ERP SYSTEMS IN SUPPLY CHAIN MANAGEMENT

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Keywords


ABSTRACT

Supply Chain Management and Enterprise Resource Planning Systems are two of the most popular components of enterprise solutions for today. SCM ensures that upstream and downstream members of the chain are able to deliver according to the standards required in order to deliver a product or service that satisfies the customers’ needs. ERP systems on the other hand ensure that operations and transactions of a business are integrated into a centralized repository to facilitate in information sharing and decision making within the organization. Most ERP vendor solutions of today like SAP and Oracle are providing SCM as an extension module to the ERP core. These added functionalities allow organizations to collaborate and interact with other supply chain members. In addition, technologies like middleware and frameworks like Service-Oriented Architecture are rapidly gaining mainstream adoption according to recent technological trends studies by Gartner. Thus, the vision of having enterprises with a pool of integrated enterprise solutions consisting of ERP, SCM, BI, DSS, CRM, etc. is now feasible and highly possible.

In this article, we examine how ERP and SCM can work together to bring benefits to a business. We will also review two successful case studies of ERP and SCM implementations to examine how a business can gain value from such a combined solution. Finally, a conclusion of the studies was made and it was determined that ERP and SCM indeed can go hand-in-hand to deliver a solution that can be beneficial to an organization.
SUPPLY CHAIN MANAGEMENT AND E-SCM

Supply Chain Management (SCM) is the “systematic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole” (Mentzer et al., 2001). SCM is meant to make the overall processes more clear and unified. Thus the flow of management and co-ordinating decisions and inventory are faster and more efficient coming from the top of the chain all the way down. SCM uses integrated business processes in order to simplify daily operations in real time.

E-Supply Chain Management (E-SCM) uses the advances of technology made available through the advancement of the internet to further simplify SCM by utilizing it to simplify the flow of information to different members of the supply chain, thus, further making SCM more efficient and much easier. Through this, a supply chain can share crucial information in real-time. The use of the internet in information sharing will better reflect decisions from all spheres of the business in and out as it also facilitates information sharing and collaboration according to Gimenez and Lourenco (2004). Also from Gimenez and Lourenco (2004), it can be seen that the primary effect of E-SCM to organizations is that the internal value chain is improved as well because of information sharing and collaboration. Functional and business units are able to improve customer relationship management and customer service management as a result (Gimenez & Lourenco, 2004). Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert and Cooper (2000), operating an integrated supply chain requires a continuous information flow. Lambert (2004) stated that SCM and E-SCM are crucial features for a successful ERP since the flow and information sharing is important for the business to function. SCM requires the management of materials and information flow in the whole chain, from suppliers through to customers. It has been argued that if business success is to be achieved, optimization of business processes across the value-added chain must be accompanied by modern processing technology for optimization of enterprise-wide information management (Buck-Emden & Galimow, 1996).

BENEFITS OF SCM AND E-SCM

There are many benefits to SCM and E-SCM such as the flow of information in real-time in every aspect of the business. Supply chain systems configure value for those that organize the networks. Value is the additional revenue over and above the costs of building the network. Co-creating value and sharing the benefits appropriately to encourage effective participation is a key challenge for any supply system. Tony Hines defines value as follows: “Ultimately it is the customer who pays the price for service delivered that confirms value and not the producer who simply adds cost until that point” (Hines, T. 2004). Hence, SCM and E-SCM adds value to the business by enabling the business to save money through lower costs at various stages of the supply chain. Like for instance, SCM would effectively enable accuracy in the inventory of items which in turn improves resource utilization. Also another benefit would be time effectiveness, since there would be real-time information accessible which would help in making decisions more accurate and appropriate in response to timely issues (Gimenez & Laorenco, 2004). Additionally, E-SCM improves in-company cooperation and collaboration since everyone would be on the same page, which leads to improved value chain management that would help in sales and customer relations since everyone works towards achieving the same goals to satisfy each
customer. There are also human resource management benefits with E-SCM. With centralized information within the company, it would be easier to track employees hours worked and compliance to company standards. E-SCM ensures that everything is transparent to everyone in the company; therefore, improving the company’s working standards.

