.Executive Summary

In present day context, ERP - Enterprise Resource Planning has become the way of doing business. The biggest benefit of ERP is th0at it provides a centralised approach to organisation such that one can have instant access to data and information from any department within the organisation. Thus such high level of transparency and information content contributes in doing efficient business.

The known big players of ERP are SAP, Oracle, Baan, etc whose enterprise solutions contain industry best management practices. However, when it comes to actual implementation, organisations, which migrate to ERP, have to suffer through increasing overhead money and time overruns and in most cases its total failure. What's the reason behind it?

However, if small players are considered, the Extended Add-ons provided by them usually are able to fulfill their specific requirements like Process Management, Chemical Supply Chain, and Aerospace Management etc. What's there in this Extended ERP?

Objectives

The objectives of the project are:

I. To understand the gaps between the ERP offered by big players, i.e. Traditional ERP and the ERP offered by small vendors, i.e. Extended ERP;

II. To study how the environment is reacting to the gaps; and

III. To given an insight as to where the future will lead to in the next few years.

Methodology

The methodology used for the study is to understand the ERP solutions being offered by various vendors and their functionalities and architecture as given below:

I. Case Studies from large ERP vendors;
II. Case Studies from small ERP vendors;
III. Understanding the products of large ERP vendors; and
IV. Understanding the products of the small ERP vendors.

Findings

The findings of the project are as follows:

- Though ERP is implemented in organisations to make the work simpler and easier for business, it fails to do so, because of lack in providing adequate essential ingredients. The essential operations for any ERP are customisation, upgrade and integration. While the big players are able to provide a fairly generalised package, they fail to provide the niche services provided by small vendors like JDA, Wam Systems, Manugistics, etc. Thus, big players lack on **extensive customisation** and hence their upgrade and integration (with small players) are also impacted.

- Extended ERP has high degree of customisation made for specific industries like Pharmaceuticals, Transportation, Chemical, Retail, Aerospace, etc. Hence, they also provide increased flexibility as the packages are based on business intelligence to cater to the needs of the specific industries. Further, small players are able to provide quick solutions and at low cost vis a vis bigger players.

- The difference between the Traditional and Extended ERP has led to a new trend wherein organisations go for Extended ERP along with Traditional ERP. Also, there are cases where big players acquire these small players in order to fulfill the requisite intelligence in their package and offer the customers as a Complete Software Suite, which in many cases may be very costly to the business community.

- Today, when companies are trying to compete with each other, the organisations which are better able to manage its data for business intelligence would be the winner and hence the need for Extended ERP provided by niche players would continue.

- For effective supply chain management to have complete coordination of flow and information, from supplier to end user, use of Radio Frequency Identifier Devices (RFID) provides a step forward from traditional technologies. Collaborative supply chain system where buyer and supplier forges partnership that enhances the effectiveness of supply chain to great extent and help the firms to become collectively competitive.

Future Direction for further Research

This study also encourages one to believe that ERP market is evolving into a component-based strategy wherein companies would try to mix and match with the ERP packages available in the market to cater the customised need of the customers.

Limitations

The limitation of the project is that the project is based on case studies and literature survey. The findings of the project are not backed by any primary research and should not be solely considered for selecting the ERP package.

Table of Contents

Abbreviations

C/S: Client/Server

C/FS: Client/ Fat Server

DBMS: Database Management System

DSS: Decision Support System

ERP: Enterprise Resource Planning

GUI :Graphical Use Interface

GSA: General Service Administration

MIS: Management Information System

MRP: Material Requirement Planning

MRP-II: Manufacturing Resources Planning

SME: Small and Medium Enterprises

SQL; Structured Query Language

TPS: Transaction Processing System

EAM: Enterprise Asset Management

CRM: Customer Relationship Management

ERM: Enterprise Resource Management

SCM: Supply Chain Management

Chapter 1: Dimensions of Enterprise Resource Planning

1.1 What is ERP?

Enterprise Resource Planning is the process of using integrated application software to improve the effectiveness and efficiency of the entire enterprise, which helps organisation to gain competitive advantage. ERP is the way that firms operate business information systems-such as Transaction Processing System (TPS), Management Information System (MIS), Decision Support System (DSS) and artificial intelligent / expert system.

In other words, enterprise resource planning systems or enterprise systems are software systems for business management, encompassing modules supporting functional areas such as planning, manufacturing, sales, marketing, distribution, accounting, financial, human resource management, project management, inventory management, service and maintenance, transportation and e-business. The architecture of the software facilitates transparent integration of modules, providing flow of information between all functions within the enterprise in a consistently visible manner. Corporate computing with ERP's allows companies to implement a single integrated system by replacing or re-engineering their mostly incompatible legacy information systems.

More Definitions

American Production and Inventory Control Society (2001) has defined ERP systems as "a method for the effective planning and controlling of all the resources needed to take, make, ship and account for customer orders in a manufacturing, distribution or service company."

Several definitions from the published literature to further explain the concept are given below:

"ERP comprises of a commercial software package that promises the seamless integration of all the information flowing through the company-financial, accounting, human resources, supply chain and customer information"

"ERP are configurable information systems packages that integrates information and information-based processes within and across functional areas in an organisation"

"One database, one application and a unified interface across the entire enterprise"

"ERP systems are computer-based systems designed to process an organisation's transactions and facilitated integrated and real time planning, production, and customer response"
The concept of ERP can be illustrated from the figure as shown below:

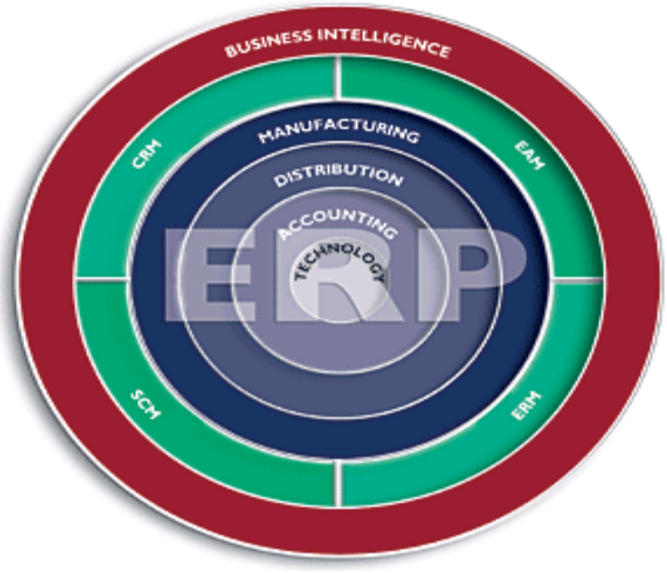


Fig 1: Concept of ERP System

1.2 Evolution of ERP

In the 1960's, business relied on traditional inventory management. In the 1970's, Materials Requirement Planning (MRP) developed along with Just In Time (JIT) methodologies. The effort was to reduce inventories. Next came Manufacturing Resources Planning (MRP-II) as enhancements to MRP by integrating other manufacturing resources, particularly shop floor, accounting and distribution management.

In the early 1990s, MRP-II was further extended to area like engineering, finance, human resources and project management. This is Enterprise Resource Planning (ERP) as known today. ERP marries management issues with information technology. ERP has evolved well beyond the origins as an inventory transaction and cost accounting systems. In simple terms, ERP systems use database technology and single interface control information on a company's business.

1.3 Architecture of ERP Systems

ERP vendors, mostly experienced from the MRP and financial software services fields, realised the limitations of the old legacy information systems used in large enterprises of the 1970s and 1980s. Some of these old systems were developed in-house while others were developed by different vendors using several different database management systems, languages and packages, creating islands of no compatible solutions unfit for seamless data flow between them. It was difficult to increase the capacity of such systems or the users were unable to upgrade them with the organisation's business changes, strategic goals and new information technologies.

An ERP system is required to have the following characteristics:

- Modular design comprising many distinct business modules such as financial, manufacturing, accounting, distribution, etc.;
- Use centralised common database management system (DBMS);
- The modules are integrated and provide seamless data flow among the modules, increasing operational transparency through standard interfaces;
- They are generally complex systems involving high cost;
- They are flexible and offer best business practices;
- They require time-consuming tailoring and configuration setups for integrating with the company's business functions;
- The modules work in real time with online and batch processing capabilities;
- They are or soon they will be Internet-enabled.

Different ERP vendors provide ERP systems with some degree of specialty but the core modules are almost the same for all of them. Some of the core ERP modules found in the successful ERP systems are the following:

- Accounting management;

- Financial management;
- Manufacturing management;
- Production management;
- Transportation management;
- Sales & distribution management;
- Human resources management;
- Supply chain management;
- Customer relationship management; and
- eBusiness.

The modules of an ERP system can either work as stand-alone units or several modules can be combined together to form an integrated system. The systems are usually designed to operate under several operating platforms such as UNIX/LINUX, Windows 2000/2003, IBM A IX, and HP-UX systems.

Enterprise systems employ thin client /server (C/S) technology or client/fat server (C/FS) architecture, creating a decentralised computing environment. In a CIS system a number of client devices operated by end users such as desktop PCs request services from application servers, which in turn get the requested service-related information from the database servers. The requests may be simple data files, data values and communication services, transaction processing or master file updates. The general practice is to have three-tier architecture such as in Figure 2. In this three-tier system the user interface runs on the client. To run ERP systems relatively powerful PCs (clients) and powerful servers are required where most of the hundreds of thousands of operations are performed. The client/server system functions are performed following three layers of logic:

- **Presentation Layer:** Graphical user interface (GUI) or browser for data entry or accessing system functions;

- **Application Layer**: Business rules, functions, logic, and programs acting on data received/transferred from/to the database servers; and

* **Database Layer:** Management of the organisation's operational or transactional-data including metadata; mostly employs industry standard RDBMS with structured query language (SQL) provisions.

This logical arrangement helps the ERP user interface to run on the clients, the processing modules to run on the middle-tier application servers, and the database system to run on the database servers.

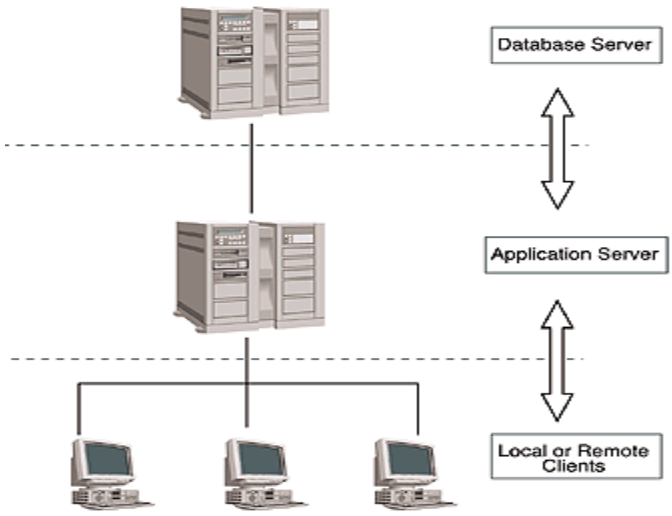


Figure 2: Three-tier Architecture of ERP System

1.4 Advantages and Disadvantages

Advantages:

- The ability for macro-level decision making by having access to consolidated data/information;
- Transparency across entire organisation;
- Integration of all standard business process (human resources, financials, operation);
- Lower inventory carrying costs;

- Lower ordering costs;
- Lower production costs;
- Lower accounting and record keeping costs;
- Lower investment in equipment;
- Lower investment in plant;
- Reduced assembly line down-times;
- More flexible production processes;
- More efficient lot sizes and scheduling;
- Reduced errors due to better coordination;
- Potential for increased profitability or increased market share (at a lower price) due to cost and efficiency improvements;
- Reduced fulfillment times;
- Increased process transparency for the customer;
- Flexibility for greater product customisation, resulting in a better match to the exact needs of the customer; and
- Potential for increased sales volume, increased sales revenue (due to a higher effective price, ie. - no discounts), increased market share, and increased profitability due to customer satisfaction improvements.

Disadvantages

The limitations and pitfalls of the enterprise resource planning are:

- The systems can be very expensive to install and maintain;

- ERPs are often seen as too rigid, and difficult to adapt to the specific Workflow and Business process of some companies--this is cited as one of the main causes of their failure;
- Some systems can be difficult to use; and
- The system is no better than the weakest link in the chain - a problem in one department or at one of the partners will affect all the other participants.

If the ERP system is integrated with a supply chain management system, other potential problems include:

- The system is vulnerable to a strike or labour problem at any one link in the chain;
- There can be transportation inefficiencies if small lots of product are transported several times before reaching the consumer / users;
- Once a system is established, switching cost from one vendor to another vendor are very high for any one of the partners (reduced flexibility and strategic control at the corporate level);
- The blurring of company boundaries can cause problems in accountability, lines of responsibility and employee morale;
- There is a resistance to sharing sensitive internal information, information that may be essential to the process;
- There are compatibility problems with the various legacy systems of all the partners;
- Customers may order more than they require (as in the dot.com/telecommunications boom and bust of 2001)

1.5 Migrating to an ERP System

Any organisation, when migrating to an ERP system should consider the following:

1.5.1 Catering to Changing Technologies

When deciding for an ERP solution, many factors come into play- the most important is that the solution should serve the company for a longer term. That is to say, the solution should be able to adapt itself to the changing technologies like operating systems and new hardware features. Most companies like JD Edwards, SAP, etc offer such upgrades; they have teams that cater to the changing needs in the software. All that is required is the application of a service pack.

