting different strategies will tap into different benefits of IT investment. For example, a firm pursuing a differentiation strategy may explore the operational functionality benefit of IT, and a firm pursuing a cost leadership strategy may rely upon the operational efficiency benefit.

Gunasekaran et al. (2001) have attempted to develop a framework for measuring the strategic, tactical and operational level performance in the supply chain. They state that the first step in assessing performance is to analyze the way the order-related activities are carried out, since it is clear that the way the orders are generated and scheduled determines the performance of downstream activities and inventory levels. They also stress the need for delivery performance evaluation by monitoring delivery to committed date and order fill lead times. Supply chain costs are also included to measure performance.

Otto and Kotzab (2003) have developed a multi-dimensional multi-perspective view of supply chain goal attainment. Six different perspectives to measure the performance of managing a supply chain – System dynamics, operations research, logistics, marketing, organization and strategy perspectives have been identified and detailed metrics developed within each perspective.
Bhagwat and Sharma (2008) have developed a comprehensive balanced scorecard that measures after the evaluation of business operations from several perspectives – evaluation of planned order procedures, supply chain partnership metrics, measurement of customer service and satisfaction, production level measures and metrics, performance evaluation of delivery link, supply chain finance and logistics cost. The metrics proposed by them covered the areas of finance, customer, internal business process and innovation and learning.

Sambasivan et al. (2009) have attempted to present a consolidation of supply chain performance measures through a case study approach and have classified metrics into the following areas: Fund flow, Internal process flow, Material flow, Sales and services flow, Information flow, and Partner evaluation. Metrics have been further classified under these six flows. They have identified the top five supply chain performance criteria as inventory turnover, cycle time, fulfilment rates, supply chain service and perfect order.

Martin and Patterson (2009) have focused mainly on inventory, cycle time and financial performance to measure supply chain performance and in their findings through statistical analysis suggested that the first two indicators were clearly viewed as more important than financial performance for ongoing decision making in a supply chain. Inventory performance was an indicator of how well the firm was transforming its inputs into the required outputs to fulfil market demand. Cycle time measurements allow the company to quantify how efficiently the company was completing market demand.

2.6 Strategic Marketing Benefits

The implementation of IT in the downstream supply chain is expected to yield strategic marketing benefits to the selling organization, which should impact competitive marketing performance of the firm positively. Researchers have identified these benefits in the marketing context.

Grawe et al. (2009) have done an empirical research on how a firm’s strategic orientation affects service support innovation capability and market performance. The
findings support the theory that customer orientation and support affects service support innovation capability which in turn positively impacts market performance.

Christopher and Lee (2004) have stated that market turbulence has increased for organizations due to supply and demand uncertainties, globalization and shorter technology and product lifecycles. Supply chain risk has increased due to lean practices and outsourcing. The one key element recommended by them to mitigate risk is ‘end-to-end’ visibility which reduces market risks. They opine that reduction of market risks through visibility leads to increase in sales and market share, penetration of new markets and speedy new product introduction.

Francis (2008) has reviewed the existing literature to propose at a definition of supply chain visibility which unifies and captures the characteristics mentioned earlier:

“Supply chain visibility is the identity, location and status of entities transiting the supply chain, captured in timely messages about events, along with the planned and actual dates/times for these events”.

The proposed definition is all about the necessary and sufficient information (identity, location and status) required for entities, stationary or moving, that are hierarchically organized, making their way through the supply chain. This requisite information is transmitted in messages about events as defined, within processes. Date and time of actual event occurrence are compared to the corresponding planned date and time, to render transparent the implications for decision making. Thus, such a visibility assists in providing strategic insight into the status of orders, inventory, and shipments across the supply chain and enables the organization to manage its inventory and meet customer demand.

Lee (2010) has suggested that, to tame the ‘bull-whip’ effect, one has to understand what is really behind the order and demand signals, to reduce the demand amplification at the company end. Organizations need to differentiate between orders that were re-stocking versus orders that were customer demand-driven. Gaining visibility in the supply chain was the route suggested to minimize the effect.
Simon and Dolan (1998) have advocated the need to customize prices to gain significant gains in profits. This can be achieved through a study of customers’ valuation of products through the information available in the supply chain itself.

Zhang and Krishnamurthi (2004) have used modelling techniques to propose customized promotion in online stores. They have demonstrated that customized promotions can increase the effectiveness of promotion activities. Gelb and Andrews (2007) advocate a strategic focus to promotions, considering how customers and competitors will react to a promotional effort, and state that such strategic promotions will yield disproportionate benefits to the marketing organization. Chatterjee and McGinnis (2010) have found that in the case of online promotions, customized offers have led to significantly higher purchase intent than universal offers.

Fleischmann (2001) has identified the consumer as an important source of new product ideas. Story et al. (2009) have confirmed that within-firm competencies were not sufficient for product innovations and there was a need to tap external relational resources for new product development.