Lancaster et al. (2006), has a list of the most common benefits of utilizing E-SCM as below as summarized below:

- **Speed and the ability to communicate** – electronic channels decreases costs of communication, carrying inventory and providing customer service
- **Collaboration** – minimizes the “bullwhip” effect which is the distortion of demand forecasts along a supply chain as a result of inaccuracies or inadequacies of information on hand
- **Ability to build long-term relationships along the supply chain** - organizations increase the availability of information with each other, enabling them to align their strategies and goals, making supply chains committed to the end consumer; it also moves to stabilize processes, since organizations can focus on their core competencies, while outsourcing their remaining needs to trusted and reliable partners
- **Improved customer relationships** - eliminates stock outs and encourages customer driven demand as well as efficiency in tracking of deliveries
- **Decreased costs** – through the sharing of information in the supply chain, a pull-based demand inventory system is created leading to lower warehouse and facility costs and more reliable operations

**ENTERPRISE RESOURCE PLANNING**

Enterprise Resource Planning (ERP) systems are changing the ways many businesses and governmental organizations’ carry out their business processes by providing a means of connecting all the various departments together thus resulting in more accurate information for the company. ERP systems provide an organization with a single platform system responsible for the coordination and integration of key-business processes. ERP systems ensure the smooth flow of information within various levels of the organization thus leading to more focused and precise decisions for the company.

Before the ERP system’s implementation, organizations had several different information systems in place supporting various activities like Finance, HR, Logistics, Supply Chain, etc. without the integration of activities individually. These systems existed separately and did not support interconnectivity. With the implementation of ERP systems, all these systems mentioned above along with various other systems become integrated and it creates a backbone for the organization by providing a means of connecting all the different departments through a single system that is efficient enough to integrate all the relevant information together and is able to present meaningful on-time data and results for the business.

ERP systems are considered the system of records by many companies and offer persistence of almost 25 years. ERP systems mostly cost around $10 to $100 Million and sometimes even more. ERP systems are widely being used globally and according to a study by (Gartner, 2010), ERP systems have a market of $21.2 Billion in software revenue & a growth of 5.5%. ERP software has the 3rd largest
market share, just behind Database and Operating Systems. ERP systems’ main worldwide usage is in North America and Western Europe where its overall market share is 80% while the 20% is for the rest of the world (Gartner, 2010). The potential markets for the ERP systems exist in Asia Pacific, Latin America, Middle East and Eastern Europe.

   ERP systems not only integrate the various individual systems within an organization but also provide an integrated system capable of supporting various web services, integrated supply chain, e-commerce and mobile support etc. According to a research conducted by Meta Group, as much as 70% of the US federal, local and state government agencies have implemented ERP solutions based on the same reasons as businesses; i.e., to integrate the organization-wide information and lead to more useful decisions. Many ERP vendors see this as an opportunity, as in the coming future, other countries too would be following the same path as the US model by installing various ERP to replace their traditional legacy systems throughout the local and federal departments in order to increase efficiency and productivity.

   ERP systems are not just limited to large firms but also are very useful for the small organizations. According to the data provided by SAP (the largest vendor of ERP systems worldwide), the company generated 90% of their revenues from large multinational organizations but in late 90's & early 2000, 50% of their revenues came from smaller and mid-size companies.

IMPACT OF ERP SYSTEMS

Impact on Competition Behavior

   The ERP systems these days differentiate many organizations from each other due to the competitive advantage gained through the successful implementation of ERP systems. Organizations can now look at their competitor companies and try to learn from their implementations and come up with a better ERP solution for themselves. This makes them not only competitive in the market but also innovative at the same. These firms are able to secure a much better position in the market compared to the reference group based on the experience gained from other companies and design solutions that result in producing more efficiently at a lower cost.

Impact on Business Partner Requirements

   During the implementation of ERP systems organizations need to stay ahead. They need to focus on the smooth organization-wide implementation and be ready to face the challenges as every firm is resistant to change. At this point, an organization must become quick in collecting, analyzing, disseminating information as its going through a change process and there can be a certain situation inside the firm that a business partner may need to adhere to the change process or quit as there is no turning back and conflicts can arise that can create a problem for the whole company.

Impact on the Nature of Consulting Firms

   ERP systems have enabled many firms to increase their efficiency by integrating the processes and sharing information at all functional levels within the organization ultimately leading to more useful information for the decision makers. Most multinational firms these days have either implemented the ERP systems or are in the process of implementing it because they have realized that in order to stay
competitive or survive in the market they have to implement such a system. ERP systems have replaced various existing legacy systems such as the ones for Finance, HR, Logistics, Supply Chain, etc. by a single system capable of running all the functions of the different systems more efficiently at less cost and thus changing the way organizations used to deal with processes as the information from top to bottom is shared through a single system also capable of performing various web services at the same time.

**Impact on Nature of Information Systems Function**

ERP systems are outsourced from different vendors who are also responsible for the maintenance and update activities thus, skipping the part of designing & developing as the organization can rely on various ERP vendors that already have a suitable ERP system in place that just needs modification in order to meet the company requirement and move on with the implementation stage. The firms nowadays, don't need to hire system analysts and programmers as the whole system is outsourced from ERP vendors and these systems can be run by almost all employees with some training that’s all, while previously the such employees needed to be hired that were specialists in system design etc. Now the companies can focus on its core processes instead of getting too much involved in developing systems that meet their requirements as it puts together a list of its requirements to the ERP vendors and it is up to them to design & develop such systems.

