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REINFORCE CUSTOMER SATISFACTION THROUGH ENTERPRISE

RESOURCE PLANNING AND SUPPLY CHAIN

MANAGEMENT INTEGRATION

A Project Presented to the Faculty of California State University, San Bernardino

In Partial Fulfillment of the Requirements for the Degree Master of Business Administration

> by Yu-Hsiang Chen March 2007

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California State University,

San Bernardino

by

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March 2007

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ABSTRACT

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Today, most companies use packaged software for their important business tasks. Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) have become popular in many industries because they help companies improve their Information Systems (IS) which helps support their operational goals. New technology is being used in resource planning and e-commerce and a stable supply chain helps corporations integrate many basic applications.

The term 'ERP' originally referred to systems that were designed to utilize enterprise-wide resources. Although 'ERP' was initially used by manufacturers, today 'ERP systems' has a much broader meaning. When ERP is implemented in the SCM area, it helps enterprises automate and integrate functions such as order entry and inventory, purchases, product configuration, supply chain plans, and supplier schedules, etc. It also helps share information so SCM enables supply-chain partners to work closely together and it helps facilitate smooth supplier-customer interactions while minimizing transaction costs.

However, several problems still exist in supply chain such as poor coordination and uncertainty. High uncertainty results due to a bullwhip effect induced by customers, value-added processes that are unpredictable,

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poor performance by vendors, and a control system that uses incomplete, noisy, or out-of-date data. Under such circumstances, supply chains display unnatural behavior. This leads to performance which cannot be predicted.

In this project, we aim to provide a solution for such issues by establishing an ERP - SCM framework which will help improve client satisfaction. This project ends with a case study about a company that improves their supply chain by integrating IT with SCM. It also demonstrates the advantages of integrating ERP and SCM.

ACKNOWLEDGMENTS

Let me take this opportunity of thanking everybody who helped me in finishing the project. Firstly Dr Lin must be thanked for giving me an opportunity to learn more about a subject I am interested in. There was a lot I learned when I took classes under Dr. Lin and that's the reason for asking him to be my committee chair for this assignment of my graduation. Secondly, Dr. Dyck must be thanked as the second reader for the project. In the SCM arena he excels as a professor. He further advised me when the matter was pertaining to SCM. Thirdly, Dr. Walter Stewart must be thanked for helping in my work in his capacity as department chair, Lastly, I must say thank you to my friend Shradha Merchant. All the spelling and grammatical errors were corrected by her and the project could not have been completed without all the help I received.

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CHAPTER ONE

INTRODUCTION

Supply Chain Management (SCM) has become one of the most important business processes which help companies save costs, re-engineer, and enhance their revenue strategies. A good supply chain can save many millions of dollars, while improving services and reducing inventories. A stable supply chain can be implemented successfully to develop products and design them. Enterprise Resources Planning (ERP) help large companies automate and integrate their functions like inventory control, distribution, finance, procurement, and project management.

Recently, many companies are looking to find replacements for their existing applications which run on outdated mainframes. As a result, they cannot meet their growing needs. ERP systems are one solution because it provides a means to manage integration across business functions (Mabert et al., 2000). SCM helps supply-chain partners to work in close collaboration by helping share information. This results in smooth supplier-customer interactions and it also helps minimize transaction cost (Lawrence, 1999; Premkumar, 2000; Lee & Whang, 2000). This

is how demand will increase for better supply-chain efficiencies as more and more large businesses implement SCM.

The global market keeps introducing greater complexities in both external and internal supply chains. Therefore, competition and the benefits of advancing technology will increase the use of SCM.

Uncertainty is the main problem with supply chain. As a result, sales meander from forecasts, components become defectives during distribution, and shipping are delayed by customs. In reality, executing plans smoothly is as dependable as rolling a dice.

To improve performances, companies need to work towards a seamless supply chain. A seamless supply chain is attained with smoothly flowing information plus material flow. This happens when supply chain users think and take action as one. Therefore, companies have to integrate their ERP applications through their SCM software. With the integration, it will result in the increase of efficiency through the whole supply chain and then a seamless flow of information will be formed. Finally, ERP functions as the integrated planning and control system and then becomes a critical section in the supply chain.

Today, more and more organizations have realized that internal efficiency is important but not enough by itself. Its benefit is limited unless it is complemented by an efficient supply chain. Also, enterprises have understood that for succeeding in a competitive market which uses cutting-edge technology, smooth flow of real-time information through entire supply chain is very important. This project is trying to provide a way in which to implement ERP systems properly into SCM. It should result in improved business performance.

Problem Definition

"The more uncertainty related to a process, the more waste there will be in the process" (Persson, 1995).

Supply chain uncertainty refers to indecisive decision makers who do not know for sure what he needs to decide for the clear goals, lacks information about realizing the circumstances of the supply chain, lacks information about the capacities of the process, and has non-controllability or cannot precisely foresee the results after taking actions on supply chain activities. In general, process uncertainty, supply uncertainty, demand uncertainty and control uncertainty are the four types of supply chain uncertainties.

<u>Process Uncertainty</u> - It impacts a company's ability to meet their targets. By estimating each work's process yield ratios and operations lead time, we can measure the amount of process uncertainty more easily.

<u>Supply Uncertainty</u> - It results from suppliers that perform poorly and don't meet their company's requirements. This hampers value-added processes. Factors that affect supply uncertainty are various, such as, time series of orders placed or call-offs and deliveries from customers, supplier delivery performance, actual lead time, raw material stock time series supplier quality reports etc.

- <u>Demand Uncertainty</u> It is the difference between the orders which placed by clients and the real demand of the marketplace. It also can be measured by looking at how well enterprises meet their customer's demand.
- <u>Control Uncertainty</u> It is affected by information flow and impacted by the way a company translates orders into targets and requests for raw material from their suppliers. Furthermore, it also can be calculated by comparing the requirements of the customers, what are production targets over the same periods of time and the requests for delivering by suppliers.

The Purpose of the Project

The purpose of this project is to try and establish a blueprint for integrating ERP and SCM. At the end of the project, a case study is presented for a real enterprise that implements ERP and SCM integration successfully, it will help us to know the improvement of the business performance through integration.

Limitations of the Project

There are only 2 limitations of this project inability to change with fluctuating supply chain demands and IT cannot increase the effectiveness of supply chain performance unless organizational processes and structures are also redesigned. On the flip side, process reengineering depends on Information Technology to increase the performance of supply chain.

The Term of the Project

The term 'Supply Chain Management' was invented in 1982 by Keith Oliver, who worked for a strategy consulting firm called Booz Allen Hamilton.

CHAPTER TWO

SUPPLY CHAIN MANAGEMENT

The Concept of Supply Chain Management

Supply Chain Management (SCM) involves controlling, planning, and implementing the supply chain in order to meet customer requirements more efficiently. Supply Chain Management covers moving and storing raw materials, taking an inventory of finished goods work-in-process right from the origin to the consumption.

The CSCMP is a professional association that developed a definition of SCM in 2004. According to them, SCM involves managing and planning all activities that including conversion, sourcing, procuring and all management activities. It also involves coordinating and collaborating with distributors like suppliers, retailers, service providers, intermediaries and customers. Briefly, Supply Chain Management involves integrating demand and supply through entire organizations.

Basically, SCM has five components -

 <u>Plan</u> - the over-all SCM strategy. This includes developing SCM metrics, which is a strategic part of SCM. You need have a strategy in place to manage resources that help meet customer demand

for your service or product. An important part of the plan is to develop a set of metrics that help keep tabs on the supply chain for efficiency, cost efficiency, and great value and best quality for all customers.

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- 2. <u>Source</u> suppliers who provide the products and services necessary to run your business. Develop processes for pricing, delivering, paying, inventorying goods and services, receiving and verifying shipments, shipping them to the factories and authorizing payments which from supplier. Finally, create metrics for evaluating and improving the relationships between the enterprises and the suppliers.
- 3. <u>Manufacture</u> Processes required for creating, testing, and packaging your products or services. We need to create the necessary steps for producing, packaging, testing and preparing for delivery. This is the most metric-intensive portion of the supply chain where you should consider products or services quality, manufacturing, finished goods, and the productivity of workers.

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- 4. <u>Delivery</u> This is the system for evaluating a network of inventory, receiving orders from clients, transferring the products to the clients, sending receipt to clients and collecting payment from clients.
- 5. <u>Return</u> Process customer returns and/or provides support for customers who face problems with the products or service they have purchased.

Recently, SCM offers cheaper logistical solutions for enterprises which have supply chain problems. The supply chain involves the whole manufacturing process of all products or services. It starts with supplier processes, producing processes, raw materials, distribution of the product and evaluation of post production. The concept of SCM is based on two ideas - first, we have to know that most of the products that receiving by customers is the result of collaborative efforts of many different enterprises or companies. All these enterprises and companies can be considered a part of the supply chain. Secondly, although supply chains have last for a long time, almost every enterprises only tried to manage activities with '4 walls.' Due to lack understanding of the enterprises or handling the series of activities that

transmitted goods to their end-user, and then disjointed and non-effective supply chains happened.

Therefore, SCM involves managing the activates of a supply chain which increases customer value to the fullest and helps achieve an advantage for the enterprise that is competitive and sustainable in the long run. For most of the supply chain companies, it is a continuously effort for them to find a way that can evaluate and support supply chains more effectively.

