Master's Thesis

Impact of Enterprise Resource Planning in Supply Chain Management

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Summary

To survive and stay ahead in today's competitive world companies are pushed to their limits in search for organizational skills and technologies. Of those Supply chain Management and Enterprise Resource Planning are the two most primarily used terms. In order to stay and survive in the competition companies are forced to speed up their production, reduce their cost and improve performance. All these three factors go hand in hand and in order to achieve these factors, information exchange from both inside and outside plays the key role. Supply chain management is the term used managing this accurate information's in and out and ERP is the technology used for achieving the same.

The purpose of this research is to continue in this field of study and solve real problems with ERP implementation, and eventually create analytical tools for these systems. With the advent of globalization ERP software has emerged as a major area of interest for many business organizations.

There are two main research orientations in these studies which include: first, how to implement ERP system in a corporation and, second, what are the advantages of this system in resolving a variety of problems an organization might encounter.

The first area, on which most of the studies have already focused, comprises studies on the fund, timing, economy and success of the implementation of ERP. On the contrary, our study addresses the functions of ERP in strategic and operational levels and also aims at bringing in the major difficulties and disadvantage on implementation of ERP systems into an organization.

Our results suggest that ERP systems in its current state have a modest role to play in obtaining supply chain integration and management. With the major development in the field of communication and IT solutions we can expect a time shift where many solutions could be available for better interfacing of ERP systems and in turn which can help in achieving much better supply chain management.
Many studies claim that the major advantage of an ERP system is that it is integrated and centralized. An ERP system offers the decision makers the means of enhancing the knowledge about the process which in turn helps to make reliable decisions more rapidly and as well collecting sources to support their decisions. However according to our findings from various studies it is evident that ERP helps to improve the reliability of decision by mutual participation of the participants, improves co-ordination of tasks which makes inter-related decision making easier. As a result it improves the satisfaction of decision process across the participants.

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Chapter 1
Introduction

1.1 Brief Introduction

It has been two decades since the internal operations are being streamlined, manufacturing boost up, quality of the products are being improved, the costs of manufacturing are being reduced but now the companies are now focusing on the reduction of logistics by mean of putting right supply chain strategies for the excellence of organizations. The statistics show that the logistics costs in European organizations ranged between the 5% to the highest ratio of 15% of the total budget or the turnover of the company (AT Kearney, 1993). In the USA, the businesses have spent more than $670 billion on the supply chain related activities during the year 1993 which was the 10.5% of the total GDP (Kurt Salmon, 1993).

The other key reason for the modifications that are regularly made in the scope and methodologies of the supply chain management (SCM) is the advent of the network economy (Castells, 1996; Arthur, 1996). Nowadays, there is more transparency in the markets where there is more customization added to the demands of the customers (Jensen, 1999). However, it has been noticed that there is always an increment in the prices for the business world (Gleick, 1999). The developments in the supply chain management (SCM) can have a great impact on the businesses.

There is a rapid growth in the literatures that are being published about the models for new business following the age of internet however, most of them have stressed upon the fact that supply chain management is also enlisted as competency element with the growing competition in the business.

It is also interesting the Enterprise Resource Planning (ERP) is also growing in the business pipelines where the businesses are starving to make improvements in their supply chain management based operations. Enterprise Resource Planning is also considered as an extension of the Market Requirement Planning (MRP) which is being launched during the 1970s and also the manufacturing Resource Planning (MRP II) which was introduced in the next decades of 1980s.

There are two major considerations which are held responsible for this development in the simultaneous manner. The first consideration that is noticed is marked as like the decisions which are managerial based are considered to be the closed linking factors for the two separate prospective. There evolution in the industry is considered as industrial (White et. Al., 1999).

1.2 Historical Background

Enterprise Resource Planning (ERP) took its start in the late 1980's and then properly extended in the 1990's whereas the large area of focus was the huge scale business organizations. These systems are considered as complex, they are expensive, they are powerful while these systems were also considered as the key platform for simplifying the complex operations. On the other hand, there are certain limitations that are accompanied modifications that make companies bound to make changes in the complete operational system of the business to make an adjustment with the module of the software.

1.3 Research Rationale

For survival in today's dynamic environment, organizations have to speed up, quality and flexibility and also reduce their costs, in such circumstances to make up the performance of organizations, their competition is necessary. In order to achieve such purpose, access to accurate and important information within and outside the organization and efficient use of them play the key role. In order to achieve this purpose, information technology tools and information systems and effective use of Information technology is so important, and has deserving effect to obtain, and maintain these competitive advantages.

1.4 Thesis Statement

"The Impact of Enterprise Resource Planning (ERP) in the Supply Chain Management (SCM)"

1.5 Research Objectives

The research is being conducted following these research objectives:

I. To analyze the role of Enterprise Resource Planning (ERP) in the enhancement of operations within the organization.
II. To analyze the role of Enterprise Resource Planning (ERP) in the enhancement of operations being out bounded by the organization.
III. To analyze the support of Enterprise Resource Planning (ERP) towards the Supply Chain Management (SCM) operations.

IV. To analyze the role of Enterprise Resource Planning (ERP) in the decision making in Supply Chain Management (SCM).

1.6 Aim of Research

The purpose of this research is to continue in this field of study and solve real problems with ERP implementation, and eventually create analytical tools for these systems. With the advent of globalization ERP software has emerged as a major area of interest for many business organizations. As companies are more and more interested to implement ERP systems into the companies, the need for proper implementation of the same has increased as well.

The very advantage of the ERP itself can be described as its main disadvantage. ERP allows easy access to reliable integrated information but whereas its biggest disadvantage is its integration of its system which is the basic problem in its implementation.

Some researchers indicate that ERP won't be able to make decision by itself, and some others say for making decisions based on information stored in ERP, the integrity of the system and algorithm optimization is inevitable.

On the other hand the whole system processes and data integration organization is always necessary tools for supply chain management and prerequisite for implementing its process. Application for supply chain process modeling in analytical layer, which must interact with ERP, will cause to implementing standard processes and supply chain collaboration. This research tries to bring out how information transparency impact on enterprise business process and thereby reduce operational cost. This research also aims to study about the ERP effects in supply chain decision making, and precisely ERP's role on implementing standard supply chain process and SCM collaboration. This paper also study about supply chain problems and how to improve supply chain performance indicators by implementation ERP.

1.7 Research Questions

The research is being conducted following these research questions:

I. What's the impact of enterprise resource planning on supporting supply chain management?
II. What’s the impact of enterprise planning system on organizational decision?

1.8 Significance of the Research Study

ERP plays a major role in Vendor Managed Inventory. A vendor managed inventory (VMI) is a process where the manufacturer generates order for the manufacturer based on the demand created by the distributor using ERP. During this process the manufacturer follows mutually agreed objectives between the manufacturer and distributor for filling rates and transaction costs. In this regard, some ordering model in Vendor Managed Inventory (VMI) for the retail industry will be discussed, and its effect on supply chain collaboration mechanism is reviewed, and finally the process cost reduction as a supplier, will be discussed as operational model and rate of this quantities improvement is measured.

There have been numerous researches in the field of ERP and its advantages on its implementation. Our focus is to bring out how important is to integrate ERP into the whole system so that the system can yield long term benefits in long run. The reason we stress how important is because ERP implementation is like a big bang effect which changes the activity of the whole organization and proper understanding of the system and co-operation for implementation of the system between the members of the organization are very important because humans are prone to change but a change as big as an implementation of ERP is not very easily acceptable. Therefore we bring out how beneficial can be ERP on a larger scale like organizational decision making and proper management of the supply chain. Also our important aim is to bring out the benefits of ERP in cost reduction during ordering especially regarding VMI.

1.9 Theoretical & Methodological Framework

The methodology adapted to this work was to gather information from various text books, articles and various kinds of reliable information from different companies and many other reliable sources. Some of our older interviews with various Logistics Managers for our previous school work have been instrumental in constructing this thesis work. The interdependency of

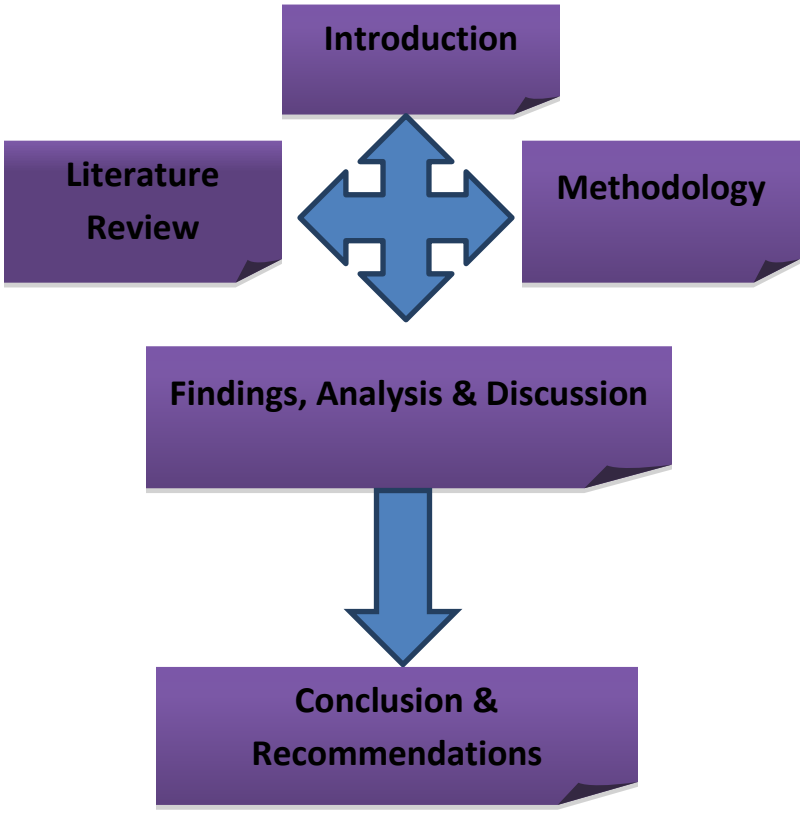
ERP and SCM has been backed up by various articles and we have chosen few of those articles depending upon our objective and goal. After getting the information and data from various literatures and from various other sources, we have analyzed our information sources critically depending upon the needs of the thesis work to get our result on the basis of this information. We have narrowed down our result in essay form in our Result chapter which will help resolve confusion of many readers which was one of our priorities. We have also provided a list of our sources along with references for the reader to provide with more information on how we arrived at our result.

This paper in terms of target considered as applied investigation, and has descriptive approach because of modeling and some mathematical tools that is applied. In this study after reviewing the role of enterprise resource planning systems on mechanisms of cooperation in supply chain, the information infrastructure of VMI cooperation Mechanism and integrated supply chain model, and also information sharing effect on supply chain decision-making in these areas, will be discussed.
In next chapter, the past researches about ERP effect on over organizational decision and supply chain will be reviewed. In third chapter the role of enterprise resource planning system on cooperation mechanism will be analyzed. In Analysis chapter ordering model for supply chain distribution mechanism under VMI mechanism, will be reviewed. And in final chapter discussion and conclusion about the developed model and usage of used methods in future will be reviewed.

Validity and Reliability:

This study has been an effort to bring out the importance of unknown factors of ERP system which inherits both advantages and disadvantages and also its disabled functions in large scale organizations. The work has been developed closely relative to the available information from various trusted sources. The reference list for various sources has been stated in the thesis work and therefore the information provided in this thesis work is valid information's. However the reliability of the information is to be tested in real scale for future work which will take an extended amount of time considering the time given for the thesis work. But we are very sure to state that the information and results developed are reliable except that the fact it is not been tested in real time environment.

1.10 **Research Roadmap**



Chapter 2
Supply Chain Management and Role of ERP

In this chapter, firstly we will deal with the advantages gained by implementation of ERP over the supply chain management and a detailed perspective view is described over how ERP systems helps making organizational decisions. Then we will be dealing with the concepts of coordination, cooperation and integration in the supply chain which forms the main base for our research question. And then we will proceed by considering cooperative mechanisms including vendor managed inventory (VMI). Subsequently, we will examine the role of ERP systems in creating the information structure, process support and cooperative mechanisms in the supply chain. In this respect, we shall consider the underlying informational and procedural structure required to implement the VMI mechanism.

2.1 Supply Chain Management in Network Economy

Supply chain is a network which consists of suppliers, manufacturers, distributors, customers and many others. There are three types of flow which needs close co- operation and co-ordination.

- Material flow – This is a physical flow which represents the movement of product from supplier to customers as well as the movement of product from customers to suppliers in case of servicing, repairing and etc.
- Information flow – This is a flow of information which represents the transmission of orders, tracking of orders and etc. This information flow is always co-ordinated with the physical flow of goods.
- Financial flow – this flow represents the credit terms, payments and consignments and other ownership arrangements. This flow requires highest level of co – operation between the members of the supply chain (Silver, Pyke and Peterson 1998).