1.5.2 Connecting to heterogeneous environments

In this changing business world, companies are being bought and sold. It is likely that a company will sold off or may merge will some other company. It may so happen that companies may be using different ERP packages. These ERP packages should now be able to work together. ERP solutions like SAP have offered technologies like web enabled services and exchanging technologies that help integrate these completely different ERP environments.

1.5.3 Minimizing Support

A bulk of the budget in a company is spent not on new development but on support.

Having an ERP system minimizes support. At most, a two-member team is required for generating reports and solving minor problems that surfaces up when a lot of varied data is in the database. This way a company could spend less on support and divert the money in purchasing new capabilities.

1.5.4 Choice of the Database

The database should be meticulously chosen because a lot depends on it. It is the choice of the database that determines the performance of the ERP system. Server database that runs on a multi-user platform is required for an ERP application. Server databases contain mechanism that ensures reliability and consistency of data. The primary factor that should be looked for is the concurrency model. The two most commonly used server databases are Microsoft SQL server and Oracle. Both have their own advantages and disadvantages. They differ widely in terms of the concurrency model. Oracle provides a multi version read consistency with no read locks and no dirty reads. Readers do not block writers and writers do not block readers. In Microsoft SQL server, read consistency is not available. It requires shared read locks to avoid dirty reads. If locks are not shared, dirty reads are possible. Also the readers block writers' block readers. Deadlocks can be serious issue with Microsoft SQL server, which escalates row-level locks, to table-level

locks depending on the transaction's volume. To the user, the application simply hangs. These unpleasant deadlock situations can result in aborting one or more of the concurrent users. Oracle, on the other hand, does not escalate row level locking. Microsoft SQL server is easier to use , easier to manage, less complex and requires lot less tuning than Oracle and is an excellent choice of windows platform. For cross platform support, Oracle is an excellent choice, which runs very well both on windows and Linux platforms. Most ERP solutions are built on both platforms, and it is up to the customer to decide the database of their choice.

1.5.5 ERP System Security

Perhaps the most important module in an ERP application is the security module that creates logins and grants select, update, insert, delete, and execute etc rights to the various database objects such as tables and stored procedures. Most ERP solutions restrict user directly accessing tables. The user can perform operations on a table via a stored procedure and these stored procedures have many validations checks for the data. Also, the idea is to pass the entire logic to back-end stored procedures so that debugging and alterations become easy for the IT team. Another feature that should be looked for in the security module is password encryption for the user logins. Password encryption prevents direct access to the database servers thereby preventing malicious users from gaining access to the servers. The user can only access the server through the ERP software.

1.5.6 Transiting from existing ERP to new ERP System

The new ERP provider should be able to migrate from the existing ERP data to its new system with minimal efforts, that is, by using data translators, scripts and useful programming techniques. The data should make sense in the new ERP system. Also the ERP provider should audit the data to ensure its integrity before making the system live. If the data is not suitable for transfer, the ERP provider should perform initialization techniques like calculating the opening balance amount for the new system, for inventory it can calculate the opening stock for each of the items, etc.

1.5.7 Will the ERP Provider Support Customisation?

This is a question frequently asked. It should be noted that no two business processes are alike. An ERP solution that suffices for a company may not be the be all and end all solution for another company. At some point of time, customisation is required. The customisation should also remain intact for future upgrades of the software. The factor that should be looked upon is whether the

ERP provider is capable of doing this. The ERP solution should also have builder tools for creating new forms and report writer tools for generating new reports. By having this, some customisation can be done at the user end also.

2 ERP and Extended Software

2.1 Traditional ERP

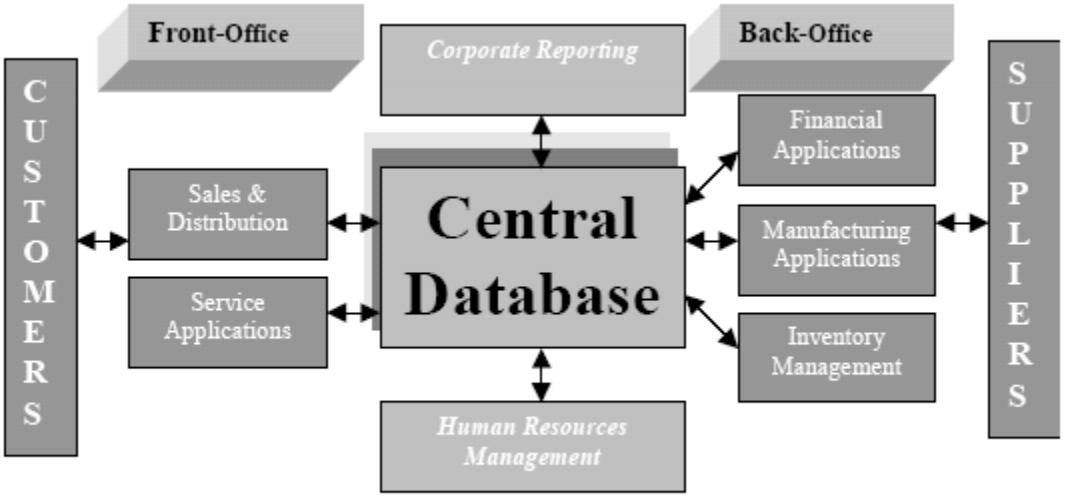


Figure 3: ERP Systems Concept

The evolution of ERP systems closely followed the spectacular developments in the field of computer hardware and software systems. During the 1960s most organisations designed, developed and implemented centralised computing systems, mostly automating their inventory control systems using inventory control packages (IC). These are legacy systems based on programming languages such as COBOL, ALGOL and FORTRAN. Material requirements planning (MRP) systems were developed in the 1970s, which involved mainly planning the product or parts requirements according to the master production schedule. Following this route new software systems called manufacturing resources planning (MRP II) were introduced in 1980s with an emphasis on optimizing manufacturing processes by synchronizing the materials with production requirements. MRP II included areas such as shop floor and distribution management, project management, finance, human resource and engineering. ERP systems first appeared in the late 1980s and the beginning of the 1990s with the power of enterprise-wide inter-functional and integration. Based on the technological foundations of MRP and MRP II, ERP systems integrate business processes including manufacturing, distribution, accounting, human resource management, project management, inventory management, service and maintenance, and transportation, providing accessibility, visibility and consistency across the enterprise.

2.2 Extended Software

During the 2000s small ERP vendors emerged, doing what big ERP producers often would not do – customizing ERP packages to meet the specific requirements of the corporations. These modules and functions, called “add-ons”, added to the core modules of big players gave birth to the “extended ERPs”. These ERP extensions include advanced planning and scheduling (APS), e-business solutions such as customer relationship management (CRM) and supply chain management (SCM).

Companies go for such high level of customisation because traditional ERP systems are restrictive and do not give enough flexibility to solve issues. **In fact, ERP add-ons address the limitations of ERP more effectively and at lower cost then ERP.**

Standalone Add-Ons

There are about 50 established and a few more newly emerging smaller and midsize ERP vendors including third party developers competing for the ERP market. The result is stiff competition and feature-overlapping products difficult to differentiate. Due to keen competition for control of the lucrative ERP market share, the vendors are continuously updating their products and adding their new technology-based features. Long-term vision, commitment to service and support, module features, specially, experience and financial strength for R&D are considered the major vendor qualities for product selection and turnkey implementation. In the following sections we provide brief profiles of these five ERP giants.

An example of add-ons: The Financial Supply Chain

<u>The Enterprise Resource</u>

Planning (ERP) movement of the last 20 years has made significant inroads into reducing company’s cost of inventory. ERP proved that with better supply chain management it is possible to reduce the uncertainties that encourage hedging through higher stockholdings and consequently reduce the cost of stockholding itself. I believe there are direct parallels between the success of ERP and the potential success of a new concept in corporate automation – the Financial Supply Chain.

The Development of ERP

ERP was perhaps the major application movement of the last two decades in enterprise computing, implemented by 85 percent of Fortune 1000 companies, representing almost major companies whose business model matched the proposition., Its origins were manufacturing Resource Planning(MRP), a system used by manufacturing companies to optimise materials, purchasing, run lengths and inventories with the aim of reducing the total cost of manufacturing.

ERP broadened this to cover the whole manufacturing enterprise and, critically in the mid-80s, to go beyond the boundaries of the company to communicate with the supply chain. This additional information being collected from broadest possible view of the enterprise, including its suppliers and customers, continued to reduce uncertainty and thereby enable inventory reduction.

To put this in financial terms, the cost of financing the inventories of the Fortune 1000 companies in the early 90s is estimated at US$ 150 Billion. Big savings in financing costs were available if inventories could be reduced – the U.S. Department of Commerce estimated a reduction in the inventory / sales ratio from 4.8 turns to 5.4 turns over the period 1980-90.

The final component that made ERP so successful was evolution of technology. Over the 15-year period that witnessed the growth of ERP, computing changed from central mainframes with a few application –specific dumb terminals to one- per-desk PC usage for all administrative tasks. There is no doubt that these technical developments were an important enabling backdrop to the success of ERP.

Let us now draw a parallel between the inventory reduction levels that prompted ERP implementation and the issue of cash management -maintaining stocks of cash. Both inventory and cash holdings need to be kept higher if there is lack of visibility into its sources or uses. In both cases, uncertainty can be reduced by managing and taking information from the relevant supply chain (namely the materials and services supply chain in the case of inventory , and the financial supply chain in the case of cash), and making it visible quickly and accurately. Estimates set the cost of the cash holdings of the Fortune 1000 companies at $90 billion.

The Financial Supply Chain:

Can the concept of Financial Supply Chain Management reduce the amount of cash corporations need to hold? Is the parallel with ERP useful?

There are two facets of the comparison that are particularly pertinent. First, there is no doubt that one of the keys to successful cash management is accurate information on what the future outgoing cash requirements will be and of incoming cash. Second, the enabling technology base is now in place. In the last three years, the Internet has become a truly cost effective solution for inter-organisation communications and a trusted infrastructure for business processes, secure enough to carry forward the technical advances being made in e-payment systems.

The heavy investment in e-procurement in recent years has not fed through into automation of the payment process and there remains currently a lack of progress in the automation of payment systems. Problems include:

- Fragmented point solutions with very limited integration;
- Limited inter-organizational integration and automation; and
- Manual processes of dispute resolution, reconciliation and payments.

But the biggest impediment most solutions fail to address is that 80 percent of the processes today are still paper driven. So automation solutions have to start by:

- Digitizing paper where possible so paper intensive processes do not slow down the processes, and
- Doing so without getting bogged down in complexity of business process re-engineering.

To address the needs of the marketplace, the fragmented point solutions available today must address both these weaknesses and re-invent themselves. As many observers, although e-ordering now takes seconds and goods can be delivered next day, it still takes months for the money to be moved. The good news is that now money can be moved swiftly, and the processes of invoice receipt, tax calculation, invoice approval, payment and cash management are ripe for automation.

Some visionary companies are building systems to address these issues, automating the entire billing and payments process and enabling contact down the supply chain with resultant benefits in:

- Cash Flow: ability to take early discounts and improved price terms for ePayments;
- Operating efficiencies: self-service vendor management and reduced cost of invoice processing and reconciliation;
- Internal controls and visibility: improved period – end accruals and elimination of payment duplication; and
- Implementing Financial supply Chain Management.

So, how are these benefits achieved, and what are the processes of implementing Financial supply Chain management? The implementation can be seen in four stages:

Convert Paper Documents to Electronic Documents

This can be achieved with a high degree of automation, including OCR, and does not involve extensive keying. Electronic invoices can be more easily reconciled with purchase orders, circulated for approval and swiftly passed through the system using standard workflow processes, devoting time only to the exceptions containing errors that involve resolution of disputes. For the percentage of instances where OCR does not work, it needs to be augmented by manual approaches for exception management located out of low-cost geographies like India.

Automate Financial Transactions

The move from manual to ePayments gives full control over the payment process, paying when you want to pay. E-payment does not necessarily shorten your payment cycle; if you want to maintain 30-day payment terms, then e-payment enables you to pay on exactly that last day. However, with e-payments, companies can negotiate improved terms for shorter payment periods based on their newfound ability to meet payment dates with full reliability. E-payments can be made precisely on time. The biggest myth that needs to be debunked here is the perceived benefit of float built into the delays caused by paper processes. For most companies, the benefits derived from operational efficiencies when paired with the capability of scheduling payments at-will more

than compensates for any real loss in float revenue. Also, with automation it is more practical to implement strategies like controlled disbursements to optimise cash positions.

