

## **The Importance of the Information Technology Application on Supply Chain Management**

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### **Abstract**

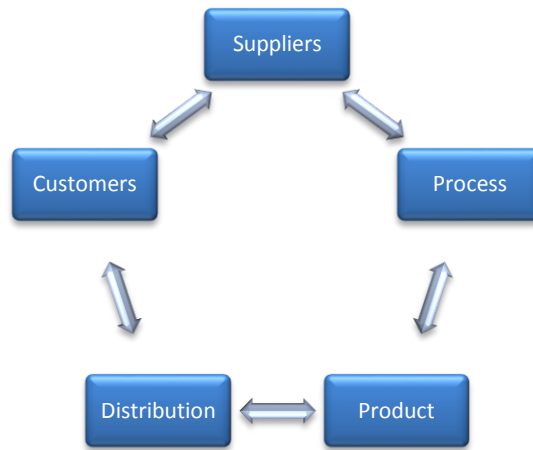
*Information technology draws a huge impact and advantages which has already taken place and brought a great change and development in the field of supply chain management in each types of factories and industries. Now a days with the comparison of rapid technological changes and high competitiveness the success factor of the companies are depend on the collecting the consumer needs and regarding their existing opportunities in order to satisfy their customer demands in time so information technology plays a key role factor in this purpose. Collection of certain amount of information it is necessary for the companies to control or maintain operational and the strategic issues of supply chain management in a tactical level. By using those data and the help of better information technology can helps the companies to improve their existing supply chain management which directly positively impact on increasing the production, qualities of the products and brings out the better serviceability and helps to build up better relationship between customers and the manufactures. The purpose of this research paper is mainly focus on the importance of the information technology application on supply chain management, assigning different problems related with supply chain management and try to find out the competitive solutions of that identified problems by the help of the application of information technology in order to make the total supply chain management system more sophisticated and more modest in the respect of current international trade market and improves the internal collaboration between the different stages of the supply chain management and increase the overall efficiency of the service level of the company.*

Keywords: Supply chain management, Information technology, Inter-organizational systems, E-commerce, Supply chain collaboration, Information sharing, Case study

### **1. Introduction**

Supply Chain Management is a foremost concern in many industries as Companies comprehend the importance of building an integrated relationship with their suppliers and customers. According to the Global Supply Chain Forum (GSFC), Supply Chain Management is defined as “the integration of key business processes from end user through original suppliers that provide products, services, and information that add value for customer and other stakeholders.”(Chan & Qi, 2003)Information technology is a crucial segment of any business or organization, and under goes constant change.

Supply chain management is a growing and rapidly evolving area of employment being shaped by international competition. If resources - people, money, machinery, facilities, material and information - are to be used wisely, supply chain management personnel must be familiar with computer technology, quantitative methods, and planning and problem-solving technique useful in analyzing business systems. For the better control and make the supply chain system more flexible information technology plays an important role in this purpose and also information technology helps to better sinking among the different stages of supply chain management system which helps the organization to cope up with their full filling the issues of customer demand and be able to sustain or maintain equilibrium balance in their productions or services. IT gives information flow which makes the supply chain stronger and more flexible without reducing its efficiency. The following figure demonstrates the process of full filling the customers demand in supply chain management systems. This flow diagram is also partially demonstrates the flows of information between the different stages of supply chain management and provides a potential realization to the applications of the importance of information technology in supply chain management system.



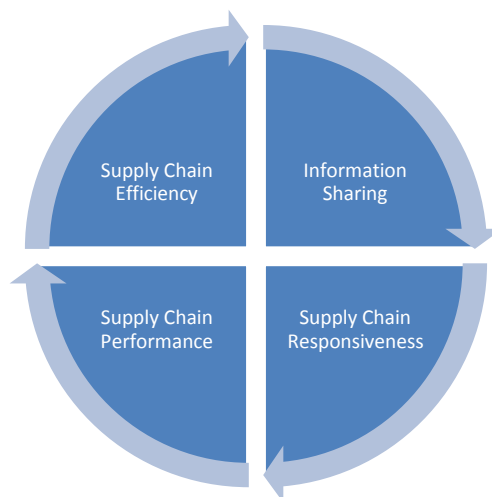
**Fig. 1.** The process flow diagram of satisfying the customer demand in supply chain management.

Information systems to organizational performance is changed effectively and nowadays information systems for organizations, are the creator of value information systems play the role of integration and coordination between different parts of the supply chain and the performance of this system has a direct impact on the efficiency of supply chain performance.