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Table 1. Summary of Key Operations and Supply Chain

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Activities

Operations & Supply Chain Activities	Purpose	Key Inter-functional Participants	Key Inter-organizational Participants
Process Selection	Design and implement the transformation processes that best meet the needs of the customer and firm.	Engineering Marketing Finance Human Resources IT	Customers
Forecasting	Develop the planning numbers needed for effective decision making	Marketing Finance Accounting	Suppliers Customers
Capacity Planning	Establish strategic capacity levels ("bricks & mortar") and tactical capacity levels (workforce, inventory levels).	Finance Accounting Marketing Human Resources	Suppliers Customers
Inventory Management	Manage the amount and placement of inventory within the company and the supply chain.	IT Finance	Suppliers Customers
Planning & Control	Schedule and manage the flow of work through an organization and the supply chain; Match up customer demand to supply chain activities.	Marketing IT Suppliers	Suppliers Customers
Purchasing	Identify & qualify suppliers of goods & services; Manage the ongoing buyer-suppliers relationships.	Engineering Finance Marketing	Suppliers
Logistics	Manage the movement of physical goods throughout the supply chain	Marketing Engineering	Suppliers Customers
Recovery & Recycling	"Close the loop" by recovering and recycling used products and material.	Engineering	Suppliers Customers

Adopted from Bozarth & Handfield, Chapter 1 (2/7/03)

Supply chain activities covers product development, sourcing, production, logistics and the information systems needed to integrate these activities. An enterprise needs to create their own supply chain by information flows and physical flows.

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<u>Information Flows</u> - "Allows all the supply chain stakeholders to coordinate their long-term plans and control the daily flow of goods and material through the supply chain" (Cecil Bozarth, Introduction to Operations and Supply Chain Management).

Supply chain management is customer-driven - it must respond efficiently to meet customer requirements precisely and quickly without any defects and waste. Supply chains collapse in real life because they fail to accurately gauge customer demands or translate those demands effectively throughout the supply chain.

<u>Physical Flows</u> - "This includes the transformation, movement, and storage of goods and materials, and this is the most visible part of the supply chain, but just as important are information flows" (Cecil Bozarth, Introduction to Operations and Supply Chain Management).



The Goals of Supply Chain Management The aim of a supply chain is to deliver high end user value with least cost to the supply chain as a whole (Christopher, 1998).

First of all, the main goal of SCM is to maximize the value to customers and the businesses themselves by improving effectiveness through entire supply chain and providing the required level of services at the lowest total cost. Thus it can provide better products or services to their target client. To fulfill this goal, the enterprise should be more flexible about the product line, lead-time, process stability, response when volume is changed and shipment.

- Secondly, maximizing the efficiency of the supply chain is another goal for SCM. In order to meet this goal, "the enterprise should be lean about price, productivity, inventory, utility of assets,

and transaction costs" (Arbnor and Bjerke, 1997). Optimal performance of a supply chain is achieved due to a combination of effectiveness (flexibility) and efficiency (lean) of the supply chain processes.

Supply chains exist for the purpose of connection, transaction, and delivery (kuei and Madu, 2001). With materials flowing downstream from suppliers, manufacturers, warehouses, and stores to customers and information flowing in both directions, a set of networked organizations need to work together to minimize the entire supply chain's system-wide costs, reduce lead time and transit time, improve system-wide quality and operational efficiency, and improve customer service levels. The ultimate goal of such a supply chain is customer satisfaction.

The Development of Supply Chain Management In the past four or five decades, structures and functional areas have changed significantly within organizations.

- In the late 1950s and early 1960s, scholars began to deal specifically with operations management as opposed to industrial engineering or operations research. These scholars noted the commonality of problems faced by all production systems and emphasized the importance of viewing production operation as a system. They also stressed the useful application of waiting-line theory, simulation, and linear programming, which are now standard topics in the SCM field.
- In the 1980s, the evolution in the technologies and management concepts lead to a new development of the manufacturing. Just-in-time (JIT) production was the main part in manufacturing field. JIT - coupled with total quality control (TQC), which trying to reduce defects during manufacturing - is also a part in many manufacturers' production practices.
- In the late 1980s and 1990s, another major development was the focus on total quality management (TQM). The ISO 9000 certification standards which created by the International Organization for Standardization, now plays a

major role in setting quality standards for global manufacturers.

Today, the central idea of SCM is to apply a total system approach to managing the flow of information, materials, and services from raw material suppliers through factories and warehouses to the end customer (Richard B. Chase, 2003). Recently, trends like mass production and outsourcing are forcing enterprises to find flexible ways to meet customer needs. The focus is on optimizing core activities to maximize the response speed to changes in customer expectations.

	Phase 1: Functional or Departmental	Phase 2: Integrated	Phase 3: Value Networked
Supply Chain Planning	 Done in functional silos Ineffective due to limited information visibility and standardization across the enterprise 	 Shift to a business process focus Increase in effectiveness due to standardization of information across the enterprise Integrated supply chain planning: demand forecasting, planning & scheduling 	 Collaborative planning Extension of the planning process beyond the enterprise to include contract manufacturers, key customers and suppliers
Supply Chain Execution	 Silo-bases execution- often in a reactive mode Decisions often made by functional managers and key associates 	 Integrated cross-functional decisions, still primarily in a reactive mode Limited collaboration 	 Decisions taken at the most appropriate level in the organization Greater proportion of collaborative, pre-emptive decisions

Table 2. Phased Evolution of Supply Chain Management

Source: Maha Muzumdar and Narayan Balachandran, The Supply Chain Evolution.

The Function of Supply Chain Management

SCM is a cross-functional approach that helps enterprises transport raw materials into their factories or warehouses and distribute products to their clients. SCM involves customer needs and production plan as well as business-to-business relationship. Enterprises have to realize that designing the supply chain is very important because random decisions and uncertainty creates chaos in the complex shipping network. SCM offers a quick response and flexible way to protect the demand from uncertainty. Supply chain management can synchronize the entire supply chain which, in turn, helps a company integrate internal processes. Thus, not only every business function in the enterprise can be operated smoothly and simultaneously with each other, but also SCM allows the processes integration between a single company and its business partners. Therefore, once an enterprise joins a part in a supply chain network, productivity and process efficiency of the company are the key factors to success as well as its business partners.

In today's faster-paced environment, markets are becoming more competitive and customer-driven. Customers are demanding the right product in the right place at the right time and at the right prices (Fisher et al., 2000). Recently, supply chain management has been recognized as one of the most important ways for achieving sustainable competitive advantage. When the SCM is implemented properly, an integrative supply chain system that consists of various firms, functions, and technologies can result in substantial improvements in customer service, product quality, environment safety, and shareholder wealth.

The Cost of Supply Chain Management

Important parts of SCM are logistics and product distribution. However, the big payoffs lie in optimization of demand forecasting, management of suppliers, and development of products. Every company owns several types of the supply chain, but the main purpose of SCM is the idea of maximum efficiency. These ideas get help from new types of software which can optimize enterprise's business process and use the Internet as tool to communicate each other. In fact, the whole idea has become popular recently because senior management is beginning to realize the important role that supply management plays in increasing profits.

SCM costs, including services and products, have become almost 75% of the budget of a typical manufacturing company now. There is a study by A.T. Kearney shows that inefficiencies in supply chains can add almost 25% to a firm's operating costs. Most enterprises have 3% to 4% profit margins, so the efficiencies of the supply chain can easily doubled when even moderate 5% improvements in enterprise's profit margins. Another study by the University of Michigan points out that less than 50% of American enterprises go through conventional "purchase to sell" relationship in their supply chain practices.

A single model of optimum SCM is lacking and requirements differ according to the size of enterprises and real market. The concept of a supply chain optimization and its constituents is changing continuously and quickly. There are still a lot of good enterprises in the very beginning stages of SCM because of the inter-organizational politic, lack of focus, and corporate fragmentation.

CHAPTER THREE ENTERPRISE RESOURCE PLANNING

The Concept of Enterprise Resource Planning Enterprise Resource Planning (ERP) refers to configurable information systems packages integrating information and information-based processes across the business functions of a company. ERP is a 'software solution that addresses the enterprise needs taking the process view of the organization, to meet the organizational goals tightly integrating all functions of an enterprise' (Kumar & Van Hillegersberg, 2000).

In this sense, ERP is a term of industry referring to that the multi-module application software supported the business activities. This helps an enterprise or other types of businesses to manage the critical facets of its operations and logistics like goods designing, materials ordering, associating with supplier, maintaining inventories, tracking orders, and providing customer service. ERP has several application modules for such as human resources or other departments of an enterprise as well. Generally, an ERP system is a relational database system that integrates with the enterprise and its users. Implementing an ERP system involves analysis the

procedures, training the employees, and establishing suitable working process etc. Furthermore, ERP helps integrate information systems within an organization with the potential to cover all enterprise.



Figure 2. Enterprise Resource Planning Components

The Aim of Enterprise Resource Planning The objective of ERP is to create an information system that integrates all the business functions or departments with a center computer system trying to satisfy different needs across entire organization. Naturally, it will require extensive software which can help integrating the different functions of the separate units and departments like operations, human resources,

finance, accounting, and marketing. Before the idea of ERP was implemented, all departments or business functions performed like fragmented islands using its own computers and each capable of achieving its own department goals. Thus, optimizing a department was often the outlay to the enterprise integration objectives. Therefore ERP system trying to help an enterprise attain the entire company optimization levels rather than optimizing individual departments. Through an integrated approach like this, different units shares and exchanges information, and aim for similar enterprise objectives. By implementing ERP, all business functions will integrate properly with each other and each unit understands and appreciates the contributions made by other departments towards their company's objectives.

The History of Enterprise Resource Planning

The origins of ERP can be looked back to J.I. Case, the manufacturer of tractors and construction machinery, and IBM in the 1960s. In the beginning, ERP was focus on evaluating software that helped planned and schedule materials for complicated manufacturing goods.

- In the 1960's, software was developed and focus on how to manage the inventory and warehouse more

efficiently since it assumed prime importance. These were handled by tools called Bill of Materials or BOM processors.

- In the 1970's, because of the increasing manufacturing complexity of the operation, the focus shifted to Material Requirement Planning or MRP. Such tool continued to evolve and more functionality was added to meet the increasing demand.
- During 1980's, the idea of Manufacturing Resources planning or MRP II took shape and grew in importance. This was a development of MRP that planning to acquire the materials for manufacturing more efficiently through the computerize system.
- In the early 1990's, due to the complexity of the business is increasing and the need for integrating all departments or business units across a company, enterprises started to develop Enterprise Resource Planning or ERP tools in order to meet the increasing needs.