All these networks are in turn supported by the three main pillars. They are

1. Processes which determine the firm's ability to manage logistics develop new product and knowledge management.
2. Organizational structure which determines the relationship between the various members across the supply chain. This structure can be classified as vertical integration and horizontal integration.

Technologies used by the companies which help in easing out the operations related to process and organizational management (Hillier and Lieberman, 2005).

2.2 Four Key Benefits of ERP on Supply Chain Management

An n ERP system can offer high value to any organization whose aim is smooth planning and execution of related operations to achieve long term profitability and maintain a solid competitive edge. This is the main reason more and more companies are attracted towards purchasing and implementation of the information technologies like ERPs. What does an ERP has to offer an organization?

- Improved Supply Chain Network: ERP provides complete visibility across the supply chain network which is highly impossible in the manual process. With the implementation of ERP an organization can monitor all the status and activities of all suppliers, plants, storage facilities and all the members of the supply chain which makes it easy for communication throughout the network. This in turn helps in effective tracking and management of all processes, right from ordering, through manufacturing and shipping of finished goods to the customers (Theis, 2004). The status of all the operations can be monitored at any time and corrected anytime in case of problems.

- Minimized delays: Many supply chains which are not configured with the ERP systems have already placed complaints over poor business relationships and as well as loss in business. Some of the general complaints are late shipments from vendors, slow down or crashes on production lines, logistical errors in distribution channels. These all have negative impacts on organization and therefore results in negative impact with the customers who are the main force of attraction for a supply chain. With the implementation of ERP all the activities can be co-ordinated and executed ensuring higher levels of on time delivery across the chain.

- Enhanced Collaboration: ERP helps organization to have a control over all the suppliers and distributors. This creates the ability to know what they are doing all the times. ERP bridges the gap between supply chain partners. With ERP all the members across the network can share vital information like demand, forecasting reports, inventory levels, status of production, transportation plans and many more in real time. This type of available real time information makes the supply chain process to run flawlessly (Stevenson, 2007).

- Reduced Costs: An ERP can help to reduce expenses in many ways. It can help improve inventory management facilitating just in time model or quick response models which eliminates the strain about the availability of raw materials and therefore the need for storing the raw goods can be eliminated.

It enables more effective demand planning so that the production levels can be set to address customer requirements without the shortages (Mabert et. al. 2003). It can also help to improve relationship with vendors and distributors, so decision makers can identify cost cutting opportunities such as volume discounts.

2.3 ERP helps higher officials in Decision Making

Research has already been done to help get a better understanding of the ERP decision making process. However there still remains concern over the appropriateness of the ERP software. Ability to handle the confusion can only be gained through experience and Managers are posted on their seats based on their level of experience (Iles, 2007). However ERP can help in assisting the officials in decision making. However our topic is debated on how ERP systems can help in decision making and in this section we have put together some of the advantages gained by ERP systems which helps in quick decision making.

In the current business environment information is the key resource of an organization. If the organization does not have an effective mechanism that gives the decision makers the needed or the right information at the right time, then the chances of that organization succeeding in the future will remain a mystery.

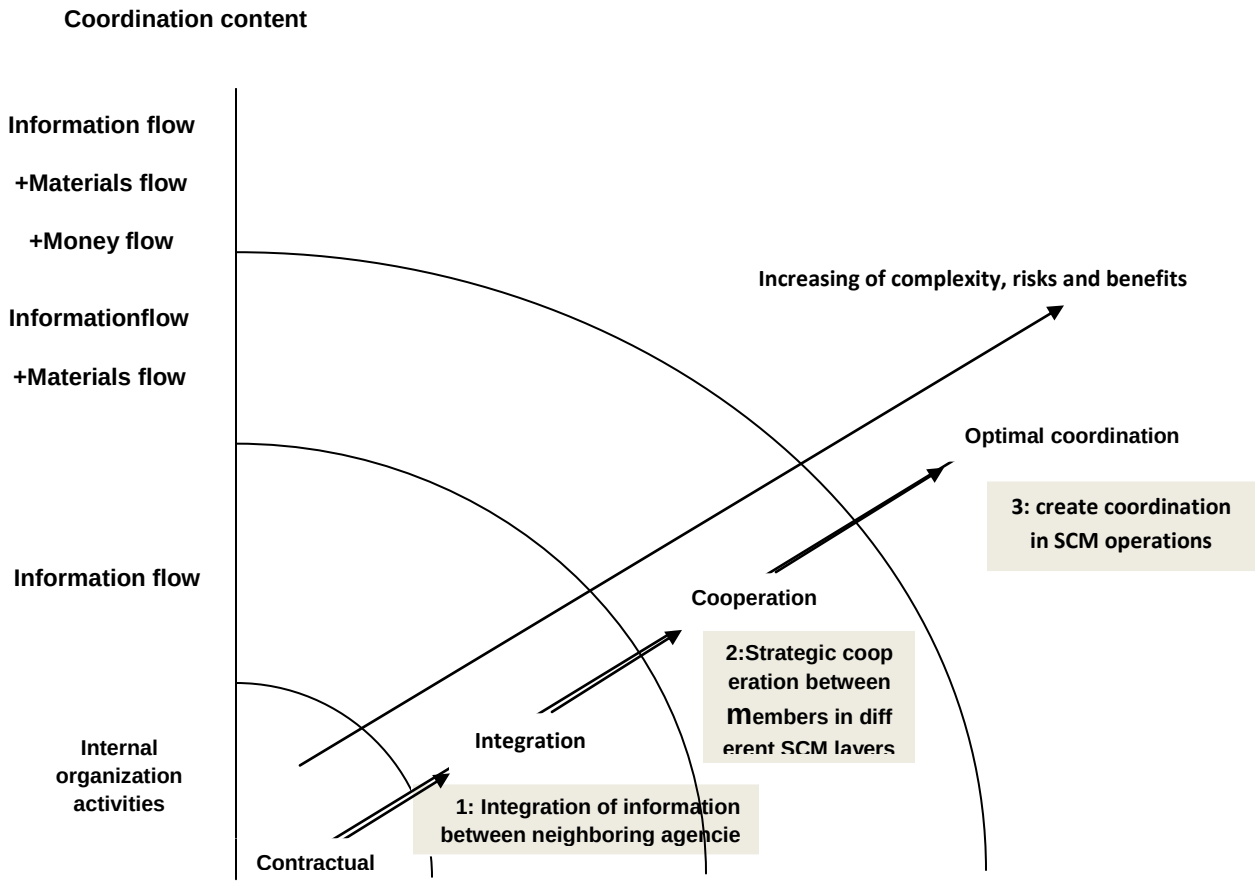
The basic fundamental characteristics of information are accuracy, relevancy and timeliness. The available information has to be reliable, and relevant for the decision makers to make decision at the right time. In the changing business environment the time available for organization to react to the change in market trend is very little (Fisher, Raman and McClelland, 2000). To stay stable with the changing trends an organization should be up on its toes. Any technology that will help this gathering of information will enhance the chances of organization to stay alive in the market.

With the implementation of ERP system, the organization will be able to function as a single entity and caters to the needs of organization as a whole. The strength of an ERP system is integration and automation and that is why implementation of ERP will help in improving accuracy and in better decision making. For example resource management is one of the biggest problems often encountered by the managers and through the information systems, it is possible to address the problems and move the required resource with in shortest possible time. Therefore the process is not stopped and the time is also saved.

2.4 Coordination dimensions in the supply chain

Supply chain management is founded on the fact that an organization may not effectively and efficiently accomplish the whole processes involved in manufacturing a final product out of raw materials. That is why the interrelationships among the supply chain members require coordination so that materials, information and money would circulate appropriately. Malone has provided a general definition for coordination which assumes the coordination to be equivalent with the management of interrelationships among supply chain members. Usually, coordination is defined in connection with the concepts of integration and cooperation (Lambert and Cooper, 2000).

Supply chain coordination takes place at three levels. At the first level, coordination takes place through the integration of cross or exo-organizational information. At the second level, supply chain coordination crystallizes in the cooperation of the supply chain members to create a joint coordination in information and materials. Higher levels contain some of the elements from the lower ones. The most advanced level of coordination takes place in the efficient management of information, materials and money to maximize the creation of value in the supply chain (Christopher and Jüttner, 2000). This type of optimal coordination is the result of using the layer coordination model illustrated in figure 2.1



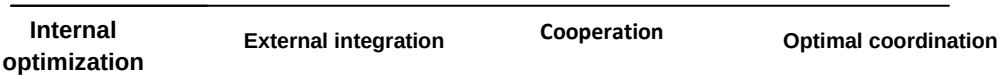


Figure 2.1- **Coordination levels in the supply chain**

The literature contains a variety of models proposed for coordination in the supply chain. For example, Lee and Whang (2002) suggest a four-level integration in the supply chain including information integration, workflow coordination, synchronization and new business models. In this model, information integration refers to the degree to which such information as demand information, supply status, capacity planning and transport planning is shared.

Coordination in the supply chain often denotes a joint planning to forecast and compensate for the product. In the literature, however, the word "cooperation" is used to describe this concept. The fourth dimension of integration in this model involves new business models which indicate the know-how of production and development of new products in cooperation with the whole chain members as well as developing a tendency of "mass production based on customer choice" (Ballou, 1987; Magee et. al, 1985). The fifth dimension points to a model which tends to analyze cross-organizational integration in terms of the technologic perspective. The levels of process integration are classified into four categories including process integration, object integration, data integration and standardization of information exchange (figure 2.2).

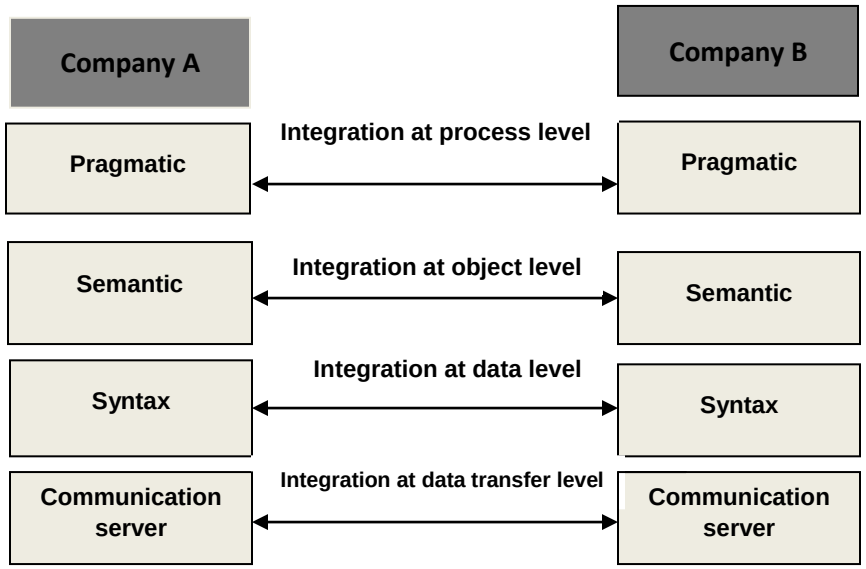


Figure 2.2- **levels of cross-organizational integration**

This and other models, developed to describe the dimensions of integration, coordination and cooperation, are all compatible with the above-mentioned model. Hence, it can be used as a comprehensive model for analyzing the dimensions of coordination in the supply chain.

Chapter 3

Methodology

3.1 Research Approach

The current research will use deductive research approach as the basic methodology of the research is to deduct the results from the available literatures that are available on the impact of Enterprise Resource Management (ERP) on the Supply Chain Management (SCM). The research study will help to draw the empirical results that will contribute in the future studies and also the available literatures on the current genre of the study. The research study will be more focused on the deducing results rather than inducing the new results based upon the assumptions. The research study will also specifically focus on the individual literatures based upon the Enterprise Resource Planning (ERP) and the Supply Chain Management (SCM).

3.2 Data Collection

Since, the research methodology being used for the current research is deductive research and for this reason, secondary sources are used. The research study will use the previous literatures that are available on the current genres of the study. The literature that is based upon the Enterprise Resource Planning (ERP) will be assessed while the literature that is based upon the Supply Chain Management (SCM) will also be assessed. The research study will also assess those literatures that are individually based upon the interactive studies of Enterprise Resource Planning (ERP) and the Supply Chain Management (SCM) is also assessed.

3.3 Result Analysis

The results will be empirically drawn from assessed literatures. The directs results will be empirically drawn where the literatures are directly about the subject matter while the similar results will be drawn from the results of other genres by molding the results towards the studies.

