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**CREATING COMPETITIVE ADVANTAGE THROUGH SUPPLY CHAIN MANAGEMENT  
(ROLE OF INFORMATION & COMMUNICATION TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT TO  
CREATE COMPETITIVE ADVANTAGE: A LITERATURE BASE STUDY)**

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**ABSTRACT**

*A supply chain is an interconnected network of many suppliers, producers, wholesalers, distributors, transporters and retailers through which materials are obtained, transformed, produced to finish goods and delivered to the end customer. Supply chain is consisting of activities concerned with the flow and conversion of goods from raw material to finish goods and to the delivery of finish goods to final customer, as well as the associated information flow back in the chain. ICT (Information and communication Technology) including hardware and software has lead to massive opportunities to supply chain and fostering it to grow at even more speed. In SCM, information plays an important role as it drives the whole supply chain system. It has become evident that a supply chain that transfer materials and information smoothly can become a market differentiator and the ultimate winner in competition. IT based supply chain management systems improves supply chain integration and make efficient flow of market information and goods throughout the chain. This study reviews the modern technology and use of emerging supply chain software solutions provided by software manufacturing vendors. In this article, traditional approaches to supply chain operations, current development of information technology and examples of world's famous organization's supply chains are discussed. A theoretical model for supply chain management is also recommended which make use of information and communication technology as competitive advantage.*

**KEYWORDS**

Supply Chain Management (SCM), Information & Communication Technology (ICT), Supply Chain (SC), Competitive Advantage, Resource-based view (RBV).

**1. INTRODUCTION**

The impact of information and communication technology in supply chain is unarguable in order to gain competitive advantage. Moreover the main benefits which organizations can plan to acquire are; rapid responsive supply chain, efficient customers services, less process cost, short cycle time, and new means to expand goods (KPMG, 1998; McGuffog, 2002). In today's competitive and fast growing market; customer's needs vary widely and manufacturers tend to produce variety of different products in smaller lots to satisfy each customer's needs and decision making across the supply chain management which includes purchasing, production, distribution, scheduling, and inventory control, becomes more complicated. This manufacturing trend of large production and mass-customization has created big challenges for those companies who are attempting to utilize their supply chain not only domestically but also internationally to deliver products/services to customers faster and in an efficient manner. To develop an efficient supply chain, firms are adopting: (a) information & communication technology and (b) availing all opportunities of global economy to build strategic association and to strongly integrate processes within their supply chains. In today's competitive market, effective supply chain management is the focal point of every organization's top management. Approaches to supply chain management and deployment of Information & Communication Technology (ICT) have three components. The first one is strategic component, which focuses on acquisitions of resource including strategic partnerships, associations, investments and mergers and acquisitions (M&A). Second component is a tactical which uses resources allotment plans to utmost utilization of the firm's supply chain resources. The third and last component is operational which focuses on activities to make supply chain well-organized and efficient to decrease total operational cost. All of them are tightly connected to each other. But in this article, more focus is places on the tactical and operational components of the supply chain management and associates information technologies as competitive advantage.

In this article, we examine and contrast supply chain management of two companies, their former and future development and their competitive advantage. Then we suggest opportunities for supply chain innovation from the viewpoint of operations management, supplier manufacturer relationships, and the role of ICT. The main research questions will be investigated within the theories of RBV (Resource Based View) and SCM (Supply Chain Management) with focus on the

benefits obtained from information, communication technology. In this study, the author will analyze the question to find out the impacts of ICT in supply chain management. The purpose of this study is to create a foundation for future improvement regarding efficiency and effectiveness in use of ICT for the flow of goods, information and the way of work within the procurement process.

For the academic world, this article gives a theoretical basis in SCM, logistics and competitive advantage related matters. For the general public, mainly the companies in need of developing their logistical strategies and equipment, this article provides a basic frame of reference to study and develop the logistical functions to gain competitive advantage.

For better understanding this research is outlined as; next chapter describes the literature part of study. Section three provides the deeper insight of eminent studies in order to get benefit out of their findings and last section of this study describes the recommendations, conclusion and future implications.