ERP is an extension of MRP II. It covers a range of activities across every company (Figure 3). It also covers technological parts such as RDBMS, client and server

architecture, object oriented programming (OOP), etc. By 1989, sales of MRP implementation support and software exceeded one billion dollars in USA, following the American Production and Inventory Control Society or APICS' `MRP Crusade.' On the other hand, global sales of ERP packages with implementation support exceeded fifteen billion dollars the year 2000 with growth rates of more than 30% per annum. By 2004, ERP is estimated to become a 10 billion dollar industry, in spite of the IT spending slowdown. Recently, a Fortune magazine survey showed that globally, 7 of 10 pharmaceutical and petroleum companies, 9 of 10 ten computer companies, and all top 10 chemical companies use SAP's R/3.


Systems

The major vendors of ERP system include such as PeopleSoft, SAP, Baan, Oracle, and JD Edward. They supply standard business processes for management and their packaged ERP applications help improve business performance (Mabert et al., 2000). Earlier, the performance of the ERP industry was not up to the mark. According to a survey, when savings and gains were balanced against the amount spent for ERP software, consulting help hardware, and support, it resulted in an average negative value of 1.5 million dollars (Stedman,

1999). As the ERP implementation range became broader, implementing an ERP system became costlier than before. To solve this problem, ERP vendors began to offer packaged ERP solutions instead of custom ERP implementation to meet the different requirements of companies with varying sizes. These packaged product offerings are basically component-based solutions and therefore they lack the width of ERP implementation. Such packages systems provide a modular approach that allowing rapid, distribution customization and low costs installation. This benefited even medium-sized or small-sized organizations that can take advantage of ERP systems which were earlier confined to larger enterprises before.

Purpose of Enterprise Resource Planning

Bringing together different sections of a company through single system application package is the main aim of ERP. There are various uses of the data that is run by an ERP system.

 For instance, the information within the system enables added efficacy in decision making by the executives and staff in accounting, finance, customer service, and production.

- The system provides a common platform for different sections in an organization for purposes of correspondence and exchanging ideas.
- The capacity of the system to impart info in the present day business scenario makes it a valued instrument. In fact, the statistics needed by various sections of the organization is made available by the ERP that makes the flow of data the central system. Thus, the know-how of making use of that info would be the means to triumph over competition.
- But towards achieving outstanding results the central system needs all the constituents functioning together, essentially because the idea is yet to be mastered. Moreover, Palaniswamy and Frank (2000) understood that on the normal ERP systems a crucial aspect for success is the enhanced union of the cross-functionality.
- In business the usages of the data handled by the ERP systems can be varied.
 - o For instance, note the basic task of ERP.Consequent to a demand placed by a customer,the relevant information logged in by the

salesperson in the computer is made available to the whole organization.

- The catalog of supplies and parts would be routinely updated by the system as required, sometimes even globally.
- The amendments made include variations in balance sheets and production schedule.
- o What is most resourceful is that none of the workers in any of the sections need to be waiting for that crucial data that is required to complete their works.

Moreover, there is a quicker response. While the date of delivery is notified by the salesperson, the outcomes of inventory, financial or the SCM assessments are instantaneously obtained by the supervisors.

Mitigating Reasons for Enterprise Resource Planning Costs

Just cost cannot justify ERP just like no new technology can be justified. The noteworthy gains of a fully implemented ERP based system may be incomprehensible due to putting too much emphasis on the initial capital requirement. Additionally, due to focusing on traditional cost accounting systems to justify new technology like the ERP, this is because some of the benefits might not be

tangible. But they might be necessary for the company to survive and compete. However the cost factor must not be disregarded. Any business decision making would regard it as an essential element and consider it carefully. Though, besides the element of cost, some other crucial indefinable essentials need to be emphasized. Let me identify some of these factors that might support the need to put into operation a system that is ERP based.

Information that is coordinated - A lot of information is collection so that quality decision can be made by various businesses. If there is no common database system the functional departments or business units in a company become akin to isolated pools of information that can be found throughout the firm. The decision making procedure is made more difficult because of an inability to synchronize the information. This is because the various units within the company might be operating in different premises. The actions and specific decisions of the company are a lot steadier and more predictable when, in the company all information is commonly shared and integrated. ERP assists in integrated information that can be used for a proficient decision making.

- <u>Customer Service</u> There are many fronts on which firms enter into competition with each other, and of them customer service is extremely important. As communication and information technology is increasingly technology, customers want information as soon as it is required. They have to be able to connect to the internet and get all the information needed from the enterprise's website. At this juncture, thanks to the ERP system information is better managed and organized and the customer is given information at super speed. Customer loyalty can be lost and dissatisfaction can grow if there is any deviation from this.
 - <u>Quality Data</u> The standard of information is extremely important. Customers and firms have to make decisions that are based on quality data. Customers and firms can take decisions that are not only well informed, but suitable if the management information system is coordinated. Therefore, quality decision making is enhanced, the data keeping quality is improved and redundancies are done away with, if ERP is properly used.

<u>Operations streamlined</u> - With ERP, in order to make the enterprise more proficient a number of services and operations have to be updated. One can easily automate customer services and information. That is what many enterprises are doing. Productivity can thus be increased and organizations might even be able to generate more income.

- <u>Competitiveness</u> The modern business atmosphere is extremely vibrant and aggressive. There is a need for businesses to be more responsive, supple and be able to implement forceful changes in the surroundings.
 - Efficiency Enterprises must be extremely capable in order to still remain competitive. Inventory is one of the principal costs of operation. If the inventory is badly managed, it might even result in the company dying out. Possibly that is why Kmart is Bankruptcy protected but Wal-Mart, its rival, is continuing to expand. An effective management of the supply chain and a complex link of suppliers are an asset in reducing the inventory cost. This in turn can be diverted to customers. If the inventory is professional,

timely practices can be put into effect. Thus customers have their orders just when they need them and at the scheduled dates.

Software Prerequisites

The software designing and execution for ERP has been around specific prerequisites. Given below are basic aims.

- <u>Illustrating comprehensive and universal course of</u> <u>logistics at specific points</u>. In other words, though the production activity for each nodule is not shown, the supply and demand source is linked through the network.
- <u>Sustaining unstable and decentralized models of</u> <u>organizations</u>. From the external supply to subcontracting, to supporting in a virtual venture, the system supports a case-by-case description of the relationship between the nodules, without relying up on a chartered network scheme. It helps it to be general and commercially usable.
- Permitting measurable as well as flexible network patterns. New nodules are permitted to be introduced by the system. Each of those nodules is then supported towards readjusting its functions

towards network. It could be about making available new resources to cooperative manufacturing or reacting to changes within the network group.

- <u>Supporting operational and strategic level</u> <u>decision-making</u>. This would mean, selecting potential associates in accordance to their abilities and past performances, planning the respective activity and material flow set off by incoming orders, and replacing failing or delayed nodules in an active flow.
- Undertaking and synchronizing several decisional processes. Each node in the system is assigned a responsibility according to its role in the manufacturing network. The system maintains distributed decision making schemes that resolve potential conflicts and integrate each of the decision thread in consistent and transparent manners.
- <u>Integrating as well as distributing appropriate</u> <u>data across the network</u>. The supply-related data in each node is harmonized and integrated into generalized data model. Then, in accordance with the transparency rules and decision making scheme

within the network group model it is made available to the other nodes.

Integrating without overlapping with ERP and other internal-logistics management tools. Confinement of node autonomy due to system interference with a node production planning mechanism would mean limitation to the network survival and extension. Thus there is a provision of local logistics management functions for proper integration instead.

Our trust in incorporating regular implements helps avoiding duplication of functionalities and misuse of assets. Commercial tools for messaging, data interchange and process automation form the basis of communication and workflow infrastructure being compliant with standard network protocols and common operating systems.

Competences and Mechanisms of the Software

Keeping in mind the aims to be achieved, the subsequent software constituents have been used in order to provide a sophisticated IT infrastructure.

- An infrastructure enabling the flow of fundamental information exchange and message services.

Advanced functionality is achieved by configuring the info that is now easily available.

- Making a high level network model over this level helps in -
 - Consistent illustration of the network from the aspect of the node to be provided for and updated
 - Describing a liability structure and network
 physical layout
 - Adjusting the view of the node power to make
 decisions regarding the network-level changes
- Interaction with nodes in the network model is monitored by the active flows control (AFC) component:
 - It helps in maintaining updated data on active logistics flows;
 - o relevant messages and events from and to the decisions-support components get dispatched
 - o Negotiations with other nodes get sustained
- Acting in parallel with the AFC is the performance measurement system (PMS)
 - o Network activities are kept recorded
 - o Important performance meters are calculated

Diverse network roles and views are provided

several performance gauges



Nodes

0

- The input and output flow management have a decision-support system (DSS) each in order that:
 - o The external and internal demands are
 processed

- o In accordance with the policy and node role, flow planning based on AFC and PMS is permitted
- Negotiation messages and exceptions from other nodes are reacted to.
- Transparent interaction with the local production management of the node bordering with enterprise resource planning.
 - The network model is supplied with the inventory data and cumulative capacity
 - o The status info and needs are exchanged with the DSS
 - Traceability is maintained between outgoing and incoming flows.

CHAPTER FOUR

ENTERPRISE RESOURCE PLANNING AND SUPPLY CHAIN MANAGEMENT INTEGRATION

The Reason for Integration

Conventionally SCM did not use ERP tools and as a result the information that moved between the different members of the supply chain was not fast all. The reason for this is - till late into the 1990s the various set-ups concentrated only on improving the inter-organizational efficiency. Hence the ERP Systems provided support to such functions and there were dissimilar systems across the supply chains. Despite the importance of internal efficiency, organizations became conscious of the fact that there would be limited benefits unless efficiency across the supply chain harmonized. There was a further awareness that smooth flowing actual information was an important means of succeeding in the market set-up that emerged. It was typified by very rapid progress in technology, a less lengthy life cycle product etc. Hence SCM software began to be integrated with ERP applications. This made sure that across the supply chain matters were efficient and the information flowed smoothly. ERP is becoming an

important connection in this set-up because it acts as the control system as well as integrated planning. Additionally, the manner in which business is transacted has been revolutionized by web based technologies and ERP and Supply Chain Management are nothing out of the way. So that this novel technology can garner benefits work is going on to web enable ERP Systems. Thanks to the internet back to end systems, the ERP are being linked and connected to a number of outside groups are being made possible. The gain is that customers can directly access the ERP System of the supplier. As a result customers can go online and not only figure out their own products, but also get information on the price. Thus, almost instantly he knows whether that configured goods are available or not. It is feasible because the requirement that the customer has made can access directly the supplier's ERP System.