Chapter 4

Information Management in achieving Co-operation Mechanism

4.1 Information Integration

Integration of the supply chain refers to the internal and external integration in the sense that internal business processes are to be integrated and supra-organizational processes to be incorporated. Integration of the internal chain denotes the assimilation of intra-organizational activities such as purchase, warehousing, material management, transport and production (Croom et. al. (2001). Indeed, the question pertaining to the degree to which these processes are integrated should also address the information systems supporting them. Even if intra-organizational processes are thoroughly integrated, the competitive advantages of an organization may not persist independent of external integration and cooperation with partners. Information integration within an organization takes place through supporting core processes by the same system and database. In fact, this is the method used to realize the implementation of ERP systems, process integration and enterprise information (Puschman& Alt, 2001).

Information integration in the supply chain is a higher-order sharing of information because while it is likely to share information using any communication device (e.g., telephone, fax, etc.), information integration often denotes systematic methods of information exchange (figure 4.1).

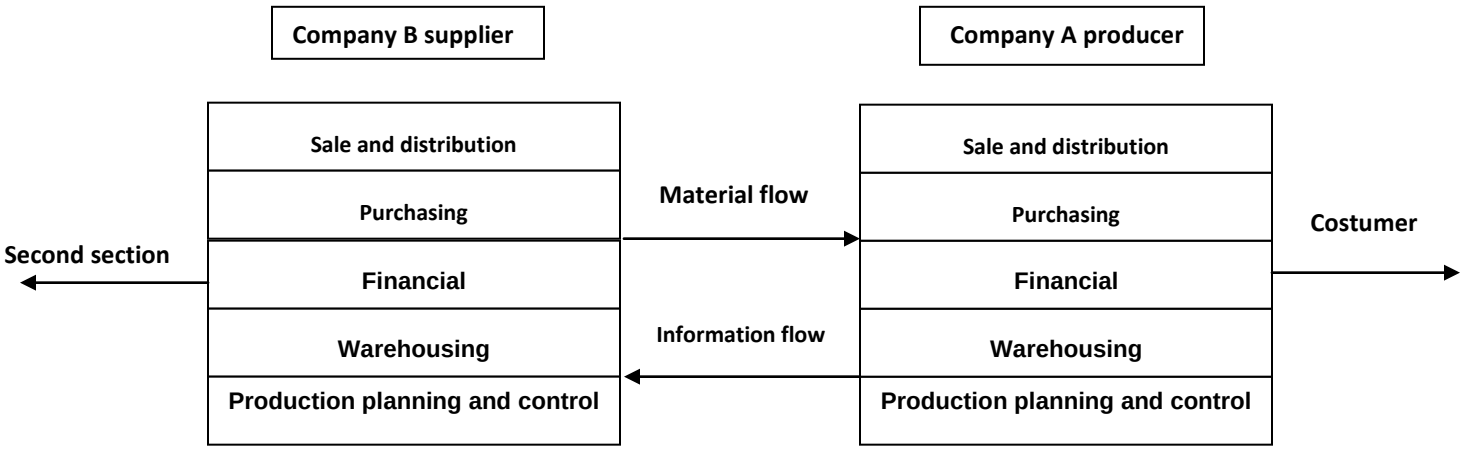


Figure 4.1- **Integration of Information between two organizations**

Sharing such information as data pertaining to point of sales from retailers or data relating to the quantity of orders in two successive stages in the supply chain may directly influence production planning, delivery and controlling members' supply. The quick developments in information technology such as database management systems, network communication protocols, electronic exchange of data and internet, the flow of accurate and immediate information have been made possible (Zhang et al, 2004).

Consequently, sharing information across the supply chain may be regarded as a feedback among the supply chain members if it is supported by information technology. Without such relationship, the down-stream members may receive a delayed feedback with some time interval. Under the worst circumstances, the down-stream members would be informed of the quantities and transport schedule only when the merchandise is already arrived. Such a much- too-delayed feedback cannot serve anything in the forecast and calculations. The flow of information reduces the complexity of decision-making and improves the quality of decisions. A well-timed sharing of information through DEI, fax, Email and other information technology media is a solution for providing a supplier and his customers with quick, direct feedback, which helps the company with exploiting dynamic decision-making.

This information may include information pertaining to demand, warehouse stock, etc. The range of information may be so vast to include even the information pertaining to the product design (Mourtizis et al, 2004) and quality (Tsung, 2000) as well. Figure 4.2 illustrates some types of information. Although, sharing information would enable the other members of the supply chain to better manage their internal processes and to improve their performance indices, such issues as the effects of information exchange on the intra-organizational processes and the formation of supra-organizational processes are not dealt with at this stage; rather, they are covered at the cooperation level.

As explained earlier, information integration in terms of technology requires the utilization of information services as well as integration at the data syntax level. In case the two enterprises are using the same information systems, the integration will be inherently realized at this level. To establish such level of integration, the two organizations need to exchange information.

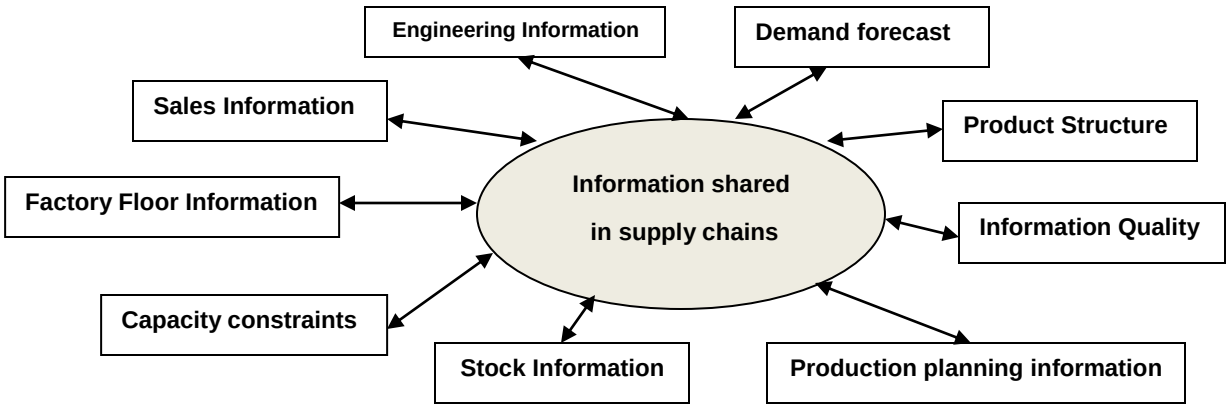


Figure 4.2- **sharable information in the supply chain**

Studies carried on to investigate the profitability of information exchange in consumption goods industry indicates that such exchange would exert a positive impact on the profitability of the involved enterprises such that as the exchange rate increases, the profitability of the organizations will also increase. Moreover, case studies on computer manufacturing industries suggest information exchange to have an impact on the reduction of expenses (Lee, 2010).

Information exchange among the supply chain members with independent ownerships may entail a variety of barriers. Figure 4.3 illustrates major impediments to the information exchange and the role each may play in this process. One major barrier is that traditionally every enterprise with independent ownership may take its own profitability as significant and consequently disregards other member's performance in the chain. In this case, each member in the chain may assume themselves as an independent entity striving to improve not only their bargaining power but also to sell their product to the other members at the highest price; therefore, they refrain from sharing their financial and operational information. Of course, the joint ownership of members in the supply chain would alleviate the resistance to information sharing. However, this is not the only solution to the problem; rather, there have been many studies to examine motivational factors that encourage information sharing. Another major barrier refers to the unavailability of accurate information within the enterprise, which indicates a lack of integrated, efficient information systems (Sinha et al., 1989). A further barrier is the existence of heterogeneous systems in the supply chain whose integration requires high cost and strong cooperation among the members.

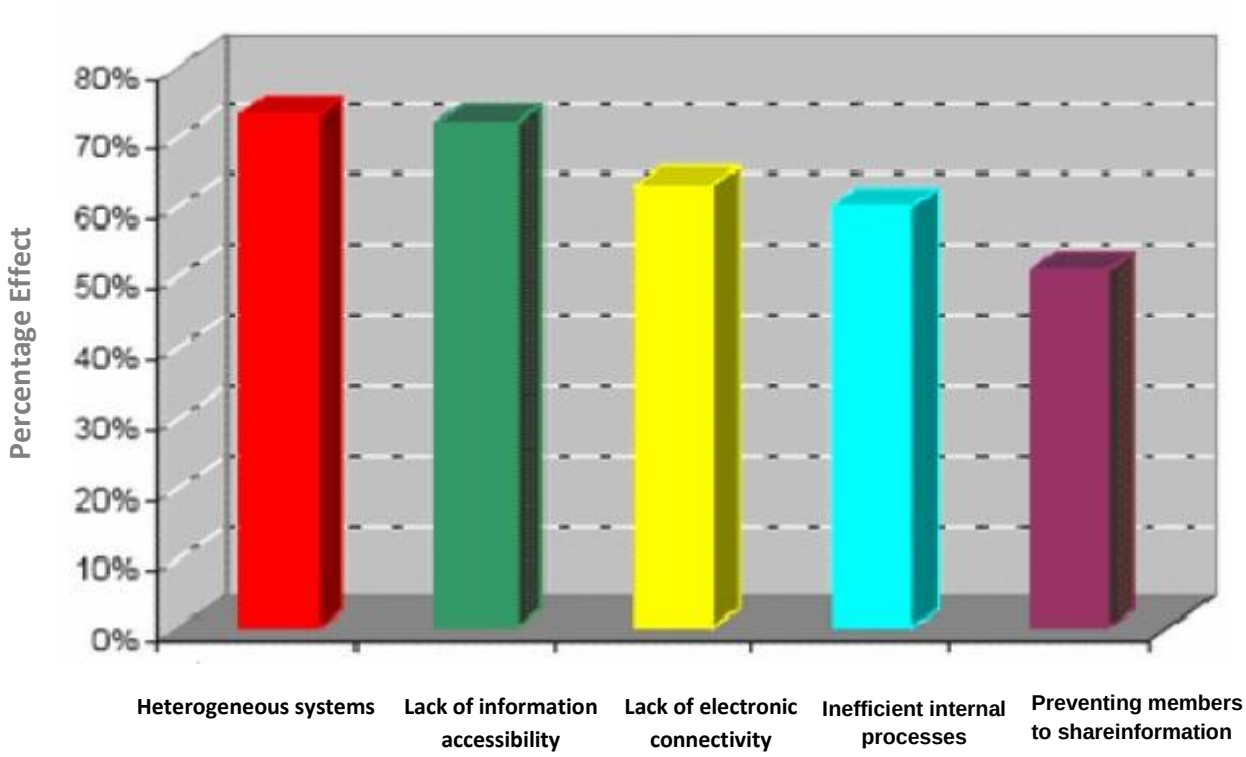


Figure 4.3- **information integration barriers**

Despite the barriers that prevent the information exchange based on information sharing among the supply chain members, this is the first step in creating coordination in the supply chain. Evidently, unless this fundamental factor exists, the other coordinating factors will not be realized. As explained above, the existence of coherent information systems will alleviate many of these problems, though some other barriers depend on the organization policy and culture.

4.2 Cooperation mechanisms in the supply chain

As shown in 4.1, sharing information helps realize the clarity of information in the supply chain. With regard to the model presented in 4.1, this factor, in addition to information integration requires the integration of processes as well. Though, the term cooperation has been given many definitions in the supply chain literature, all these definitions denote both a common goal shared by the supply chain members and the involvement of supply chain members in routine decision-makings like the amount of orders placed, delivery deadline and sales particulars (Judge, 1997).

Lack of cooperation and information exchange among members of the supply chain will instigate the bullwhip effect. This phenomenon will be observed due to such reasons as the demand

forecast based on manipulated data, unclarity of end-consumers data, orders placed in the form of cargo and price fluctuation. The members' performance is such that each member's order fluctuation toward an upstream member will be higher than an order fluctuation received from a down-stream member.

One major goal of cooperation models, to be covered in the following sections, is to alleviate this phenomenon and its causes. These mechanisms, formed in cooperation with adjacent participants to the chain, require not only the exchange of information between down-stream members but also using this information in processes and decision-makings affected by the information.

As Chandra (2007) puts it, issues pertaining to the supply chain should be determined and also the information pertaining to each member in the supply chain should be shared in order for the supply chain processes to be formed.

4.3 Information structure of cooperation mechanisms in the supply chain

There have been attempts at creating cooperation in the supply chain, which include mechanisms involving adjacent and independent members in the chain such that the members would consider long-term relationships and take each other as significant in their survival. These structures include:

- Sequential information sharing: in this structure, every member's activity output is the next member's input. Thus, cooperation processes founded on this information structure are connected in a chain-like manner. These types of mechanisms are easier to implement than other mechanisms. Due to the sequential flow of information, each pair of the supply chain members can select their own protocol for the information exchange; therefore, there is no need for a pervasive standard as to the information exchange among the members (Markus and Tanis, 2000).
- Reciprocal information sharing: this structure bears a more complex structure than the previous one. The reciprocal exchange of information may lead in a higher probability for the information inconsistency; therefore, it is necessary for the corresponding processes to be coordinated and integrated.
- Hub-and-spoke information sharing: this type of information sharing works based on a central hub which is connected to all members. Internet hubs usually act as a virtual market and help create cross-organizational processes. These information hubs are to store up every member's information and make decisions based on the accumulated information; subsequently, they inform the members of the decisions made (Caldas and Wood, 1998).