## 2. CONCEPTUAL REVIEW ON SUPPLY CHAIN MANAGEMENT (SCM) AND INFORMATION TECHNOLOGY (IT)

The supply chain is expressed as a set of activities that cover enterprise functions from the ordering and receipt of raw materials, raw material handling, manufacturing of products, to the distribution and delivery of final product to the customer. All these activities are associated with the material flow and information flow (Li 2006). Supply chain management (SCM) is a set of synchronized activities for joining together all suppliers, manufacturers, transporters, and customers efficiently so that the right product or service is delivered at the right cost, at the right quantities, at the right time, to the right places. The crucial objective of SCM is to achieve sustainable competitive advantage (Li 2006). SCM's purpose is to integrate information and material flows seamlessly across the supply chain as an effective competitive weapon (Childhouse, 2003).

As per available literature, one common definition of SCM does not exist. Some researchers describe that it is not a chain of businesses with one-to-one and business-to-business relationship, but a network of businesses and relationships. There is a crucial need for development of theory, tools and methods for successful SCM practice. The Global Supply Chain Forum is a group of non-competing firms and a team of academic researchers, who has been meeting regularly since 1993 with the objective to improve the theory and practice of Supply Chain Management. The definition of SCM developed and used by the members of The Global Supply Chain Forum (2009) as follows:

*"Supply Chain Management (SCM) is the combination of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders".*

Supply chain is a network of actors that transform raw materials into distributed products. But as the name states; the supply chain has traditionally considered being a chain of actors. Furthermore, the supply chains were considered to be a form of long term upstream co-operations. In the early 1990's, supply chains were still perceived as linear chains of companies (Kemppainen & Vepsäläinen, 2003).

TABLE 1: DEFINITIONS OF SUPPLY CHAIN MANAGEMENT (SCM)

Authors	Proposed Definitions of Supply Chain Management
Jones and Riley (1985)	"An integrative approach to dealing with the planning and control of the materials flow from suppliers to end-users."
Ellram (1991)	"A network of firms interacting to deliver product or service to the end customer, linking flows from raw material supply to final delivery."
Christopher (1992)	"Network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer."
Berry et al. (1994)	"Supply chain management aims at building trust, exchanging information on market needs, developing new products, and reducing the supplier base to a particular OEM (original equipment manufacturer) so as to release management resources for developing meaningful, long term relationship."
Saunders (1995)	"External Chain is the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers."
Kopczak (1997)	"The set of entities, including suppliers, logistics services providers, manufacturers, distributors and resellers, through which materials, products and information flow."
Lee and Ng (1997)	"A network of entities that starts with the suppliers' supplier and ends with the customers' custom the production and delivery of goods and services."
Cooper, Lambert, and Pagh (1997)	"SCM as the management and integration of the entire set of business processes that provides products, services and information that add value for customers."
Tan et al. (1998)	"Supply chain management encompasses materials/supply management from the supply of basic raw materials to final product (and possible recycling and re-use). Supply chain management focuses on how firms utilize their suppliers' processes, technology and capability to enhance competitive advantage. It is a management philosophy that extends traditional intra-enterprise activities by bringing trading partners together with the common goal of optimization and efficiency."
Simchi-Levi and Kaminsky 2000)	"The integration of key business processes among a network of interdependent suppliers, manufacturers, distribution centers, and retailers in order to improve the flow of goods, services, and information from original suppliers to final customers, with the objectives of reducing system-wide costs while maintaining required service levels."
Stock & Lambert (2001: 709)	"SCM involves three closely related elements namely the SCM infrastructure, the supply chain business processes and the management components."
Bowersox, et al. (2002: 4)	"Supply chain management consists of firms collaborating to leverage strategic positioning and to improve operating efficiency."
Patterson, Grimm, Corsi, (2003: 96)	"The integration of key business processes from end user through original suppliers that provides products, services and information that adds value for customers and other stakeholders."
Turban & King (2003: 48)	"A supply chain is the flow of materials, information, money and services from raw material suppliers through factories and warehouses to the end customers. A supply chain also includes the organization and processes that create and deliver these products, information and services to the end customers."
Kemppainen et al. (2003, p. 701)	"SCM is a strategic view of materials and distribution management that shows the benefits to the individual companies from the boost of performance of the supply chain as a whole through the lens of the business processes across functional and corporate borders."
Global Supply Chain Forum, 2009	"Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders."