The use of IT in the supply chain facilitates the capture of such strategic information from customers and downstream supply chain channel partners.

2.7 Supply chain performance measurement

Today organizations are not independent entities but are composed of a network of suppliers, distributors, customers and service providers engaged in the manufacture and delivery of goods to the final consumer. Supply chain management (SCM) has become necessary to perform this task efficiently and effectively. The use of IT is considered necessary for transaction processing, planning and collaboration and for order tracking and delivery coordination.

Investment in new IT is a strategic issue in organizations as they are trying to gain competitive advantage through its deployment. Researchers and managers in organizations are therefore interested in seeking evidence that these investments produce better firm performance (Armistead and Mapes, 1993; Stratopoulos and
Dehning, 2000). Weill (1992) found a positive effect from transaction processing technology but no effect from informational IT supporting administrative tasks. Dos Santos (1993) have reported that innovative IT investments including investment in informational IS has led to higher market value. Hitt and Brynjolfsson (1996) have found a positive relationship between IT investment and firm productivity.

More recently, Wu et al. (2006) and Dehning et al. (2007) have found positive impact of IT usage on firm performance. Dehning et al. (2007) have argued that the metrics used to measure the economic value of the investment should reflect the specific business objectives of that investment and then a proper measure of performance from IT investment can be obtained. Ramayah et al. (2008) have however found an insignificant relationship between usage of IT tools and supply chain performance. The research in this area has thus been less equivocal in the assessment of performance of IT investment.

He and Chen (2008) have stated broadly that literature on IT in SCM was available as two streams of study. The first stream focuses on the specific technology or application and its implementation and the second studies the applications and benefits of IT in SCM on firm performance. Reviews on IT impact on firm performance are presented below.

Bharadwaj et al. (1999) have done an empirical study on the information technology impact on firm performance using Tobin’s q, a financial market based measure of firm performance. They have found that, in the five years of their study, IT investments had a significantly positive association with Tobin’s q value.

Sanders and Premus (2002) in their study on IT applications and organizational benefits have found that 27% of high IT usage firms indicated SCM to have a significant role in the strategic planning process compared to only 2% and 10% for low and medium IT usage firms, respectively. The level of IT usage was related to aggregate company performance with 33% of high IT usage firms have reported substantial growth in market share over the past five years. This compares to 17% and 25% for low and medium IT usage firms.
Byrd and Davidson (2003) have reported a positive relationship between IT impact and firm performance. Dehning et al. (2003) have observed that IT investments have resulted in process improvements around supply chain initiatives lead to firm financial performance and that contextual factors also affect such performance.

Jin (2006) has studied the performance effect of IT implementation with the objective of investigating the moderating effects of firm size on the relationship between the level of IT adoption and three performance levels, operational, financial, and strategic in an apparel supply chain. The results indicate that that firm size was a significant moderator variable for operational (lead time), but not strategic and financial performance. It was observed that large firms’ operational performance increased after IT adoption.

Kim et al. (2006) have investigated and empirically tested the relationships between IS resources, channel capabilities and performance. Their study explored how innovations surrounding supply chain communication systems (SCCS) affect channel relationships and market performance. The results suggested that the effect of applied technological SCCS innovations on channel capabilities was mediated by interfirm systems integration. In contrast, administrative SCCS innovations enhanced information exchange and coordination activities directly. Furthermore, the influence of applied technological innovations for SCCS was not strong enough to affect either responsiveness of the partnership or firm performance, whereas administrative innovations for SCCS affected both factors.

Blankley (2008) has developed a model for evaluating the financial performance benefits of investments in supply chain management technologies. He has proposed that investment in supply chain management technology leads to improvement in knowledge-intensive capabilities that lead to operational improvement leading to first order direct effects which generate the second order indirect financial effects. The direct effects of usage of technology have been identified as improved inventory metrics, optimized investment in inventory and improved logistics/service measures. The financial effects measured were Sales growth, COGS reduction, other SG and A reduction and ROE, ROA and ROI margin analysis. The financial effects were also
influenced by exogenous forces like market demand, competition and current performance of the industry.

Byrd et al. (2008) have used the RBV approach and examined the direct and indirect influence on IT on firm performance. Through a path analysis approach they have found that IT infrastructure led to better intermediate performance as well as better overall organizational performance. It contributed to Logistics Information systems and through this to organizational performance as well as directly on the organizational performance measure (Return on Assets) used in the study.

Kim and Kim (2009) have established a research model and empirically tested the relationships among IT investment directions, IT strategies, process innovation capability, and management performance (both financial and non-financial performance). It was found that there were significant relationships among the variables identified with IT investment direction and IT Strategy leading to Process innovation capability which resulted in non-financial and financial performance. Non-financial performance was significantly related to financial performance.