Automate liability management

Sarbanes - Oxley has imposed new compliance burdens onto an already onerous area of operation. Requirements for accurate, rapid and transparent reporting cannot be realistically achieved without end-to-end automation solutions. Furthermore, the thousands of sales/use tax jurisdictions and rates, and the hundreds of changes each year, make tax compliance an increased cost and an increased worry. Again the benefits of automation can provide savings and, just as important, corporate confidence in compliance.

Implement Working Capital Management

Once the processes are automated, contact with the supply chain financial departments is improved and most of the uncertainties are taken out of the payment chain, companies can begin to optimise their cash management. This may be a purely internal process, managing cash against precise knowledge of daily payables and receivables, and improving credit decisions. There is also the option to explore external finance sources, such as factoring, which can be obtained at advantageous rates once the evidence of the effectiveness of the financial supply chain can be presented.

A recent implementation of Financial Supply Chain management at a top U.S. company showed impressive improvements. Data entry has been eliminated from 85 percent of transactions; the cost of invoice handling has more than halved to US$ 1.27 each; and operational cost base has improved by 30 percent (direct impact of reduction in full time equivalents). Strategic benefits now being negotiated include trade and payment terms improvements and reduction in the IT resources require supporting multiple payment systems.

It is ironic that 'the department most conscious of the need to make savings, the finance function, has been left behind in gaining the cost savings through automation that other functions have been routinely delivering. The emergence of these new Financial Supply Chain concepts, products and services signal the start of the next major corporate paradigm post-ERP , bringing financial and operational benefits to the very heart of the business.

RFID reshapes Supply Chain Management

RFID will be a major advance in supply chain management, but enterprises will need to do considerable upfront planning and testing to successfully implement and integrate the technology.

Although radio-frequency identification technology can be used in a broad range of applications, its focus right now should be on the supply chain. RFID will have a significant impact on every facet of supply chain management—from the mundane, such as moving goods through loading docks, to the complex, such as managing terabytes of data as information about goods on hand is collected in real time.

RFID will initially be used to manage the identification of large lots of goods—for example, at the pallet and carton levels. RFID tags, therefore, must have unique serial identifier information that associates each lot with a corresponding bill of lading sent from the originator. Because RFID readers can scan tags many times during a 1-second period, the serial identifier will prevent the application making the data request from getting multiple counts of the same items.

RFID tags are classified as passive or active. Passive tags work by taking the energy received from the reader through a tag's antenna and using that energy to transmit stored data back to the reader. Passive tags will likely be more widely used, at least at first, because of their low cost.

Active tags include their own power supply, usually a battery, to transmit information directly to a reader. The battery can also be used to help power or interact with other devices. For example, a company shipping perishable goods may want to use active tags that integrate with thermometers to ensure the goods are kept at an acceptable temperature.

RFID tags also have the potential, at the individual-item level, to store information that can be relevant to broader applications. For example, individual items with embedded RFID tags could contain information about warrantee and prior service to make it easier for companies to service those items.

Collaborative Partnership for better Supply change management

The collaborative supply chain management solution can help to eliminate costly supply chain errors. This solution extends visibility into supply chain processes and data to internal and external partners. Now misaligned supply chain expectations can be identified and resolved quickly using

collaboration. In collaborative supply chain management solution buyer and suppliers form a long-term relationship with each other for mutual advantage to create Win-Win situation. Instead of searching the market for best bid or cheapest price, buyer uses the partnership mode. The firms for business advantages may share resources, technology, information and expertise. This collaboration can help the business to great extent.

Major Players

The major players in the "Extended ERP" market are:

- **Manugisitcs**: Known for Supply Chain Management;
- **WamSystems**: Specialists in Chemical Industry Supply Chain Planning;
- **Agilisys;**
- **Aspen Tech;** and
- **12 Technologies**: Known for Supply Chain Management.

Products Offered

Manugistics

Manugistics is a clear winner to improve processes. They prove to have best combination of expertise, customer successes in various sectors and proven abilities to implement solutions that can enable strong, rapid high return on investment.

Changes in the structure of the way airlines, railroads, cargo operators, hotels, and operators manage their capacities, book and sell their products, and compete have transformed these businesses. Increasingly, pricing control has been lost to and to low-cost providers of the services. Tariff fences and market segmentation tools no longer effectively differentiate passengers, guests or customers.

Customer loyalty erodes, as price becomes the dominant driver. Similarly, media companies face complex revenue management challenges as they try to more profitably manage their future inventory of commercial time slots.

In environment where fixed costs are high, variable costs are low, demand is volatile, and competition is keen, profitable growth can be achieved only with sophisticated solutions designed to help you provide the right product, at the right time for the right customer, at right price-365 days a year.

Manugistics solutions for the travel, transportation, hospitality, and media industries embody more than 20 years of experience in demand and revenue management for leading companies around the globe. Our solutions help these companies meet the unique challenges of industries in which products are perishable and optimizing capacity utilization is critical, including:

- Passenger Travel: where Manugistics has helped the world's leading passenger travel companies -like Delta Airlines, TUI UK Ltd., KLM, El AI Israel Airlines, and GNER - achieve improved profits through superior demand and revenue management solutions;

- Cargo: where Manugistics has helped such leading carriers as DHL Aviation and Continental Cargo focus on increasing profits and customer satisfaction by making the right economic and capacity decisions for both contracted and spot customers -all based on reliable forecasts of demand and sophisticated optimisation techniques;

- Hospitality: where our solutions help enable hotel and resort companies and casino operators to more accurately forecast future demand and optimally allocate capacity according to customer value levels and length of stay patterns -a capability that no hospitality company can afford to be without; and

- Media: where our solutions help networks, stations, broadcast groups, and cable companies generate the maximum revenue and profit from their enormous future of commercial time slots.

Each of the services is taken in detail to highlight the complexities involved in the Extended Software.

Passenger Travel

For more than 20 years, Manugistics has helped the world's leading passenger travel companies achieve improved profits through superior demand and revenue management solutions. Our

clients are some of the most innovative companies in this sector- Delta Airlines, TUI UK Ltd., KLM, El AI, and GNER.

These companies use Manugistics solutions to improve forecast accuracy and to optimise price plans and inventory offerings while improving customer service and load factors. Our solutions consistently provide remarkable return on investment year over year

Passenger Airlines face significant challenges: high costs, increasingly price-conscious customers, and the rise of successful low-fare airlines. Offering prices without the traditional fences/restrictions and leveraging the internet as their distribution channel, the low-fare airlines have shifted the focus of airline revenue management from mass market fare setting to pricing at the individual consumer level. Traditional revenue management solutions focused on mass-market fare and inventory-setting processes simply do not solve today's airline business problems. In setting optimal fares and inventory levels today, airlines require solutions that focus on price sensitivity as a key driver of passenger demand.

Railways face the challenge of minimizing the number of unsold seats on a train while simultaneously preventing the overcrowding of trains by passengers with discounted tickets causing some full-fare demand to be refused. Because a train stops in many places, capacity is rarely an issue and passengers can buy a ticket on board, the key business problem for railways is to balance long-distance vs. local-haul traffic, walk-up vs. advanced purchase passengers, and spoilage (empty seats) vs. spillage (denying high revenue passengers). Although passengers are very price-sensitive, regulations in most do not allow rail operators to raise prices on seats offered. Railways therefore to accurately forecast demand, understand the price sensitivity of passengers, and optimally to maximize revenues.

Tour Operators provide package holidays to customers, where a package may include flights and/or hotel rooms. Hotel capacity is acquired from hoteliers on a committed or variable basis, and flights are mainly owned and are largely sunk cost. A tour operator's business model depends critically upon optimally pricing the holiday packages to fill the flights and hotel capacity. Since each seat and room can typically be used to accommodate dozens of packages at greatly differing prices, the risk of using it sub-optimally is huge, especially when some packages are part of an aggressive promotion campaign. With margins under constant pressure from competition and extremely price-sensitive customers, effective control over prices, promotions, and capacity can easily make the difference between being profitable or incurring losses. Tour operators therefore

need to continuously forecast demand, understand customer price sensitivity, and determine optimal capacity plans, brochure prices, and promotions to offer.

CARGO

For more than 20 years, Manugistics has helped the world's leading cargo companies achieve improved profits through superior demand and revenue management solutions. Our clients are some of the most innovative companies in this sector -KLM, Continental Cargo, and DHL Aviation.

These companies use Manugistics revenue management solutions to improve forecast accuracy and to optimise capacity and price plans while improving customer. These companies use Manugistics revenue management solutions to improve service and load factors. Our solutions consistently provide remarkable return on investment year over year.

Manugistics recognises that cargo companies provide the most important link in global supply chains. As a company we offer powerful solutions both for revenue management and for supply chain management that enable cargo companies to reach beyond their organisational walls into the demand and supply chain to better plan their businesses.

Combination Carriers focus on airport-to-airport transportation for the most part and offer capacity and services to their customers based on their own flight schedule, networks, and contracted third-party capacity. Their customers are extremely yet demand the highest quality of service -a need that has to be continuously balanced with high costs and limited capacity. Many customers have long-term relationships with carriers and in many cases negotiate capacity and rate agreements far in advance. These capacity allotments and rate agreements have to be balanced with the capacity and rate requirements of the spot market, which comes into play 14 days from departure.

In the spot market, the carriers manage every booking in real time by evaluating the profitability and operational feasibility of the request. Further, should demand not materialize as expected, carriers often offer discounted rates to their customers in order to stimulate demand. And finally, the carriers have to produce feasible transportation plans for all the bookings accepted so that handling agents are able to manifest bookings optimally.

Combination carriers face a very complex business problem and are required to continuously balance not only demand and supply; revenues and costs, discount rates, and load factors, but also to balance two very different time-frames of decision-making in terms of reward vs. risk. This balancing act requires sophisticated demand, revenue management, and pricing solutions that work in a coordinated manner.

Express Integrators focus on door-to-door (primarily package) service transportation. Much like combination carriers, express integrators offer capacity based on their own flight schedule, trucking networks, and third-party capacity. Where they differ is in the service they offer: their business model is based on accepting all shipment requests on any given day and guaranteeing service levels. Consequently their business planning needs are acute, predominantly in the medium-term time frame, where future daily demand must be forecast accurately, capacity plans must be optimized to ensure that a shipment request on any given day can be carried in a profitable manner, and customer contracts are negotiated.

Express integrators also face the challenge of managing pricing and promotions in the short term. Shipments must be priced profitably in advance and on a given day if a certain flight is foreseen to have excess capacity, targeted promotions need to be offered without diluting the offered rates. Again, coordinating all these complexities requires sophisticated demand, pricing and revenue management solutions integrated with capacity planning solutions.

Freight Forwarders as the intermediary between an end shipper and a cargo carrier provide the key link in the logistics supply chain. They face both a buy and sell problem: they sell services to the end shipper and buy capacity from cargo carriers to meet those commitments. They rarely own capacity themselves, managing instead a virtual capacity network negotiated with several cargos and trucking companies. As a result, their challenges arise along several dimensions; they must price the shipments profitably for the end shipper, purchase capacity from cargo carriers profitably and aligned the demand from the shippers with the virtual capacity network profitably. The freight forwarders business problems ranges from the vary long term, where customer and supplier relationships are established, to the medium term, where price, demand and capacity plans are established, all the way to the short term, where bookings are accepted, united and delivered to the cargo carriers. Such business problems require sophisticated pricing, capacity planning, and production planning solutions.

Ocean Freight companies -Container Carriers and Bulk Vessel Operators- are subject to global macro economic trends such as oil process currency fluctuation and political instability with a cost intensive asset base, these companies traditionally unable to react to short term changes in market conditions, but generally try to hedge the risk by negotiating long term contracts are creating other business units that can balance periodic down turns in a specific market. Such companies need the ability to accurately forecast demand at the customer, product and origin/destination levels so that they can on tactical capacity planning decisions to serve clearly identified segments and routes / strings. Container carriers can benefit from real time revenue management capabilities to evaluate individual booking to optimise profit on each transaction. By identifying opportunities to increase the value they offer their customers, these companies can potentially benefit from inland transportation optimisation capabilities as well.

Bulk Vessel Operators can benefit from applying demand-forecasting techniques to identify the full-unconstrained demand, medium-term capacity planning to plan for all contracted / fixed demand and real-time revenue management capabilities to evaluate spot-market demand to maximize profitability.

Hospitality:

For over 20 years, Manugistics has helped the world's leading hotel, resort and hotel gaming companies improve their profits through superior demand and revenue management solutions. These companies use Manugistics solutions to accurately forecast future demand and optimise price and availability according to customer value and length of stay patterns. Year after year, our solutions consistently provide these companies with a remarkable return on investment.

Hotel, resort, and hotel gaming companies face significant challenges: new distribution channels, increasingly price-conscious customers, and aggressive competitors willing to change the pricing 'rules'. They also face opportunities as the growth of room supply slows and demand rises. In this environment, establishing a good forecast and maximizing transient business is as critical as it has always been. Increasingly, however, hospitality companies are focusing on additional opportunities in the area of group acceptance and pricing. They must also strategically target promotions to the right date ranges and dynamically adjust them to shape demand. Most importantly, they must understand price sensitivity as a driver of demand and leverage customer profitability as the key to success.