**Impact on the Nature of Jobs in all Functions**

ERP implementation can create and at the same time remove the jobs within in a company as it integrates all the relevant information and changes the way of doing things thus eliminating certain HR involved processes as they are automated within the system. At the same time ERP systems, can also create a certain position within a company that is unique in terms of its nature as the company can redefine its goals through an ERP implementation by offering something more to its customers thus involving more HR at the same time.

**Advantages of ERP systems**

Enterprise Resource Planning systems have changed the nature of the business by transforming the ways in which the business operates. These systems have integrated all the different processes within organizations and provided a platform for information sharing at all levels. The following are a few advantages of ERP systems:

- ERP systems have enabled companies specially the manufacturing industry to cut their extra inventory by providing them with all the necessary information required to forecast the demand and manage the whole process in a more efficient manner.
- ERP systems have also enabled firms to reduce HR cost as most of the processes are automated through these systems and the ERP vendors are mainly responsible for the maintenance of these systems so the company doesn't need to hire programming specialists, etc. to develop or maintain their systems.
- ERP systems have replaced the legacy systems that existed separately like Finance, HR, Logistics, etc. by having a single integrated system capable of performing all the activities of these various individual legacy systems more efficiently at less cost.
ERP vendors provide organizations with a flexible solution based on their needs. That means, they provide specifically customized systems based on the organization requirements thus, ultimately leads to a more efficient process delivery and at the same time let the company gain a competitive edge over the reference group.

The implementation of these systems leads to new innovative production standards that set apart a company from its competitors which is why every organization aims to get an ERP solution that is better than its reference group in order to stay competitive.

As all the information flows within the ERP systems so it is easy for a company to plan for the future based on its current performance. These systems enable the decision makers to make quick decisions based on accurate information as the whole information from various departments lie within the same system.

ERP solution enable a company to improve customer satisfaction by on time delivery, increase quality and shorten delivery times providing the company with all the integrated information from various levels.

Organizations these days have realized that in order to stay competitive they have to implement ERP systems in order to get an edge over the market by offering more at the very less cost.

SUPPLY CHAIN IN ERP SYSTEMS

A successful organization must be able to manage the integration of its business, technologies, processes, departments and people within the enterprise itself and across extended enterprises (Awad & Nassar, 2010). The integration inside any business organization includes not only integrating ERP systems with legacy systems to ensure an effective and efficient communications between these systems, but also include the integration of ERP systems with SCM systems and linking it with CRM systems to encourage the cooperation and collaboration across the entire value chain (Awad & Nassar, 2010). Due to the rapid evolution in information and communication technologies (ICT), the traditional supply chain management processes have been enhanced to be integrated with different business processes for the purpose of increase the overall value of the chain, reduce cost, improve production process and compete with different business environments.

As discussed in the earlier sections of this document, ERP effectively integrates all the information which is required for the business to operate including finance, accounting, production, human resources, quality management, sales and marketing. We can see that ERP is an integrated information system which integrates the internal working process of the organization, standardize the internal procedures for data processing and combines all the operations data which are generated by multiple departments or functions (Adaileh & Abu-alganam, 2010). On the other hand, Supply Chain Management (SCM) is the management of upstream and downstream to increase the value of the chain. It looks at the business as a chain of well integrated and connected entities which will add more value, reduce inventory, reduce lead time and reduce cost. The following table illustrates comparison between ERP and SCM which will help to understand how to build relationship and integrate these two systems (Tarn & Beaumont, 2002)
<table>
<thead>
<tr>
<th></th>
<th>SCM</th>
<th>ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective</strong></td>
<td>Integrating and optimizing internal business processes of a single organization as well as the interaction of the organization with its business partners across the entire supply chain</td>
<td>Integrating and optimizing internal business processes within the boundary of a single organization</td>
</tr>
<tr>
<td><strong>Focus</strong></td>
<td>Optimizing information flow, physical distribution flow, and cash flow over the entire supply chain</td>
<td>Optimizing information flow and physical distribution flow within a single organization</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Constraint-based tool providing reasonable and feasible business plans based on the availability of the required key resources</td>
<td>Non-constraint-based tools providing business plans without the consideration of the availability of key resources</td>
</tr>
<tr>
<td><strong>Function</strong></td>
<td>Manufacturing management, inventory management, logistics management, and supply-chain planning</td>
<td>Manufacturing management, financial management, and human resource management</td>
</tr>
<tr>
<td><strong>Customer Relationships</strong></td>
<td>Involvement of external parties in process improvement, anticipating customers need and demand</td>
<td>Reacting to customer demand, but there is no involvement of external parties in process improvement.</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>Coordinating and integrating all inter-organizational activities</td>
<td>Coordination and integrating all activities within a single organization</td>
</tr>
</tbody>
</table>