To summarize, effective SCM can be aided by ERP applications in the following manner:

- <u>Real-time information</u>: Real-time information can be provided by ERP Systems which is very helpful in supply chain decisions. On the basis of the inventory details provided by the ERP systems raw materials can be ordered.

- <u>Share-data</u>: Share data can be created through supply chain players. This is an asset for managers to decide better. Further, managers of supply chains can be given a wider scope by providing them with broader information.

Correlation between Supply Chain Management and Enterprise Resource Planning

A number of SCM applications depend on the type of information that ERP software stores. All the information that is required could in theory be put together so that the SCM applications can be fed from legacy systems (for a lot of organizations this would mean spreading out spread sheets all over!) However, availing the information can be a nightmare if one wants it fast and reliably from the different areas of the organization. ERP forcibly puts together all the derived information in one single application. As a result of having major source to approach for updated information, SCM applications greatly profit. But ERP is tough and costly and it might be a good idea to find different means of providing the SCM applications with the needed information without primarily doing an ERP. Presently SCM modules are with almost all ERP sellers. Thus conducting an ERP project might well be nothing but killing two birds with one stone. Whether or

not the products meet their needs will have to be decided by the companies. They might need to think about whether a more specialized system is needed. Since collecting information across the enterprise is not as dependent on applications that merely automate the logistics aspects of SCM. Thus they have a tendency to be independent of the ERP decision. However, there are fair chances that these applications will have to be used to communicate with the ERP in some way or the other. One has to be attentive to the software's capacity of integrating the ERP applications with the internet. This is because the demand for integrated information will be driven by the internet.

Difference between Supply Chain Management and Enterprise Resource Planning

The underlying dissimilarity between the SCM and ERP systems has been intensely debated. Once of the reasons is that greater SCM functionality is being added by the ERP vendors. At the same time the functionality of the SCM vendors is also being expanded - in other words poaching on the territory handled by the ERP vendors.

Table 3. Enterprise Resource Planning versus Supply Chain Management

Point of comparison	ERP	SCM
Comprehensive	Yes, covers many more areas than SCM	Relatively less
Complexity	Highly complex	Relatively less complex
Sourcing tables	Relatively static	Dynamic
Handling of constraints	In a ERP system, all the demand, capacity and material constrains are considered in isolation of each other	Simultaneous handling of the constraints
Functionality	Relatively less dynamic as they are mainly concerned with transaction processing and have more number of jobs to do	Can perform simulations of adjustments with regard to the constraints dynamically in real-time
Speed of processing requests	Relatively slower	Faster

Source: CVOC, http://projects.bus.lsu.edu/independent_study/ vdhing1/erp/

As an increasing amount of functionality is being added by vendors of the SCM and ERP systems the differences between them have become indistinct. To take as an example optimization and advances planning are being introduced by important ERP vendors (this also constitutes a part of SCM) as part of their system. In the table that

follows, the main differences between SCM and ERP systems are available at present.

Table 4. Difference between Supply Chain Management Systems and Enterprise Resource Planning Systems

	SCM systems	ERP systems
Objective	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	Integrating and optimizing internal business processes within the boundary of a single organization
Focus	Optimizing information flow, physical distribution flow, and cash flow over the entire supply chain	Optimizing information flow and physical distribution flow within a single organization
Goal	Constraint-based tool providing reasonable and feasible business plans based on the availability of the required key resources	Non-constraint-based tools providing business plans without the consideration of the key resources
Function	Manufacturing management, inventory management, logistics management, and supply-chain planning	Manufacturing management, financial management, and human resource management

Source: J. Michael Tarn, David C. Yen and, Marcus Beaumont, Exploring the rationales for ERP and SCM integration

Supply Chain Management-Enterprise Resource Planning Linkage of System

It is by linking the SCM and ERP systems that the supply chain is integrated. This is done in order that the strengths of both - the SCM and the ERP systems can be capitalized. To the end, middleware interface software that is sophisticated is used. It enables data and processes to be shared. Thus, between the SCM and the ERP, the industrial trend that exists is nothing but that the supply chain capabilities are integrated with the ERP Systems. In the very near future, it will continue to be improved. One of the principal causes is that one of the most important organizational aims will continue to be the cross enterprise integration. This is particularly applicable to those who depend on the success of their supply chain for their success in business. The SCM is successful in creating a dominant and vital business success. This is the result of a demand for fast cycle-time-to-market as well as the shifting channel power and other such market forces. As a result companies come to depend on SCM as novel sources of competitive advantage. One sees the emergence of a new market thanks to the SCM modules being integrated into the ERP systems that are existent. The sales of a great number of ERP vendors could be enhanced by benefiting from the SCM software systems which in turn could be supplemented to the value of the packages that exist. In order to display to customers the possible way to use the new developed systems, processes become much easier thank to fresh business practices like SCM and JIT taking shape. PeopleSoft and SAP are important EPR providers. They have

invested largely in the supply chain management software field. SAP follows an exceptional policy. It allows considerable control to be exerted over the functions of the ERP Systems by the customers. At SAP the SCM system is almost the same. Towards the beginning SAP tried to enter into a partnership with I2 about how to integrate or design package software to the existing SAP systems. SAP has however developed their own system which is less expensive and works more efficiently than principal SCM vendors like I2 or Manugistics. There is a profit because when other business systems are linked by supply chain applications cycle time can be whittled down by users, a better connection established with suppliers, end customers and distributors and the inventory reduced (Stein, 1998b). Organizations are in a position to directly link their ERP systems in a cross-enterprise application integration. This is done directly to their customers' disparate applications.

CHAPTER FIVE

ENTERPRISE RESOURCE PLANNING PROPOSAL

Implementation of Enterprise Resource Planning One manages and coordinates information through system wide application software known as ERP. This is done amongst the suppliers and different business units of an organisation. Employees are authorised to make improved decisions and with the help of ERP the planning is more effective, certain resources and information are optimized. Large organizations are increasingly using the ERP as integrated software. That taking dependable decisions by making use of information is important is being increasingly realised by companies. Instead of different units or departments maintaining separate databases, the customer can more easily access the information which has been centralized and organized. The top management has to make the tactical decision to adopt ERP. By synchronising all the internal business units and coordinating the multiple units, the organization is more effectively run by ERP - thereby sharing common information. Along with a demand on organisational change, the capital investment that is needed for ERP could easily spiral up to millions of dollars. A tendency to reform the

legacy system and reengineer the total corporate culture might happen with ERP in order for its adoption. It would not be possible to implement ERP without the top management's support and commitment as a mark of the possibilities of a massive organizational change.





Figure 5. Contingency Framework for Enterprise Resource Planning Implementation Approach

ERP technology has a problem which is the deficiency of industry standards. So to truly integrate particular third party products with the ERP system might be fairly difficult. Even more important, for a more effective working of the ERP system the data base of the company has to be integrated with those of the principal suppliers.

Therefore, a holistic angle on ERP decisions should be taken. This ought to try and understand the whole of the supply chain network as well as the supplier. One should evaluate an ERP vendor on their being able to integrate various information sources from the multiple legacy systems which the members of the supply chain network share. This should be done at an even-handed cost without largely disrupting the work process and work flow. SAP software will be used for this project and to implement ERP. In the next chapter I will show a case study of a successful company using SAP software to integrate their SCM and ERP.



Figure 6. Enterprise Resource Planning Teaching Case

Integrating Components of Enterprise Resource Planning

Integrating, coordinating, and standardizing are the chief roles of ERP in most organizations. Organizations become competitive when these tasks are performed satisfactorily. The system integrates all the existing functional silos of the organization into a single database system. For instance, the sales, accounting, and finance departments of an organization will simultaneously maintain different versions of a given sales data. In larger firms with varied business components or operations spanning various countries, it gets even more complex. ERP helps in creating a common catalog system for assessing by various components of the organization. There is an elimination of the necessity to reconcile financial reports from various units during financial reporting despite maintaining accurate financial reports and records. ERP also helps in attaining process standardization. The data can be shared henceforth and method of operating standardized for organizations with multiple operations in various locations, while extending the same to incorporate the suppliers. Improved reaction rate to the markets and the enhanced productivity are the possible effects. Human resource management also benefits

from ERP. The employees' agenda and time being better matched and managed. The benefits, vacations and time of individual employees can be tracked on their own.

ERP is an efficient instrument for planning resources. It optimizes resources while reducing wastes. It also helps in limiting repetition of tasks and other liabilities through the integration of various functions. The process of maintaining and processing data will be standardized. Data retrieval needed for decision making is improved while redundancy is controlled. IT has added well to ERP. A common database system warehousing all the needed data links various business components and facilities in the organization. There is a tremendous improvement in the consistency and quality of information as there is in the reliability and prudence of decision making. The accessibility to a common database of information helps all the units in the organization benefit from the consistent decisions.

Costs reduce considerably when the functional units are integrated. When duplication of activities and tasks is stopped, productivity increases, there is a better retrieval of consistent information and faster decisions. And when quality info is retrieved timely, the organization responds better to the changes around it. The

vast gains through ERP can be attained only controlling costs. The firm can face financial drain if ERP is not executed correctly.

Modeling Enterprise Resource Planning Requirements

Business processes like manufacturing, distribution and purchasing are implements of the ERP system. Hence, Business Process Re-engineering and ERP implementation are strongly linked. As regards ERP implementation an analysis of current business processes should be involved as well as the process of re-engineering. This is in preference to the design of an application system that utilises bad processes in the best possible way. Since business processes are extremely complicated, the analysis cannot be directly done on the real world application. Thus one aims at reducing the convolutions by modelling. This is with the purpose of understanding better processes of business and the software support that is needed. In order to do this, the different angles of business processes can be concentrated on (the organizational units that are involved in the interaction, the semantic data structure, the input-output relationship or inflow and communication flows). Modeling methods support this creative process. A

group of mechanisms and the method of using these processes is what a modelling method is all about.

