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The impact of Enterprise Resource Planning (ERP) on Supply Chain Management (SCM)

Prof. Vipul Kushwaha[1], Akshay Bhoi[2]

[1]Asst. Professor, Department of Master of Management Studies, Alamuri Ratnamala Institute of Engineering and Technology
[2]Student, Department of Master of Management Studies, Alamuri Ratnamala Institute of Engineering and Technology
[1]vipulkushwaha@gmail.com, [2]akshay.bhoi29@gmail.com

A B S T R A C T

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. 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 to achieve these factors, information exchange from both inside and outside plays a key role. Supply chain management is the term used for managing this accurate information's in and out and ERP is the technology used for achieving the same [2].

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 systems in a corporation and, second, what are the advantages of this system in resolving a variety of problems an organization might encounter.

Keywords: ERP, SCM, Enterprise Resource Planning, Supply Chain Management, Competitive, Technology, Survival, SAP, Globalization, Implementation, Configuration

1. Introduction

The primary aim of this research paper is to study the impact of Enterprise Resource Planning (ERP) adoption in the Supply Chain organizations and tests their relationships with competitive advantage and organizational performance and the Secondary objectives are to analyse the relationship between information technology and organizational supply chain performance, analyse the role of ERP in the enhancement of operations within the organizations and analyse the support of ERP towards the SCM process.

It aims to introduce the impact of Enterprise Resource Planning (ERP) in enhancing supply chain performance, also to establish conditions under which ERP can be a critical enabler or a severe handicap for superior supply chain performance. Supply Chain Management is the term used to manage this accurately. Lots of efforts pay a high attention to improving and excelling the Enterprise Resource Planning performance because it is one of the main organizational indicators for success. From here the study decided to figure out the impact of the Enterprise Resource Planning in enhancing supply chain performance among Logistics Industry, that would help the organizations to draw the road map for applying and practicing the best information technologies to get the best supply chain performance.

2. Proposed System

Enterprise Resource Planning (ERP) System is a comprehensive transaction management system that integrates many kinds of information processing abilities and stores data into a single database. Prior to ERP, this processing and data were typically spread across several separate information systems. For example, a firm could have separate systems for purchasing, order management, human resources, and accounting, each of which would maintain a separate data source. ERP would subsume these into a single seamless system.[3]

An overview of the ERP system can be seen in Fig. 1.1 [3]

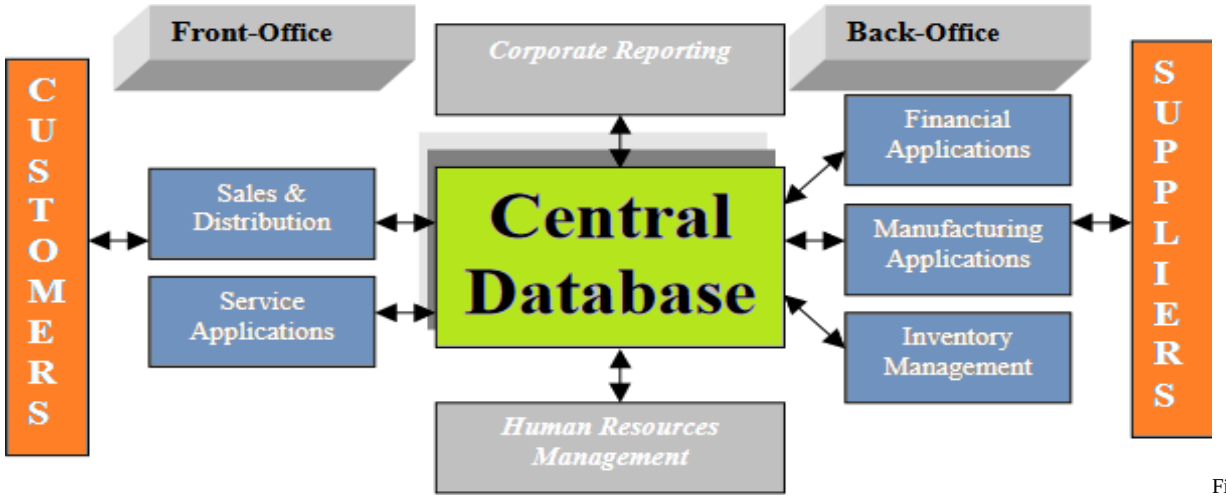

Fig 1.1

ERP system overview [3]