Yao et al. (2009) have studied the impact of boundary spanning information technology and position in chain on firm performance. They have found that the usage of boundary spanning IT resources by suppliers, customers, distributors and retailers coupled with firm size has a positive relationship with firm performance benefits measured by order processing cost reduction, inventory reduction and customer satisfaction.

It is thus evident that researchers have earlier identified operational as well as marketing related benefits arising from the use of IT in supply chain operations.

2.7.1 Competitive Marketing Performance

The impact of IT on firm performance can be measured in many ways as indicated by the reviews in the previous section. However this study focuses on efficiency improvements resulting from enhanced downstream supply chain capabilities. It is argued that these capabilities arise from the impact of IT resources and these enhanced capabilities should lead to positive outcomes for the organization. As
the firm’s downstream supply chain activities are carried out in the market, in order to assess the impact of IT resources on firm performance through supply chain capabilities, the competitive marketing performance is adopted as the ultimate outcome variable in the study.

The supply chain is primarily perceived as a resource network and hence has attracted the attention of operations researchers who have developed several optimization models through their studies. Kotler and Achrol (1999) have predicted that marketing organizations would be disaggregating into a variety of networks forms - including internal networks, vertical networks, inter-market networks, and opportunity networks. Marketing increasingly would then be responsible for creating and managing new marketing knowledge, education, real-time market information systems, intra-firm integration and the coordination of the network's economic and social activities.

More traditionally, marketing has recognized SCM in the past a part of distribution (Stern et al., 1996), but it has gained strategic importance as a potential driver for marketing’s positive effect on shareholder value (Srivastava et al., 1999). SCM is viewed as the tool to connect customers with products (Otto and Kotazb, 2003). Marketing related metrics in SCM therefore measure sales growth, market share and customer satisfaction.

Since Srivastava et al (1999), while developing a framework to understand the integration of marketing with business processes, identified supply chain management as one of the three core business processes that generate value for customers; there has been an increased interest to evaluate the marketing performance of investments in Information Technology in the supply chain.

Kohli and Jaworski (1990) laid down the three pillars of the marketing concept as customer focus, coordinated marketing and profitability. The marketing concept does have strong influences on the management of a firm, interfirm relationships and the supply chain (Min and Mentzer, 2000). It should lead a firm to focus generating and sharing market information and be responsive to satisfy customers. For instance, if an enterprise is not producing products needed by the customer, lean production still results in the stockpiling of inventory more quickly and more efficiently. However,
customer requirements are diverse and it is clear that they cannot all be satisfied by one approach. High speed low cost supply chains are unable to respond to unexpected changes in demand or supply (Lee, 2004).

Customers today are so diverse in their needs and preferences. Fuelled by increasing market fragmentation, the desire to consume ‘experiences’ and increased market literacy (Baker, 2003) consumers are becoming increasingly choosy about products they want to own. The marketer has responded by making a wide range of products offering options in colors, sizes and shapes to meet the need for variety and started piling up excess inventories which tended to increase supply chain inefficiencies.

Although this need for variety can be viewed essentially as a marketing problem, the supply chain implication needs to be addressed. Such fundamental shifts in consumer behavior and the demand creation patterns they cause must be addressed by equally fundamental shifts in the way demand is fulfilled (Godsell et al., 2006).

Supply chains have been efficient in moving products to consumers, but they need to progress towards effectiveness which necessitates that consumers should be the focus of a supply chain’s existence, and consumer demand should be at the core of a chain’s business strategy (Canever et al., 2008). This has transformed the supply chain in recent times into a consumer driven demand chain or simply a demand chain in supply chain research that recognizes the marketing perspective of supply chain management.

Svennson (2003) has argued that there should be a holistic and cross-disciplinary focus in supply chain management that should include marketing theory and the ultimate consumer perspective. Martin and Grbac (2003) have studied whether supply chain management can leverage market orientation. They propose that strong supplier relationships impact on firm performance because the firm is able to respond to customer needs in a timely fashion. Their empirical study has confirmed that supplier relationships do leverage a firm’s market orientation through improved customer responsiveness.
Therefore, in recent times, an increasing number of researchers, (Wisner, 2003; Byrd and Davidson, 2003; Wu et al., 2006; Li et al., 2006; Kim et al., 2006; Fawcett et al., 2008) have included measures of competitive marketing performance outcomes in assessing the impact of IT in the supply chain. Following Venkataraman and Ramanujam (1986), the measures that have been included in Competitive Marketing Performance are sales growth, market share and customer satisfaction along with new product and market development. The current study which focuses on IT deployment and usage in the downstream supply chain thus proposes to analyze the impact of IT only from the Competitive Marketing Performance outcomes.

In summary, the current research study has been undertaken based on the review of the previous research in the area of IT investment in supply chain. The initiative is aimed at assessing the impact of such IT investments, made by Indian manufacturing companies in their downstream supply chains.
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