Media:

Media companies face many challenges in realizing the best return on their primary revenue-generating asset -commercial spots. Two key mechanisms for addressing these challenges are pricing and the placement of the commercial spots. Pricing is the means by which media companies can adapt to the supply and demand fluctuation of the marketplace. Prices need to be constantly monitored and adjusted over months of future inventory and thousands of program air dates. Placement of commercial spots and entails the complex task of determining the appropriate combination of advertising spots to sell to the clients. It is a daunting and time-consuming process to select spots while trying to satisfy all of the client's mix, **flighting**, Correct this word and budget requirements. Factor in the, competing requirements of your other clients, as well as your own corporate objectives and you have a problem that is well beyond the capabilities of a human being to solve optimally.

Manugistics specializes in the answer to these challenges. Since 1991, Manugistics has helped some of the leading world companies solve these problems with state or art revenue management and optimal placements.

Network and cable companies have always faced these challenges, but the increasing number of programs and properties makes it exponentially more difficult. Companies must be prepared to address the challenges in both fast –paced upfront markets and more methodical scatter markets.

Manugistics has two offerings to help media companies address these challenges.

Media Optimal Placement Engine (OPE) – it has ability to consider the myriad requirements of advertisers and commercial time sellers in conjunction with a forecast of market demand in order to determine an optimal set of commercial spots for a given client request. The benefits of such a solution include quicker RFP response times, proposal that better match customer requirements and most importantly, proposals that are consistently designed to enhance profits.

Media Revenue Management System (RMS) – combines time series demand forecasting and optimisation processes to equip pricing analyst with the ability to manage the monitoring and adjusting of pricing and products for thousands of future program airdates. The forecast are dynamically updated with data from the latest program airdates to keep the forecasts synchronized

with current trends. With this managed mix of inventory sold throughout the sales cycle yield is maintained even on late booking proposals.

Aerospace and Defence

Real Industry Experience

For original equipment manufacturers (OEMs), fierce competition, a changing mix of new product and aftermarket business, and global industry consolidation are facts of life.

The maintenance, repair, and overhaul (MRO) landscape is also evolving rapidly, with independent service providers, airline technical services departments, and OEMs all vying for profitable market positions, while commercial air travel levels are down.

And military readiness, balanced with affordable costs, has never been more critical.

Manugistics understands these issues and what it takes to address them. Every day help forward-thinking OEM and MRO organisations in industry and government their tough operational challenges and improve top- and bottom-line performance. Manugistics solutions offer significant opportunity for cost savings, revenue generation, and customer service improvements. More than 150 A&D organisation including top five FORTUNE ® 500 A&D companies, use Manugistics solutions every day to help build and maintain a board array of aviation, space, marine and defense product including

- Commercial and military aircraft and engines
- Unmanned aerial vehicles (UA Vs)
- Strategic and tactical missiles
- Space systems
- Ships and submarines
- Military vehicles and weapon systems
- Structural and mechanical subsystems and components
- A broad range of avionics, display systems, navigation systems, guidance and control systems, communication systems, electro-optics, sensors, and 'black box defense electronics

Learn how Manugistics is helping aerospace & defense organisations move forward in today's economic climate via our industry experience and our market-Leading solutions, see proof from select clients, and find out where you can see Manugistics live at upcoming events.

Manugistics solutions are listed on the United States GSA Register. Manugistics has a also been awarded a Basic Order Agreement (BOA) by the NA TO Consultation, Command and Control Agency (NC3A).

Consumer Goods

For over 20 years, Manugistics has helped hundreds of consumer goods companies achieve world-class demand and supply chains. Our clients are some of the largest and most successful consumer goods companies in the world - A von, Black and Decker, The Campbell Soup Company, Diageo, Kraft Foods, Leap Frog Enterprises, Levi Strauss & Co., Pfizer, The Scotts Company - and include companies across the Apparel 1and Footwear, Consumer Durables and Non-Durables, Consumer Electronics, and Food and Beverage segments of the industry.

These innovative companies use Manugistics solutions to improve, forecast accuracy, improve inventory turns while improving customer service and fill rates, lower transportation spend, improve manufacturing productivity, and price and promote products more profitably. Numerous awards attest to our success in helping our consumer goods clients achieve demand and supply chain excellence: Manugistics has been recognized as "Best in Class" for Supply Chain Planning Consumer Goods Technology for the past 3 years!

Consumer Goods companies, producing products sold to individuals, generally through retail channels, but increasingly directly, face significant business challenges. To help meet those challenges, Manugistics provides leading demand and supply chain management solutions to various consumer goods segments including: Apparel and Footwear, Consumer Durables and Non-Durables, Consumer Electronics, and Food and Beverage. While these segments confront differing demand and supply chain issues, they also face many common challenges driven largely by margin and profitability pressures stemming from demands made by mega-retailers like Wal-Mart, pressures to move offshore, managing SKU proliferation and competing with private label brands. As a result, consumer goods companies must continually evolve their demand and supply chains to improve customer service and squeeze costs out of their operations. Manugistics

solutions uniquely position consumer goods companies to stay one step ahead of constantly changing demand.

Apparel and Footwear companies manage supply chains that are among the most complex in any industry. Long design-to-shelf lead times, resulting from global outsourcing of production, import quotas and lack of technology sophistication among many outsourcing partners require these companies to place orders 6-9 months ahead of the season. The faddish nature of many footwear and apparel fashion products makes demand very difficult to predict that far in advance and results in large promotion and markdown expenses as well as high levels of inventory obsolescence.

Consumer Durables, which include a range of products from home furnishings and Leisure products, household products, toys, and other products, are characterized by longer life spans than consumer packaged goods, non-durables, and consumables. Many durable products, however, are produced in complex manufacturing environments with a large number of suppliers and trading partners involved in getting the product to market - requiring greater supply chain coordination.

Consumer Electronics companies, producing computers, televisions, DVD players, and other household electronics, face many of the same challenges as other consumer goods companies. The lifecycle of consumer electronics products is shrinking along with severe price deflation, which makes demand, pricing, and promotions management even more challenging. Their supply chains tend to be global -with multiple tiers of contract manufacturers, component manufacturers and suppliers that must be coordinated in order to get products to market.

Consumer Packaged Goods, Foods and Beverage companies, selling their products around the globe every day, face increased competition from private label brands. These companies have products that are constantly evolving with 'new and improved' versions to an increasingly micro-segmented market to maintain brand loyalty. However, this short shelf-life dramatically increases the risk of obsolescence and further complicates an already complex supply chain. Because of micro segmentation, SKUs have proliferated to meet the needs of the individual customer, reducing average volumes and making demand and supply management very challenging. The emergence of mega-retailers has placed additional demands -as well as margin pressures. Direct-to-store delivery, Vendor Managed Inventory (VMI), and aggressive trade fund spending have, become commonplace, requiring new arid nimble demand and supply chain capabilities.

Pharmaceutical and other life sciences companies have stringent auditing and requirements to meet FDA mandates. Life sciences companies are required to provide complete tracking information, when requested, within a short period of time. In addition to this, they need to effectively manage products so that they meet minimum requirements when they reach the retailers. Other challenges, such as ongoing consolidation, globalization and the shift from supply-to-order towards a business model continue to strain their supply chains. All of these challenges whether one is making a new blockbuster drug, a new innovative medical or a new OTC product, require a synchronized supply chain and flawless execution.

Government Sector

Manugistics and General Services Administration (GSA) schedule

GSA Schedule a powerful new tool for Government Project Managers. By providing federal agencies with a simplified process for obtaining information technology (IT) services, it offers a fast, cost-efficient method for Government ordering offices to or services. Because GSA has already determined the prices cited in the General Services Administration (GSA) Schedule to be fair and reasonable, ordering offices are not required to seek further competition, synopsize their requirement, or make a separate determination of fair and reasonable pricing. And orders placed through the GSA Schedule are considered to be issued pursuant to full and open competition,

The Advantages of GSA

Speed-to-delivery

The GSA Schedule makes it possible for Government ordering offices to complete the ordering process in as little as one day -which means your Manugistics solution, can be implemented and delivering benefits fast.

No order restrictions

Because the GSA Schedule provides pre-approval of Manugistics solutions, there are no minimum or maximum order restrictions. So whether you need to address one functional area or your entire supply chain, you have the approval to license the right solution today.

Lower costs

Prices listed in the GSA Schedule reflect volume-purchasing rates. The Schedule eliminates pass-through costs and guarantees that you pay the lowest possible price for the Manugistics solution you choose.

Direct Vendor Contact

GSA approval gives the power to work directly with Manugistics from day one. By eliminating third party involvement, the GSA schedule ensures that you can leverage Manugistics supply chain knowledge and domain expertise to the fullest.

Retail

The challenge of growing revenue and profits in retailers

As growth becomes the watchword in the retail industry, retailer must find ways to turn their business challenges into opportunity to grow revenue and profits. Retailers are facing increased competition from Wall-Mart and need to find innovative ways to differentiate through the customer experience. Most retailers today support multiple channels to grow their business, which is further increasing the complexity of their operations. The out of stock rate is still very high and cost us retailer billions of dollars in lost sales every year. Today's consumers are well informed and are trained to make purchases when the product is promoted, making it imperative to manage promotions effectively. In this newly demanding environment, retailers face such issues as:

- Fighting for consumer mind share;
- Minimizing stock –outs;
- Selling across multiple channels;
- Managing complex relationships with suppliers; and
- Profitably managing shelf pricing, promotions, and markdowns.

To help address those issues, Manugistics provides leading demand and supply chain management solutions to key Retail segments including: Grocery, Convenience and Drug Stores;

Food Service companies, Specialty Retail (Hard and Soft Lines), Discount Retail and Apparel Manufacturers / Stores. Although these segments often face unique demand and supply chain issues, they also face many common challenges driven largely by margin and profitability pressures that require these companies to continually improve the customer experience while squeezing costs out of operations.

Grocery, Convenience and Drug Stores

Grocery, Convenience, and Drug Stores lose billions of dollars every year as the out-of-stock rate continues to be in the 8-15% range for various categories. High levels of in stock are also required to improve the shopping experience of consumer's -so that they find what they want on the shelf. Manugistics helps grocers reduce total costs from purchases, transportation, distribution, spoilage, and inventory while helping them manage promotions effectively.

Food Service

Food service companies, placing a high priority on product availability, require superior network planning in order to deliver the convenience that is the hallmark of their business. Carrying perishable products, food service companies rely on high inventory turns, managing volume and service while ensuring that their products with limited shelf life are fresh when they reach the consumer.

Specially retails (Hard and soft lines)

Specialty retailers in order to differentiate themselves from discount general merchandiser must focus on customer service through high in stock levels and wider and deeper assortment within their categories. Because these companies are under constant margin pressure from discounters they must operate more efficiently predict demand and place the right inventory in stores to maximize sales while improving turns. Consumers have become trained to respond to promotions and markdowns. Retailers need to manage promotions effectively to maintain margins.

Discount Retailers

Discount retailers focusing on offering a huge variety and managing high inventory turns, often face out-of-stock issues during key promotions. Since these retailers offer products at lower prices, managing costs is critical for them to preserve margins. Manugistics has helped discount retailers

improve profitability by reducing total costs through accurate forecasting, replenishment, allocation and transportation planning.

Apparel Manufacturer / Stores

Apparel manufacturers /stores often need to predict demand for high fashion items 6-9 months prior to the start of the season due to long procurement lead times. They constantly run the risk of missing out on the next season's fad by under ordering or incurring huge markdown costs by over buying. The problem is further complicated by the large assortment of style, colour and size for which they have to plan. Apparel manufacturers can achieve higher in-stocks, improve inventory turns, and profitably manage promotions and markdowns using Manugistics solutions.

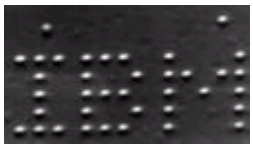
Manugistics Partners

Manugistics Alliance Program

Our alliance program is based on delivering maximum value to our global base of clients. We allay ourselves with leading companies that provide consulting and implementation services, software and technology and hardware that compliment our industry-leading portfolio of demand and supply chain solutions. Building on the strengthens of these industry leaders allows us to add significant value through comprehensive solutions that help our clients improve customer service, lower costs, sources more efficiency, reduce inventory and priced optimally. Manugistics prides itself on its approach to building alliances. We believe in meetings today's business challenges is made more difficult by the need to navigate the proliferation of so-called total solutions. We believe that our best-of-class approach, combined with our documented reputation for superior alliance relations, enables us to from alliances the maximum benefits on behalf of our clients for the delivery of "total solutions".

Consulting and Implementation Alliances

Manugistics works with leading systems integrators and business strategy and management consultancies that provide a wide range of consulting expertise including implementation of software solutions, process and change management and strategic business services. We maintain close relationship with major consulting organisations worldwide to extend Manugistics delivery and solution capability for our clients.