As for IT systems, when discussing the use of IT in SCM, we refer to the use of inter organizational systems that are used for information sharing and processing across organizational boundaries. Thus, besides internal IT systems such as Enterprise Resource Planning systems we also consider identification technologies such as RFID from the scope of this study

IT and SCM: Recently with development of IT, the concepts of supply chain design and management have become a popular operations paradigm. The complexity of SCM has also forced companies to go for online communication systems. For example, the Internet increases the richness of communications through greater interactivity between the firm and the customer. This illustrates an evolution in supply chain towards online business communities.

Supply chain management emphasizes the long-term benefit of all parties on the chain through cooperation and information sharing. This confirms the importance of IT in SCM which is largely caused by variability of ordering.



**Fig. 2.** Information sharing and the role of information technology in supply chain

## 2. Theoretical framework

Over the last 100 plus years of the history of supply chain management has evolved from an initial focus on improving relatively simple, but very labor-intensive processes to the present day engineering and managing of

extraordinarily complex global networks. Information technology, industrial engineering and operations research have their roots in logistics. Supply chain management, is result of logical progression in logistics management. Logistics management has been created by adding construction, manufacturing, supplies and orders into distribution management (Droodchi & Nikmehr, 2007). Karbassian in a survey performed in 2003 concluded that supply chain management were studied as a serious discussion in the scientific community, from the early 1980s and many researchers, provides framework and model for that.

An effective supply chain are considered as the key to creating network of sustainable competitive by improving relations inside and outside the organization. Wu and others have shown, using resource-based view that supply chain capabilities by using information technology (IT) cause distinctions in companies compared to competitors and inimitable to competitors ,in this study the impact of IT development and IT to theoretical convergence on supply chain capabilities marketing and financial performance were assessed.

The Study of Mishra, (2012) thoroughly focused on the role of Information technology (IT) in supply chain management. It also highlights the contribution of IT in helping to restructure the entire distribution set up to achieve higher service levels and lower inventory and lower supply chain costs. The broad strategic directions which need to be supported by the IT strategy are increasing of frequency of receipts/dispatch, holding materials further up the supply chain and crashing the various lead times. Critical IT contributions and implementations are discussed. Fundamental changes have occurred in today's economy.

The Study of (Dong et al., 2009) in this study, the researchers aimed to better understand the value of information technology (IT) in supply chain contexts. Grounded in the resource-based theory in conjunction with transaction cost economics, they developed a conceptual model that links three IT-related resources (backend integration, managerial skills, and partner support) to firm performance improvement. The model differs from previous studies by proposing a moderating effect of competition on the resource-performance relationships.

The technological resource alone, however, does not hold the answer to IT value creation. In fact, managerial skills, which enable adaptations on supply chain processes and corporate strategy to accommodate the use of IT, are shown to play the strongest role in IT value creation. Furthermore, backend integration and managerial skills are found to be more valuable in more competitive environments.

While commodity-like resources have diminishing value under competition, interactional and managerial resources become even stronger. Overall, their results shed light on the key drivers of IT-enabled supply chains, and provide insights into how competition shapes IT value.

The research of (Olugbode et al., 2008) aimed to study the effect of information systems on firm performance and profitability using a case-study approach on Beale and Cole Company that was experiencing significant levels of growth in its business. The researches realized that it's existing operational practices and ICT infrastructure were incapable of efficiently sustaining their level of growth. A thorough analysis of the operational systems was carried out covering both the manual systems and those supported by its computerized accounting system.

The study of (David et al., 2004) indicated that the supply chain management is critical since firms always confront the competition on their supply chain efficiency. This article discusses the trend in supply chain management by examining Web technologies that transform and streamline the supply chain management.

### **3. Problems of supply chain and application of IT:**

As the development of the industry is continuously evolves, several trends are becoming apparent. Businesses in touch with these trends and prepared to address them, will likely be better positioned to succeed.

#### **3.1. Risk management of Supply chain**

In the field of production the supply chain is a very crucial sector for the better combinations among the different stages of production and provides the better feedback of the customer demands. For this reason the matter of risk management of supply chain are eagerly considered by the companies. The risks are too high. Information technology and the techleaders build collaborative, agile supply chains, capable of rapid yet cost-effective adaptation. They achieve this agility through practices that include: a variable vs. fixed supply chain network; collaboration and risk sharing across supply chain partners; extended supply chain information visibility and sharing; sense-and-respond mechanisms for spotting anomalies and changes; segmented supply chain management risk mechanisms tied to value at risk; orchestrated supply chains, with partners aligned on key value dimensions. The more mature a company's supply chain and risk management processes are, the better the company fares when disruption occurs, the experiment shows that: 44percent of companies with mature processes are directly suffered at a 3 percent or more decline in their revenue, compared to 57percent with immature processes.