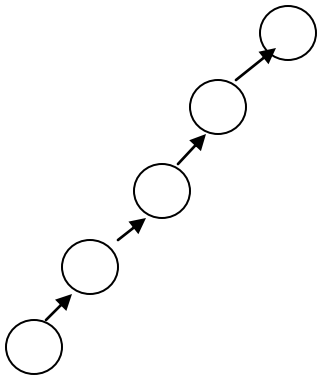
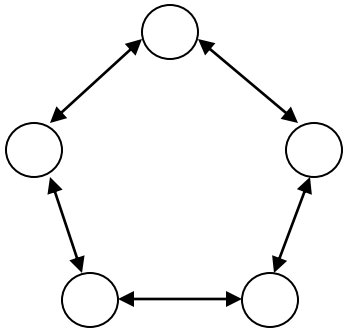
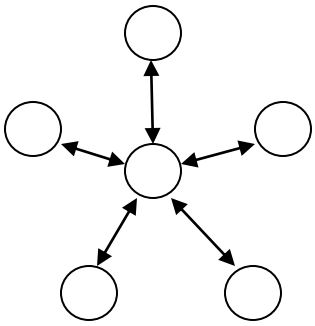
Data Exchange	Ordinal	Mutual	Central
Structure			
Level of cooperation	Between adjacent me mbers, unilateral	Between adjacent members, Bilateral	Central, Bilateral
Cooperation mechanism	Upward information flow	Multi-way information flow	Smart hub
Technology	EDI, Fax, Tell	EDI, Integrity, work flow	Web services
Example	Traditional supply chain, 3PL	VMI	CFRP

Table 4.1.1- **information structure of cooperation mechanisms** (Adam and O' Doherty, 2000a).

4.4 Classification of cooperation mechanisms based on decision-making

Examples of cooperation mechanisms, which have demonstrated much practical functions, include vendor managed inventory (VMI), collaborative, planning, forecasting, replenishment (CFRP) and efficient consumer (ECR). These mechanisms may improve such supra-organizational processes as order management, distribution, planning and forecast. The supra-organizational processes pertaining to these performance indices including stock-out, warehouse stock and transport optimization will be improved by these mechanisms. While these

mechanisms have different functions in different industries, they are classified into three categories based on the decision-making process in the supply chain (Holweg et al, 2005).

Type one: in this type of cooperation, information exchange takes place, but each member makes decisions on the quantity of their own ordering. The information exchanged among the members will be used for stock planning and long-term planning (figure 8.3). As an example, when the information pertaining to customer demands is exchanged with the suppliers, they will be able to make stronger forecasts and to reduce uncertainty in the demand. However, exchanging such information as point-of-sale information is not enough to forecast the demand. The reason is that the decisions made by retailers as to the particulars of the sales will have a considerable effect on the final demand; still, the nature of demand in some industries bears characteristics that make it possible to forecast its fluctuations (Ciborra, 1992).

Type two: in this type of cooperation mechanism, the supplier undertakes to place orders for the customer. The supplier, drawing on the information pertaining to sales and customer's warehouse stock, shoulders the responsibility of ordering and goods compensation (Sammon and Lawlor, 2001). VMI mechanism is an example of this type of cooperation. In fact, in this mechanism, the supplier undertakes to manage his own and his customer's warehouse stock.

This mechanism is mostly applicable in retailing industry. The advantage of the implementation of this mechanism in the retailing industry is that the demand can be forecasted by both the supplier and customer cooperatively. Achabal et al. (2000) in their study on the decision-making system as to the demand forecast in this mechanism suggest that, to accurately forecast the demand in this mechanism, not only the information pertaining to sales and warehouse stock but the information pertaining to pricing and sales particulars are also required, since the demand pattern depends on this information to a great extent.

A similar mechanism can be observed in the textile industry called Quick Response Manufacturing (QRM), in which the mechanism is used to manage the short-term lifecycle of products. A special case of this mechanism is when the supplier also gains ownership of the customer's warehouse stock; that is, the supplier has to pay the stock maintenance cost in the customer's warehouse. This kind of stock is called "consignment stock". The customer is to pay the supplier only after he has sold the goods.

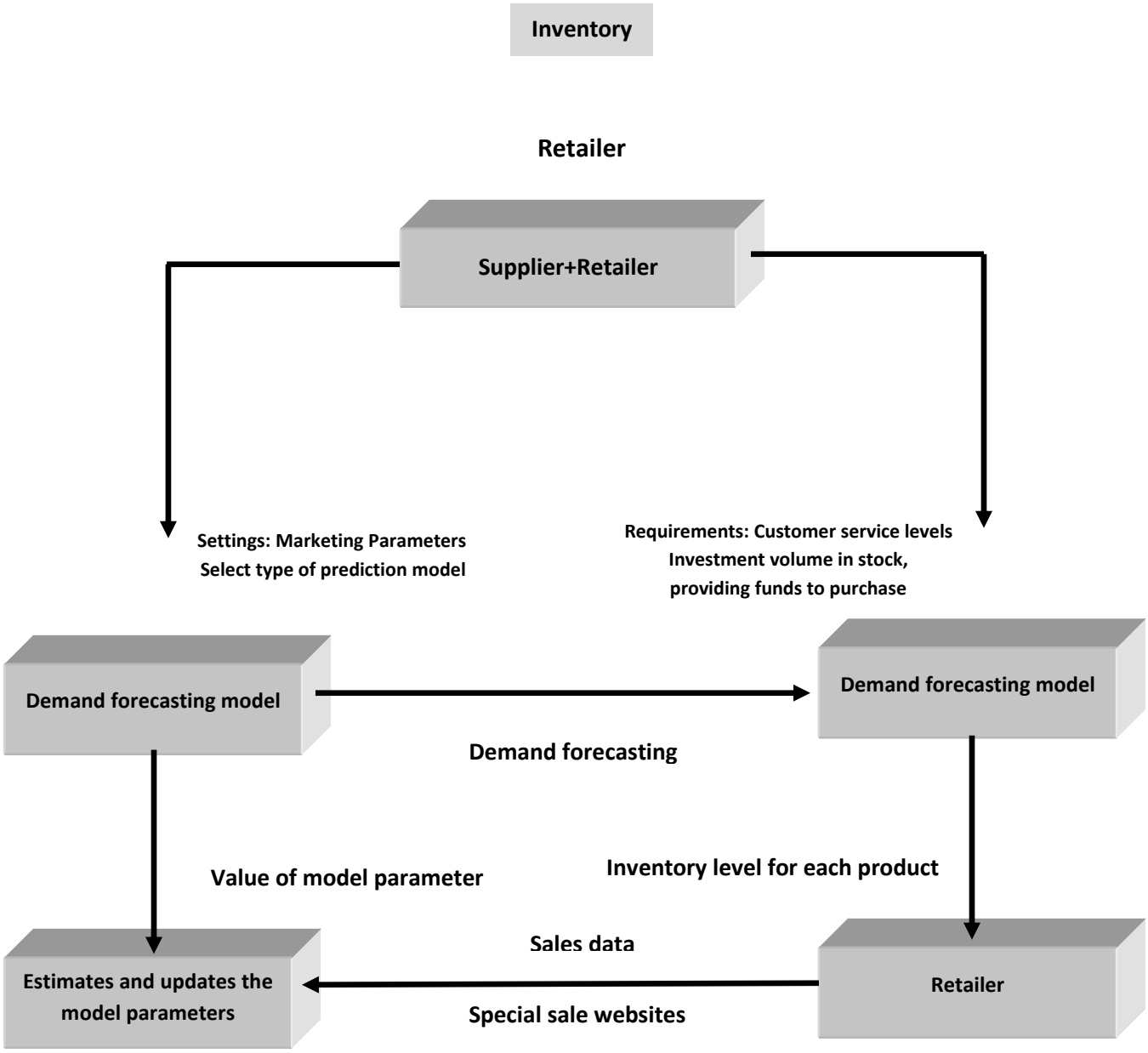


Figure 4.4 - VMI mechanism decision-making model in the retailing industry

However, there are two types of decision-makings in this mechanism. One is the decision that the supplier should make about the customer's ordering and second is the decision that he has to make about his warehouse stock and planning. Since these two decisions are independent, the supplier cannot fully exploit the information pertaining to sales and customer's warehouse stock to optimize his own operational decision-makings.

The third type: This type of cooperation takes place in the coordinated supply chain. This means that the two decision-making points integrate into the same point. This type of cooperation is an inclusive state of the second type in the sense that the supplier's decisions will be made based on the information pertaining to the sales and customer's warehouse stock. In this

mechanism, not only does the supplier, as with the other cooperation types, realize the demand fluctuations but he also uses this information in his production planning and management. In this case, performance indices of the supply chain will significantly improve.

In case the supply chain is integrated, the supplier calculates the production category based on the quantity of the customer's stock and the demand in the production cycle. As a result, the supplier improves performance indices of the supply chain (Fry et al, 2001).

Application of VMI mechanism

As mentioned earlier, VMI mechanism works based on sharing the customer's sales and stock information as well as concentrating the ordering decision-making in the supply chain. In this mechanism, the supplier is supposed to make decisions about the ordering quantity, ordering time and the manner of the distribution of orders in the distribution chain.

This mechanism benefits at the industry have been investigated which we can see in (fiugure3-7), Landbrg and Et al (2006) had investigated about application of this mechanism in automobile industry. They had researched about VMI implementation mechanisms for some part making factory

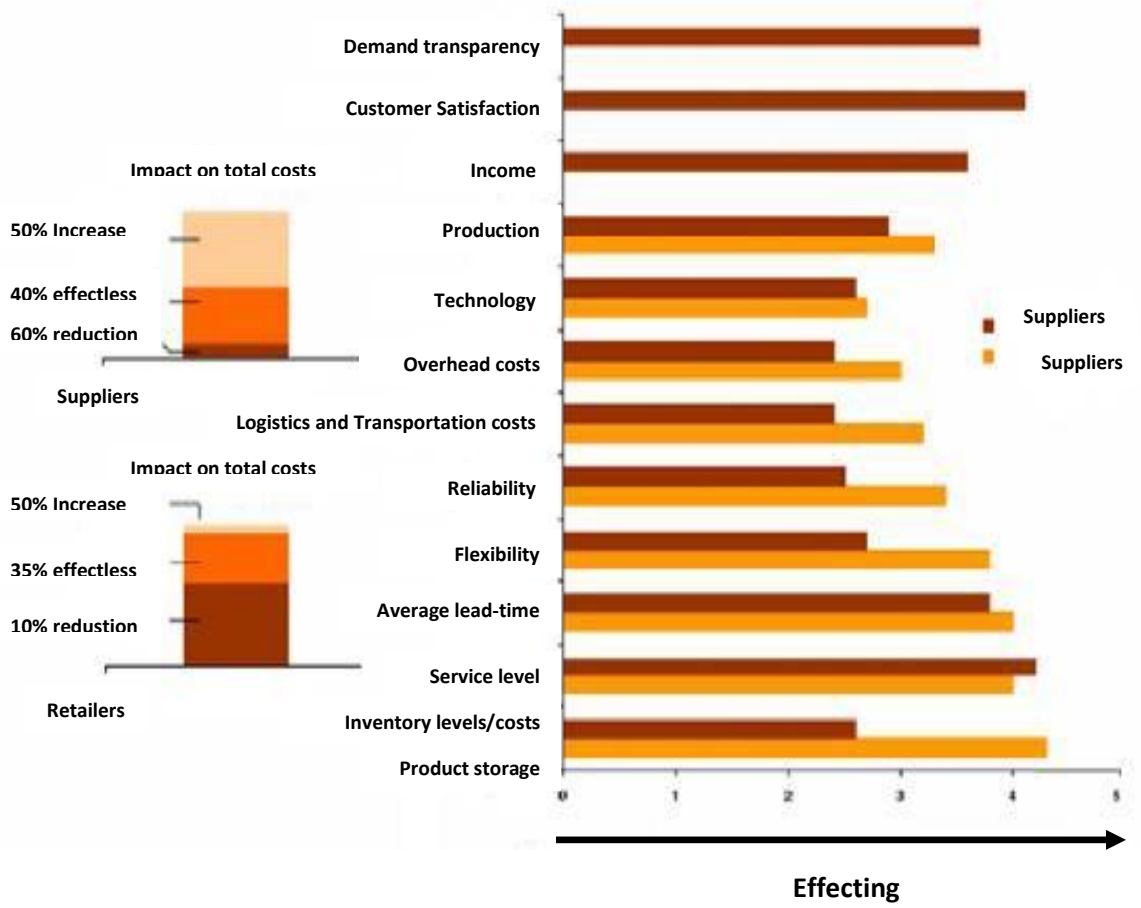


Figure 4.5- **VMI impact mechanism on performance indictors**

Coordination in the supply chain

Coordination in the supply chain would be possible through the development of information integration and cooperation mechanisms in the supply chain because that is the only method which produces an overall picture of the supply chain based on which it becomes feasible to optimize a supply chain according to its particular characteristics. At this level of cooperation in the supply chain, i.e., when cooperation and coordination are realized in the supply chain, the underlying structure appropriate for creating mass customization can be implemented in the chain (Kelly *et al*., 1999).