As already discussed, ICT is referred as Information and communication Technology. ICT is a more broader expression that comprises of any communication device or application, including: radio, television, cellular phones, computers, PDA's, I pad's, networking software and hardware, satellite systems as well as the various services and applications coupled with them, like video conferencing and distance learning through online lectures and mails. ICTs are often considered in a particular framework, such as ICTs in education, in libraries, or in health care (Christiaanse and Kumar, 2000). As defined earlier that, ICT has become a key enabler in the management of supply chains. Just back in few year, we have seen the development of a plethora of Supply Chain ICT applications Fasanghari et al., (2008).

Consequently this will lead to enhanced performance and more efficient and effective SCM (Rungtusanatham *et al.*, 2003). Martin *et al.* (2003) state that internal integration is requirement for companies before being able to share information with external partners. In accordance with RBV literature (Barney, 1995; Lambert *et al.*, 1993; Olavarrieta *et al.*, 1997; Peteraf, 1993; Rumelt, 1984), information systems may add value and optimal integrated within the organization.

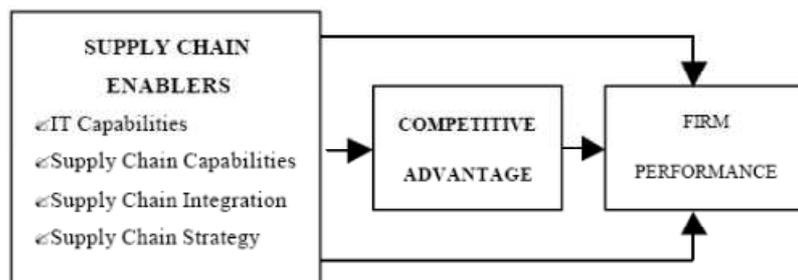
As per literature; Supply Chain Management system aims to integrate all key business processes throughout the entire supply chain (Helms *et al.*, 2000; & Knolmayer *et al.*, 2002). As the installation of supply chain management system costs a lot at initial level (Gouldson, 2001, p. 19; VanScoy, 2001/02, p. 87), the utilization of such software solutions depends on the nature and growth of the organization. A large amount of researches conducted in the field of e-business just paid attention on the technological characteristics or business cases to deal with (e.g., Dai and Kauffman, 2002; Amor, 2000).

The RBV argues that a firm's source of competitive advantage lies with the resources and capabilities it owns and controls and the unique way in which a firm bundles them together (Barney, 1991; Penrose, 1959; Wernerfelt, 1984). The RBV holds that firm resources that are valuable, rare, and hard to substitute are a basis for competitive advantage (Barney, 1991; Melville *et al.*, 2004). The literature presents a wide breadth of definitions about how to characterize firm resources. Barney (1991, p. 101) reserves the term for anything "that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness". Further, Barney (1991) refers to other research and divides firm resources into three categories: human capital resources, organizational capital resources and physical capital resources. Teece, Pisano & Shuen (2000), introduction talk about resources as dynamic capabilities. According to Barney (1995), when a firm has identified their resources and capabilities as valuable, rare and difficult to imitate, they must also be well organized to fully realize their competitive potential. Prahalad & Hamel (1990) explain that the real sources of advantage can be found in the management.

### 3. PREVIOUS STUDIES RECOMMENDATIONS

The study of Salam, A. P. D. M. A. (2007) measures the relationship of supply chain and firm performance. This study finds out the link between supply chain enablers (IT Capabilities, Supply Chain Capabilities, Supply Chain Integration, and Supply Chain Strategy) and organizational performance of Thai garments industry which is mediated by competitive advantage.