Software &Technology Partners

Manugistics pursues alliances with companies that develop technology and software solutions with specific application functionality and enabling technology that we determine offers a best of breed fit with industry solutions.

Manugistics Alliance Partners for Hardware

Hardware Partners: Relationships are maintained with multiple hardware and platform companies to provide our clients with an array of delivery options that supports Manugistics suite of industry solutions

WAM Systems

The chemical industry has been undergoing dramatic changes over the past two decades; Globalization, industry consolidation, intensifying competition and deteriorating margins have all impacted business. Chemical companies need systems that can deliver a competitive advantage through improved profitability, market share, and customer responsiveness.

WAM systems are a highly focused company dedicated to building advanced planning tools designed to help chemical companies overcome these challenges. WAM is revolutionizing how chemical l firms plan and manage their supply chains in today's competitive world.

Founded in 1987, WAM Systems has a long history of providing supply chain to any of the word's largest chemical firms. Our supply chain solution is proven to improve profitability, competitiveness, and customer relations. , a decade ago, Picasso has become the preferred chemical industry solution capable of supporting a wide variety of production operations including and fully continuous manufacturing environments. Our solutions are found in most chemical markets including basic chemicals and petrochemicals, specialty chemicals, films, sheets and packaging.

Chemical Supply Chain Challenges:

More than ever, companies are dealing with greater challenges in the complex some of which include increased: -

- External demands to improve customer response time, expand product offerings,, and hold the line on prices; and
- Internal pressures to enhance manufacturing efficiency, reduce inventory costs and boost profit margins.

The WAM solution enables chemical companies to achieve higher profitability, through PICASO^{tm}, which offers powerful decision support and optimisation tools and through its valuable industry - specific consulting services.

WAM Systems is uniquely qualified to deliver innovative solutions that help to overcome the challenges of today’s complex chemical business:

- Managing Demand;
- Optimizing Inventories; and
- Optimizing Production.

Challenge: Managing Demand Effectively in a Complex and Volatile Chemical Market

Managing demand effectively is fundamental to optimizing your supply chain. Demand is the force that drives the chemical supply chain. So, accurate prediction and timely fulfillment of demand are essential to success.

But the complexity of today's global chemical industry creates significant hurdles demand management. You depend on your customers to accurately forecast their needs. But. Like you, they are subject to market uncertainties and price volatility. The growing trends of customisation and segmentation mean that you have a wider variety of products to manufacture and more difficult choices to make to maximize production efficiency and profitability. Your customers are demanding better and faster delivery times while you face internal pressures to reduce inventory levels.

How do you meet the challenge of these conflicting pressures and take charge of demand management?

Take Charge of Demand Management with Picaso™ from WAM Systems:

Effective demand management in the chemical business requires five keys Capability:

Accurate forecasts. so you know what to expect and when:

Accurate forecasting is achieved by blending statistical analysis and customer projections and the knowledge of your sales and service teams.

Picaso provides the powerful yet flexible forecasting tools you need to develop timely, accurate forecast. The process begins with Picaso's statistical forecasting engine, which provides first-cut projection based on methods and criteria tailored to your business Picaso's forecasting tool prioritizes high-value customers and key accounts with individual attention, and handles smaller customers collectively. The collaborative features enable the key stakeholders to focus on the important details, easily share information, and arrive at a consensus. Customers can also be included in the collaborative process to achieve more accurate forecasting.

Optimized Product mix...for maximum profitability:

Picaso's Supply Chain Optimizer users advanced analytical techniques-powered by the ILOG optimisation engine-to map your demand forecast across the supply chain maximization, sales and production plans that accommodate your capacity limitations while profitability. Product and

customer mix can be analyzed interactively to find business blend that improves the utilisation of your equipment. And alternative scenario can be easily run to assess the impact of various customer and production option.

Efficient order processing… to improve customer service response**:**
Picaso's Advanced Available-to-Promise provides a powerful tool to instantly and commits customer orders while maximizing profitability. You can instantly determine if an order is within forecast, and see the best way to fulfill the order. Whether from existing inventory, planned production or alternate sourcing locations. And the, profitability of each alternative is evaluated so you can make informed sourcing decisions from the start.

Profitable order fulfillment... so the right material is in the right place at the right time.
The tight integration of Picaso's order fulfillment features assures that changing plans are instantly available throughout the organisation. Your distribution can target inventories to meet specified customer service levels...logistics receive just-in-time replenishment plans to maintain proper service and inventory levels and production schedulers see the status of every order and the impact of every change. Most importantly, your planners see the financial impact of every decision.

Real time monitoring and communication… for up-to-the minute assessment of demand:
Bottom Line-Increased –Increased Profitability:

The Picaso suite of supply chain solutions supports all of these capabilities and the information you need to achieve superior customer service, lower reduced working capital requirements, better use of production assets, and increased profitability.

Challenges: Optimizing Inventories without Sacrificing Customer Service

Proper inventory levels keep your entire operation running smoothly. When you optimise your inventories-so the right products in the right amounts are in the right time-you're able to provide reliable deliveries to your customers while controlling inventory costs...a goal that's vital to the success of every chemical company.

However, the demands of the global chemical marketplace make this balancing problematic than ever. Distribution networks are increasing in size and multiplying the difficulty of inventory decisions. Your customers demand shorter lead times and faster deliveries, creating pressure to increase rather than decrease inventory levels. Efficiency targets for your production lines dictate longer runs for each product resulting in larger stockpiles. Most important, unbalanced inventories are a significant drain on working capital at a time when you're under tremendous pressure to keep costs down.

How do you meet the challenge of trimming inventory costs without sacrificing customer service?

Solution:
Control the Complexities of Inventory Management with Picaso™ from WAM systems.

Four key capabilities are critical to unlocking the benefits of optimized inventories:

- In depth analysis... to evaluate past practices and target future inventory strategies;
- Flexible optimisation tools that weigh production and inventory tradeoffs;
- Efficient network design for a distribution system that moves materials at the lowest cost; and
- Powerful reporting system that monitor, measure and communicate performance.

The Picaso™ suite of supply chain solutions supports all of these capabilities and delivers the information you need to successfully manage inventories and make the right decision in a complex and competitive marketplace.

Bottom Line--Maximizing Your Profitability

Picaso's supply chain analysis and optimizing tools will help you control inventory levels, reduce working capital requirements, and position your products for maximum profitability, which means a better bottom line for your company.

Challenge: Planning Production.. When Faced with Competing Business Needs

Effective production planning and scheduling are core competencies of competitive chemical supply chains. But the growing complexity of the chemical industry has made achieving this goal more challenging. Corporate consolidation, globalization and expanding product portfolios increase supply chain complexity while growing competition, increased customer demands and difficult market economics put pressure on producers to meet challenging financial performance goals.

Accordingly, production planners and schedulers have to focus on several important goals: scheduling the plant efficiently, keeping inventories low, satisfying customer demand, and anticipating the impact of every decision on the supply chain.

They should understand how much inventory is needed to support demand during, the production cycle, and how much is needed to support a desired level of customer service. They should know how to reshape plans smoothly and responsively, without breaking the rhythm of the plant. And they should be able to visualize the impact of a planning decision on the entire supply chain.

How can this optimisation be accomplished to maximize your return on assets?

Solution

Optimise Production Planning with Picaso™ from W AM Systems Optimizing production requires five key capabilities:

- Generating accurate forecasts;
- Optimizing product mix and asset usage;
- Optimizing production policies;
- Scheduling in the face of change; and
- Monitoring and assessing performance

The Picaso suite of supply chain solutions provides these capabilities and delivers the information you need to successfully optimise production in a complex and competitive marketplace.

Bottom Line-Maximizing Your Return

Effective planning and scheduling help you maximize your return on high-value production assets. By improving forecast accuracy, and using the latest techniques for meeting that demand and developing optimal production plans and schedules, you can achieve significant savings from increased capacity use and decreased transition cost. And you accomplish all this while providing a high level of customer service.

Alliance Partners WAM Systems reinforces its commitment to create competitive advantages for our customers by teaming up with key business partners. We have developed strategic alliances with leading technology companies to deliver supply chain planning solutions to substantially improve profitability through measurable cost reductions and optimisation of operations.

AID Corporation

AID Corporation is a leading integrated solution supplier of software and implementation services to the process industries in South Korea, providing customers with cost-effective solutions combining plant information systems, plant automation systems, supply chain management systems, and plant engineering software. AID's mission is to help customers maximize productivity and profitability by improving operational and business performance through the deployment of integrated solutions.

AID's customers include those in the refinery, chemical, power, pulp-paper, food and manufacturing industries located in South Korea.

Honeywell

Honeywell is a 24 billion dollar diversified technology and manufacturing leader, serving customer worldwide with aerospace products and services, control technologies for buildings, homes and industries, automobile products, fibers, plastics and electronic materials. Honeywell’s automation controls and solutions group offers WAM’s PicasoTM planning systems as an embedded part of their business.

Soteica

Sotecia serves Latin American process industries implementing advanced manufacturing and supply chain technologies including WAM Picaso solutions. Since inception in 1985, it has been forefront of supplying state of art technologies to major oil and gas, pharmaceutical and chemical industries in the region.

Profit Point

Profit point Inc. is a leading supply chain management company with extensive expertise in the process industries. It provides WAM's Picaso solution to support world class breed of supply chain technologies including WAM's Picaso solutions to support world class business processes.

Complete ERP Suite

The five dominating ERP software suppliers are SAP, Oracle, PeopleSoft, Baan and J.D. Edwards. Together they control more than 60% of the multibillion-dollar global market.

Major Players

Each vendor, due to historic reasons, has a specialty in one particular module area such as

- Baan in manufacturing;
- PeopleSoft in human resources management;
- SAP in logistics; and
- Oracle in financials.

These players seeing the need for high level of customisation has started offering as a packaged deal. Extended ERP along with Traditional ERP forms the complete ERP suite, which is offered to the organisations migrating to ERP. But these lack in niche specialisation vis a vis small vendors.

The proliferation of the Internet has shown tremendous impact on every aspect of sector including ERP systems becoming more and more "Internet-enabled". This of accessing systems resources from anywhere anytime has helped ERP vendors extend their legacy ERP systems to integrate

with newer external business modules such as supply chain management, customer relationship management, sales forced automation (SFA), advanced planning and scheduling (APS), business intelligence (BI) e-business capabilities. In fact ERP is becoming the e-business backbone for doing online business transactions over the Internet. Internet based is destined to improve customer satisfaction, increase marketing and sales expand distribution channels, and provide more cost-effective billing and payments methods. The extension to SCM and CRM enables effective tri-party business between the organisation, suppliers and the customers. A supply chain has sub-modules for procurement of materials, transformation of the in to products and distribution of products to customers: "Successful supply chain management allows an enterprise to anticipate demand and deliver the right product to the right place at the right time at the lowest possible cost to satisfy its customers. Dramatic savings can be achieved in inventory reduction, transportation costs and reduced spoilage by matching supply with actual demand" With the deployment of a CRM, organisations are able to gather knowledge about their customers, opening opportunities to assess customer needs, values and costs throughout the business life for better understanding and investment decisions. The sub-modules found in packages are marketing, sales, customer service and support systems using and other access facilities with the intention of increasing customer loyalty I improved customer satisfaction.

E-commerce is the conduct of business transactions among organisations with the support of networked information and communication technologies, especially utilizing c applications such as the Web and email, effectively reaching global customers. Adoption of e-commerce and e-business solutions, especially business-to-business (B2B) are seen by many as the wave of current and future extensions of traditional systems of most small, medium and large vendors. The front-end Web-based applications are integrated with the back-office ERP-based applications, business transactions such as order placement, purchasing, inventory updates, benefits, etc. to take place between the customers, suppliers and the enterprise relevant data and applications instantly in a border-less domain.

The legacy ERP systems designed to integrate enterprise functions within the four walls enterprise have introduced software solutions with a Web-interface essentially internet-enabled CRM, SCM and other internet-business models.

Examples of such extended ERPs are available from most of the ERP vendors.

1. Thus SAP's internet-enabled integrated ERP system called mySAP. COM (SAP, 2001) is a suite of ERP, CRM and other products that can be linked together using Internet portals.

   a. An example of an extended ERP system may be Oracle's e-business suite of ERP systems that connects to CRM and SCM.

   b. Oracle's Fast Forward Web Store (Oracle, 2001) provides applications for establishing online stores for handling transactions and services with the possibility of linking into Oracle's ERP applications.

   c. ERP and e-commerce applications of an enterprise can share a common database with the deployment of Oracle Applications lli (Oracle, 2001) integrating Web sites with ERP back-office applications.

2. Baan has integrated its ERP, CRM and SCM with manufacturing management software.
3. J.D. Edwards' Oneworld ERP package is reengineered to OneWorld Xe ("Xe" stands for "extended enterprise"), which enables the organisation to extend the enterprise beyond physical walls to collaborate with customers, partners, and suppliers with additional tools for business-to-business (828) success.
4. The Swedish ERP vendor Intentia International A8 (Intentia, 200 I) has a product suite called Movex that integrates ERP, CRM and other management software.