It will be possible to achieve appropriate policies for pricing and discount only if the supply chain information is crystal clear. To achieve coordination among members of a supply chain, the particulars of that chain as well as the polarity of power in the chain should be investigated.

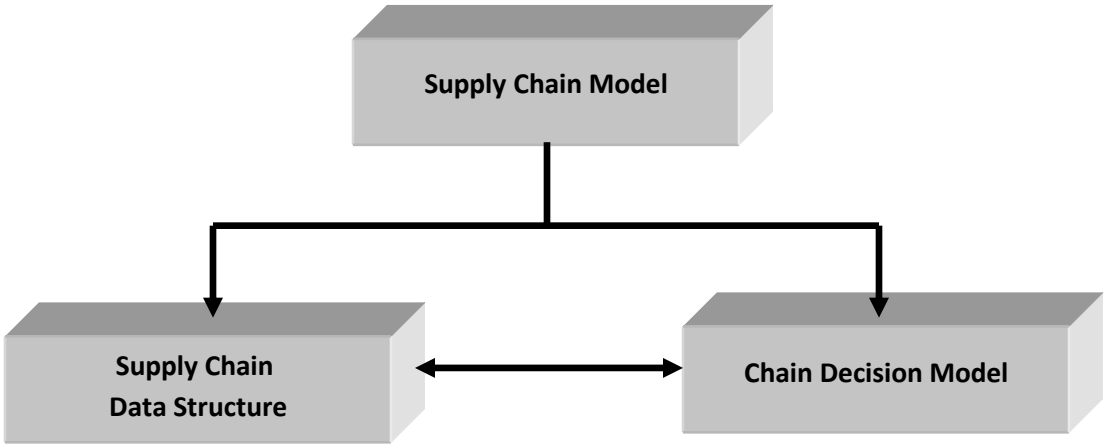
That is, in case there is a powerful pole in the chain, it will become a pioneer in the implementation of cooperation and integration mechanisms in the supply chain.

Chapter 5

Analysis

5.1 The underlying role of ERP in supporting the supply chain management

Having defined and classified cooperation mechanisms in the previous literature studies, we would now explore the role of ERP systems in creating as well as implementing the various co-operative mechanisms. However, before dealing with the supply chain information structure and utilizing ERP system, we will examine how the underlying structure of the supply chain is created. Chandra and Kumar (2006) have classified the supply chain modeling into two topics: decision-making modeling and information structure modeling



Major factors in the supply chain modeling

The information structure fulfills the informational needs of the supply chain and deals with solutions to the problems that the supply chain decision-making model may entail. The supply chain involves an information structure in which each member of the chain holds three major processes of supply, production and distribution. These three major corporate processes are integrated by three major logistic modules of ERP system.

These characteristics data, (in Figure 5.2) integrate and managed by different process of modules of material management (MM), production planning (PP) and sales and distribution (SD).

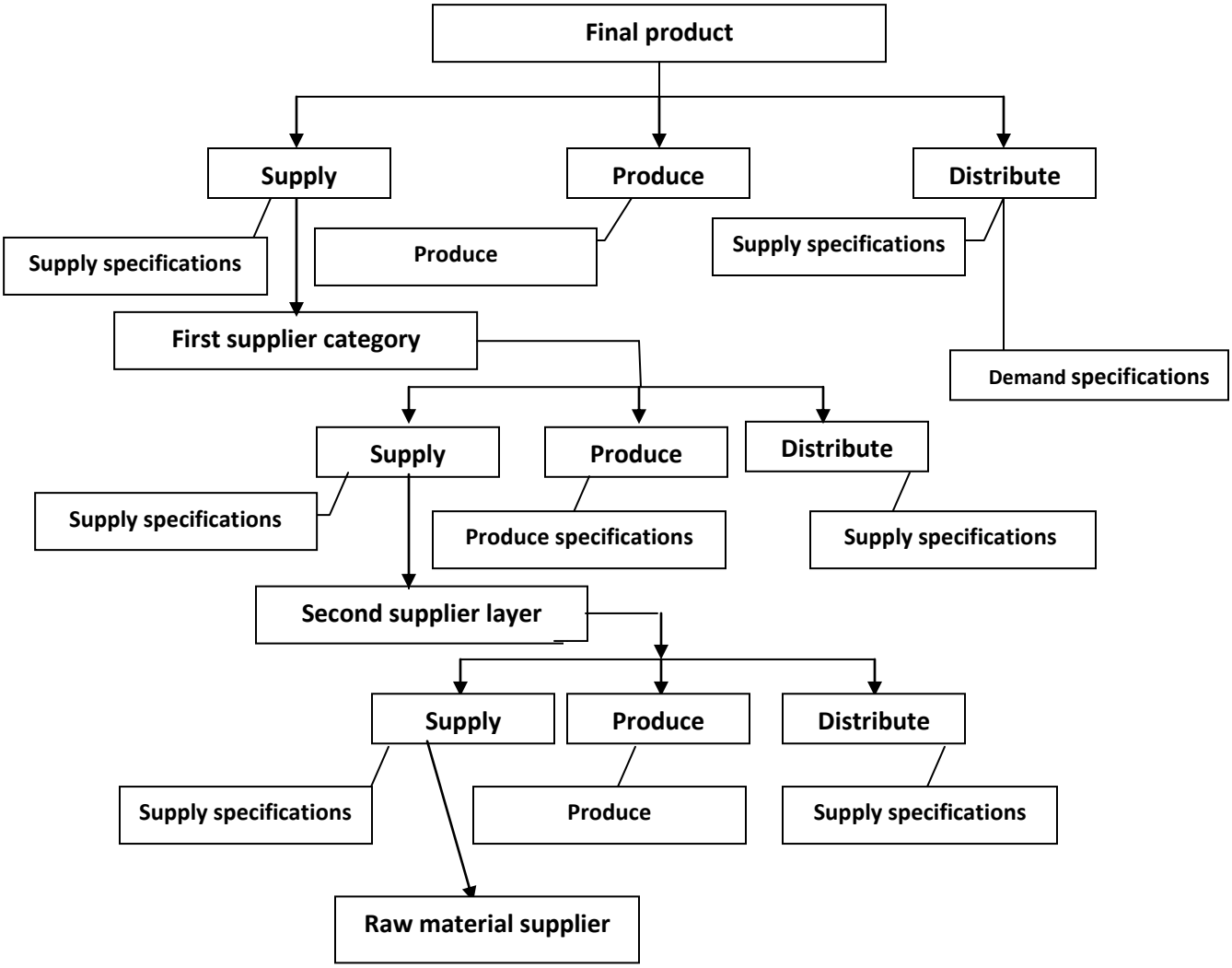


Figure 5.1 - **Supply chain data structure**

Each process has so many specifications but major characteristics for profile of each process from the perspective of the supply chain are shown above. (Rahul V. Altekar 2007).

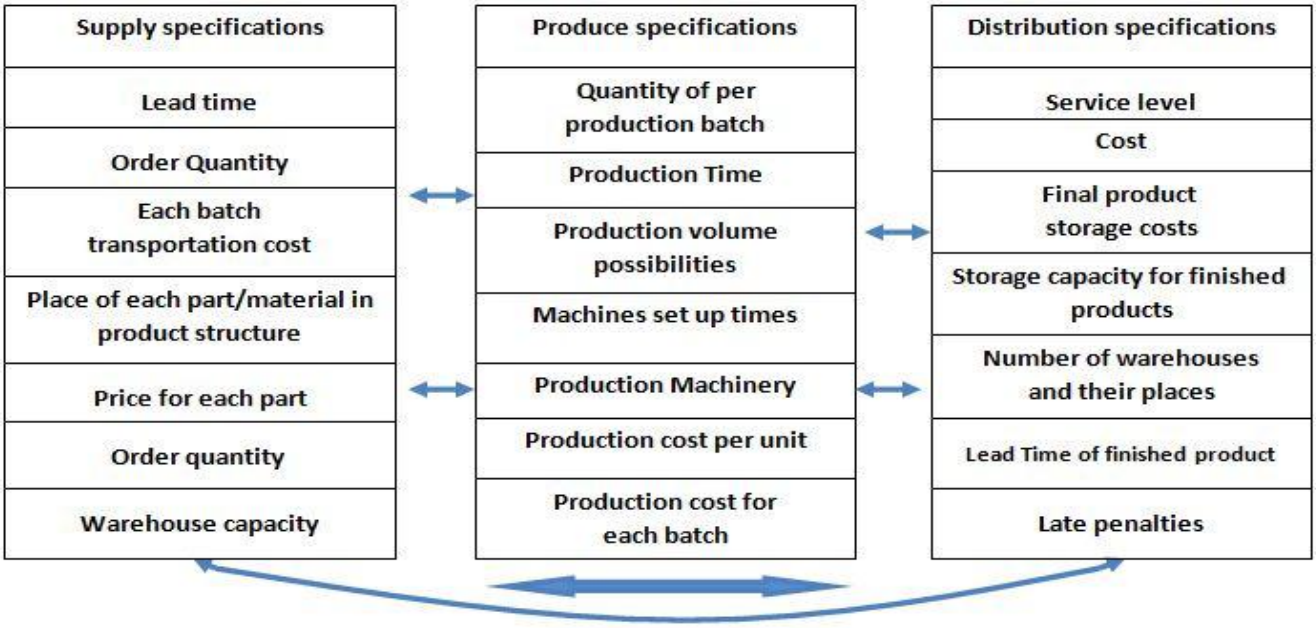


Figure 5.2 -**Characteristics of information supply chain structure**

5.2 Integration of supra-organizational processes

One of the most fundamental ERP aims is to integrate the organizational processes, but the evolutionary tendency of the process integration has driven it towards supra-organizational process integration and the creation of collaborative business process (figure 5.4) so that new requirements will be imposed upon IT systems supporting these processes.

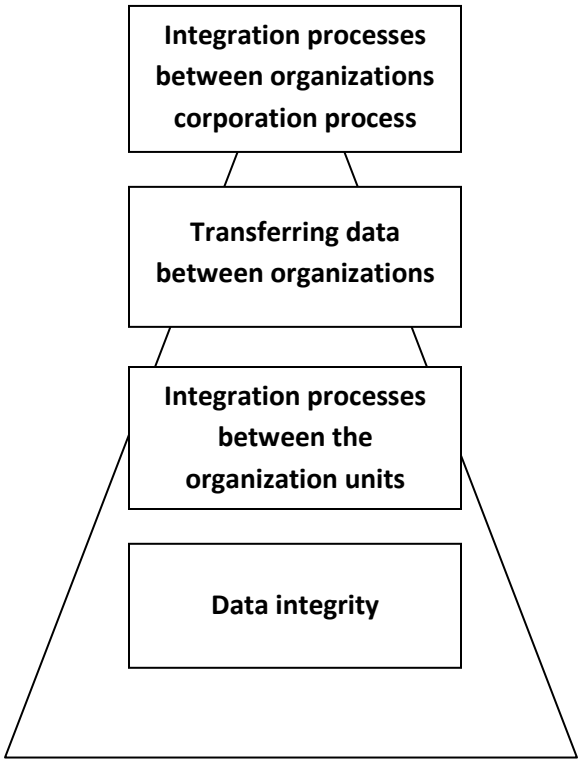


Figure 5.3 - **Evolution of process integration by ERP**

Cooperation processes or collaborative business scenario joins up an inclusive network of the raw material suppliers to the customers. Despite processes that used only to consider intra-enterprise value chain, collaborative business processes or C-business tends to integrate all the steps that provide value for the customer across the supply chain (Zang et al, 2004). Collaborative business processes have their own implications in different industries at different levels from the stock control to planning the product development (Liu & Kumar, 2003). The supply chain information systems supporting these processes hold an information structure which includes such components as the chain structure, product structure, demand forecast and production stock management (Chandra, 2005). These processes can be explored from various perspectives including the conceptual planning of collaborative business processes, the underlying technology for integration, modeling and verification, and flexibility (Kelly *et al*., 1999). These processes are managed at three layers including C-business strategy, process engineering and process implementation. At the strategy layer, processes are demonstrated by higher-order modules. The information presented at this level will address all the organizations involved in the process. The process engineering layer elucidates the role each organization would play in the process implementation. It also demonstrates the output information where it is due to be issued. The implementation layer refers to the information technologies that help realize the integration of processes and data (Zang et al, 2004).