Table 1: ERP vs. SCM (source: (Tarn et al., 2002))

The rapid enhancement and the development in ICT opened the door for globalization where companies are seeking to expand their activities outside of their original areas looking for more opportunities all over the world (Tarn et al., 2002). In order to adopt with globalization, companies are required to build integrated information systems which allow the transmission of data across different geographical area. This will allow the company’s different departments, applications and functions to cooperate and communicate in more effective and efficient ways. Furthermore, companies have to make sure that all its business process and functions are integrated and work together before extended the integration to other companies (Tarn et al., 2002). For example, the company has to make sure that its business process such as logistics and distribution functions are well integrated with supply management manufacturing and information technologies before integrating with external companies (Tarn et al., 2002). In order to face the global business environment and different challenges, companies are seeking to integrate its business process together using technology solutions. For this reason, companies all over the world are seeking to link its ERP, SCM and CRM together and share part of the information with their suppliers and customers to increase the overall value of the chain.

Traditional supply chain management systems are designed to take data from organization legacy systems and then data will go under certain processes to be evaluated to make different decisions and forecasting customer demand (Küçükçay, 2011). At that
time, SCM systems were standalone software provided by limited number of vendors. Since different companies started using ERP systems, SCM system started directly relying on ERP and CRM to get the information about customers and the focal company. SCM system needs the information in CRM systems to make decision about customer’s demands and future forecasting. Furthermore, an SCM system needs to be connected with all the departments and units in the company by relying on ERP systems to do this function (Küçükçay, 2011).

**Integration Methods**

The integration of SCM and ERP combines business processes with state of the art technology solutions to increase the communication and cooperation between the organization different departments and functions. Since both ERP and SCM rely on similar frameworks (e.g. intranet, extranet and EDI), it is said that ERP is the backbone of SCM (Tarn et al., 2002). For this reasons, most ERP vendors such as SAP, Oracle, PeopleSoft and i2 have enhanced their ERP systems to be integrated with different SCM systems and also by adding SCM capabilities (modules) to increase efficiency, productivity and value to the end customer (Tarn et al., 2002). The following figure illustrates a general framework of how ERP, SCM, BI and CRM can be integrated to increase the communication and cooperation between suppliers, partners and customers.

![Figure 1: ERP, SCM, BI & CRM Integration](image)

The increasing demands of using SCM systems within the ERP systems forces top ERP vendors to realize the need to integrate their ERP systems with an SCM solution (Tarn et al., 2002) or to create their own version or module of SCM. For the process of integrating ERP systems with SCM systems, vendors follow three different methods of integrations which are (Tarn et al., 2002):

- **The notion of conformity** which emphasizes on the idea that all supply chain members use the same system. This method is impractical in large scale supply chain and some issues of security and trust may appear.
Developing a middleware between applications which could be very expensive and require more time and effort, but it is very practical. In this method, programmers and developers are asked to link different systems together to ensure an efficient and effective communication and transmission of data.

SIS which is a specialized integration software programmed to integrate SCM software with ERP systems.

At the beginning, the world’s top ERP vendors such as SAP, Oracle, i2 and PeopleSoft focused their intentions and efforts to find solutions so their ERP systems can be integrated with other SCM software. For example, an application link enabler (ALE- middleware) used in order for I2 Rhythm Supply chain suite to communicate with SAP R/3 ERP suite (Tarn et al., 2002). Later, the rapid development and growth in SCM systems and the high demand of linking and integrating it with ERP systems have awaken ERP vendors to add more sophisticated SCM capabilities to their ERP packages. Some of the leading ERP vendors such as SAP or Oracle had partnerships with the SCM vendors for the purpose of adding SCM capabilities to their systems. Thus, the leading ERP vendor SAP added SCM module to its systems and name it as SAP®SCM as a part of SAP Business suite (SAP Website, 2012). Following SAP’s example, Oracle also added SCM modular to its ERP system and named it as Oracle Supply Chain Management as a part of Oracle’s E-Business Suite (Oracle Website, 2012). Other ERP vendors are doing the same by adding SCM modules to their system or by providing easy and efficient tools to integrate their systems with SCM systems from different vendors.