2000	Extended ERP
1990	Enterprise Resource Planning (ERP)
1980	Manufacturing Resource Planning (MRP II)
1970	Material Requirement Planning (MRP)
1960	Inventory Control Packages

Products Offered

Some common ERP packages along with their examples are:

AG-Flagship Products R/3, mySAP. COM

SAP AG ("Systeme, Anwendungen, und Produkte in Datenverarbeitung"), or Systems, Applications and Products in Data Processing, was started by five former IBM engineers in Germany in 1972 for producing integrated business application software for (SAP, 2001).

Characteristics:

- Its first ERP product, R/2, was launched in 1979 using a mainframe-based centralised database that was then redesigned as client/server software R/3 in 1992.

- System R/3 was a breakthrough and by 1999 SAP AG became the third largest software vendor in the world and the largest in the ERP sector with a market share of about 36% serving over 17,000 customers in over 100 countries.

- In 1999 SAP AG extended the ERP functions by adding CRM, SCM, sales-force warehousing.

- SAP has also invested significantly in its R&D sector with the result of newer versions of R/3 3.1, 4.0, 4.6 including Internet functionalities and other internet -enabled ERP solutions are provided by the recently launched product called mySAP.COM.

- SAP has the broadest ERP functionality, to spend significantly on R&D, strong industry-focused solutions and vision.

Modules of internet version mySAP.COM		
MySAP Workplace	MySAP e-Procurement	MySAP Human Resources
MySAP Supply Chain Mgmt	MySAP Product Lifecycle Mgmt	MySAP Marketplace by SAPMarkets
MySAP Customer Relationship	MySAP Business Intelligence	MySAP Hosted Solutions
MySAP Financials	MySAP Mobile Business	MySAP Technology

Oracle Corporation-Flagship Product Oracle Applications:

Oracle (Oracle, 200 I), founded in 1977 in the USA, is best-known for its database software and related applications and is the second largest software company in the world after Microsoft.

Characteristics:

1. Oracle's enterprise software applications started to work with its database in 1987. It accounts for $2.5 billion out of the company's $9.3 billion in 1999, which places Oracle second to SAP in the enterprise systems category with over 5,000 customers in 140 countries.
2. Oracles ERP system is known as Oracle Applications, having more than 50 different modules in six major categories: finance, accounts payable, human resources, manufacturing, supply chain, projects and front office.
3. Oracle has other strong products in the software field including OHMS, data warehousing, work flow, systems administration, application development tools (APIs), and consulting services.
4. A notable feature of Oracle is that it is both a competitor and a partner to some of the industry leaders in the ERP market such as SAP, Baan and PeopleSoft because of the use of Oracle's DBMS in their ERP systems.
5. Oracle has integrated its ERP solutions with the Internet and has introduced several applications in the electronic commerce and Internet based commerce areas. Oracle's Internet infrastructure is created around two powerful products: Oracle9i Database and Oracle9i Application Server.
6. Another significant feature of Oracle is its OSBS, or Oracle Small Business Suite, which provides consistent financials, payroll, inventory control, order entry, purchase orders, and CRM functionality-all delivered as a Web service.
7. Oracle also offers an easy-to-activate Web presence that helps companies to sell, goods via the Internet.

The erstwhile PeopleSoft Inc.-Flagship Product PeopleSoft8

PeopleSoft is one of the newest ERP software firms started in 1987 in Pleasanton, California, with specialisation in human resource management and financial services modules. PeopleSoft quickly managed to offer other corporate functions and attained revenue of $32 million in 1992.

Characteristics:

I. Enterprise solutions from PeopleSoft include modules for manufacturing, materials management, distribution, finance, human resources and supply chain planning. SAP AG and Oracle-with longer experience, stronger financial base and worldwide presence-are the main competitors to PeopleSoft.

2. Many customers comment that PeopleSoft has a culture of collaboration with Customers, which makes it more flexible than its competitors. One of the strengths of PeopleSoft is the recognition by its customers that it is flexible and collaborative.

3. The flagship application PeopleSoft8 with scores of applications was developed by PeopleSoft with an expenditure of $500 million and 2,000 developers over 2 years as a pure internet-based collaborative enterprise system. "Our revolutionary e-Business platform is the first open XML platform to offer scalability and ease of use for all users. PeopleSoft 8 requires no client software other than a standard Web browser, giving you the ability to securely run your business anytime, anywhere" (PeopleSoft, 2001).

4. "Our e-Business applications and consulting services enable true global operations-managing multiple currencies, languages, and business processes for more than 4,400 organisations in 109 countries" (PeopleSoft, 2001). PeopleSoft with about 10% market share, is the third largest ERP vendor after SAP AG and Oracle.

5. In 2004, PeopleSoft has been acquired by Oracle.

The Baan Company-Flagship Product BaanERP

Founded in 1978 in The Netherlands, Baan (Baan, 2001) started with expertise in software for the manufacturing industry and by 1997 claimed an ERP market share of roughly 5%. Bann's revenue in 1998 was roughly $750 million and while facing a slight slowdown in 1999 started growing again in 2001 with sales up 12% at £7,231 million and operating profit of £926 million. Baan has more than 15,000 customer sites allover the and more than 3,000 employees.

Characteristics:

- Baan believes that "the Internet is the ultimate enabler technologies help companies become order-driven and customer focused by enabling collaboration across the value chain. Supplier, distributors, manufacturers and customer can work together to deliver the right product.

- ERP solution areas that Baan covers include finance, procurement, manufacturing, distribution, integration and implementation, planning, sales, service and maintenance, business portals, collaborative commerce and business intelligence.
- Bann's flagship product is BaanERP (formerly called Triton, then Baan IV), launched in 1998.
- One innovative product from Baan is the Orgware tools that can cut implementation cost significantly by automatically configuring the enterprise software
- Baan's ERP software is best known in the aerospace, automotive, defence and electronics industries.

J.D. Edwards & Co. -Flagship Product OneWorld

J.D. Edwards was founded in 1977 in Denver (cofounded by Jack Thompson, Dan Gregory and C. Edward McVaney) with long experience of supplying software for the **AS/400 market**.

Characteristic:

1. J.D. Edwards' flagship ERP product called OneWorld is "capable of running on multiple platforms and with multiple databases, [and] revolutionizes enterprise Software by liberating users from inflexible, static technologies" (JD Edwards,2001). The product includes modules for finance, manufacturing, distribution/ logistics and human resources, quality management, maintenance management, data warehousing, customer support and after-sales service. J.D. Edwards' revenue jumped to $944 million in 1999 from $120 million in1992, having more than 5,000 customers in over 100 countries.

2. The OneWorld system is considered to be more flexible than similar competing products and within the reach of smaller enterprises. J.D.

3. Edwards' internet-extended version of OneWorld was launched recently as OneWorld Xe ("Xe" stands for "extended enterprise").

3. Indian Case Studies

3.1 Cases with small vendors (Extended ERP)

Whirlpool - Slashing Inventory

Major appliances play a part in the daily lives of millions of people throughout the world. The convenience that these appliances offers means that most consumers don't want to deal with a machine that doesn't work – most will quickly repair or replace a broken appliance

And, even with an average life span of 10 to 15 years for most major appliances. Consumers often choose to replace their dishwashers, refrigerators, and washers and they have reached the end of their lifecycles.

Consequently, the major appliance industry is driven by replacement demand, which accounts for the majority of all appliance purchases. Major appliance must fine-tune their demand management systems in order to accurately -for both replacement and new appliances.

During an extensive review of Whirlpool Corporation's best practices, company executive realized the appliance manufacturer was lacking in its demand management process. Planners were using everything from spreadsheets to homegrown systems to determine demand.

"But none of those systems has the power to really manage the various inputs and various customer constraints," said J.B. Hoyt, Whirlpool's Director of Global integration.

Why i2?

Whirlpool management formed a global team to look at demand management and possible software providers. Following a thorough review, executives eventually i2 Demand Planner™ part of the i2 Supply Chain Management™ suite of suite of solution.

"We chose Demand Planner because of its power and its ability to segment demand by customer, by geographic area," Hoyt said. "We couldn't do that in le past, and it was something other solution vendors couldn't provide."

i2 solutions enable consumer goods companies to simultaneously optimise and monitor inventory; reduce costs and risks through integrated sourcing, negotiation, and procurement; and improve customer service levels and reduce fulfillment costs through multi-division and multi-channel order management.

Additionally, consumer goods companies use i2 solutions to minimize transportation costs and increase service levels through integrated transportation procurement, planning, execution, and monitoring.

I2's Contribution

Whirlpool has implemented Demand Planner at its operations on three continents: North America, Australia, and Europe.

Demand Planner provided Whirlpool with precisely the flexibility it needed in forecasting. The software's multidimensional database gave the company the ability to make forecasts at any level. With the stroke of a few keys, logisticians could calculate the overall needs in the market, determine how many repair parts for appliances to order, or pare product forecasts for their major accounts.

"Demand Planner is not just helping us to forecast demand, but to manage the inputs we receive from specific customers," Hoyt said. "Then we can build an aggregate forecast in a way that assures that we're building the right product at the right product at the right time to meet all of our customers' needs."

i2 solutions also facilitate inter- and intra-enterprise collaboration within Whirlpool divisions and with its business partners.

Whirlpool's Results

Whirlpool realized dramatic changes only a few months after implementing Demand Planner. We're seeing reductions in finished goods inventory and improvement in our to customers. This has already led to a $4.8 million reduction in standing inventory in Australia alone over just seven months," Hoyt said. "Our benefits in North America have been substantially greater -in the double-digit millions of dollars in inventory savings."

These inventory changes were not lost on Whirlpool's customers. The company's business in Australia has doubled since the Demand Planner implementation.

At the same time, customer service improved by 10 percent and product availability from less than 60 percent to more than 70 percent. "The value that i2 has added Whirlpool goes beyond tangibles like inventory reduction," Hoyt said. "i2 has caused to rethink our business processes and to recognize that there are big savings in the what we've seen today."

Whirlpool executives have also been impressed with i2's commitment to add $75 in value to its customers by 2005.

"I kind of chuckled when I first heard of the goal," Hoyat said. "Now I think that might be too low. The value that we're seeing and the potential value we see down suggest that i2 will exceed its commitment."

Whirlpool-Achieves maximum supply chain value:

After conducting a thorough search of solutions providers to help it streamline its chain, Whirlpool Corporation knew that i2 offered the right solutions for its challenge -but the appliance manufacturer was unsure of who should help with its implementation and Support. Whirlpool executives recognized that a third-party systems integrator would not have the knowledge or experience that i2 had of its own solutions, so they chose to utilise i2 Business Optimisation Services. Using i2 BOS throughout the implementation and post-implementation periods, Whirlpool has mastered i2 solutions' capabilities and has achieved significant results in its targeted areas of improvement.

As the largest appliance manufacturer in the world with product being shipped to as many as 400 retail across North America – from independent appliance stores to the big box retailers – Whirlpool Corporation faces a variety of supply chain challenge.

In addition to striving to manage working capital and inventory levels, Whirlpool's foremost goal is to achieve greater product availability for its trading customer, customers, and consumers.

"We try to ride the fence between greater availability and lower and lower inventory levels," said Mark Rantz, Whirlpool's Director of Production Planning. "When don't have good availability, we hear it immediately from our sales organisation, our customer, and our trading partners. On the other hand, if inventory levels are higher than expected, we quickly feel the pain internally as we tie up working capital."

Whirlpool had developed a number of in-house planning systems, which employed disparate components. With eight factory distribution centers, 11 regional distribution centers, and 60 local distribution centers, the appliance manufacturer did not have single unified system that could close the loop by taking it from master scheduling to deployment and inventory planning.

"On a strategic level, we saw an opportunity to change the entire cost equation with our trading partners in terms of our supply chain, not only from a balance sheet standpoint, but also from an operating expense standpoint," said Reuben Slone, Whirlpool's Vice President of Supply Chain for North America. "We saw it as a strategic enabler of our brand strategy to drive differentiated service levels to the trade and ultimately to the consumer. "

After a thorough analysis of solutions providers, Whirlpool executives chose to Implement a broad range of i2 solutions to integrate and drive greater efficiency through chain.

" As we looked at potential solutions, we wanted to work with the thought leaders supply chain space," said J.B. Hoyt, Whirlpool's Project Director of Supply Chain. We saw that i2 could really let us drive the business not only as we saw it today, but it so take us to the next level. i2 had the intellectual property that was really going IS, rather than us trying to lead a software provider." While Whirlpool executives in that i2 was the best choice for reinventing its supply chain, they questioned lid help them with their implementation.

i2 BOS?

As they considered the magnitude of the supply chain overhaul that they were about to undertake with i2, Whirlpool executives initially considered using systems. After examining the implications of that approach however, Whirlpool decided to use i2 Business Optimisation Services (BOS).

i2 BOS methodology is a framework of tools and techniques consisting of property and service offerings required to model, build, and operate an planning-execution framework to synchronies

supply chain operations. With BOS i2 customers can optimise business processes within the five core competencies of their organisations: production, spending, revenue and profits, fulfillment and logistics.