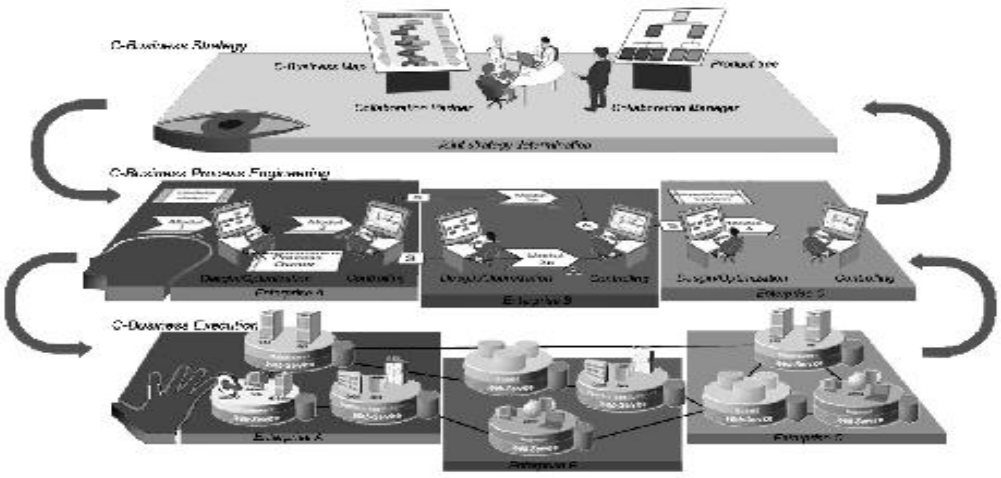


Figure 5.4 - **The layers of C-business processes**(Zang et al, 2004).

5.3 The role of ERP in creating cooperation mechanisms

With regard to the model introduced in the previous section, we shall now examine the role of ERP systems at different levels of cooperation including integration, cooperation and coordination. As mentioned earlier, integrating the information is the first step in creating cooperation in the supply chain. Creating integration or the systematic exchange of information develops at two levels of processes and data. If the supply chain includes some ERP systems, there should be an intermediate ERP system to connect various levels (figure 3.16). The intermediate system is responsible for receiving the information extracted from ERP databases established at different levelsin the supply chain and subsequently converting it into formats that can be received by other ERP systems as well as transferring the information to ERP databases. The technology of this intermediate software uses such formats as EDI, HTML and XML to transfer the data (Ball et al, 2002).

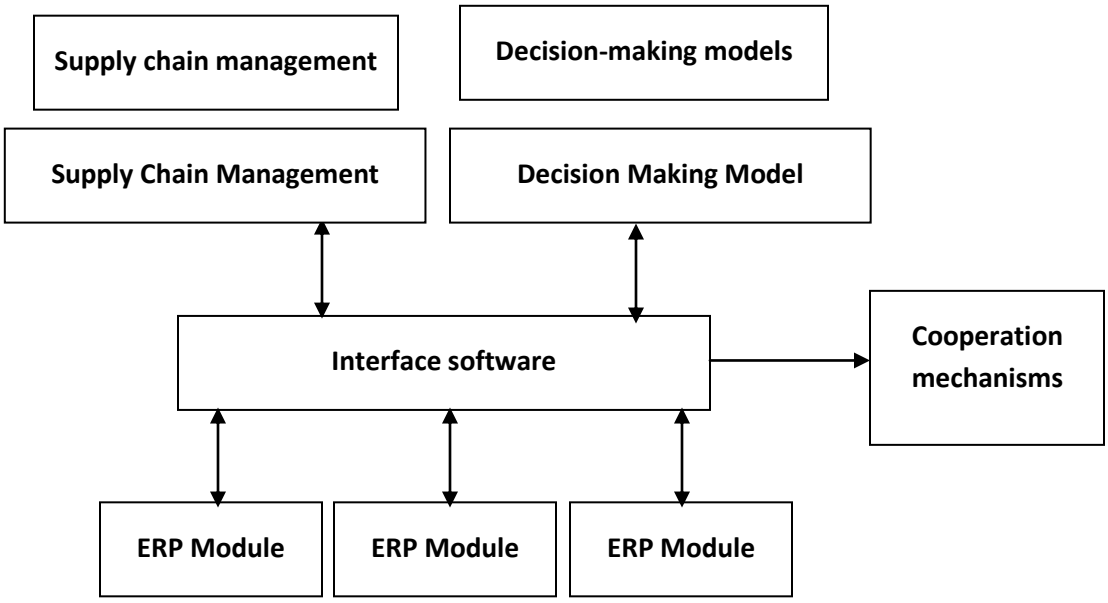


Figure 5.5 - **The role of ERP in creating the supply chain systems**

To exchange information at the data level, the data resources distributed across the supply chain need to be connected. Exchange at the data level can take the form of receiving information from an ERP database in order to update another ERP database- the information field of the data should be defined in either of the databases (figure 5.3)- (Ball et al., 2002). However, if the information exchange is at the process level in the sense that processes in the two organizations should be interrelated, the functional routine of some of the organizational processes should be integrated as well (figure 5.5)- (Themistocleous et al., 2002). An example of this can be a scenario in which the information pertaining to the vendor's warehouse is transferred to the supplier. Subsequently, the information will be interpreted by the supplier's system and in case the warehouse stock level is lower than the permissible level, the supplier will be informed.

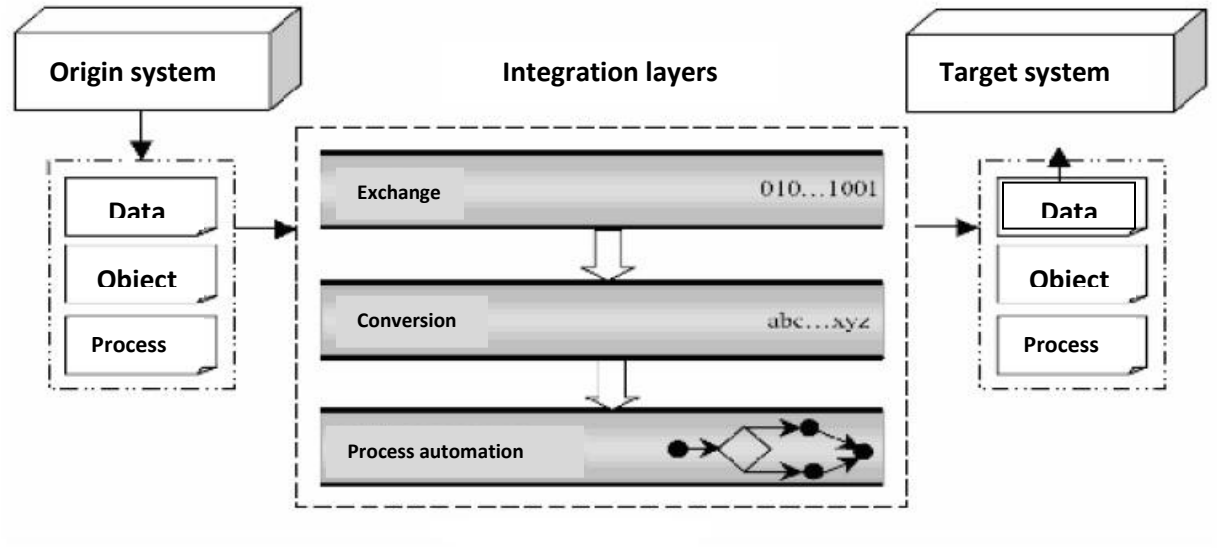


Figure 5.6 - **Layers of cross-enterprise business process integration**

As mentioned earlier, integration at the process level can be created in the intermediate software. Another example to be acknowledged is the process of planning the supply chain. The process, which should be implemented at different levels in the supply chain, include such steps as: the accumulated pre-demand across the supply chain, distributed requirement planning across the chain ranks, and Master Production Plan (MPS) for every manufacturing member. Then each production unit should be implemented through using the input of ERP master production plan. The integrated processes will be implemented at different levels of the chain respectively (figure, 5.7).

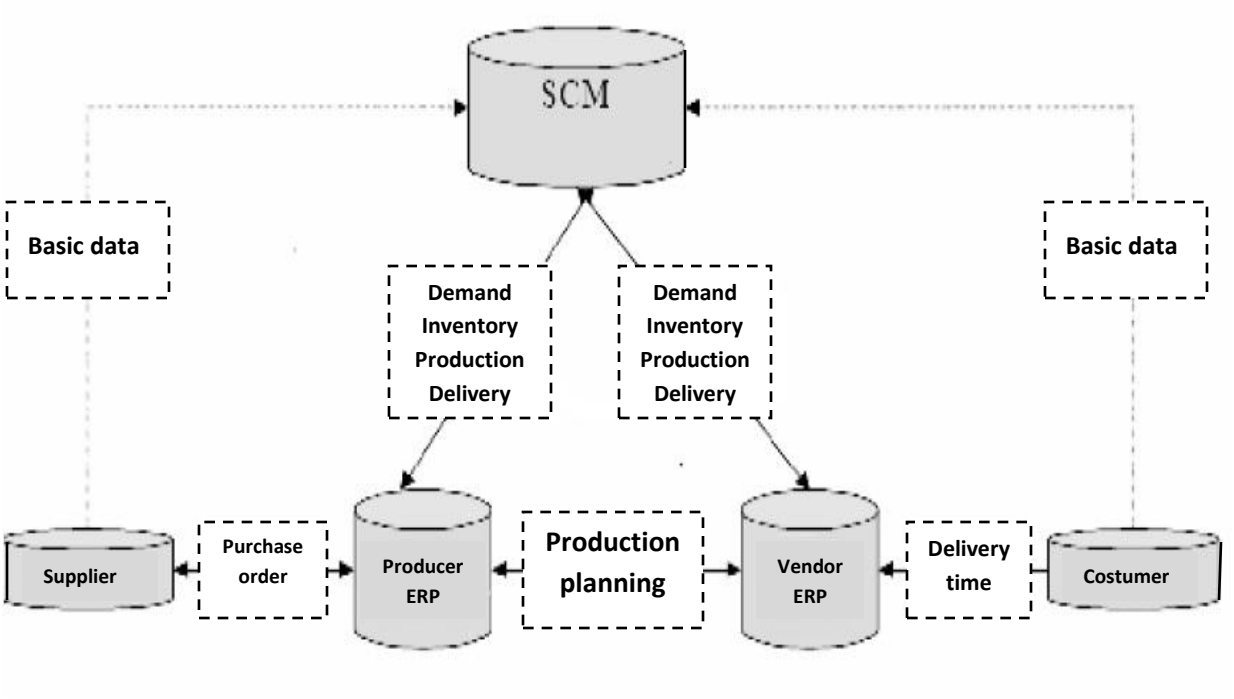


Figure5.7 -**ERP role in the implementation of supply chain process**

Chapter 6

Findings and Discussion

During the various study through the literatures, it is evident that manufacturing companies have undergone many evolutionary changes. The concept of SCM has helped companies to compete flexibly. The importance of a long term long lasting relationship has been enlightened in this work. Co-ordination, co-operation and integration will improve profitability not only to the manufacturer but also to the supplier.

With the emergence of technology new developed software's and architectures have been available for managing various operational levels in a supply chain management and one among these technologies is the widely used Enterprise Resource Planning.

Order management has received wide recognition from researchers and practitioners. The timeliness and accuracy of order transmission and its fulfillment have always been a major goal of supply chain management. We have tried to propose methods to achieve better order management in SC systems. There is a complex situation in order processing due to the complexity of members in supply chain. This makes interaction complex and also placing an order across the complex system becomes order. Cost is an important element in the supply chain and therefore playing down with the cost is very essential.

The impact of ERP system is always results from the case studies, interviews and industry surveys. Companies report growth in the performance in several areas as a result of ERP implementation. The impact of ERP implementation always branch out into four categories.

- Improve information flow across sub – units, standardization and integration facilitates communication and better co-ordination.
- Enabling centralization of administrative activities such as accounts and payroll.
- Reduce information system maintenance cost and increase the ability to deploy new functionality.
- ERP helps in moving a firm from inefficient business process into accepted practice process. (Galbraith, 1974).