#### **3.2. Bullwhip Effect and the application of IT**

Bullwhip effect in the field of supply chain creates a great problem. It generally occurs for the lacking of information between the different stages of the supply chain. Consumers demand in the market will to be influenced by the entering of the new products or by the satisfactions of using the current products and the value of the incumbent competitor products and so on. This type of fluctuation of demands of the customers greatly affected not only the proper satisfaction or the supply of the products but also to the production of the product or services. This type of problem occurs for the lack of information among the different stages of supply chain which creates the bullwhip effect. In this regard if the proper information systems will to be adopted by using the flexible information systems and technology the better conformity between the information of different stages of supply chain and provide the organizations to avoiding the bullwhip effect. In this regard they use different types of supply chain software like SAP, ERP, MRP software etc.

### **3.3. Transaction processing**

Transaction processing of IT use for increasing the efficiency of repetitive information exchanges between supply chain partners. In this type of IT use the exchanged information is typically related to such tasks as order processing, billing, delivery verification, generating and sending dispatch advices, and producing order quotes. The second type of IT use, supply chain planning and collaboration, represents the use of IT for sharing planning-related information such as demand forecasts and other demand information, inventory information, and production capacity information, with the intention of increasing the effectiveness of the supply chain.

### **3.4. Data collection**

The data about the customer demand and about the production is one of the major concern in the field of supply chain management. For maintaining good and balanced relation between the customer demand and production proper data and the better collection of these data should be confirmed by the production or service organizations. Because proper and updated data provides better flexibility and helps to boosts up the eminence and service ability of the organizations. On the other hand lack of proper data collection is so much deleterious for the organization in order to maintain harmony of the organization. In this respect the information technology provides a support to maintain or collection of proper data among all the stages of the supply chain management by using different types of data assortment software (JDA software, DOYELI etc.) and using computer and different varieties of information technological system.

### **3.5. Data analysis and information sharing**

The success of the organization and also the service ability not only depends on the data collection but also proper analysis of the collecting data and also the proper information sharing. Because the proper data analysis helps the organization to understand the fluctuation s of their customer demand, their production rate, their service condition, their current market situation and so on. In this regard information of these analyzed data should be shared among different stages of the supply chain management. Because it helps the company to rescheduling or scheduling their production plan, aggregate planning, better forecasting, resource scheduling and better flexibility among different stages of supply chain management. The modern information technology plays an important role in this purpose. Such as using the MATLAB software the FUZZY LOGIC is more appropriate for analyzing and calculating most critical and more amount of data within a short time and helps to maintain the record of this analyzed data.

### **3.6 Scheduling and planning problem for effective supply chain management:**

Scheduling and planning is one of the most valuable parts in the supply chain management system. Better planning and scheduling system helps the organization to control their supply policy in the more sophisticated way and also helps to reduce to the chance of risk occurring event and helps to up to date their information. The better scheduling and planning technique help the company for the better utilization of their scare resources and also helps the company to lessen the extra manpower and transportation cost.

We survey a local company in order to utilize how the information technology plays an important role in the field of better planning and scheduling in order to effective supply chain management.

The name of the company is “Brothers Beverage Company Limited”. They have total 68 sub point in Khulna city where they supply their beverage items.

**Table1.** Sub point category, their numbers and company routing policy in a month

Sub point category	Number of sub point	Company policy
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High Value	8	Monthly travel 5 times
Medium value	41	Monthly travel 4 times
Low value	18	Monthly travel 2 times
Total	68	Total travel 199 times in a month

In this routing policy in each month the company use 5 rickshaw van and 4 mini pickup and they were 10 workers for delivery the products in different shops. Including all the fixed cost (office rent, employee salaries, furniture etc.) and also the transportation cost the total expenses of the company is approximately 1 corer 20 lakhs monthly. It seems too much expensive for the company. The routing policy of the company is not sophisticated. The table shows that the company emphasizes mostly the high value sub points. In this respect we found that the medium value and the low value sub point is not get so much routine observation than the high value sub points. The survey find out that there is a distinguish and for the lacking of proper synchronizing causes great expenses each month for the company. This problem can be solved by using better information technology and adopting the updated technological facilities and also by using different types of information software. For collecting the order from the retailer shop easily and quickly and up-to-date the data time to time we suggested to use a server based ordering system instead of classical system. This helps the company to gather their demand from the retailer shop quickly and reduce the time to record them by the classical manner and helps the company to response of their customer more quickly than the current system. The “DOYELY” is one of the most effective software in this purpose which is server based software and helps to collect the data in a more sophisticated way.