SAP®SCM (SAP Business Suite)

SAP Supply Chain Management is a part of overall SAP Business Suite which was developed to help organizations to perform its essential business process in more efficient and reliable ways (SAP Website, 2012) supporting integrating with SAP and non-SAP software. The SAP Business Suite contains different systems which are well integrated with each other and can be used with different software vendors. The business suite as illustrated in Figure 2 includes: SAP Enterprise Resource Planning (ERP), SAP Customer Relationship Management (CRM), SAP Supplier Relationship Management (SRM), SAP Supply Chain Management (SCM) and SAP Product Lifecycle Management (PLM).
SAP SCM provides different solutions which enable business to carry out supply chain planning and generating high efficiency business processes with different partners and suppliers. It enables business to respond to demand using a supply network where distribution, transportation and logistics are well integrated into real-time planning processes (SAP Website, 2012). The following figure illustrates the solution map for SAP SCM which includes the general features and more detail services which the system can provide. This can include:

- Order Fulfilment
- Procurement
- Transportation
- Warehousing
- Manufacturing
### Figure 3: SAP SCM Solutions Map (source: (SAP Website, 2012))

<table>
<thead>
<tr>
<th>Demand &amp; Supply Planning</th>
<th>Demand Planning &amp; Forecasting</th>
<th>Inventory Management</th>
<th>Supply Network Planning</th>
<th>Distribution Planning</th>
<th>Service Parts Planning</th>
<th>Demand Planning in MS Excel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement</td>
<td>Strategic Sourcing</td>
<td>Purchase Order Processing</td>
<td>Invoicing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Production Planning &amp; Scheduling</td>
<td>Manufacturing Visibility &amp; Execution &amp; Collaboration</td>
<td>MRP Based Scheduling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warehousing</td>
<td>Invoicing &amp; Receipt Confirmation</td>
<td>Outbound Processing</td>
<td>Cross-Country</td>
<td>Warehousing &amp; Storage</td>
<td>Physical Inventory</td>
<td></td>
</tr>
<tr>
<td>Order Fulfillment</td>
<td>Sales Order Processing</td>
<td>Billing</td>
<td>Service Parts Order Fulfillment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Management</td>
<td>Operational Planning</td>
<td>What-If Analysis</td>
<td>Multi-Tier Response Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>Freight Management</td>
<td>Planning &amp; Dispatching</td>
<td>Routing &amp; Billing &amp; Settlement</td>
<td>Driver &amp; Asset Management</td>
<td>Network Collaboration</td>
<td></td>
</tr>
<tr>
<td>Real World Awareness</td>
<td>Aisle-ID (RFID) &amp; Item Serialization</td>
<td>Event Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Chain Definition &amp; Visibility</td>
<td>Supply Chain Monitoring</td>
<td>Supply Chain Analytics</td>
<td>Sales &amp; Operations Planning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Design</td>
<td>Network Design &amp; Optimization</td>
<td></td>
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</tr>
<tr>
<td>Supply Network Collaboration</td>
<td>Supplier Collaboration</td>
<td>Customer Collaboration</td>
<td>Outsourced Manufacturing</td>
<td></td>
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</tr>
</tbody>
</table>
Oracle Supply Chain Management (Oracle E-Business Suite)

Oracle Supply Chain Management module is part of Oracle E-Business Suite which include different kind of modules to support organizations in streamline their business processes and connecting them with different supplier, distributors, partners and customers (Oracle Website, 2012). Following the same idea of SAP Business Suite, Oracle E-business Suite is one of the comprehensive suites that integrated global business applications in order to provide the most complete, integrated business intelligence portfolio, the most adaptable global business platform and the most customer focused application strategy (Oracle Website, 2012).

Oracle E-business suite includes Customer Relationship Management (CRM), Financial Management, Human Resources Management, Supply Chain Management (SCM), Advanced Procurement, Customer Service Management, Project Portfolio Management, Value Chain Planning and Value Chain Execution (logistics). As a part of suite, Oracle Supply Chain Management (SCM) is a comprehensive suite of applications with open and flexible architectures (Oracle Website, 2012). It can be integrated with Oracle or Non-Oracle software which allows businesses to transform their operations across the demand and supply in order to deliver operational and innovation excellence. The following figure illustrates the architecture of Oracle Supply Chain Management:

![Figure 4: Oracle SCM](source: (Oracle Website, 2012))
IMPORTANCE OF ERP ON SUPPLY CHAIN

Recent communication and information technologies are essential in managing supply chain. It is useful to facilitate the integration of upstream and downstream activities and provide several stakeholders to collaborate with each other. These technologies include information systems such as Enterprise Resource Planning systems (ERP), Transportation Management System (TMS) and Warehouse Management Systems (WMS). Moreover, it also includes communication systems such as radio frequency identification tags (RFID) and global positioning systems (GPS). These technologies also include optimization software. These software are designed to develop better management of inventories, best delivery routes, and configure the whole logistic network such as the number and location of production and distribution units. Simply, the use of technologies enables visibility for product along the chain while also providing greater connectivity to partners and facilitating integration and cooperation. (Roy, 2010)

ERP can be seen as the logical extension of MRP systems of 1970s and MRP II systems of 1980s from a technical viewpoint. The impact of ERP on supply chain is very significant, according to the American production and inventory control society (APICS), sales of MRP software and implementation support exceeded $1 billion in United States by 1989. On the other hand, worldwide sale of ERP packages together with implementation support exceeded $15 billion and had an annual growth rate of 30%.