These above literatures states that ERP systems has potential benefits on the organization on successful implementation.
Cooperation processes or collaborative business scenario joins up an inclusive network of the raw material suppliers to the customers. Despite processes that used only to consider intra-

enterprise value chain, collaborative business processes or C-business tends to integrate all the steps that provide value for the customer across the supply chain (Zang et al, 2004). Collaborative business processes have their own implications in different industries at different levels from the stock control to planning the product development (Liu & Kumar, 2003). The supply chain information systems supporting these processes hold an information structure which includes such components as the chain structure, product structure, demand forecast and production stock management (Chandra, 2005). These processes can be explored from various perspectives including the conceptual planning of collaborative business processes, the underlying technology for integration, modeling and verification, and flexibility (Kelly *et al*., 1999). These processes are managed at three layers including C-business strategy, process engineering and process implementation. At the strategy layer, processes are demonstrated by higher-order modules. The information presented at this level will address all the organizations involved in the process. The process engineering layer elucidates the role each organization would play in the process implementation. It also demonstrates the output information where it is due to be issued. The implementation layer refers to the information technologies that help realize the integration of processes and data (Zang et al, 2004).

6.1 Research areas on ERP

There are two main research orientations in these studies which include: first, how to implement ERP system in a corporation and, second, what are the advantages of this system in resolving a variety of problems an organization might encounter.

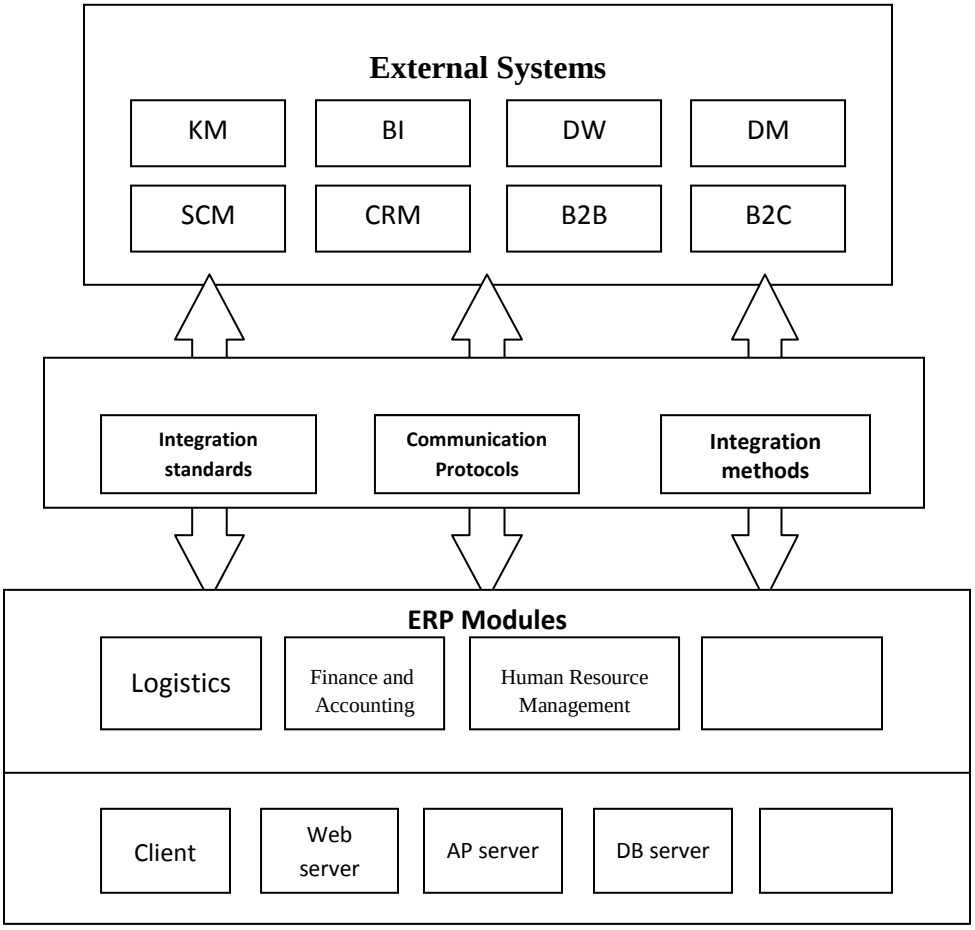
The first area, on which most of the studies have already focused, comprises studies on the fund, timing, economy and success of the implementation of ERP. On the contrary, there have been few studies to address the functions of ERP in strategic and operational levels. Studies on ERP are often classified into two categories: studies on the concept of ERP and studies on the system of ERP. Conceptual studies on ERP have concentrated on the potential effects that ERP might have on the organization, while studies with systemic orientations have presumed ERP as a tool for creating a particular output (Cumbie et al., 2005). Table 6.1 illustrates some of the research topics in each one of these areas.

Table 6.1- two main topics in ERP studies

systemic orientation	conceptual orientation
project implementation management(ERP) organizational process reengineering support and maintenance of ERP systems	supply management supply chain management Demand forecast

Still, researchers have proposed different classifications for the studies carried on ERP. Such researchers as Genoulaz et al. (2005) have placed the studies carried on ERP during 2003 and 2004 into five distinct categories. The first category goes for the case studies that investigate the implementation of ERP as well as issues pertaining to it such as socio-cultural factors in the implementation of ERP, correspondence between ERP and business processes, ERP software and ERP for supply chain management. The second category involves studies that examine the organization's profitability and performance after the implementation of ERP (Subramoniam et al., 2008). Also, these studies seek to explore the effects of the implementation of ERP in gaining competitive advantage. An example of such studies is the works by Nikolaou and Bhattacharya (2005) in which the long-term effects of the implementation of ERP have been explored on the organizations fiscal performance and profitability.
The third category includes studies that address the effects of the implementation of ERP on the organizational management (including such factors as managerial levels and organizational culture). An example of this is Boersma and Kingma's study on the implementation of ERP in multinational corporations. Also studies by Disha and Merits (2002) , which examine control and integration after the implementation of ERP, fall within this same category. The fourth category involves studies concentrating on ERP tools which encompass such issues as: system structure, programming language and information modeling, establishing logical relationship among ERP database tables and customizing this system with actual demands and conditions of business.

Figure 6.2 **ERP connection with other enterprise systems**



Studies that fall into the fifth category deal with the importance of ERP as a foundation for other enterprise systems (e.g., CSM and CRM) (Glaser and Strauss, 1967; Strauss and Corbin, 1994;Webster and Watson, 2002). ERP would integrate business processes within an organization. Since, even with the presence of other enterprise systems such as SCM, CRM and SRM, many a decision along the supply chain may not be integrated; therefore, there ought to be studies to investigate the integration of ERP with other information technologies (e.g., APS and MES). This way the decision-making process between various system modules (e.g., sales and production planning) may be integrated (Chen, 2000). In this connection, there have been many studies to investigate the effects of ERP on improving cooperation and coordination in the supply chain, which deal with the sharing of information in the supply chain as well as its impacts on the supply chain performance (Kelle&Akbulut, 2005). The topic under investigation in this dissertation falls within this same line of research.

6.2 Business Value of Information Technology

There are extensive sources of information's available which supports impact of information technology. Investment in information technology has resulted in significant effect on productive levels, growth and also the value of business organization. There are also other works which have proved that there are also positive results on internal performance such as inventory turnover (Barua, Kriebel and Mukhopadhyay, 1995). All these researches suggests that there are positive benefits from the implementation of IT systems with successful ERP deployment, many little have pointed out the statistical models and reports that favors the advantages.

Over the last few decades, companies have paid a considerable attention to the methods of Manufacturing Planning and Control Systems (MPCS). Management responsibilities concerning the concept of MPCS include:

- Determining the requirements of a reliable capacity to fulfill market demands
- Creating activities concerning scheduled production, manpower and machinery coordinated in an appropriate function.
- Tracking materials and customer orders will support machinery planning and other resources (Neuman, 1997).

MRP is a system which is likely to support the concept of MPCS. This system, first developed in the 1970s, serves as a precision tool for the accurate planning of materials in manufacturing and assembly lines. In the same direction, in the 1980s, alternative MRPII systems were introduced which emphasized the optimization of production in regard to production resources (Shehab et al. (2004)). The first ERP system was introduced by SAP Company during the late 1980s. The system had the capability to integrate the overall business processes within a corporation. ERP denotes a system whose modules integrate the whole activities within an organization such as planning, production, sales, marketing, distribution and accounting. It utilizes the same database and function in the whole organization. Technically speaking, EPR systems are generally planned based on client/server technology which comprises three layers of database layer, application layer and graphical user interface (GUI)- (Kalus&Roseman, 2000). During the 1990s, suppliers of these systems incorporated new modules with new capabilities into ERP. These newly-added modules include advanced planning and scheduling (APS), customer relationship management (CRM) and supply chain management (SCM). Each one of these modules or their integrated combination are also called enterprise system (ES)- (figure 1.1)- (Moller, 2005).

Nowadays many researchers would claim that using ERP may not simply solve the problems posed in business environments; but rather, these systems need to be integrated with other enterprise systems (Bond et al, 2000). Such technologies as programming frameworks (e.g.,

NET, J2EE), databases (e.g., Oracle and MS SQL) and decision support systems (DSS) employed in advanced ERP systems are not necessarily developed by ERP providers themselves; rather, they are newly-established technologies integrated with enterprise systems by ERP-developer companies, and thus these systems have gained a higher significance. This theory has helped develop a second generation of Enterprise Resource Planning (ERP II). In addition to utilizing the underlying structures of ERP system, these systems also incorporate two more layers of analysis and Portal.

6.3 ERP and Decision making

During recent decades, enterprises spend billions of dollars to implement and use of ERP, indentify implementation goals of ERP and And utilization planning for ERP is one of the critical factors for successful implementation, such as standardization of business processes and integrating operations with the data are primary goals of ERP (Botta-Genoulaz et al. (2005)) .

Studies show that ERP Alone has a positive impact of various decisions, Kohli and Gupta consider ERP's benefits In operational decision making in the field of design processes, programs planning and production operations, respectively, warehouse management, quality management and human resource management.

As mentioned earlier in this chapter, ERP helps integrate the internal processes within an organization; hence, it lacks a chain management perspective. Still, this integration provides companies with an instrument for the integration and optimization of the supply chain. To successfully integrate the supply chain, companies need to exchange a great deal of programming and operational information so that through facilitating the immediate accessibility of members to such information as production planning, delivery of materials and point of sales, the supplier-customer relationship will be improved. ERP structure may not support business models across the supply chain. However, taking a macro-level perspective on the supply chain and using such technologies as internet and Extended Mark Up Language (XML), companies may be capable of distributing the processes throughout the supply chain(Esteves and Pastor, 2001). A critical factor in supply chain management is to utilize ERP systems in integrating the information pertaining to the chain members. However, due to the existence of discrepant ERP systems in different enterprises, this factor has suffered many challenges in the supply chain (Kelle&Akbulut, 2000). In short an ERP system provides an organization with the following advantages.

- Reduce operational costs and improve efficiency
- Gain better visibility of transactions across the enterprise
- Make better business decisions
- Deliver the right product at the right time
- Keep customer promises
- Adopt manufacturing best practices, including lean

In many instances, researchers have taken ERP as an underlying structure for other enterprise systems, particularly the supply chain management. In some instances, companies have drawn on the data extracted by Extraction, Transformation and Loading technique (ETL) from ERP databases to model and/or simulate the supply chain networks and make strategic decisions (figure 2.4).