For better synchronization between the different sub points we use the “ARC GIS” software. This software helps to better synchronizing between different sub points and create an optimum route by synchronizing closest sub points on each individual route. This software is generated 11 routes by combining 68 sub points. It helps to emphasize the sub points of all categories almost equally (to cover all routes 5 times in a month) which helps the better distribution and increasing the sales. The “OPTRAK” is more sophisticated tool. This creates an optimum travel schedule of the vehicles on the basis of the data and the optimum route plan which is generated by Arc Gis software. These optimum vehicles routing schedule helps the company to reduce the total number of vehicles. And it shows that only 3 Rickshaw van and 3 mini Pickup are able to covering all the optimum routes equally in a month instead of 5 rickshaw van and 4 mini pickup. So it is able to reduce 2 Rickshaw van and 1 mini Pickup. This optimum routing schedule of the vehicles not only helps to increase the serviceability but also help to reduce the total routing in each month as well as the transportation cost and also the manpower.

The following table giving the overall comparison between the existing and optimal network.

**Table 2.** Comparison between Existing & Optimal Distribution Network Analysis

Criteria	Existing	Optimal	Difference
Manpower	10 Delivery Man	6 Delivery Man	4 Reduced
Vehicle	5 Rickshaw van+4 mini Pickup	3 Rickshaw van+3 mini Pickup	2 Rickshaw van and 1 mini Pickup Reduced
Transportation cost	2,40000	1,51000	89000 Taka Reduced
Other fixed cost	372000	320000	52000 Taka

Total Cost Reduced= 89000+52,000= 1, 41,000 taka Per Month. This practical example shows that the information technology and the modern technologies are plays an important role in the field of supply chain management for better planning and scheduling and helps to improves its service ability as well as sustainability in the competitive market place and helps to extended the network and reduce the chance of risk.

**Table 3.**The following table shows the fields of supply chain management where the IT is frequently use.

Supply Chain Problem	IT Solution
Linear sequence of processing is too slow.	Parallel processing, using workflow software.
Waiting times between chain segments are excessive	Identify reason (using decision support software) and expedite communication and collaboration (intranets, groupware)
Existence of non-value-added activities.	Value analysis (SCM software) , simulation software
Slow delivery of paper documents.	Electronic documents and communication system (e.g., EDI, e-mail).
Repeat process activities due to wrong shipments, poor quality, etc.	Electronic verifications (software agents), automation, eliminating human errors, electronic control systems.
Learn about delays after they occur, or learn too late.	Tracking systems, anticipate delays, trend analysis, early detection (intelligent systems).
Excessive administrative controls such as approvals (Signatures). Approvers are in different locations.	Parallel approvals (workflow), electronic approval system, and analysis of need.
Lack of information, or too slow flow.	Internet/intranet, software agents for monitoring and alert, barcodes, direct flow from POS terminals.
Lack of synchronization of moving materials.	Workflow and tracking systems, synchronization by software agents.
Poor coordination, cooperation, and communication.	Groupware products, constant monitoring, alerts, collaboration tools.
Delays in shipments from warehouses.	Use robots in warehouses, use warehouse management software.
Redundancies in the supply chain. Too many purchasing orders, too much handling and packaging.	Information sharing via the Web, creating teams of collaborative partners supported by IT.
Scheduling problems, manufacturing lack of control.	Intelligent agents for B2B modeling.

#### 4. Conclusions

The outcomes of this analytical study contribute support to the interrelationships between supply chain and the use of IT. So the contribution was also essential to found to the expected influence of the use of IT for supply chain management. The main focus was to use of IT for supply chain planning and collaboration, conversely, discuss about some further possibilities and findings and more through research and findings. Also now a days the information technology has greatly influenced the supply chain management by adopting E-commerce. By using information technology (IT) the will be more systematic and more electric mode of control over the supply chain and thus more complex and critical procedure will see the light of success.

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