"As we went further into the process, we felt that fewer organisations are involved we would have better focus" Hoyt said. We chose to utilise i2 BOS because we saw that team would bring us the intense knowledge of the product and the application, combined with real knowledge of supply chain activities and the ability to leverage experience with other organisations and other implementation".

Because Whirlpool knew that i2 understood its own products better than a third-party systems integrator, whirlpool executives anticipated a more efficient implementation with i2 BOS.

Whirlpool also saw that using i2 BOS would be more cost-effective.
" if you use a third party systems integrator, you have three sets of mouths to feed rather than two," Slone said. By using i2 BOS, we spent money. In the economic times we are in, we are always looking to find a more effective and efficient way to drive a solution.

i2 BOS's Contribution

During the implementation of i2 solutions -which included i2 Supply Chain Planner, TMi2 Inventory Planner, TM i2 Demand Planner, TM i2 Load Configuration, TM and i2 Shipment Scheduler™ -the i2 BOS and Whirlpool teams became unified through their common goals.

"We really were working as one team, and we all had the right objectives in mind
-first and foremost, what made sense for the business," Hoyt said. "The objectives they weren't Whirlpool objectives or i2 objectives; they were what was necessary to implement the project successfully, and that really drove the behavior of all of us"

Whirlpool found that the support from the i2 BOS professionals extended beyond the implementation and beyond geographic borders. In addition to the onsite i2 BOS team at Whirlpool, the appliance manufacturer utilised resources from the i2 BOS Solutions Center for around-the-clock service.

Staffed by a team of talented professionals based in India, i2 solutions center is a cost-effective resource designed to help customers with special initiatives as custom development, fast-track implementations, upgrades, application support, and offshore implementations.

"No one looked at the i2 BOS team as coming from a separate company or as having a separate interest," said Spencer Brown, Whirlpool's Director of IS for logistics. “That feelings has continued even after the completion of the implementation. We feel that when we have support issues there is a team on the other end that truly still cares. And, during and after the project, the India resources were used effectively. We were a little gun-shy, but it actually enabled us to have our issues worked on for more extended hours, we didn't have the communication issues that I thought we might have. That was a learning experience for me, to see how effective an overseas relationship with offshore and onsite services can be”.

It is the i2 BOS team’s combination of expertise and forward thinking that has brought the most value to Whirlpool.

“I think there are two primary benefits for Whirlpool in using i2 Business Optimisation Services,” Hoyt said. “ The first is that i2 BOS team has great knowledge of the software tools and how the tools work. They have a connection back to development to configure the tools in a unique way if necessary, or in a way that has only been done in a few other implementations. The second benefit is the intellectual property.
The i2 BOS team has the knowledge of where the industry is going, where the future of supply chain planning is going. That enables us to take advantage of things that are coming down the road."

Whirlpool's Results

Since its implementation of i2 solutions, Whirlpool has achieved significant results in its targeted areas of improvement.

"The i2 suite that we use -Supply Chain Planner for Master Scheduling, Inventory Planner, Supply Chain Planner for Deployment, and Demand Planner- guides our three critical outcomes: product availability or fill rate, working capital productivity, total cost productivity," Slone said. "In the first full calendar year after our implementation, we were able to deliver 92.6 percent across all of our brands and product, and our target was 93 percent. We were supposed to deliver a 10 percent

reduction in finished goods working capital for North America, and we came in slightly better than that on inventory .We had a goal of 5 percent total cost productivity year over and we were at 5.1 percent."

Whirlpool believes that these results were made possible by the support of i2 BOS professionals during and after implementation of i2 solutions. The i2 BOS team has Whirlpool staff to become more effective at their jobs.

"Every two weeks we do an end-user survey with our 18 production planners and our deployment analysts, and in our most recent survey, 100 percent of them said that were easier to perform than they had been previously," Slone said. "At the end if our users are able to use the sophisticated capabilities of i2 solutions, we are on the path to deliver results." Whirlpool's users have been able to master i2 solutions from i2 MOST (Manage, Operate, Sustain, and Transform), which is an integral component i2 BOS.

Designed to enable customers to better manage, operate, and evolve with i2 solutions, i2 MOST ensures sustained value delivery by offering rapid response and resolution to application issues, minimizing the risk of downtime and ensuring uninterrupted business operations. An onsite/offshore team, consisting of functional and technical experts with multi-industry experience, delivers the service.

"i2 MOST has significantly improved the cycles of learning of our core users," Slone said. "In fact, we have weekly user meetings that we have converted into practical training sessions with just-in-time training from i2 on how to use problem windows, or improvements in problem windows, or understanding other algorithms. We couldn't do that in any other mold without having the support here on site."

By utilizing i2 BOS, Whirlpool executives have found that they have had a level of stability throughout their implementation that they would not have had otherwise.

"One of the things that have really helped us by having i2 involved throughout the process has been continuity -continuity both of people and of concepts," Hoyt said.
"We've had i2 folks involved with the design of our implementation, with the implementation itself, and now in the post-implementation as we go from 'crawl' to 'walk' to 'run.' Having i2 personnel

working with us day in and day out has helped us to refine our business processes, to provide training for our people, and to understand what is in the coming release and how to take advantage of it. It is really that continuity that has been the greatest sort of hidden attribute in this whole process."

Asian Paints- Transforming to Market Leader:

When looking to elevate its customer service levels through a value chain initiative, Asian Paints chose i2 solutions. The company anticipates improvements in forecast accuracy, a decrease in finished goods inventory, and an increase in filling lost sales, all of which will help Asian Paints further its international growth.

For years, Asian Paints has relied on a strong supply chain to provide the needed to customers precisely when customers needed them. But the homegrown chain systems Asian Paints employed could not take the company to the next level in term of customer service. The company needed an innovative solution that would to dominate the paint market in Asia.

Asian Paints executives first looked at enterprise resource planning (ERP) systems to meet their needs, but soon realized that only a leading-edge value chain management solution would give the company the competitive advantage it sought.

Why i2?

After an extensive search for solution providers, Asian Paints chose i2 Supply Chain ManagementTM (SCM) to meet the continually changing needs of the marketplace.

"i2 differentiated itself from the other vendor we were looking at in terms of its response," said Manish Choksi, Asian Paints' Vice President, Strategic Planning and Information Technology. "i2 proactively showed us the capabilities of the solution."

Because of i2's strong presence in India, Asian Paints also knew that the solution provider could readily offer the necessary implementation and post-implementation support.

i2 provides software and services that help businesses make a lasting, positive impact on their profitability. Through solutions for value chain management, i2 delivers innovative ways to increase efficiency and velocity within the enterprise and across all of partners, and customers.

Asian Paints implemented i2 Factory Planner, Demand Planner, and i2 Supply parts of i2 SCM.
i2 solutions have completely replaced Asian Paints' homegrown planning which were not integrated. Using the i2 SCM applications, Asian Paints' is coordinated at both the corporate-wide and the individual plant levels. i2 solutions work under a unified time horizon -something Asian Paints could not do previously.

Asian Paints Result

Because of the benefits Asian Paints is gaining from i2 solutions, the will realize a full return on investment in only one year. “The benefits of we get from i2 are across virtually all parts of the supply chain”, Choksi said. Although, i2 solutions have only recently been implemented, Asian Paints anticipates improvements in demand forecast accuracy and a decrease in finished goods inventory. Additionally, Demand Planner, Factory Planner, and Supply Chain Planner will help the paint maker increase its rate of filling lost sales.

"The real value will come when we utilise the full suite of products to make the supply chain far more linear, as well as clean up the number of vendors that we use and change some of the processes we have in the company," Choksi said. Most important, though, is that i2 solutions are enabling Asian Paints to realize its goal of becoming the fifth largest decorative coatings manufacturer in the world by optimizing -and squeezing money out of - its value chain. Money saved using i2 solutions will help Asian Paints acquire other companies inside India and around the world.

3.2. Cases with large vendors (Traditional ERP/ Complete ERP Suite)

Tata Steel rolls steel power with SAP technology

SAP enables seamless remodeling of Tata Steel from product-driven to a of the Internet economy.

"Implementing any ERP system is a challenge for an organisation because of the success rate of ERP implementations world-wide. The challenge is compounded if the ERP provider is a world leader –SAP"

"Post the introduction of the SAP solution, the results have been terrific. The has spent close to Rs 40 crore on SAP implementation, and has already saved Rs 33 Crores"

Tata Iron and Steel Company Ltd., is Asia's first and India's largest integrated steel company. It has a state-of-the-art 3.5 million tonne steel plant and is meeting the most rigorous demands of its customers worldwide. Turnover of Tata Steel was about Rs 69 billion in 1999.

Tata Steel has adopted ERP technology to take a lead in the competitive steel and through constant learning, innovation and refinement of its business operations, has transited seamlessly from a production-driven company to a customer-one. The existing technology was a simple replication of the manual system. Not only did it operate as individual islands of information but the technology had outlived its lifetime and was completely obsolete. The employees and management at Tata Steel faced a cumbersome task exchanging and retrieving information from the system. Further the reliability of information obtained was questionable because of and duplication of data from different departments. Also there was no " integrity check for various data sources. Besides, several times the information against certain items was found missing.

In 1998-99 a small cross-functional in-house team along with consultants from Arthur D. Little (Strategy Consultants) and IBM Global Services (BPR Consultants) redesigned the two-core business processes, Order Generation and Fulfillment and the Marketing Development processes, to improve customer focus facilitating better credit control and reduction of stocks. In keeping with this commitment, it adopted the latest production and business practices to offer innovative processes that meet the changing demands of its global and local customer.

Responding to changing customer needs started as early as 1991 with a study on cost competitiveness and a formal business planning followed by ISO 9002 certification and benchmarking initiatives. Realizing the need to further support the re-engineered core processes and quickly aligns the business processes to radical changes in the market place, TISCO decided to go for a new robust solution.

Choosing the best platform and appropriate technology:

The management at Tata Steel wanted the software to seamlessly integrate with its existing information system and further provide compatibility with its future implementation. After an in-depth study of functionality, cost time, compatibility esteem, operability, support and future organizational requirements was done, SAP topped the list of contenders.

The implementation of SAP software was associated with certain strategic goals in mind. With this implementation, TISCO wanted to bring forth a culture of continuous learning and change. This would enable TISCO to achieve a world-class status for its products and services and strengthen its leadership position in the industry. Besides this, TISCO also wanted the software to result in quick decision-making, transparency and credibility of data and improve responsiveness to customers across all areas.

Adds Mr. B Muthuraman, MD (Designate), Tata Steel, "Implementing any ERP system is a challenge for an organisation because of the declining success rate of ERP implementation world-wide. The challenge is compounded if the ERP provider is a -SAP. At Tata Steel, however the challenge for us did not lie in successfully implementing SAP or in rolling it out to our 46 odd geographic locations across the country under a big bang approach in just eight months. The challenge lay ahead in building a conducive environment such that SAP was embedded in the hearts and minds of the people and the customers of Tata Steel, for we all looked forward to knowledge-based successful organisation. It is inspiring to know that our TEAM ASSET with support from Pricewaterhouse Coopers and SAP successfully lived up to our axiom and truly demonstrated leadership skills by going live across 46 locations within a record time frame of eight months."

Mapping technology to business processes

The path was set' to achieve success through SAP. All the branches, which had huge numbers of transactions and complexity, were identified as a HUB while the smaller branches along with the consignment agents were defined as SPOKES which were attached to these branches. In January 99 the team from TISCO was decided and christened 'TEAM ASSET' an acronym for archive success through SAP enabled Transformation. The TEAM ASSET had two simple axioms:

- Go-Live date –1st November 1999; and

- There are only 24 hours a day

Preparatory task forces activities were conducted and core business processes were mapped to SAP modules. Also another parallel activity called 'Change Management' was initiated within the company. The prime objective of 'Change Management' was to reach out to people involved non-directly in the project to apprise them of the developments taking place. "We wanted that Tata Steel be the number one in the steel industry, we wanted to be the first to have the latest systems" said Mr Sandipan Chakravortty, OM (Sales), TISCO.

Tata Steel planned a big-bang approach of going live with all the modules at the same time, in just a span of eight months. Driven against the speed of time, the pace of was fast with all activities backed by a lot of thought process and meticulous planning. On 1st November 1999 Tata Steel pulled off a big bang implementation of all SAP modules at one go across 46 countrywide locations, as per the set deadline.

The Result

The introduction of SAP solutions within Tata Steel has led to efficient business processes, enhanced customer service, reduced costs, improved productivity, accelerated transaction time, workflow management and reduction in the number of credit management errors.

"Post the introduction of the SAP solution, the results have been terrific. The company has spent close to Rs 40 crore on SAP implementation, and has already saved Rs 33 crore," said Mr. Ramesh C. Nadrajog, Vice President (Finance). The manpower cost has reduced from over $ 200 per ton two years ago, to about $140 per ton in 2000. The overdue outstanding has been brought down from Rs 5170 millions in 1999 to 4033 millions by June 2000. The inventory carrying cost has drastically deflated from 190 per ton to Rs 155 per ton. To add to this, there have been significant costs saving through management of resources with the implementation of SAP.

