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*Dr. Ali E. Kashef, Dr. Mahyar Izadi, & Dr. Saud H. Al-Sehali*

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Dr. Ali Kashef is a Professor and Graduate Co-Coordinator in the Department of Industrial Technology at the University of Northern Iowa.



Dr. Mahyar Izadi, CMfgE, is a professor and chair of the School of Technology at Eastern Illinois University.



Dr. Saud Al-Sehali, received his DIT from the University of Northern Iowa in 2000 and has begun his professional career in his native Saudi Arabia.

# ERP: The Primary Solution Provider for Industrial Companies

*Dr. Ali E. Kashef, Dr. Mahyar Izadi, & Dr. Saud H. Al-Sehali*

The incorporation of the Internet and the World Wide Web into corporate life and business practices has created new computer capabilities and technologies, enabling Corporate America to move forward with a revolutionary way of transferring their business practices from MRP and MRP II to a fresh functional paradigm known as Enterprise Resource Planning or ERP (Chase, Aquilano, & Jacobs, 2001). ERP is an updated system combining relational data base management and graphical user interface with a client/server architecture. Enterprise Resource Planning consists of many program modules that integrate applications programs and serve all areas within an enterprise by linking business computer systems (such as those used for accounting, finance, purchasing, warehouse, sales and distribution, manufacturing and logistics, domestic and global suppliers, human resources and materials management). This helps to facilitate the smooth flow of information across an entire organization. The integration is accomplished through a common database that can be shared by all applications programs. Internet technology has allowed real-time collaboration between customer and companies. This collaboration helps the corporation to implement a better decision-making and planning process. ERP allows a manager to expedite, as well as de-expedite, according to market demands. This process brings a competitive advantage to any industry. Companies such as Compaq, Alcoa, Ottawa Truck, Domino's Pizza, and Hershey Foods have utilized ERP systems to reduce inventories, shorten cycle times, reduce idle time, optimize setup and tear-down costs, and to improve their overall supply chain management practices.

These companies are also planning an enterprise system that will speed manufacturing, improve customer service and reduce the impact of predictable errors caused by manual processes. Due to ERP, these companies have more competitive prices and faster response time to market demand. Several vendors have entered the ERP market with complete enterprise solutions. Some have tried to focus on a niche market by offering more industry specific applications. Presently, five companies dominate the ERP market. They are SAP, Oracle, Baan, PeopleSoft, and J.D. Edward (Mtefanie, 1999). SAP, a German based software developer, was one of the first vendors to offer an ERP solution. Their original offering was intended for a mainframe platform. The popularity of client/server and distributed computing came about at the same time as the ERP market was expanding. SAP, Oracle, and Baan targeted their products for big manufacturers and consumer goods corporations. They developed offerings in the client/server arena. PeopleSoft and J.D. Edwards also developed offerings in the client/server environment, but, in contrast, focused their products on smaller to mid-size companies.

This paper offers an overview of Enterprise Resource Planning with regard to its vision, components, client expectations, system parameters, benefits, costs, as well as major steps towards the successful implementation of ERP.

## ***What is Enterprise Resource Planning?***

Enterprise Resource Planning is a set of applications that help manage and automate a business. A large database provides access to all application

programs and serves in all areas within a manufacturing enterprise. This is accomplished by exchanging information with suppliers and customers directly or through trading community portals and e-commerce links, and with outsourcing partners (Wreden, 1999). ERP incorporates all of the elements of a business, from financial processes to manufacturing and marketing activities, into a unified whole that operates more effectively and efficiently in today's competitive economy (Hill, 2000). These applications include finance, human resources, management, manufacturing, logistics, and supply chain management. Technically, any software developer or integrator that helps businesses streamline their operations can style themselves as an ERP vendor (Loizos, 1998). Major ERP providers include SAP AG, PeopleSoft Inc., Oracle Corp., Bann Co. and J.D. Edwards Co. (Mtefanie, 1999). These companies enjoy 63% of the ERP market (Brown, 1997). For instance, SAP is used at more than 20,000 sites around the world, making it one of the most widely implemented broad business software systems in place (Jacobs & Whybark, 2000). It is estimated that businesses around the world are now spending \$10 billion per year on enterprise systems. This amount probably doubles when associated consulting costs are added (Davenport, 1998).