ERP system primarily supports the management and administration of resources within a single organization. Organizations can be multi-sited. The resources include materials production capacity, capital and human labor. ERP systems can provide 3 types of functionality (H.A. Akkermans et al., 2003):

Transaction Processing Engine: it integrates management of data throughout the enterprise.

Workflow Management Functions: it controls the numerous process flows that exist in the organization such as purchasing process or order to cash process.

Decision Support Functions: it assist the creation of plan or in deciding the on the acceptance of a specific customer order.

IMPACT OF ERP ON SUPPLY CHAIN

On June 30, 1999 the Delphi research study conducted a workshop having 140 respondents. Participants are accommodated in a room that enabled GDSS-supported conferencing in both plenary and subgroups formation. The goal of the workshop was to:

1. Identify key SCM trends
2. Assess the expected business impact of these SCM trends
3. Assess the expected ERP support for these SCM Trends
4. Identify key limitations (if any) in current ERP systems for effective SCM support

To achieve these results, an eight step workshop script was developed. The eight steps include: Define SCM and ERP, Generate SCM trends, Group SCM trends, Prioritize SCM trends, Assess SCM trends on business impact and ERP support, Select 5 SCM trends for subgroup discussion, Identify ERP limitations and Cluster ERP limitations.

After prioritizing SCM trends in step 4, the respondents were asked to plot top 12 trends on 2 dimensions in step 5: the expected business impact of each trend and the ratio which ERP
could support or hinder these trends. These assessments were then aggregated. The first observation made by researchers is that the respondents were not overly optimistic about the contribution of ERP in future SCM development. Only 3 or 4 out of 12 key SCM trends are perceived as being supported by ERP. The panel extracted the conclusion that the link between strategic SCM-ERP is negative because for implementing ERP organizations has to change or transform their processes or in some cases transform whole business strategies. However, technical SCM-ERP link is positive. The issue required to address is to have IT tools that will integrate supply chain partners. Secondly, the strategic issue of the mass customization, global IT and standardization plays a vital role on whether ERP and SCM can successfully co-exist.

**ERP vs. SCM Systems**

According to the study by K.B. Hendricks et al., the primary benefit of SCM systems is better operational and business planning. The ERP systems and MRP II of the 90s usually included only unrefined capacity planning logic and basic fixed capacity planning logic to key work centers (Vollmann et al., 2005). But the recent SCM systems provide the capability of real-time planning and allow an organization to react instantly to cope up with supply and demand changes. The coordination and communication of information, planning and flow of material among supply chain partners can lessen the Bullwhip effect (Lee et al., 1997).

Although ERP systems provide a great deal of planning capabilities, various material, capacity and demand constraints are all considered separately on the other side. The leading edge SCM products are able to consider all the constraints simultaneously and perform real-time simulations of adjustments in the constraints. Moreover, ERP systems find difficulties in adding this more dynamic functionality because they are mainly focus on transactions processing also doing more jobs than SCM. Therefore, getting answers from already loaded ERP might take hours whereas is a matter of seconds or minutes to get the same answers from separate SCM systems (ERIC, 1998). The leading SCM solutions like Manugistics and I2 have many other improvements when compared with ERP. Manugistics described themselves as “Navigating your way through mountains of supply chain information is made easier with Supply Chain Navigator's state-of-the-art graphical user interface. This intuitive GUI gives you complete visibility into the inner-workings of the supply chain - through demand, supply, manufacturing scheduling, and transportation - all at your fingertips.” SAP has added similar functionalities with collaboration with I2 as a separate module of SAP. (ERIC, 1998)

Thus, from the review of SCM and ERP literature above, it can be said that ERP and SCM systems can work together to deliver a more complete solution to an organization. While ERP can be used to manage transactions and workflows, adding an SCM solution on the other hand, enables an organization to monitor and analyze real-time data that can facilitate better collaboration and decision making. With the advent of middleware technologies, it is now more than ever easier to integrate these systems together. Adding in other enterprise solutions such as BI and CRM will allow organizations to have a complete solution that can help them obtain competitive advantage. Therefore, in conclusion, ERP is an essential piece to successful SCM because this is where internal data and processes can be optimized to further benefit the overall supply chain.
Case Study