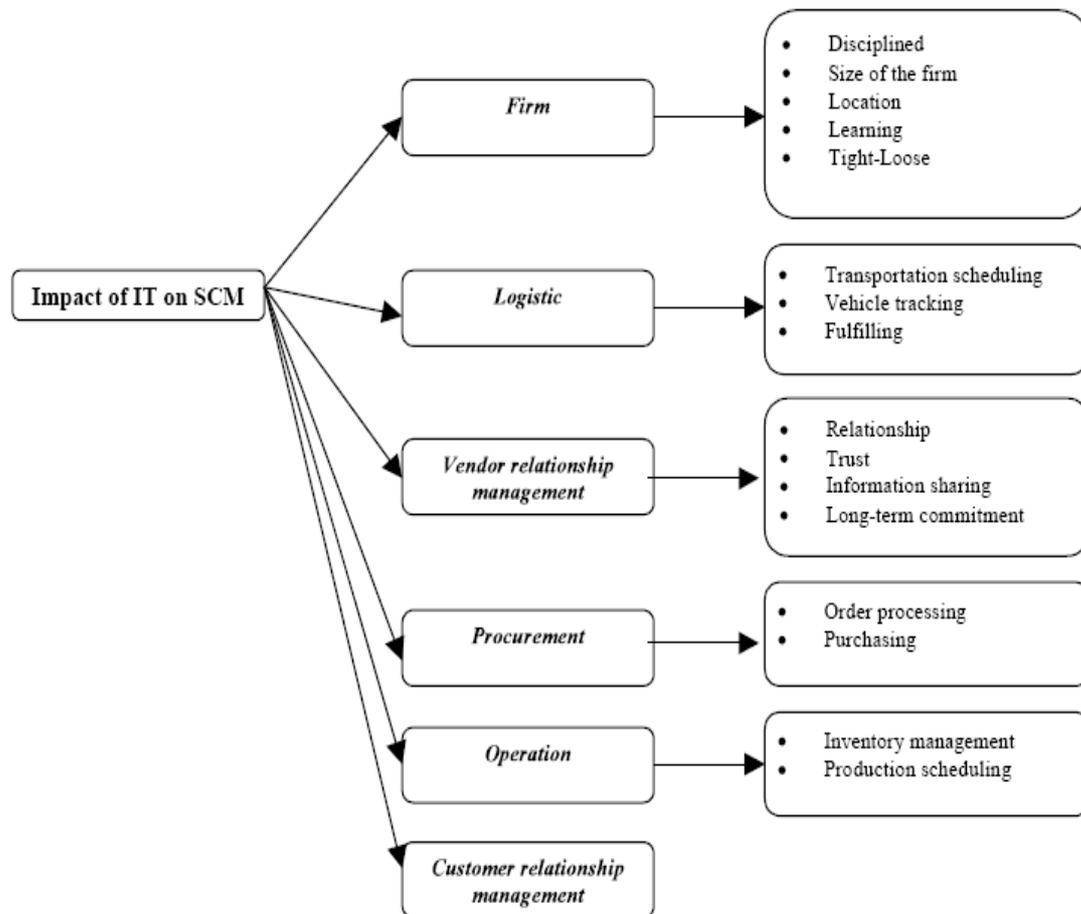
#### PROPOSED THEORETICAL FRAMEWORK



The mediating variable (competitive advantage) proposes that it's important to find a source of competitive advantage for efficient firm performance. The results of the study also provide evidence that, the firm will get superior performance as per availability or extent of resources. If the firm is totally integrated in all of its process of upstream and downstream then it will definitely get competitive advantage over its rivals.

The results show that this model has a major mediating effect of competitive advantage for organizations. It also proposes that IT resources and supply chain integration are the crucial factors in contributing to the firm performance. The results put more emphasis on importance of supply chain integration as only this single element can contribute to get competitive advantage. The more explanation of results reveal that the combination of two factors, supply chain integration and IT capabilities jointly can play an enormous result to achieve competitive organization. So the overall results of study suggest that Supply chain management strategy should be the part of the overall business strategy to gain competitive advantage in long run.