ERP systems offer the necessary resources for the implementation of a common database for everyone's use in a real-time environment. This database can be updated as changes occur, thus providing up-to-date status information to everyone in their part of business. Therefore, users can use data from today's events to make accurate decisions about tomorrow's activities. Globally, ERP can work in worldwide markets with multiple languages and currencies; for example, it can tell users how many parts are at a warehouse in Japan and the parts' value in yen or dollars. Accounting practices, government tax requirements, human resource management practices, and even manufacturing practices that are local to different regions around the globe are incorporated into the ERP system. This gathering and usage of

information for complicated demand, inventory and other types of planning gives staff the ability to quickly act, and the company the ability to greatly optimize performance.

### **Vision**

Globalization, rapid technological change, and rising customer expectations, combined with growing pressure from stakeholders, are changing the paradigm of world commerce. Ten years ago, the top manufacturing priorities of companies were eliminating direct labor through automation and the integration of manufacturing systems in order to have a competitive advantage. Today, on the contrary, technology is affordable and skilled workers are in short supply. More accessible information through the Internet now allows small niche players and companies in emerging markets to bypass expensive information infrastructures and to function globally. In this environment of global competition, early partnering with customers and suppliers in the products development process is very important. To make this approach work, manufacturers depend heavily on information technologies such as ERP combined with Internet-based technologies.

The user base of ERP systems has now risen to 20,000 companies worldwide, paying \$10 billion to ERP vendors for products in 1997, which is up 40% from 1996 (Martin, 1998). The sales of the largest ERP vendor, SAP, have soared from less than \$500 million in 1992 to approximately \$3.3 billion in 1997, making it the fastest growing software company in the world (Brown, 1997). The trend is likely to continue. The appeal of integrated information systems to large companies is very clear. If there is an adjustment needed in the system for inventory lists, parts supplies, production schedules and balance sheets, ERP automatically implements the changes in the system, so every employee has access to the necessary information. This provides a feedback that it is very positive and exceptionally fast. Salespeople can promise firm delivery dates, and managers can make effective

decisions in a short period of time. This is the desired vision of companies today, but integrating ERP is costly and difficult (Singh, 1998).

### **Characteristics and Components**

\* **Client/Server System:** Enterprise Resource Planning systems depend on client/server technology, which enable the users to access the information from a central server. These enterprise applications typically reside on a server and provide users access at the PC level. They invite greater access to the non-computer-literate end users. This concept has the ability to bring a systematic computerized power to the desktop.

\* **Enterprise-wide Databases:** ERP has one database that serves all the application systems. These applications enable a company to automate almost every aspect of its operations by tying the ERP database to its intranet and extranet, and thus allowing full browser access to them.

\* **Applications/Modules:** Each ERP vendor provides a number of ERP applications (or modules) for their systems. These are the functional software packages for each individual business unit like finance, human resources, order processing and so on (Stevens, 1997). Most ERP systems start with a set of core modules, and offer additional modules from which a company can select as desired. All these applications are fully integrated to provide consistency and visibility for all the activities across entire system operation (Baan, 1997). However, ERP systems require users to comply with the processes and procedures as implemented in the individual modules.

\* **WWW/ERP:** To accomplish communication among multiple computers a common software standard and a communication standard is needed. This issue has largely been solved by the existing protocols and standards of the WWW like Java and HTML. The ERP system collectively organizes a company's processes, communication systems, and management organization to make seamless software paradigm embedded in the WWW. Hence, companies can give

customers access to their own records, give employees control over their own benefits, and let financial departments control purchases of office supplies in innovative ways (Alsop, 1998).

**How Do ERP Systems Work?**

ERP is composed of many different (as many as 60) modules that connect to the company’s financial systems for collecting data. This system helps to set up and keep inventory, establish product costs, and estimate cost standards against real costs. Both base costs and value-added costs are maintained for material, labor, overhead, material movements transactions, and subcontract activities in the database. Jacobs and Whybark (2000) presented a diagram to show a data warehouse paradigm (see Figure 1). It demonstrates how information flows from the top management planning activities, through the functional area plan, to the execution and accounting activities. This system manages the entire order cycle from order entry to product shipping and order invoicing. It provides accurate and real-time information to fulfill any company mission.

**What do Manufacturers expect from ERP?**

Manufacturers often have very high expectations of their ERP systems. Companies want an all-encompassing software package that will run every aspect of their business. They also want to improve the overall functioning of a business quickly.