As discussed in the earlier sections of this document, it can be seen that ERP systems are indeed considered to be an integral component to successfully implementing effective supply chain management in modern organizations. In fact, the top two ERP vendors namely, SAP and Oracle have included a special SCM module in the enterprise system solutions they sell to provide organizations with a set of specialized tools that enable them to better monitor, implement, collaborate and decide on supply chain related matters. SAP’s SCM for example, can help organizations change a linear or sequential supply chain to become a more responsive supply network that allows communities of customer-centric, demand-driven partners to share knowledge, intelligently adapt to changing market conditions, and actively take initiative to respond to shorter, less predictable lifecycles (SAP Website, 2012). Oracle’s E-Business Suite also has an SCM module that enables an organization to anticipate market requirements and risks, adjust and innovate to respond to unpredictable market conditions, as well as align operations across networks worldwide (Oracle Website, 2012). Consequently, Oracle also claims that organizations are able to carry out lean and demand driven principles to effectively manage their international supply chains that are continuously becoming more complex over time (Oracle Website 2012).

For this research report, the group reviewed a successful real-world implementation of ERP and enterprise solutions for each of these two vendors mentioned above to demonstrate the significance of what Enterprise Systems can bring to an organization’s supply chain if implemented properly.

Welch Foods Inc. (Oracle E-Business Suite)

Welch Foods Inc. is a American consumer goods company based in Concordia, Massachusetts that is owned by a cooperative of grape growers called the National Grape Cooperative Association. Since its founding in 1869, the company has continuously been successful and has now grown into a business that is comprised of approximately 1,090 farmers in the US. Its key products include the grape and other fruit juices, jelly, snacks and other fruit-based food products. As of 2011, the company employs over 952 employees and had an annual revenue of US$640.9 million while selling its products in more than 50 countries globally. (Welch Foods Inc. Annual Report, 2011)

Prior to implementing Oracle’s E-Business Suite, Welch was encountering several challenges as listed below (Oracle Customer Snapshot, 2010):

- Welch wanted to formulate better decisions with regards to product mix, production, and marketing in order to match product offerings with emerging continually changing dietary trends and customer demands.
- They wanted to standardize their production processes and better keep track of all their inventories.
- They needed to adapt their sales planning to improve forecasting for food product sales and optimize the company’s supply chain to ensure that it is not over-producing and over-stocking on products.
In order to address these challenges mentioned above, Welch hired Oracle consultancy partner Fujitsu Consulting Inc. to implement a wide range of Oracle E-Business Suite’s modules to allow the company to achieve an ERP solution that is capable of handling the supply chain management needs. Through the help of Fujitsu Consulting, Welch was able to implement Oracle’s Demantra Demand Management, Demantra Real-time Sales & Operations Planning, and Oracle SCM Applications which took just 16 weeks to go live. Fujitsu also helped them implement Oracle E-Business Suite that allowed Welch to streamline processes in 5 important areas of their business (Oracle Customer Snapshot, 2010):

1. Order to Cash  
2. Plan to Produce  
3. Procure to Pay  
4. Demand Generation  
5. Financial Management

Having the E-Business Suite ERP in place enabled Welch to have a centralized single source of information on production costs in addition to customer and product profitability. Thus, this allowed them to have the means to carry out more effective decision-making with regards to product offerings and campaigns that they must implement. E-Business Suites also enabled a centralized procurement system for allowing maintenance in various plants to optimize supplier relationships by using volume purchasing. Lastly, the ERP solution allowed the company to aggregate various views of demand and analyze those views to create a single consensus forecast. As a result of this initiative Welch was able to gain the following benefits from implementing Oracle’s ERP and SCM solution (Oracle Customer Snapshot, 2010):

- Reduced inventory through improved forecast accuracy; removed about US$8 – 10M of products from circulation to prevent losses and reduce costs for warehouse space
- Reduced number of sales to discount retailers by 60%; helping to decrease losses by approximately US$1.5M
- Decreased the quantity of “over-age” products on shelves which resulted in savings of about US$400K through the significant reduction in the need to dispose excess products are too old to meet the company’s quality/freshness standards
- Improved order fulfillment capabilities by attaining a 99.6% order fill rate score
- Efficiency improved as a result of decrease in the need to ship products between distribution sites for order fulfillment
- Conformed to various FDA tracking requirements for lots and sublots back to specific customers as Welch is now capable of collecting data for recalls within an hour
- Inventory accuracy increased to 99.916% and completed a comprehensive physical inventory of raw materials, supplies, ingredients and finished goods with minimal labor and work hours required (e.g. 15 people in 6 hours at largest production site)
- Improved planning and sales as well as operations processes by increasing the refresh of S&OP plans and financial outlook statements to monthly, instead of the previous capability of only 2 times/year; giving the company more opportunities to frequently evaluate and adjust its business plan
- Enabled employees to perform benefits and expenses claims online leading to the elimination of printed paystubs
AstraZeneca (mySAP SCM)

AstraZeneca is one of the top 5 pharmaceutical firms in the world right now. The company was formed in April 1999 from the merger of the Swedish pharmaceutical company Astra with the UK based company Zeneca. Its research and development unit is primarily based in Germany. Their site in Wedel, Germany is integrated in the AstraZeneca worldwide supply chain network and is responsible for packaging and distributing about 75% of all their products for the German-speaking market in Europe (SAP Case Study, 2005).