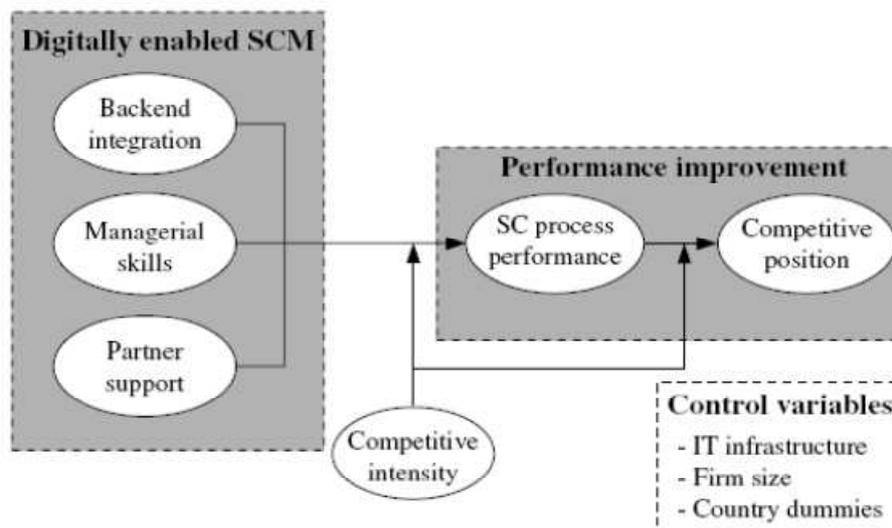
Fasanghari, M., Roudsari, F.H. and Chaharsooghi, K. (2008) express that in this rapidly changing and competitive business environment; every organization is trying to make flexible and quick responsive supply chain to gain competitive advantage through information technology. The following framework depicts their contribution in order to measure impact of information technology (IT) and supply chain management (SCM)



For evaluation, eight experts have tested these results in Iranian automobile industry's supply chain and 90% were satisfied with the results. The IT based Supply Chain Management can be used to evaluate SCM performance.

Another study presented by Dong, S., Xu, S. X., & Zhu, K. X. (2009) understands the importance of Information Technology in context of Supply chain. By focusing on "Resource Based Theory" Wernerfelt, B. (1984) and "Transaction Cost Economics" Williamson, O. E. (1995), the author developed a conceptual framework that links three IT resources such as, backend Integration, partner support and managerial skills. A moderating variable competitive intensity proposed to check the effect on resource and performance relationship. The manufacturing firm's sample size for this study is 743 firms. The results of the study represents the key drivers of IT enabled supply chain and approach toward the value of IT in tough competition.

**PROPOSED CONCEPTUAL FRAMEWORK**



**MAJOR FINDINGS OF THIS STUDY**

1<sup>st</sup>: Information Technology creates value in supply chain through digitally integrated operations and having a complete visibility at all processes.

The variable backend integration in theoretical framework represents the level of performance at different stages of the supply chain. The findings shows that IT creates value, however the effective use of technology to strengthen the relationships between supply chain partners and processes gives more advantage. This result is supported by RBV concept which defines that ordinary technology can be turned into priceless resources through proper utilization in a specific process. 2<sup>nd</sup>, the major value contributors in supply chains are IT related managerial skills and partner support.

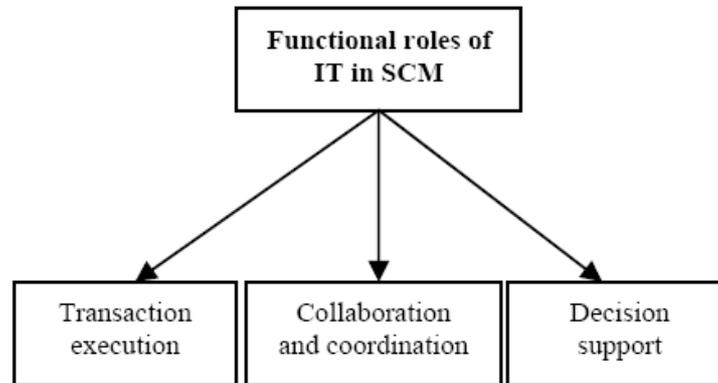
In this research, author has found that managerial skills and relational resources are also very much important for creation of value in supply chain management. So the successful supply chain not only requires technological resources as well as managerial skills and external resources are also required.