In order to ensure an improvement that is integrated, every relevant aspect of modeling framework is required. ARIS or Architecture of Integrated Information Systems makes available three types of applications that allow a business process improvement that is without any hitches.

- ARIS is an idea of architecture that allows structure modeling methods in order to design business processes from various angles. Petri Nets and Event-driven Process Chains describe the logical process flow and ERM or Entity Relationship Methods model the data aspects.
- HOBE or the ARIS House of Business Engineering is representative of a way for a computerized support business procedures management that is comprehensive. It consists of implements for any procedures management beginning from defining the strategy to configuration of the system.
- All this ARIS methodology is supported by the ARIS toolset software system (2). IMG or SAP's Implementation Management Guide is totally integrated with it. The enterprise improvement

which is model based thus enabled up to the ERP system's parameters that are customized.

Reference models can be included when business processes are to be improved. The reference models that the ERP vendors provide or the customers are benefited by the consultant companies. This is done by a utilization of the business process knowledge and best practices. This in turn provides an opportunity for business software solutions to be compared or positive and negative implementation issues pinpointed. The SAP R/3 software documentation is in all probability the most comprehensive business reference manual. It has been developed mostly according to the Event-driven Process Chain or EPC method. An EPC from a SAP R/3 reference model is represented by Figure.7. It consists of a lot of overall functions and business activities. The concrete process chain is buried deep inside a matrix of enterprise procedures, which in turn is obtained from super-ordinated scenario process.



Figure 7. Excerpts of an Event-driven Process Chain from a SAP R/3 Reference Model

Model-Based Customization

If the enterprise procedures model files the improvement and properly re-designed enterprise procedures, the conceptual models can be configured by the ERP systems. But it is necessary for the process models to be linked with the repository of that particular ERP System. The implementation strategy of the ERP software is modified by a directions interaction between modeling tools, conceptual models and the application system. It

was customary for rigid phase concepts with an analysis specifying every potential weak point. After that one developed ERP software ideas and this was done by customizing techniques. It is interactively and simultaneously that these phases are increasingly executed. Thus enterprise and ERP person can work in close partnership. This leads to a concurrent addressing of implementation and business issues. There is an example in Figure 8.





In the upper right window represents the business process model in the ARIS modeling tool. This illustrates that part of the standard software process that can be hidden. One must add an additional process branch, which is not enclosed in the standard software. At the bottom left, the screen is shown the function "Create inquiry". It is a function that questions the user as to which

screen is being used in SAP R/3. If the process model is used as a modeling tool and then the function is clicked, everyone can call upon SAP R/3 effortlessly. IMG, which is SAP's customizing tool, is made active in order for the function to be adapted. In the figure, the upper left window shows the function parameters that are available. In the bottom right window, by making use of the modeling tool, decisions about parameters, discussion results and unresolved issues etc. are stored in the function. This is what permits a detailed description of enterprise as well as IT specific enterprise procedures engineering. The description that has been done can be used later on to clarify questions and use this knowledge to follow projects as well as monitor them. Therefore ERP implementation which is model based allows knowledge management for a continual process improvement.

Systems Applications Products for Data Processing

Based in Walldorf, Germany, SAP was founded in 1972 and is acknowledged as one of the largest ERP vendors around the world. Besides, it is also the third largest independent supplier of software. In the 1990's the product line was expanded to additionally take in e business software through ERP. This recognizes the online

presence of many companies that is rapidly growing. The front and back office applications, which is linked by SAP e-commerce technology mySAP.com has become very popular. Besides, a strong competitive has been given to it in e commerce application, that is growing rapidly. That mySAP.com can provide, 'admittance to every preconfigured content, tools and methods that are likely to be used in project preparation, preparation for live operations and more' - is claimed by SAP in its website. (www.sap.com)

One of the three principal products that have been developed by Sap for an ERP application is SAP R/3. It is the real time three tier systems that is referred to by R3. This software could be incorporated with other software like CRM software and is table driven. From being an ERP vendor, SAP has grown to becoming a Solution Company. It is now in a position to market a greater ranger of software products. The core functionality of SAP R/3 is distribution and sales, production planning, materials management and controlling/finance. While using SAP/R3 a pull or push system can be utilised by the user. This is done with the help of a push system. By hit information is sent to all business functions that are affected or linked. However, if the pull is used, a decision can be taken by the user about what she or he

wants to see. ABAP or Advanced Business Applications Programming is the language on which SAP R/3 is set. By using a system integrator or middleware, the backend system of SAP R/3 can be joined to front office applications like CRM. Thus information can be transmitted to the internet. Front office functionality of CRM is supported by CRM and generally, the following are involved:

- <u>Customer Engagement</u> Issues like developing initial contacts leads, planning, internet pricing, sales and marketing strategies and configuration engines. Constitute this facet.
- <u>Fulfillments of order</u> Customers' orders are tracked. Further, the status of availability can also be tracked and the customer's ability to track and check orders as online shops or shipping agencies like UPS, USPS and DHL that issue customers with tracking numbers is taken into account.
- <u>Customer Service</u> What is dealt with here is partnership determination and sales, call center management, problem and product identification, service and assignment scheduling of customer

representatives, determining the type of service and sales orders and billing requests. The Internet Transaction Server or ITS is a middleware that translates the ABP data from SAP R/3 to html for internet use.

Basic Details of mySAP.com and mySAP Technology

An introduction to mySAP.com was made in October 1999 and sub divisions have been made into infrastructure and services, cross industry solution and industry specific solutions. It is software and middleware solutions that constitute the technology components and are used to support and implement mySAP.com solutions. In this category are:

- The interface between SAP R/3 and other mySAP.com constituents is the SAP R/3 plug in.
- The workplace plug in is an interface that permits data to be exchanged between the mySAP.com components and the SAP Workplace Server.
- Use is made of the SAP internet Transaction Server to internet enable SAP solutions. It is the predecessor of the SAP Web Application Server.
- A component of mySAP.com is the SAP Web application Server. The technological base is
provided by it for other mySAP.com components. In the past it was known as SAP Basis and taken to be an integral part of SAP R/3.

- The graphical user interface is SAP GUI & it is used for the3 SAP software.
- A middleware product is the SAP Business Connector. It is sued to integrate different IT architecture. This is based on mySAP.com components which are open and not Proprietary Internet technologies like XML.



35 N

Infrastructure and Services of mySAP.com

The service and infrastructure has three basic divisions:

- mySAP Hosted Solution
- mySAP Services
- mySAP Technology

So far as mySAP Hosted Solutions is concerned, service is provided by SAP and other partner companies. This allows implementation of mySAP.com solutions cost

Cooperation with SAP Solutions 2nd Edition.

Figure 9. Architecture of the mySAP.com Solutions

effectively and rapidly, without being forced to set up ones own e-business platform. It is through the internet that applications are accessed, through a web browser, so that small and mid sized companies can also be addressed as a target group. Among mySAP Services are transfer of know-how, implementation support and of course training. In November 2001 technology was introduced. That is the technological infrastructure for mySAP.com Systems. An integration architecture it is funded on open internet standards. This is how solutions from third part suppliers as well as SAP can be integrated. To achieve this my SAP technology in inclusive of the four components:

- <u>Portal Infrastructure</u>: The pre-condition for a user oriented integration and cooperation is met by the Portal Infrastructure. This for SAP means that the various sources of information can be utilized by a great number of users. A central entry point is provided by the enterprise portal. This is applicable to all information, services and applications that might be needed by employees in order to do their tasks in accordance with their role assignment. Vendors, customers, partners and employees are provided with an option through these sources of information, to securely

and easily access to all vital contents. Thus they are also able to be a part of the different business processes. The portal infrastructure helps in pursuing the objective of user oriented integration. In order to fulfil that purpose, from different sources data is co-related and then combined to logical units. This is so that users can be provided with information which corresponds to their functions in the company. In this instance, the information access is activated through internet browsers, mobile devices or other external infrastructure. Users can long on one time and after authentication, all areas for which they are authorized can be accessed. However, the source of the information will not be viewed by the user.



Figure 10. Portal Infrastructure

- Exchange Infrastructure: In contrast to the Portal Infrastructure which is used for user oriented integration, it is the process oriented integration and cooperation that the Exchange Infrastructure focuses on. This integration which is process oriented and beyond company limits is the basic principle that establishes and practices inter-organizational cooperation. In this instance the role of the 'polyglot mailman' is taken on by

the Exchange Infrastructure. Not only are shipments distributed to the correct location, but their contents are also translated into the correct formats. The idea that lies behind this process-oriented integration is avoidance of one to one links between all the parts in a heterogeneous system infrastructure. Attempts to reduce the effort necessary for this integration are marked by the Exchange Infrastructure. This is done by a detailed description that is provided of the cooperation knowledge that is necessary in a collective knowledge pool. That knowledge is inclusive of the functionality of the cooperation relevant factors like business rule, processes, interfaces, web services and roles etc (SAP AG 2002c, p. 24). The common knowledge base that is created is to make the integration of the in-house and external components simpler. This is because a component has to be described just one time to be accessible system-wide.



Figure 11. Overview of the Exchange Infrastructure

Architecture

- <u>SAP Web Application Server</u>: In order for the provision and development of Web Applications and Web Services to be enabled, the SAP Web Application Server is used. Both are applied here --- functionalities and technologies of the conventional SAP basis. As regards the server, high level Web technology and scripting allow the provision of Web applications and Web services. It is given to understand that the system and

software management capabilities and data are to be regarded as the conventional SAP basis. Open Internet Standards like HTTP, HTML & XML are supported by this platform. Both, the Web Standards and SAP basis can be used thanks to ABAP (Advanced Business Application Programming) and J2EE (Java 2 Enterprise Edition) being integrated.