Researchers have pointed to information system fragmentation as the primary culprit for information delays and distortions along the supply chain. Information delays and distortions, in turn, cause the famous bullwhip phenomenon. An ERP system could potentially enhance transparency across the supply chain by eliminating information distortions and increase information velocity by reducing information delays. Hence, there is reason to believe that ERP adoption could be associated with significant gains in supply chain effectiveness [8].

ERP is the acronym of Enterprise Resource Planning. ERP utilizes ERP software applications to improve the performance of organizations' resource planning, management control and operational control. Enterprise resource planning systems are software systems for business management, encompassing modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation, and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. Corporate computing with ERPs allows companies to implement a single integrated system by replacing or re- engineering their mostly incompatible legacy information systems [8].

The goal of these systems is to coordinate functions and strategies, throughout a company, and across businesses, to improve the performance of all parties involved. Because supply chain management systems link several different branches of an organization, each of these systems is different, and requires fine tuning to work. Running remote diagnostics via logistics software can give integrity to a supply chain's operations.

3. Evolution of ERP systems:

Technically, ERP is the logical extension of Material Requirements Planning (MRP) systems of the 1970s and of Manufacturing Resource Planning (MRP II) systems of the 1980's [1]. ERP's impact, however, has been much more significant. The ERP phenomenon can be traced back to 1972 [1] when a group of IBM engineers devised an integrated Sales & Distribution and Materials Management package for ICI Chemicals. This was a logical extension of the MRP thinking. Some of these engineers later founded SAP AG and released the mainframe-based R/2 package with the large multinational corporations in mind. With minimal marketing effort, some 4,300 copies [1] of the package were sold over the next 20 years [1].

During the 1990s [4], ERP vendors added more modules and functions as add-ons to the core modules giving birth to the extended ERPs. These ERP extensions include advanced planning and scheduling (APS), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM).

In 1992, SAP moved from the mainframes to the client-server architecture by releasing the R/3. Today, SAP dominates the ERP industry by controlling one third of the market. In fact, one often talks about an "ERP ecosystem" consisting of ERP software developers, consulting firms, hardware developers, specialty software developers, and IT service providers. Worldwide sales of ERP packages together with implementation support, on the other hand, are anticipated to exceed twenty billion dollars by the turn of the century with annual growth rates of over 30% [6].

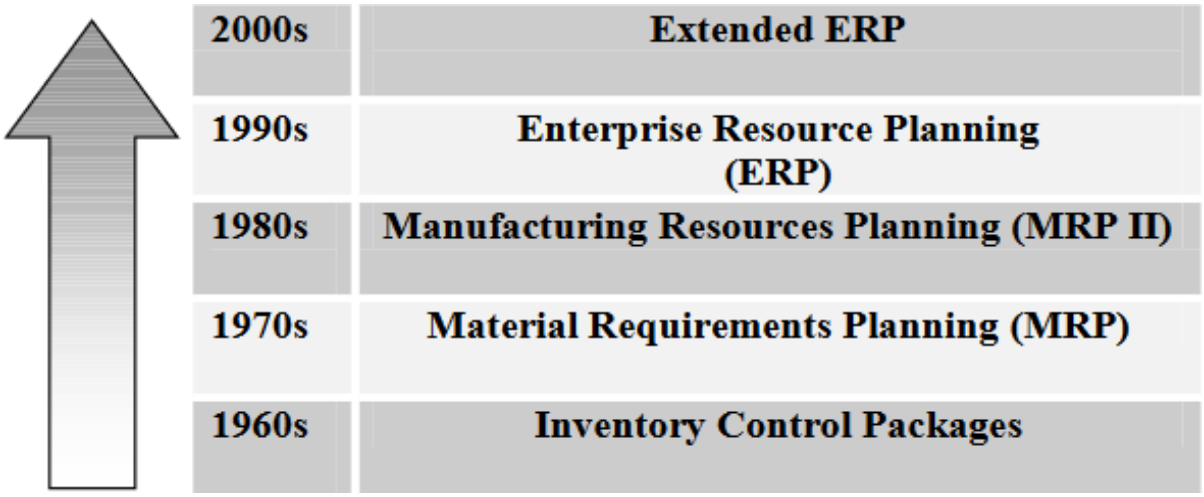

Figure 3.1: ERP evolution [8]