Manufacturing complexity in the pharmaceutical industry is increasing as a result of the continually increasing number of new medical product while on the other hand, batch sizes are on the decline. Pharmaceutical manufacturers are consequently focusing more on production costs and service levels. In 2003, the company’s objective was to improve their efficiency levels through production unit specialization and the implementation of SCM best practices. They decided to implement a “make to demand” based process approach in their packaging plants, meaning, their production will no longer be driven by medium-term forecasts but by daily sales requirements instead. (SAP Case Study, 2005)

Driven by their strategic goals to enhance delivery performance, achieve market-driven planning and consumption-based procurement, decrease lead time, as well as improve effectiveness and information exchange between sites in supply chain through supply chain transparency, AstraZeneca decided to integrate SAP Advanced Planning and Optimization (APO) and mySAP SCM into their existing SAP R/3 ERP implementation. The following changes were done to the Wedel facility’s supply chain system (SAP Case Study, 2005):

- A distributed control system based on bar codes was implemented to regulate the entire materials movement process, from staging at the production lines to delivery and storage in the high-rise warehouse. This process control system was also integrated with SAP R/3 and production planning via a bidirectional communication system.
- Implemented a dynamic, demand-based production planning system including simultaneous material and capacity planning as well as sequence optimization.
- Revision and consolidation of SAP R/3’s master data in a Good Manufacturing Practice based production environment. These data about customers, products, employees, materials, suppliers, etc. which are non-transactional in nature had to be modified to adapt to their demand-driven SCM approach.
- Modeled planning scenarios with the production planning and detailed scheduling functions of SAP APO while also reviewing various planning concepts related to the company’s new demand-driven SCM philosophy.
- Training and coaching was provided for staff involved in the project to better understand the new approach and to adapt to the change.

After 6 months of development in partnership with SAP’s consultants, AstraZeneca went live with their new ERP-SCM-APO package. The following improvements below were achieved (SAP Case Study, 2005):
Finally, the integrated ERP-SCM integrated process that the company achieved is illustrated in the succeeding diagram (SAP Case Study, 2005):

![Diagram](source)

Figure 5: SAP ERP-SCM Integrated Process (source: (SAP Study, 2005))
CONCLUSION

Enterprise Resource Planning (ERP) Systems as defined by the Aberdeen Group is a system with an integrated suite of modules that make up the operational and transactional system of record upon which a business is based upon. The main goal in the move from traditional management information systems to ERP solutions is to achieve a level of integration in the enterprise system where redundancies are eliminated, data is shared across different modules of the system, integrity of information is improved and aggregation of data across the enterprise is possible to come up with comprehensive reports needed by management for better decision making strategies. Supply Chain Management (SCM) is a “total systems approach to managing the entire flow of information, materials, and services from raw-material suppliers through factories and warehouses to the end customer” (Ruhi, 2011).

According to Gartner, ERP systems have a crucial role in centralizing transaction data. SCM systems on the other hand, are gaining importance as organizations attempt to respond faster to changing market conditions (Gartner Website, 2012). While ERP systems provide organizations with capabilities in planning, the different material, capacity, and demand constraints are not-integrated with one another. Adding SCM into an ERP solution enables an organization to integrate these various constraints and through the tools provided by the SCM system, they can better monitor, collaborate and make decisions based on the information collected by the system from their supply chain. All of this results in the organization being able to continuously improve their supply chain so that they can gain competitive advantage.

Thus, in conclusion, the group believes that the various components of the enterprise systems such as ERP, CRM, BI, SCM, etc. are individually beneficial when implemented. However, when used effectively in combination, these integrated enterprise systems can enable organizations to be more competitive than others who have not successfully done so. This is because once integrated, the organization has at their hands all the valuable information they need to make strategic decisions. Through their Business Intelligence and Decision Support Solutions, companies can aggregate and mine these data for management to come up with solutions that will improve their supply chain, satisfy their customers as well improve their overall process efficiency and effectiveness also. Lastly, with the advent of middleware technologies and the concept of Service-Oriented Architecture (SOA), now more than ever, it is easier to integrate these various systems together to come up with a complete enterprise system solution. Therefore, it can be expected that in the future, ERP and SCM systems will continue to work together to help organizations optimize their processes and better keep track of all their activities, transactions and inventory.
REFERENCES