Figure 12. Architecture of the SAP Web Application Server

Infrastructure Services: Infrastructure Services are part of mySAP Technology and they provide for globalization functions as well as security procedures. The beginning of the inter-organizational check of the system infrastructure commences with extensive safety instructions being developed. Then, one must check the functionality of all processes and applications. One has to distinguish between audits in closed and open systems. In a closed system a reporting framework that is responsible for storing information on roles, authorization and other user data suffices. In an open system the audit is more complex. An auditing framework is required which is used by the company not only to check the security of its own architecture, but also ones of their business partners. An application of the technical audit procedure achieves this and they are a part of the auditing framework.





Figure 13. Transmitting a Message Using the Integration

Server

SAP Implementation

Four main phases constitute the SAP implementation process. They are respectively - preparation of the project where a future state vision of the SAP solution is in the process of being created, a blueprinting and sizing phase. Here one creates the solution stack and the training is also performed. There is also a functional development phase and at the end a final preparation

phase. Here, before the actual go live, the last tests are conducted. Vital activities are addressed for each phase and the products/deliverables are explained.



Figure 14. SAP Implementation Process - Data Diagram

In the process data diagram that is shown, there is an overview of all the activities, processes, and deliverables. The four main implementation phases are shown in the four gray boxes. There are four sequential processes in each one. In the boxes that are on the right all the concepts and deliverables that result from the processes are shown. In the boxes that do not have a shadow, there is no further sub concept. The boxes that have a black shadow show complex closed concepts. Thus concepts having sub concepts will not be described at greater length. There are also boxes that have a white shadow (which basically mean a box behind), which show open closed concepts. It is here that one expands the sub concepts in greater detail. The 'has a relationship' between concepts is shown in the line with diamonds.



Figure 15. SAP Implementation Technical Support

Organization Chart

Detail steps and process for SAP implementation will list in APPENDEX section.

CHAPTER SIX

CUSTOMER SATISFACTION

Enterprise Resource Planning and Enhanced Performance

Business practices are deeply affected by ERP. To achieve competitiveness, it is essential to improve upon performance and productivity. For the organization to compete effectively, the business processes need to attain high levels of productivity. The function of ERP is to automate and to get in sync the firm's tactics with its business processes. It is the desire of businesses in the present day to respond quickly to changes in the market situation. They also want to be providing better quality products and services as and when demanded by the customer. There is also a desire for the enterprises to reduce product development and inventory by streamlining their procedures. Organizations attain all these through ERP. Order fulfillment processes, for instance, can be greatly improved upon by maintaining a single database accessible to all functional units. Any section can track the orders through each level of processing. Tracking items through any of the logistic channels and warehousing becomes easier. It thus adds towards the effective management of inventory. The company is able to respond to

market changes since all that mentioned above happens very quickly. Thus ERP helps enable quicken responses in a firm.

Employees participate in the delivering quality services to customers by means of the increased scope of the job function due to ERP. Inventory levels and order fulfillments now no longer depend solely upon the store clerk recording any of it. The status of the customer's order can be tracked by and responded to by the same clerk at the click of a button. There is an extension in the sale clerk's job, offering customer service too. He may be able to better serve customer because of the enhanced feel of job satisfaction. Responsibility and accountability are improved upon by using a computerized system. Easier record keeping ensures improved accountability. Once the data is entered into the database, it is readily available for all authorized users. The store clerk does not have to maintain manually recorded information. Customers can be served better by segregating or querying the info into generating important information as and when required. As importantly enhanced is the responsibility. Tracking the various levels of customer processing as also those accountable becomes easier. Thus ensuring that the attention during the job of all involved is high at all

times and that the job is done right the first time. Satisfying the needs of the customer and customer service becomes the focal point. Since information is collected from various points in the system, there more communication with the customer. There is better recognition of the customer's requirements and wants as a result of the improved contacts. That enables the designing and delivery of the right kind of services and products to customers.

Benefits of Enterprise Resource Planning and Supply Chain Management Integration

There are a great number of benefits so far as the integration of ERP and SCM applications is concerned. As a result software vendors have been encouraged in looking for integrative software - which is how the term ERP II has come about. Some of the advantages are as follows:

- <u>Competitiveness</u>: In today's business environment, the key to competitiveness lies in information. Those enterprises are successful that have been able to make effective decisions and mine their data as well. In a market environment that is dynamic, it is absolutely of the essence as far as time is concerned to respond in time. Thanks to the internet information is mounting at an

exponential rate. Thus to isolate critical information from the virtual avalanche of information available becomes much more available. The great deal of information that the customer supplies will decide how better the customer is to be served and satisfied. In conventional thinking it is necessary that the voice of the customer is listened to by organizations so that goods and services they require can be provided. Thus, whatever the customer desires can be identified (customer requirements) and "how" it is wanted by the customer (design requirements). When ERP and SCM are integrated first hand knowledge is gained by all enterprise partners of what is wanted by the customer. Thus he can decide how those wants are to be satisfied and can collaborate accordingly. The meaning is that the product development process must start from the information that is directly derived from the customer. These are the only ways the needs of the customer can be taken care of.

<u>Flexibility</u>: Customers have varying needs. The mass Production Era is long over. eDell Computer is a company that has remained successful because

they have a strategy of mass customization. Instead of assuming that each customer has a unique requirement, they are handed the means of fashioning a product they way they want to. By these means the varying requirements of customers can be satisfied. In order to effectively manage inventory by providing this flexibility and getting customers for an online order commitment. The major component of any production system is the inventory cost. However, inventory is easier to manage when the demand forecast becomes deterministic. In addition, when a linkage is set up between suppliers and enterprise partners, there is an exact knowledge of when the order is placed and its production is scheduled to meet the due date. One could apply 'Just-in-time' manufacturing principles. This would further reduce the need to maintain a high level of inventory.

<u>Speed</u>: Customer information being easily available and as a result of being directly relayed to the enterprise partners, delays in production are made minimal. In effect one has less cycle time to production. There is less of production design

time and along with its partners the enterprise can speedily respond to the dynamic changes in the market place. There is a constant evolvement of the customer 'needs. They do not remain static and as advances are being made in new technologies & availability of information, life cycle of products are much less. So, customers are becoming more demanding. Production systems can be adjusted by organizations so that a response to these changes can be made and there can be a proactive response to market changes.

- Efficiency: The information that a customer gives on its needs can help in transforming the organization. The members of the enterprise and its partners are helped in appreciating the roles they play and observation of the impact that is made on the study of the firm. Thanks to the various functional departments that exist within the firm and value partners, an essence of effective collaboration will be seen that serves customers better. Efforts to develop further strategies on serving customer needs will be encouraged thanks to the value of information in

transforming products and services for the customer.

- <u>Cost Management</u>: One achieves customer satisfaction when a service or product is rightly designed the first tine itself. Thus there is minimum wastage and an increase in productivity. One can continue to better serve the customer by dedicating more resources. Some of the profits made can be shifted to the customer - either in terms of a reduction in price or addition of more features in products and services.

Some of the benefits that are brought about as a result of the integration between SCM & ERP might be indefinable. Justification might not be feasible always of the high costs involved in transforming an enterprise to an ERP system, particularly if it short term. However, if one manages the transformation properly, the company gains from increased competitiveness.

CHAPTER SEVEN

CASE STUDY: ASTRAZENECA INTERNATIONAL

Project Introduction

One of the largest pharmaceutical companies of the world is AstraZeneca. Where SCM or Supply Chain Management is concerned, it is an innovator. A worldwide initiative is in progress so that the demand flow technology in logistical operations is integrated. This would lead to an important SCM project in the packaging plant at Wedel in Germany. The driving force behind the project was the need for an increased agility and flexibility in the supply chain process. This ultimately aimed at bettering customer service and making even better the information that passed to the European bulk product manufacturing locations. It is on the basis of daily needs rather than mid term forecasts that AstraZeneca planned to control manufacturing operations. Using the existing SAP technology as a platform, the project leaders of Asta Zeneca chose mySAP SCM solutions and SAP Advanced Planning & Optimization component (SAP APO).

Company Overview

On the 6th of April 1999 Astra Zeneca was established by merging Astra AB of Sweden and Zeneca Group PLC of the

UK. These two firms had a same science culture background and a vision of the pharmaceutical field that they shared. Through the merger they aimed at improving the companies' combined ability to handle continuous growth and maximize the shareholder value and satifaction.

The AstraZeneca Group PLC has headquarters in London one of the top five international pharmaceutical concerns. It is also one of the foremost manufacturers of pharmaceuticals & is occupied in research and development (R & D) in Germany. There it has two sites -- Plankstadt, near Heidelberg and Wedel near Hamburg. It is the Wedel site that has been integrated into the supply chain network of AstraZeneca worldwide. It has a responsibility for packaging and distributing. This roughly constitutes 75% of the pharmaceutical products of AstraZeneca for the market which is German speaking. Thus the firm is a key asset in the company wide production network. This is inclusive of the pharmaceutical manufacturing operations and sales companies that are there in the United Kingdom and Sweden.

Project Opportunities

There was an opportunity for AstraZeneca to enforce 'make to demand' processes in the packaging plants when it

came face to face with a need to improve the efficiency levels through SCM (Supply Chain Management) and production unit specialization best practices. Medium term forecasts were not responsible for the drive; it was more the daily sales requirements. It is the hope of strengthening innovation and an ambitious growth target that have led to mergers taking place in the pharmaceutical industry. Pharmaceutical companies are being placed under greater pressure of cost and a force to constantly improve efficiency levels. This is done through the enforcement of the best practices of the SCM and production unit specialization. Manufacturing complexity is on the rise because of an increasing number of new products. At the same time batch sizes are tending to fall. As a result manufacturers of pharmaceuticals are tending focus more on service levels and production costs. In that context AstaZeneca took that opportunity to model SCM processes on a concept that was demand driven.