3.1 ERP Tools:

There are several ERP software manufacturers and among them, prominent are SAP, Oracle Corporation, PeopleSoft, JD Edwards, Lawson etc. SAP has the major share in the ERP market and next comes the Oracle Corporation. Oracle has bought JD Edwards, PeopleSoft, and Siebel recently and they compete with SAP aggressively. Leading ERP software like SAP, Oracle Apps, etc., are focusing on all functionalities of an enterprise and few companies are focusing on certain domains only. Below are the popular ERP Tools and their respective vendor list.

Sap R/3: It is an enterprise-wide information system designed to coordinate all the resources, information, and activities needed to complete business processes such as order fulfilment, billing, human resource management, and production planning. Sap R/3 is the client/server version of the software and its 3-tier architecture in which three layers Presentation, Application and database are installed in three servers/systems [5].

Oracle e-Business Suite: Oracle E-Business Suite (EBS), also commonly known as Oracle Applications, is a suite of business applications made up of many distinct software modules. It provides organizations of all sizes, across all industries and regions with a global business foundation that reduces costs and increases productivity through a portfolio of rapid value solutions, integrated business processes and industry-focused solutions [5].

PeopleSoft: Oracle's PeopleSoft applications are designed to address the most complex business requirements. They provide comprehensive business and industry solutions, enabling organizations to increase productivity, accelerate business performance, and provide a lower cost of ownership. It existed as an independent corporation until its acquisition by Oracle Corporation in 2005 [8].

JD Edwards EnterpriseOne: Oracle's JD Edwards EnterpriseOne is an integrated applications suite of comprehensive enterprise resource planning software that combines business value, standards-based technology, and deep industry experience into a business solution with a low total cost of ownership. EnterpriseOne is the first ERP solution to run all applications on Apple iPad. JD Edwards EnterpriseOne also delivers mobile applications [5].

Microsoft Dynamics: Microsoft Dynamics is a line of enterprise resource planning (ERP) and customer relationship management (CRM) software applications. Microsoft Dynamics applications are delivered through a network of reselling partners who provide specialized services [5].

Lawson Financials: Lawson Financial Corporation is a diversified, full-service financial institution that provides its clients with a distinct creative edge. They offer a wide range of ERP applications and industry-specific solutions for small, medium, and large enterprises. The company was recently acquired by Infor. Combined, they are the third largest enterprise software company behind Oracle and SAP [8].

Sage MAS 500: Sage 500 ERP (formerly Sage ERP MAS 500) is a complete enterprise management solution that was developed to help progressive companies streamline operations, manage with insight, and springboard to the next level. A complete enterprise management solution, Sage 500 ERP integrates unmatched financial accounting software with the full range of business functions in a modular design, and with a low cost of ownership and high ROI [5].

NetERP: NetSuite's NetERP streamlines back-office processes for growing and midsize businesses. It accelerates business cycles, improves data reliability, and offers higher levels of service to customers, suppliers, and partners. It provides real-time visibility into key business metrics for better, faster decision-making. Because data is stored centrally, you also benefit from integrated reporting and analytics across all departments [5].

Visual Enterprise: Infor VISUAL is a manufacturing-centric software solution delivering end-to-end functionality, low cost of ownership, and ease of use to serve the needs of diverse manufacturing business models, including engineer-to- order, make-to-order, configure-to-order, make-to-stock, and assembly-to-order [5].

Agresso Business World: Agresso is a fully integrated system encompassing General Ledger, Accounts Payable, Accounts Receivable, Logistics and Planning Costing and Billing [5].