With SAP's solution Tata Steel can now update their customers on a daily basis and provide seamless services across the country improving customer management. The availability of online information has facilitated quicker and reliable trend analysis for efficient decision-making. Besides the streamlines business process reduces the levels of legacy system and also provides consistent business practices across location and excellent audit trail of all transactions "NOW I SHUDDER TO THINK HOW WE WERE FUNCTIONING SO MANY YEARS WITH OUT A

WORLD RENOWNED ERP SYSTEM. Along with the hard times we had, came the rewards of the success of implementation" remarked Mr. K. V Srinivasan, Member Team Asset at TISCO.

Achieving business ability through SAP:

Marching ahead, web enabling of SAP R/3 is on the cards. On the surface, it means , it would allow any one to access our SAP R/3 over the internet. But beneath it, implications are tremendous, as it would result in sharing of information with enterprises accounts and key customer. The success in marketing and sales has prompted a revisit of the existing system in the works and a detailed roll out is expected as below:

- Phase – 1: To extend SAP with FI, CO, MM, PP and QM
- Phase – II: To implement SAP module such as asset management and budget management sub modules of FICO, plant implementation, human resources, production optimizer (such as SAP APO)
- Phase – III: SEM (Strategic enterprise management)

The company also plans to adopt the mySAP customer relationship management solutions to enhanced its customer relationships in the near term and eventually realised its dream of becoming the most efficient and competitive company in the world in its vertical.

Usha:

Over 3000 products in 6 categories, scores of vendors, 30 store houses, 16 divisional offices and innumerable dealers. In all corners of the country , no wonder it was utter chaos at Usha International Ltd every month-end. Nobody seemed to really know about the sales, inventory and cash-flow position at the end of a month. Every office was virtually functioning as a separate island. And by February 1999, the company decided enough was enough and started looking for solutions.

Before narrating how Usha International solved the crisis that threatened to affect its performance, lets have a dekko at the company. For over 50 years, Usha, which belongs the Siddharth Shriram Group, has been a household name in India with its sewing, fans and home appliances. In addition to these products, Usha International also markets various auto components, agro products and

air-conditioners. The company doesn't manufacture any of these products and outsourcers the entire range from vendors and its sister concern. Sales during 2001: over Rs 400 crore; employees: 1100.

Now back to the problem. Usha had realized that unless it put the house in order by streamlining the processes, it would find itself to move ahead what with increasing competition from multinationals. The obvious choice was to go for an enterprise resources planning (ERP) implementation. After toying with developing its own ERP system, Usha opted for a SAP 4.6 C version.

That decision changed the profile of Pradyumna N. Poddar too. An engineer by training but marketing professional to the core, Poddar, whose visiting card says he is the Deputy General Manager, was asked to oversee the ERP implementation. "We found that in India many consumer durable companies have gone for SAP. We just needed a very basic ERP system and hence SAP 4.6," Poddar says.

How they went about it?

For implementing the ERP, Usha roped in IBM as the partner. And for its part, Usha put up a team of 9 people. "Firstly we have to map our requirements. We choose the sales, finance and control, material division as a required modules for the ERP" Poddar says. For a month, the team did the "as is" study to stock of the present system in the company. The nest step was "to be", to decide what should be automated and how. After about 4 months spade work, the system was configured in just 15 days.

Along with the implementation, Usha also started training its people. The training was conducted in 2 phases – first a core committee of 9 people were trained who, in turn, trained others in the 2nd phase. By the time company was ready to go live in March 2001 with 2 pilot divisions – in Chennai and Delhi besides its head offices around 50 people had been trained in the system. One by one, Usha covered 14 out of its 16 divisional offices under the system and by January end; the other two divisions will also be roped in. Today around 800 people in the company are on the ERP. "On an average, it took 40 days for a division to port the data in SAP, train its people and start working on the system," poddar says.

“ Problems were plenty during implementation stage”, He recalls. “People who were accustomed to using paper files, found it difficult to suddenly to move into the screens. They also had problems in shifting from the legacy system. We were determined that we would not have the legacy system running parallel to the ERP and right from day one, we went straight into the ERP ," poddar says.

Usha International invested nearly Rs 6 Crores in the ERP, which include the cost of software, hardware as well as connectivity but exclude the cost of manpower, training. (The company uses Satyam’s virtual network to connect its offices). “They started getting returns on investment from end of 2003” He says.

'Goodbye to chaos'

Unlike in the past, month-ends are peaceful at Usha these days. On any given day, officials can access information on the sales position, inventory and even damaged products that are to be returned to the vendors. "We can evaluate the performance each and every dealer now and don't need the divisional office to tell us what is happening." Also, the ERP ensures that nobody can get around with short cuts. "If some dealers were earlier given the leeway to postpone payments, now nothing can be done as you need to deposit the money on time or the system won't clear the delivery," Poddar says. The system has also helped the company in reducing manpower, though Poddar insists that Usha did not resort to any retrenchments. "We did not fill up many vacancies that came about, but did not give pink slips to any," he claims. Buoyed by the success, Usha is now planning to connect its vendors also to the ERP in the second phase of implementation. However, that is still a while away. Meanwhile, Poddar is confident that next year's balance sheet of the company should reflect all the hard work that he and his team have done.

3.3 Mix-and-Match ERP

Vendor revenues come from add-ons, not core products

The overall enterprise resource management (ERP) market grew 4 percent in 2001, even as traditional ERP investments (financials, human resources, production management) dropped 3 percent, according to a recent report by Boston-based AMR research.

AMR predicts that ERP vendors will soon derive most of their revenues from adding customer relationship management (CRM), supply chain management (SCM) and lifecycle management (PLM) capabilities. These extensions produced $4 billion of the $ 20 billion of total vendor revenue in 2001. According to the report by 2006, they will make up half of vendor revenues.

"Where we see the growth opportunity is in strategic extensions, big things like CRM and supply chain capabilities," says Colleen Nevis, vice president of research enterprise applications, at AMR. "The growth is not going to be based on core ERP".

Nevis says companies that made ERP investments during the boom of the mid-90s are now interested in adding small modules and tying their front-office systems to their back-office systems. Although AMR estimates that the total ERP market will grow from $19.8 billion to $31.4 billion in 2006 at a compound annual growth rate of 10 percent, most of this will not be the result of core ERP software sales. Most companies have not budgeted for such upgrades, nor will they for a long time. Nives says upgrade cycles that formerly ran 5 to 7 years are now growing to 10 to 15 years. "People who bought ERP systems in the ERP gold rush of the mid-90s aren't going to be replacing those until at least 2006," Nives says; "more likely 2010."

Companies that didn't invest during the boom-namely government organisations and service industries-may be ready to do so now. "Industries and trends where people didn't invest are where the opportunities are now," Nives says. "Service industries made ERP investments in the late 80s and early 90s. They didn't participate in the boom of the mid-90s."

AMR predicts that core ERP will make gains in the mid-markets, however, most activity to date has come from the high mid-market segment ($250 million to $1 billion in revenue) , says Nives, but the lower segment ($10 million to $50 million in revenue) is now showing significant growth. Overall, the mid-market ERP segment will show 10 to 15 percent growth over the next four years. "In 1999, we all thought that mid- market ERP was an untapped market," Nives says. "But at the same time there were 100 of vendors in the market. Since then, that market has consolidated quite a bit. Its become much more mature as far as vendors."

4 Gap-Analysis between Traditional and the Extended ERP

4.1 The Gap

Analyzing the cases we find the following parameters over which Extended ERP is able to serve customers better than that of Traditional ERP. They are:

Level of customisation

It's seen that niche players like Warn Systems, 12 Technologies, Manugistics cater to the specialised needs of the clients and hence develop add-on based on complex algorithm which work intelligently. Consequently, organisations need not every time change their management practices in order to be compatible with the ERP package but continue with its tested management practices by customizing the package itself. On the other hand, traditional ERP fail to provide such extensive customisation.

Level of Flexibility

The software add-ons provide more flexibility than traditional ERP since they are specific to the industry and hence are more solution-focused.

Cost and Service

The "Extended ERP" or the "add-on components" can be installed standalone or bolted on to existing ERP systems. These can be implemented relatively quickly and at a lower cost price. These companies also have alliances with various players in areas of consultancy, software and hardware implementation (as mentioned in Chapter 2), which help the vendors to provide much prompt and speedy service than the big ERP players.

4.2 Limitations

For almost all the companies, ERP extension software is quite pertinent. But these add-ons need to be integrated with the traditional packages. And during such phases, the add-ons from the same player are preferred, because integration with existing software is far easier than with external vendor.

4.3 Trend

How's the gap minimized?

There's more satisfaction among the customers with the niche ERP vendors for they provide customised services with relatively easy upgrade and integration. Hence we see giant players like Oracle, SAP, etc existing with fairly intelligent software from i2 Technologies, Wam Systems, etc.

Also, the big players take a step further and acquire such niche players. The cases in point would be the following:

a) SAP acquiring the data-warehousing player A21 Technologies

b) Peoplesoft acquiring Vantive for CRM.

c) Oracle acquiring Datalogix for its process manufacturing management.

But, if not the acquisitions, the traditional players attack the problem head-on and try developing the necessary solution provided by the ERP extension. Henceforth, every new release has the add-ons.

Where does the future lead to?

At present, ERP focuses mainly on structured transaction data in organisations. As we move to a more Web-based multimedia world, enterprise-wide information is also likely to expand to include multimedia documents such as engineering drawings, scanned documents, and audiovisual product descriptions.

Second, ERP has focused primarily on transaction processing. The extensive databases provided by ERP are likely to provide the platform for decision support, data mining, and executive information systems.

Finally, so far the development of ERP has been an inside-out process. On the other hand, supply chain management software such as i2 and Manugistics aim to foster outside-in inter-organizational integration.

As we move closer to a network economy, these two initiatives will need to converge. A component-based ERP architecture is likely to facilitate these developments.

To this extent there are wide opportunities for new ERP vendors to emerge from industries that so far have not contributed to the ERP phenomenon. Some obvious examples are the aerospace industry, the finance industry and the logistics industry. Analysis of the market penetration of ERP systems shows clearly that the current players have to downsize their products and offerings to be attractive to SMEs (Small and Medium Enterprises) .This situation again is an opportunity for smaller players to seize the day and offer smaller systems running on smaller hardware platforms more efficiently. These innovators will ultimately take the lead in the ERP software market as large systems will not produce the continual income stream that small, robust, easy-to-use systems can

achieve. Importantly these attributes contribute to a system becoming ubiquitous in the same way that Microsoft has achieved ubiquity for its operating system. Future successful vendors will capture large markets of smaller businesses, which will provide a more consistent and enduring income stream.

In this dynamic environment, ERP will continually evolve and hence, in spite of big players' acquisitions or developing the expertise, the niche players will continue to exist, as ERP will never reach its saturation and hence the need for ERP extension software will always be there.

5 Recommendations

The preceding gaps discussed above have their genesis in the monolithic architecture of ERP systems. The design of the current generation of ERP systems is based upon the assumption that the requisite variety and complexity in organisations can be best accommodated by increasing the number of parameters, options, and configurable functionality in the ERP system (as in the transition from Baan IV to Baan ERP).

However, variety and complexity can also be managed through an alternate minimalist strategy. This strategy relies on composing large systems from largely independent components that are assembled to meet situation-specific requirements. The idea of software components has evolved from object-oriented systems modeling. Components hide their internal complexity, communicate through clearly defined interfaces, and are both configurable and extensible. Similar to the concept of browsers that provide a platform for third party plug-ins, a component-based strategy would rely on a minimal ERP backbone supplied by few key ERP vendors together with a variety of domain-specific components supplied by third-party software houses.

In those cases where the needed components are not available, the user organisation will need to adapt or develop its own components. The organisation is further responsible for selecting, assembling and when necessary, installing new versions of these components.
The characteristics of such a component strategy would be:

I. First, firms would be able to gradually acquire and assemble component-based ERP solutions customised to their specific needs. This would reduce the problem of mismatch between organizational requirements and ERP solutions.

2. It should also lower the cost of acquiring and implementing reasonably customised ERP solutions for small- and medium-size enterprises

3. Migrations will become more gradual as outdated components are upgraded individually instead of the whole system.

4. Moreover, in multi-site implementations, the versions implemented at each site can be tailored to the site itself.

5. Use of RFID plays a big role in the supply chain improvements – production operations, asset utilization, forecasting, inventory accuracy and eventually customer satisfaction.

6. Collaborative Partnership approach with suppliers and buyers produces efficient supply chain. ERP vendors should also join hands together so that they are able to cater to the needs of the customers more effectively and efficiently.

7. Modeling toolsets, instead of being mainly configuration tools, will need to evolve to incorporate support for selecting, configuring, and extending components and for wiring components together.

8. Finally this strategy should give the CIO and the IT department a renewed central role in identifying the organisation's information requirements and implementing the ERP system. ERP is about people, not just technology and the issues like trainings, formation of project teams should be given priority.

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