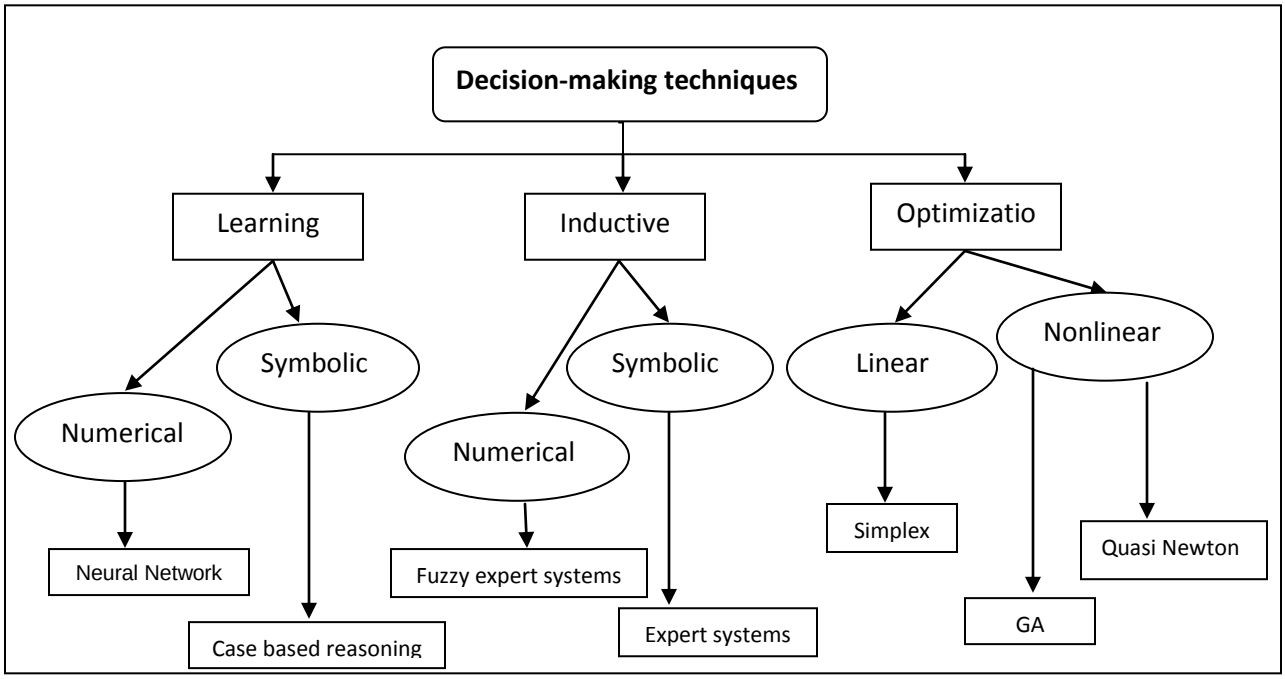
There have been studies to investigate the utilization of underlying informational ERP systems in implementing supply chain managements based on Supply-Chain Operations Reference (SCOR), which suggest that it is unavoidable to use the information pertaining to the supply chain management, extraction and the concentrated information in enterprise databases because the information is supra-organizational (Chopra, 2007; Ball, 2002)

Research topics on decision support systems can be classified into three categories:

The first category involves studies that concentrate on information retrieval. At first, the databases of decision support systems (DSS) were unstructured files, but they were displaced by logical databases then. There are new storage technologies such as data warehousing, online analytical processing (OLAP) and report generator, which are used for retrieving information (Hess & Wells, 2002).

The second category encompass studies that seek to investigate the development of decision-making models including optimization models as well as statistical and analytical tools which utilize such programs as Visual Basic for modeling and defining decision-making process. The third category includes studies that deal with the knowledge concerning decision-making, introduction and assisting the decision-maker to select the potential options for decision-making and recognizing the outcomes of each one of these option(Esteves and Bohorquez 2007). Some of the techniques, used for problem-solving in decision support systems and investigated at the relevant knowledge levels, include Fuzzy Logic, genetic algorithm, neural networks and linear optimization (Worley et al, 2002).

Figure 6.3- **classification of some decision-making techniques (source: Worley, 2002)**



There are also some other classifications in the literature concerning the research topics on DSS. Some researchers suggest that ERP is unlikely to support the decision, and hence they emphasize the necessity to integrate these systems with decision support systems. Some of the providers of such systems, however, have emphasized them to be informative enough, while some others have developed data warehousing and decision support systems within ERP systems (Markus et al, 2001). The most significant characteristic of a decision support system is its capacity to be integrated with other information systems (Worley et al, 2000).

Research has already been done to help get a better understanding of the ERP decision making process. However there still remains concern over the appropriateness of the ERP software. Ability to handle the confusion can only be gained through experience and Managers are posted on their seats based on their level of experience (Iles, 2007). However ERP can help in assisting the officials in decision making. However our topic is debated on how ERP systems can help in decision making and in this section we have put together some of the advantages gained by ERP systems which helps in quick decision making.

In the current business environment information is the key resource of an organization. If the organization does not have an effective mechanism that gives the decision makers the needed or the right information at the right time, then the chances of that organization succeeding in the future will remain a mystery.

The basic fundamental characteristics of information are accuracy, relevancy and timeliness. The available information has to be reliable, and relevant for the decision makers to make decision at the right time. In the changing business environment the time available for organization to react to the change in market trend is very little (Fisher, Raman and McClelland, 2000). To stay stable with the changing trends an organization should be up on its toes. Any technology that will help this gathering of information will enhance the chances of organization to stay alive in the market.

With the implementation of ERP system, the organization will be able to function as a single entity and caters to the needs of organization as a whole. The strength of an ERP system is integration and automation and that is why implementation of ERP will help in improving accuracy and in better decision making. For example resource management is one of the biggest problems often encountered by the managers and through the information systems, it is possible to address the problems and move the required resource with in shortest possible time. Therefore the process is not stopped and the time is also saved.

Integrating ERP systems with decision support systems bear several advantages including the improvement in clarity and quality of information, enhancement in understanding and the capacity for the implementation of supra-organizational decision-making systems. ERP systems can be utilized to collect and subsequently integrate various, discrepant data from different corporate divisions; however, they may not be used to analyze these data for making particular decisions within an enterprise (Wei et al., 2005; Wei and Wang, 2004). Thus, the integration of ERP systems with decision support systems through using Enterprise Applications Integration technologies (EAI) helps transform the data into knowledge. The integration of decision support systems with ERP systems makes it possible to extract the integrated data from a database and then to discover the patterns and interrelations of the data, hence the conversion of the data into knowledge (figure 6.4).

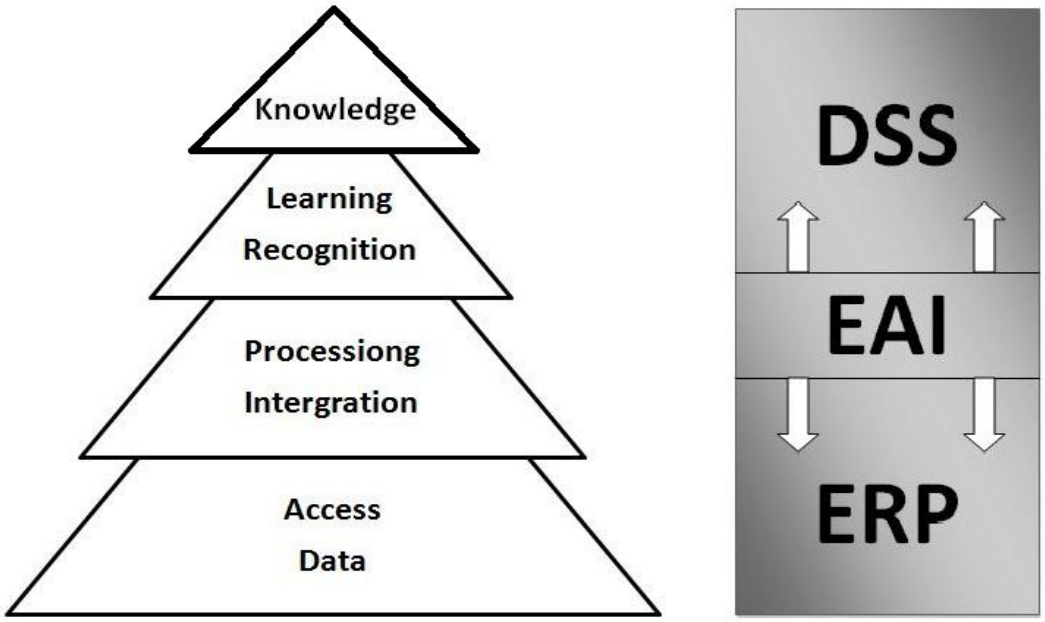


Figure 6.4 **- integration of ERP and DSS to create knowledge**

Concerning these issues, one can acknowledge the necessity to integrate ERP systems and decision support systems so that either of the systems may be used efficiently (Parr and Shanks, 2000). In addition to the integration of these two systems in intra-organizational content, that is the derivation of data from an ERP database and acquiring intra-organizational knowledge, companies may make use of integration in cross or supra-organizational content as well. Nowadays, the nature of decision making is such that the sole accessibility of organizational information is not enough and some decisions need to be made cooperatively and supra-organizationally (Markus et al., 2000; Kraemmergaard and Rose, 2002). Organizations need to share their information with the suppliers and in turn gain the information pertaining to their customers. Decisions made by any one of the members of the supply chain would affect the others; thus, they ought to share the information pertaining to their decisions. Figure 6.2 illustrates a model of supra-organizational decision-making in connection with the integration of ERP systems and decision support systems in adjacent organizations (Ngai et al., 2008; Dezdar and Sulaiman, 2009).

The impact of ERP system is always results from the case studies, interviews and industry surveys. Companies report growth in the performance in several areas as a result of ERP implementation. The impact of ERP implementation always branch out into four categories.

- Improve information flow across sub – units, standardization and integration facilitates communication and better co-ordination.
- Enabling centralization of administrative activities such as accounts and payroll.

- Reduce information system maintenance cost and increase the ability to deploy new functionality.
- ERP helps in moving a firm from inefficient business process into accepted practice process. (Galbraith, 1974).

These above literatures states that ERP systems has potential benefits on the organization on successful implementation.

Chapter 7

Conclusion & Recommendations

7.1 Conclusion and Recommendations

In this library study, we studied enterprise resource planning (ERP), supply chain management system and decision-making systems. We recurrently pointed out in the review of literature that how ERP can affect the supply chain management. The previous findings suggest that this system has already solved some of the supply chain problems but not others. Some studies have shown that ERP systems play an underlying role in other organizational systems. In this study, we sought to investigate how ERP systems can be used to create the underlying information structure of the supply chain. This underlying structure can be considered as the core transactional layer of other systems. The transactional layer has been created by linking ERP systems. It is possible to solve the supra-organizational problems of the chain via processing transactional information. Therefore, the analytical layer, which supports decision-making processes and supra-organizational issues, can only be created via an information structure or the transactional layer. In other words ERP is not enough to solve all the problems of the supply chain; however, there are some considerations that make ERP a prerequisite for analyzing the supply chain issues and organizational decision-making, including: sharing vast information in the supply chain processes, the capacity to absorb this information in the organization and using cross-organizational information in addition to intra-organizational information in the chain processes. In short ERP is a system which helps commercial areas like finance, logistics, sales, production and distribution and etc which are inter-related to each other so that if an activity is registered at one place it reflects immediately at all other places. This was studied in chapter 4 through modeling the supply chain which involves the information structure model and decision-making model. In other words, the analytical layer should be created considering the enterprise strategic and tactical issues and their role in the supply chain.

In co ordinance with its advantages ERP also has some major disadvantages which are over shadowed by its advantages. According to the studies of Sunil.C and Peter.M it is clear that ERP focuses on production level and therefore they have a weak analyzation. So it becomes a necessary to have highly skilled professionals to use the software in the planning level. Also another disadvantage is that ERP systems are so expensive and complex and therefore it becomes harder to implement on different systems. Therefore the major requirement of an ERP system is that it has to fit with all other information systems and should be flexible and easy to change with the change of processes and tools of any layer of a system. It needs re-engineering in all the processes and tools in a commerce part and this as per our findings has been the biggest

disadvantage of ERP systems. According to our findings the successful integration and operation of ERP systems with other systems depends purely on skilled operators and workers.

The major conclusion that we have arrived from our findings is that we should not much help from ERP on supporting supply chain management in extended enterprises. It was surprising that ERP has become a standard though having a major advantage. After the installation of ERP into an organization a process orientation takes place which will act as a back bone though within a single organizations business areas and supports supply chain management. But ERP systems are not compactable to support SCM across multiple enterprises and therefore IT solutions are required. The emergence of IT solutions has encouraged the implementation of ERP across its boundaries. Emergence of internet and communication systems will help interfacing the individual ERP implementations. Thus according to our findings ERP systems in its current state have a modest role to play in obtaining supply chain integration and management. With the major development in the field of communication and IT solutions we can expect a time shift where many solutions could be available for better interfacing of ERP systems and in turn which can help in achieving good supply chain management.
The major advantage of an ERP system is that it is integrated and centralized. An ERP system offers the decision makers the means of enhancing the knowledge about the process which in turn helps to make reliable decisions more rapidly and as well collecting sources to support their decisions. It also helps managers to handle more larger and complex problems. As per our findings from chapter 3 ERP helps to improve the reliability of decision by mutual participation of the participants, improves co-ordination of tasks which makes inter-related decision making easier. As a result it improves the satisfaction of decision process across the participants.

7.2 Future studies

This study can function as a foundation for future studies which concentrate on the two areas of cross-organizational decision-making modeling and integration of analytical systems with ERP system. As to the integration of systems, developing the relationship between ERP systems and analytical systems such as decision-making systems provide contexts for the application of this research.

On the other hand, developing the supply chain decision-making models categorized based on Supply-Chain Operations Reference (SCOR) which mentioned in chapter 3, may be another path for future studies. The performance indices of supply chain can always be improved by the development of decision-making and optimization models with more realistic assumptions. An in-depth research is needed to fill the gap to develop ERP systems to support multiple enterprises.

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