Epicor Enterprise: Epicor Enterprise offers rich functionality and unmet performance--providing a competitive edge. A single, end-to-end software solution for business, Epicor ERP is available on premise, hosted, or in the cloud as a software as a service (SaaS) solution—Epicor ERP is built on 100% Microsoft technology for greater access and mobile workers [5].

IFS Applications: IFS Applications is a single, integrated application suite that enables global and demanding businesses to successfully handle 4 core processes: Service & Asset Management, Manufacturing, Projects, and Supply Chain Management [5].

MFG/PRO: QAD MFG/PRO is enterprise resource planning (ERP) software, designed to streamline the management of global manufacturing companies. MFG/Pro was built on a deep, foundational understanding of manufacturing operations and processes [5].
Ramco E-applications: Ramco ERP on Cloud enables you to get a 360-degree view of your business, anytime, from anywhere by putting all your business functions on to one single platform on the Cloud and automating and integrating them, end- to-end [5].

4. ERP Life Cycle and impact on SCM:

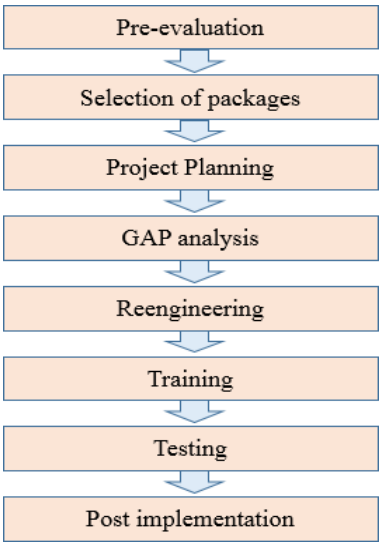

Fig. 4.1 ERP Life Cycle [2]

4.1 Conventional Procedure of SCM:

In tradition the supply chain consists of 4 major nodes, i.e., suppliers, manufacturers, distributors, and customers. In some cases, organizations become their own distributors or set up their own distribution department within the organization, which can cause them to eliminate the distributor node [7].

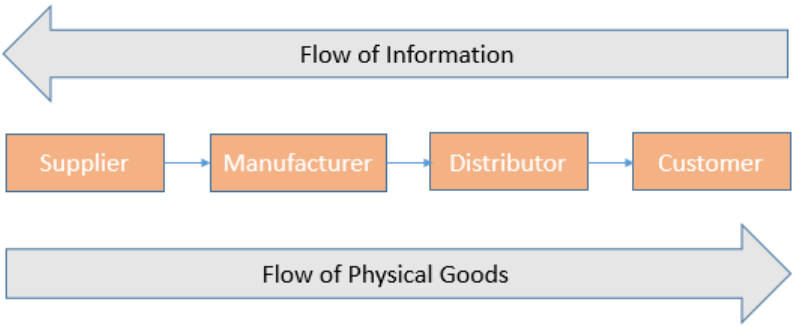

Figure 4.2: Conventional Supply Chain Management [7]

First, the supplier supplies the raw material to the manufacturer, according to the requirement of quality and quantity of the organization. Second, the manufacturers manufacture the products according to the customers' requirements, do the packaging and hand it to the distributors for the distribution in the market. In this context the flow of physical goods remains from supplier through manufacturer and distributor toward the customer. The feedback from the customer flows in a reverse direction i.e., from the customer to distributor and then to the manufacturer. Manufacturers alter their products according to customer requirements and ask for the changes in raw material (if necessary) from the supplier. The information helps in making products and providing services according to the customer's requirements. The sequential flow of information is a time-consuming process, as seen in the above figure [7].

4.2 Changes in SCM after ERP implementation:

Information sharing is a prerequisite for successful operations of supply chain (SC). Organizations can use technologies like the internet and web that can enhance effective communication. Software that uses the internet can help every member of the supply chain review past performance, monitor current performance and predict when and how many certain goods need to be produced. The Internet can help us in lowering the cost of SCM. Keeping in mind

that in implementing the technology, sometimes organizations must restructure their processes. However, the primary goal of IT in the supply chain is to link the point of production seamlessly with the point of delivery, but it highly depends on the way it is implemented. The internet changes the way companies do business (Short, 2002). Many organizations are now providing software solutions for Supply Chain Management. In general, the main core idea of implementing these solutions in the industry is to have a combined shared database by which sharing of information between the links on the SCM becomes easier and faster, as seen in the following figure [7].