Project Goals

While deciding to put into operation a dynamic supply chain at the Wedel Packaging Plant, the AstraZeneca group-wide SCM strategy greatly influenced it. This involved an extensive integration of the demand flow

technology in logistical operations. In the pharmaceutical industry, this innovative objective of the SCM strategy is to increase the conventional SCM practices. This is based on processes which are made to forecast, with dynamic supply chain processes. AstraZeneca leans towards processes that are 'made to demand' and this is especially applicable in the packaging plants. Daily sales requirements rather than medium-term forecasts will propel the production processes and the replacement more strongly in the future. Organizational restructuring and change management processes are associated with this initiative at the manufacturing sites. By using both its 'make to' strategies AstraZeneca wanted to switch from a 'lean' to an 'agile' SCM system. Some SCM and IT experts were asked to implement this system at the Wedel facility.

Strategic Goals

- Delivery performance that is improved.
- Planning that is market-driven
- Procurement that is consumption based.
- Condensed lead times.
- Effectiveness that is enhanced.
- A better exchange of information between supply chain sites.
- Supply chain transparency.

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Approach of the Project

A state of art and highly automated process of supply chain management is lined up at the Wedel Production facility. The entire materials movement process is controlled by a distributed control system based on bar codes. This is inclusive of staging at the production lines right up to delivery and storage in the high-rise warehouse. SAP R/3 integrates this process control systems and production planning takes place through a bi-directional communication system. The SAP R/3 functionality can now be availed of in mySAP ERP. However, AstraZeneca became aware that SCM processes which were based on the ERP system did not fulfill the most recent requirements for a supply chain organization that was highly dynamic and flexible. Bernd Lammerskötter, former vice president of operations said that the goal of their SCM project was to integrate the flow of information and improve their internal service levels.

A proposal for the project reads as follows:

- The 'as is' planning processes are to be analyzed in details along with the existing data structures.

- There is to be a consolidation and revision of the master data of the ERP in a production environment that is GMP based.
- Production planning is to be there along with a modeling of planning scenarios. There is also to be a detailed scheduling function of SAP® Advanced Planning & Optimization (SAP APO). There is also to be a review of different planning concepts that remains in connection.
- The new demand-driven SCM policy of AstraZeneca
 Provisions will be made for intensive coaching and intensive training of staff who are involved in the project.



Figure 16. Typical Separation of Forecast-driven and Market-driven Demand in the Pharmaceutical Industry along

the Supply Chain

Project Scheduling and Planning with SAP

The need to identify a new production scheduling solution dominated the SCM Project Initiative at the Wedel Plant. This in turn would introduce a greater flexibility and agility into the supply chain process. To better customer service was the main focus as well as to improve the information that entered the European bulk product manufacturing locations. In order that this be achieved, first of all there had to be a marked reduction in the planning process in the packaging plant. This lasted up to

ten days and was based on a fourteen day cycle. At the same time there had to be an improvement in the quality of the process. So that the response was capable of being more responsive to customer requirements, an application of concepts and tools for integrated multilevel planning had to be applied; the scope of the conventional ERP planning methodologies were thus exceeded. Lammerskötter said that processes and tools were needed to plan and control the manufacturing operations on the basis of daily requirements rather than medium term forecasts. The SAP R/3 technology at Astra-Zeneca, which was transaction based, had a limited value for purposes of scheduling. It was obvious that the requirement of AstraZeneca was a production planning system that was demand based and dynamic. It was to include capacity planning and simultaneous material as well as sequence optimization. In view of the SAP technology that exists, the AstraZeneca project leaders chose mySAP SCM solution as also the SAP APO component.

Project Implementation

There were a number of reasons because of which the project succeeded. Some of the factors were: the 'as-is' planning being analyzed at length along with the existing

data structure, the ERP master data being revised and consolidated in an atmosphere that was structured on manufacturing practices that were good. There was also modeling of numerous planning scenarios in SAP APO. Completion of the project took place in six months and the Wedel plan began functioning with a supply chain planning system that was new - right on schedule, at the beginning of 2003. Arrangements were made to provide training and coaching and that also contributed to the success. Burkhard Braatz, the Project Manager at AstraZeneca said that in order that the project goals are achieved speedily after the software had started functioning, the staff who were caught up in the project were trained in the new system and also rigorous coaching in the new scheduling philosophy. SAP APO has achieved a high level of maturity for the requirements of pharmaceutical production.

The success of the project was largely due to the following functions and capabilities:

- The new SAP APO database technology which was robust, powerful, and easily available united with integration handling that was optimized and lay between the centralized ERP systems. And the real-time-based-planning system.

Characteristics based set-up time calculation. : A characteristics-based setup matrix that was automatically generated by a solution. This was in reference to criteria in the pharmaceutical arena like retooling and changing folding and blister packages. As a result, the master data maintenance efforts are pointedly reduced by this capability. The heuristic planning system is day supply based, to apply SCM concept which is demand driven; this is for a real time computation of dynamic safety stock levels as well as a days supply of finished products. This would be as a function of a forecast of sales & the actual inventory situation. Production schedulers are enabled by this information - application of demand driven principles - to schedule automatically the sequencing priorities of the manufacturing orders. This is based on the supply data of the day, which differs from day to day.

Alert Monitoring Capabilities and a graphic detailed scheduling planning board are supported by the SAP APO. The planning transparency is augmented as a result of these functions and there is a faster response to changed scheduling requirements. This is the result of

unpredictable situations like lack of resources or an increased market demand. An integrated, demand-driven production scheduling system and dynamic replenishment is supported by the SCM solution. This is from sales forecasts, right through to the production schedule actually sent, to the production line and real time procurement planning. AstraZeneca's specifications are entirely met by the solution. These specifications are for an integrated planning between the production requirements of the sales companies and packaging plants on one side. The other would be between the procurement and replenishment of pharmaceutical bulk products.

Results of the Project

The main advantages of AstraZeneca's implementation of SAP APO are as follows:

Qualitative Improvements

- Capacity views for production scheduling and concurrent material in reference to the criteria relevant to manufacturing of pharmaceuticals.
- An integration that is synchronized of the planning and execution systems & this allows real time scheduling with an escalated degree of transparency.

- Dynamic setup times to be calculated as a task of characteristics that are typical of manufacturing pharmaceuticals e.g. batch changeover, blister packaging changeover, and retooling.
- Dynamic safety stock levels for local S AP APO planning as a function of forecasts.
- Implementation of concepts that are demand driven and which are based on days' supply oriented sequencing.

Quantitative Improvements

The quantitative improvements are calculated with the help of SAPs business consulting group. It is then classified according to the Key Performance Indicator system of the Supply Chain Operations Reference (SCOR) model. There is a link of all the key figures with each other. If for example a shorter planning cycle leads to an increase in the delivery reliability and an inventory turnover that is faster, this is because the supplies of the day for the warehouse are recalculated daily. By reducing the total set up time the flexibility that is gained results in additional, transparent production capacity. There is a double benefit – there is a support for both, a higher output of packaging units and a faster inventory turnover. Subsequently, the production capacity

that has been freed provides for options like an introduction of flexible employee models, capturing new business or supporting promotional campaigns.

Table	5.	Result	Table	for	the	Project
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Scope	Attribute	Key Performance Indicator	Quantitative Improvement
External	Reliability	On Time Delivery (OTD)	Improvement of on-time delivery from 98.1% to 99.9%
	Responsiveness	Re-plan Cycle Time	Reduction of planning cycle from 14 days to 1 day
Flexibility	Production Fle	exibility	Reduction of total setup time, resulting in a 12% capacity increase and a 13% rise in output
Internal	Assets	Inventory Turns	14% increase in inventory turns
Source: SAP	.com		-

List of Project Results

- Planning cycles were brought down from 14 days to one day.
- There was an increase in the service level from 98.1 to 99.9%.
- There was greater production flexibility. As a result of the total setup time being reduced the production index was lowered and there was a 12%

capacity gain. The total line setup is now done at batch changeover.

- There was an increase of 13% of the total package output. This was in a period with a comparable count of orders.
- There was a 14% rise in inventory turnover.
- Software started functioning on schedule at the end of a 6 month period.

There were also a number of benefits that made a significant contribution in establishing a high degree of using SAP AP at Astra Zeneca.

- There is a feasible manufacturing order as a result of scheduling with SAP APO.
- There continues to be a link between finished products and raw material all along the total value chain.
- Automated support is received by schedulers from the exception based planning.
- The planning processes with execution processes are fully integrated by dynamic setup time calculation.
- Planning processes have become much clearer.

The modeling of new product launches is fully supported by simulation functionality.

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CHAPTER EIGHT

CONCLUSION

Information is transferred laterally to various units in an organization through ERP. A simple function of processing a customer order would be difficult without an integrated system. What would get further complicating is the tracking of orders as they are processed in various departments. ERP helps serve the customer better where the status of his order can be tracked and the information relayed to any department that needs it. Since the need for individual departments to maintain their own individual databases, the system turns out to be cost effective as well. Customer orders don't need to be re-entered in different departments thus cutting down setup costs. Possibility of committing errors reduces due to the more efficient processes. But this also means a possibility of an error prone system due to a possible error in the common database. Thus the data entered in the common database needs to be highly precise. A properly executed ERP can help cut down costs and bureaucratic tangles of conventional firms that act as independent islands adding towards serving customers better. Other possible advantages in the long run are lower costs,
enhanced efficiency, and productivity while also facilitating data acquisition. ERP helps an organization's efficiency by making effective use of the computer technology. It cuts down the structural size of a firm by integrating their functions and converting it into a single unit. And since the resources of a firm are dealt with, turning the firm more productive and efficient, ERP can be said to deal with resource planning. It helps in making the firm use their resources optimally. Conserved time and paperless go towards lesser costs borne by the customers. Improved quality is also another trait that ERP adds for an organization due to conserved resources. Better customer satisfaction translates into the organizations' benefits. Customer orders are effectively tracked. Valuable information on production stages, order fulfillment and inventory levels are also provided. The business experiences higher profit margins due to effective and timely management of information and inventory levels. The accountability of a firm increases with an integrated ERP system. The individual departments are watched over by each other. The customer representative that is the first contact point of the customer is also observed. Areas of enhancement are identified and sources of errors in the system tracked

easily. There is a definite improvement in the communication as well. The level of the stocks in the production department can be tracked and matched with the new order. It can also be matched with the levels of scheduled production and the production capacity. Decisions regarding increasing production, subcontracting or then overtime for meeting rising demands can be made based on this. The supply chain and business processes of a firm can be effective managed as a result of a revolutionary business practice called ERP.