3<sup>rd</sup>, in the context of supply chain, the importance of managerial skills and backend integration have more value when there is a highly competitive environment.

Based on this research; author explains that resources have different effects in different contexts. This study defines that managerial skills and backend integration have extremely positive effects on supply chain if it is in a competitive environment.

Shavazi, A. R., Abzari, M., & Mohammadzadeh, A. (2009) purposed the relationship between Information and communication technology (ICT) and SCM from viewpoint of information and communication technology utilization. The author consider all available digital supply chain management resources and reveal that those organizations will get competitive advantage in future that will take advantage of these resources.

#### PROPOSED THEORETICAL FRAMEWORK



The study of Shavazi, A. R., Abzari, M., & Mohammadzadeh, A. (2009) does not consider traditional supply chain resources. Furthermore they consider new electronic tools, including e-business, e-procurement, extranet and intranet, internet marketplace and use of internet in supply chain management. They studied different parts and aspects of ICT and made it simpler to evaluate how these ICT components effect supply chain management. The components of ICT which are discussed in this research topic are:

##### A. Internet (www)

1. e-commerce
2. Information sharing
3. Knowledge sharing
4. Design an efficient supply chain

##### B. e-business

##### C. e-procurement

##### D. Extranet and Intranet

##### E. e-Internet Marketplaces

This study suggests that ICT can be utilized to for the development of supply chain management system. Furthermore; the World Academy of Science, Engineering and Technology has suggested that Internet can provide significant advantages in supply chain management such as cost reduction, demand estimation, channel coordination & service efficiency. In conclusion, Internet provides excess to useful information quickly and cheaply but having a responsive supply chain is not enough; supply chain should have an efficient flow of goods as well.

In general, the author proposed that, the competitive advantage in future will hold only those organizations who will utilize digital supply chain facilities.

## 4. CONCLUSION, RECOMMENDATION AND FUTURE IMPLICATIONS

### 4.1. Conclusion

Nowadays, world is a global village and every organization in the world can have access to any customer segment without doing any investment in other country through internet technology and e-business concept. In this tough competition, the only organization can survive which meet up the ever changing demands of the customers and deliver the right product, at right place, in the right quantity, at the right time and in right price. This cycle could not be completed without inter and intra organizational coordination, customer and supplier relationship management, transportation & distribution management and rapid flow of information, which means a strong integration among all functions of the supply chain is required. The modern information and communication technology provides software solutions (ERP, SCMS), web based internet facilities (e-business, e-procurement, e-commerce, etc.) and centralized databases which help out in efficient communication and coordination within as well as outside the organization. Supply Chain management software solution provide analysis of demand forecasting, production planning, inventory management and distribution which reduces uncertainty with less process and inventory holding costs. In this competitive market, the organizations have very limited margins and ICT investments are the best way to get efficient return on investment in shape of competitive advantage.

### 4.2 Recommendations

As already discussed the importance of ICT in SCM, we highly recommend SME's and multinational organizations to use modern technology to create value for their customers and suppliers. All organizations should spend a certain percentage of total profit for developing their technological infrastructure every year as it is the only way to get sustainable competitive advantage over its rival.

### 4.3 Future Implications

It is evident that ICT improves organizational supply chain efficiency but still there isn't much valuable research available regarding e-business and virtual organization. Nowadays, there are many virtual organizations successfully operating e-business setups around the world like amazon.com, ebay.com and expansys.com. An empirical research creating competitive advantage through Supply Chain Management should be conducted to study their supply chain system as well as to determine the attributes that improve their supply chain efficiency. This research can be much valuable for those organizations which still not have used e-business related technology to expand their business working in developing countries specially in Pakistan.

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