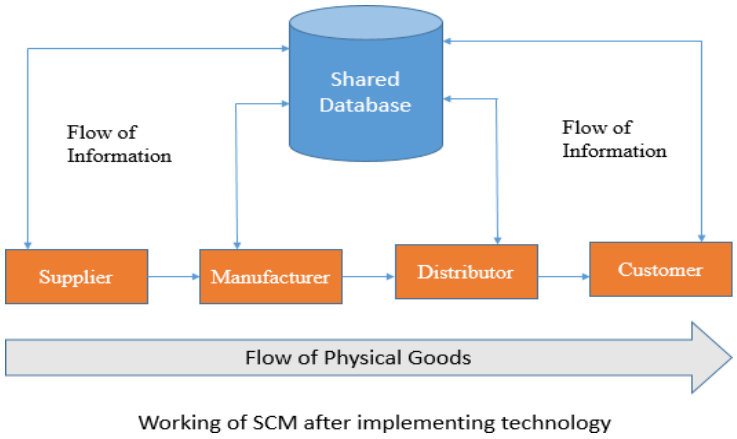

Figure 4.3: SCM after Implementation [7]

The Internet seems to be an extra distribution channel to most firms. In fact, the Internet and Web technologies can support the entire supply chain's operations. Internet-based supply chain operations are fast and inexpensive. Moreover, customers can instantly check the status of their orders by simply clicking their computer mouse. Corporate executives and managers can conduct real-time access to a firm's inventory level, and so do their suppliers and distributors [7]. Some of the solutions presently working in the industry are implementing enterprise resource planning (ERP) software like SAP, electronic data interchange (EDI) and customer relationship management system (CRM).

The goal of these systems is to coordinate functions and strategies, throughout a company, and across businesses, to improve the performance of all parties involved. Because supply chain management systems link several different branches of an organization, each of these systems is different, and requires fine tuning to work. Running remote diagnostics via logistics software can give integrity to a supply chain's operations [7].

Process Improvement in	**Mean**	**St. Deviation**
Order Fulfilment Lead Time	**4.04**	**0.84**
Order Fill Rate	**4.36**	**0.49**
Total Logistics Cost	**3.68**	**0.48**
Return Processing Cost	**3.72**	**0.98**
Inventories Days of Supply / Inventory turnover	**4.68**	**0.48**
on Time Delivery	**4.36**	**0.95**
Rate of Return	**3.64**	**0.49**

Table 4.1: Performance improvement in Supply Chain Organizations [7]

5. Conclusion and Future Research

This study can function as a foundation for future studies which concentrate on the two areas of cross-organizational decision-making modelling and integration of analytical systems with ERP systems. 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. The performance indices of the supply chain can always be improved by the development of decision-making and optimization models with more realistic assumptions. In-depth research is needed to fill the gap to develop ERP systems to support multiple enterprises [1].

This study contributes to my knowledge of Enterprise Resource Planning systems and Supply Chain research. As a result, this study provides an organization with a proven reason to improve and extend the Supply Chain Management practices and ERP System, through the innovation, investment, and development of these systems. The efficiency and effectiveness of ERP System and SCM practices have a positive impact on both competitive advantage and firm's performance.

Organizations can gain competitive advantage from ERP, but they must embark on a process of continuous improvement and organization learning to do so. Organizations who do not take this route will be caught by 'competitive convergence' and eventually overtaken by their competitors [4].

This study found that fully web enabled ERP services have helped to remove many drawbacks of the earlier applications. This has gained momentum as it has made ERP function more meaningful and dynamic with the latest inclusions. Web enabled ERP services help companies to keep track of what is going on. Since the entire system comes under the purview of the internet it is not possible for the employees to engage in any sort of misappropriation

of funds or otherwise. In addition, the errors could be easily deduced and corrected. This system not only helps the personnel in the company but also its stakeholders and well-wishers or anyone who would like to obtain information on the company. They can access the details anytime online.

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