APPENDIX A

TABLE OF CONCEPTS FOR SAP IMPLEMENTATION

The data table below provides a summary of all the concepts addressed in the process-data diagram.

Concept	Definition
CHANGE MANAGEMENT	Activities involved in (1) defining and instilling new values, attitudes, norms, and behaviors within an organization that support new ways of doing work and overcome resistance to change; (2) building consensus among customers and stakeholders on specific changes designed to better meet their needs; and (3) planning, testing, and implementing all aspects of the transition from one organizational structure or business process to another. (www.gao.gov)
CHANGE MANAGEMENT DOCUMENTATION	All documentation that is required and being delivered whilst performing change management, e.g. the functional test cases and all the other documents a new end-user of SAP requires and the various tools and approaches used to manage change by the TSO. (Anderson, 2003)
COST OF OWNERSHIP ANALYSIS	Determination of where and when the costs are inquired within the context of the SAP solution stack and ongoing operations. The analysis addresses all internal and external costs, both one-time as well as recurring (Anderson, 2003)
CUTOVER	The process of transitioning from one system to a new one (Anderson, 2003)
CUTOVER PLAN	All documentation related to planning, preparing and executing cutover, describing how to lock down the system from a technical change management perspective, preparing the TSO for its new role and rolling out the SAP graphical user interface to all future end users. (Anderson, 2003)
DATA CENTER	A data center is a facility used for housing a large amount of electronic equipment, typically computers and communications equipment. (www.wikipedia.org)
DATA CENTER REQUIREMENT	A requirement for the SAP data center, i.e. a physical requirement like power requirements, a rack requirement, a network infrastructure requirement or a requirement to the network server. (Anderson, 2003)
DISASTER RECOVERY (DR) REQUIREMENT	Requirement that focuses on downtime that lasts many hours to days or even weeks (Anderson, 2003)
FUNCTIONAL TEST	A set of conditions or variables under which a tester will determine if a certain business process works (www.wikipedia.org)

Concept	Definition
HIGH AVAILABILITY (HA) REQUIREMENT	Requirements that describes the amount of time that the system needs to be available to satisfy the needs of the users. (Anderson, 2003)
INSTALLATION DOCUMENTATION	All documentation related to the installation of an end-to-end SAP solution (Anderson, 2003)
OPERATIONS MANUAL	The collection of current state system documentation, day-to-day and other regularly scheduled operations tasks, various installation and operations checklists and how-to process documents. (Anderson, 2003)
SAP	SAP AG is the name of the biggest European software company. The head office is in Walldorf, Germany. SAP was founded in 1972 as Systemanalyse und Programmentwicklung ("Systems Analysis and Product") by five former IBM employees in Mannheim, Germany. (www.wikipedia.org)
SAP IMPLEMENTATION PROJECT PLAN	A comprehensive project plan that contains all products that are delivered whilst performing an SAP implementation project (Anderson, 2003)
SOLUTION STACK	Set of software subsystems or components needed to deliver a fully functional solution, e.g. a product or service. (www.wikipedia.org)
SOLUTION STACK PARTNERS LIST	A list of all vendors that deliver the products that make up the SAP solution stack (Anderson, 2003)
SOLUTION VISION	A vision of the future-state of the SAP solution (Anderson, 2003)
STRESS TEST PLAN	A test plan that is focused at determining the stability of a given system or entity. It involves testing beyond normal operational capacity, often to a breaking point, in order to observe the results. (www.wikipedia.org)
TEST PLAN	A detail of how the test will proceed, who will do the testing, what will be tested, in how much time the test will take place, and to what quality level the test will be performed. (IEEE 829)
TRAINING	The acquisition of knowledge, skills, and attitudes as a result of the teaching of vocational or practical skills and knowledge that relates to specific useful skills (www.wikipedia.org)
TRAINING PLAN	Consisting of training units, a training plan is the result of hierarchical decompositions of a training goal, tailored according to the learning preferences and prior knowledge of the trainee. A plan is the means by which the trainee satisfies the goal. (www.ece.eps.hw.ac.uk/).

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Concept	Definition
TSO	Technical Support Organization. The people that are committed to implementation and management of SAP. (Anderson, 2003)
TOO CHADT	A chart that deniets the structure of the TSO (Anderson 2002)

TSO CHARTA chart that depicts the structure of the TSO. (Anderson, 2003)Source: SAP Implementation,
http://en.wikipedia.org/wiki/SAP_Implementation

APPENDIX B

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ACTIVITY TABLE FOR SAP IMPLEMENTATION

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The following table provides a summary of all of the activities that form the SAP implementation process. These activities will be described with more detail and elaborated with examples in the rest of this entry.

Activity	Sub-Activity	Description
Project preparation	Craft solution vision	Refine and communicate a SOLUTION VISION of the future-state of the SAP solution, to sketch a design that meets both business and financial requirements. The focus should be on the company's core business and how the SAP solution will better enable that core business to be successful.
	Design and initially staff the SAP TSO	Design and staff the key positions of the SAP Technical Support Organization (TSO), the organization that is charged with addressing, designing, implementing and supporting the SAP solution.
Sizing and blueprinting	Perform cost of ownership analysis	Perform a COST OF OWNERSHIP ANALYSIS to determine how to get the best business solution for the least money i.e. to determine where and when the costs are incurred within the context of the SAP solution stack.
	Identify high availability and disaster recovery requirements	Determine all HIGH AVAILABILITY and DISASTER RECOVERY REQUIREMENTS, to plan what to do with later downtime of the SAP system
	Engage SAP solution stack vendors	Select the best SAP hardware and software technology partners for all layers and components of the SAP SOLUTION STACK, based on a side-by-side sizing comparison
	Staff TSO	Staff the bulk of the TSO, i.e. fill the positions that directly support the near-term objectives of the implementation, which are to develop and begin installation/implementation of the SAP data center.
	Execute training	Train the various members of the SAP TSO, like data center specialists, high availability specialist and network specialists and train the end-users to give all the required SAP knowledge and skills
	Setup SAP DATA CENTER	Build a new SAP DATA CENTER facility or transform the current data center into a foundation capable of supporting the SAP SOLUTION STACK

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	Perform installations	Install the (My)SAP components and technological foundations like a web application server or enterprise portal.
	Round out support for SAP	Identify and staff the remaining TSO roles, e.g. roles that relate to help desk work and other such support providing work.
SAP functional development	Address Change Management	Develop a planned approach to the changes in the organization. The objective is to maximize the collective efforts of all people involved in the change and minimize the risk of failure of implementing the changes related to the SAP implementation.
	Address SAP systems and operations management	Create a foundation for the SAP systems management and SAP computer operations, by creating a SAP OPERATIONS MANUAL and by evaluating SAP management applications.
	Perform functional, integration and regression tests	Test the SAP business processes, by executing functional tests to ensure that business processes work, integration tests to ensure that the organization's business processes work together with other business processes and regression tests to prove that a specific set of data and processes yield consistent and repeatable results.
Final	Perform systems and stress tests	Plan, script, execute and monitor SAP STRESS TESTS, to see if the expectations of the end users, defined in service level agreements, will be met.
Preparation	Prepare for cutover	Plan, prepare and execute the CUTOVER, by creating a CUTOVER PLAN that describes all cutover tasks that have to be performed before the actual go-live
Go Live		Turn on the SAP system for the end-users

Source: SAP Implementation, http://en.wikipedia.org/wiki/SAP_Implementation

APPENDIX C

ASTRAZENECA PERFORMANCE SUMMARY

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2005 PERFORMANCE SUMMARY

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ECONOMIC SM	2005	2004	200
Sales	23,950	21,426	18,849
Operating profit (before exceptional Items)	6,502	4,547	4,007
Jividends	1,676	1,408	1,244
Ratio of market capitalisation to book value of net assets	5.6	4.1	6.1
R&D investment	3,379	3,467	3,012
Total wages	5,761	5,452	4,883
Taxation (before exceptional items)	1,943	1,161	1,033
FARADONIMENTAL			
		·	
Sitemitouse gases	1 4 2	1 /0	1 59
coy-equivales its fittinio (contres)	50	60	
ndex (connession sales)			04
	2 460	2 480	2 420
	2,400	2,400	120
Index (www.shirbales)	103	110	123
CFC11 control depiet (composition)	Ĕĸ	67	75
	20	20	36
index (kg/shirsales)	2.3	2.9	
	50	сс [,]	
lodau (aubie meteor)	3.0	3.3	3.1
Index (CLDIC Interes/Sin Sales)	210	260	300
waste	00 A	20.0	200
Hazardous waste (kte)	28.4	30.0	20.3
lotal waste (kte)	59.Z	60.4	56.5
index – total waste (tonnes/\$m sales)	2.41	2.82	3.10
SOCIAL			
Safety and health: AstraZeneca employees			
Accidents with injury ² with and without days lost (per million hours)	3.05	3.62	3.65
Accidents with injury ² with days tost only (per million hours)	2.27	2.57	2.67
Cases of occupational illnesses (per million hours)	1.34	2.07	1.65
Safety and health: AstraZeneca employees and contractors			
Accidents with injury ² with and without days lost (per million hours)	3.07	3.61	3.58
Number of animals used in research	267,000	245,000	229,000
Sales and marketing: number of confirmed breaches of external codes or regulations	56	n/a	n/a
Site audits that included CR	18	24	11
Community support (\$m)		···	
Community sponsorships	18.4	15.4	16.4
Charitable contributions	15.6	5,3	5.6
Total	34.0	20.7	22.0
Product donations and patient assistance programmes valued at average wholesale price (\$m)	835	870	724
RECHLATORY INFRINCEMENTS - SAFETY HEALTH AND ENVIRONMENT			
	0	0	1
Prosecutions and fines			1
Prosecutions and lines Regulatory enforcement actions	1		

Source: AstraZeneca International,

http://www.astrazeneca.com/article/11161.aspx

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