ERP provides all users, from the company CEO to its buyer at a remote plant, with a unified, real-time view of the company’s available resources and commitments to its customers. For example, if a salesperson logs a new order into a laptop computer while on a sales call, the transaction flows throughout the company, alerting the procurement system that parts need to be ordered and telling the manufacturing system to reserve a spot in the production queue for the newly ordered product (Minahan, 1998). ERP combines the needed functions of every application that a company requires to do its job, and integrates these applica-

tions into a seem-less paradigm. ERP also can make a difference at the shipping and distribution end. An ERP system removes duplications, delays and mistakes on order fulfillments, and allows manufacturing to become much more flexible. Shipments can go directly to end users and are therefore more cost effective. In addition, there is no longer a need to have a supply of materials or finished units in the warehouse that may become obsolete with time and have to be written off (Loizos, 1998).

**Benefits of an ERP System**

**\* Easier Access to Reliable Information:** ERP systems function utilizing a common database management system. Thus, decisions on cost accounting or optimal sourcing can be made across an enterprise. This bypasses the need to look at separate operational units and then trying to coordinate the information manually, or reconciling data across multiple interfaces with some other application (Baan, 1997).

**\* Elimination of Redundant Data and Operations:** Driven by business process re-engineering, the implementation of ERP systems reduces redundancy within an organization. With functional business units utilizing integrated applications and sharing a common database, there is no need for

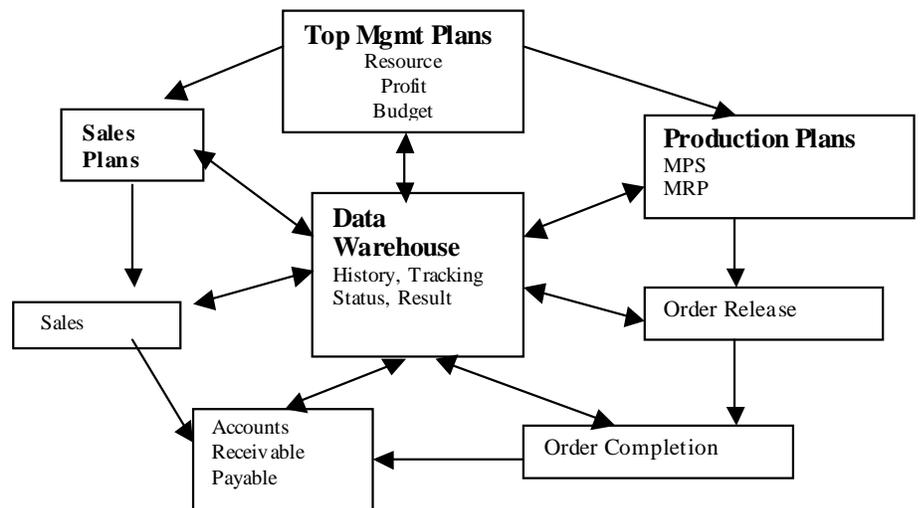
repetition of tasks such as re-entering data from one application to another (Blanchard, 1998).

**\* Reduction of Cycle Times:** ERP systems recognize that time is a critical constraint variable, for both the overall business and the business use of information technology (Sheridan, 1995). Minimizing delays in retrieving or disseminating information achieves time reductions and cost savings.

**\* Increased Efficiency and Reducing Costs:** ERP allows business decisions to be analyzed enterprise-wide. This results in time saving, and an improved control and elimination of extra operational costs (Baan, 1997). For example, a year after implementing ERP, Par Industries in Moline, Illinois, reduced lead time to customer orders from six to two weeks, delivery performance increased from 60% on time to more than 95% on time, inventories dropped almost 60%, and the life of a shop floor order went from weeks to hours (META Group, 1997).

**\* Easily Adaptable in a Changing Business Environment:** Recognizing companies’ needs to reduce their time to market for goods and services, ERP systems are designed to respond quickly to new business demands and can be easily changed or expanded without disrupting the course of business. Hence, the time required to deploy and continuously improve

Figure 1.



business processes will be greatly reduced through the use of ERP (Appleton, 1997).

### **Disadvantages of ERP**

\* **Implementation:** The implementation of an ERP system is a very time consuming, expensive and arduous task. In an interview with Information Technology executives from Fortune 1000 companies that had implemented ERP, 44% reported that they had spent at least four times as much on implementation than they did on the software license itself (Michel, 1997).

\* **Conformity to the software processes:** ERP systems force their customers to re-engineer current practices to fit within the processes described by their modules. Selecting the wrong ERP software could result in an unwilling commitment to an information architecture and applications that do not fit with the organization's global strategic goals (Hecht, 1997).

\* **Commitment to a Single Vendor:** Letting one vendor provide all enterprise systems is an attractive but risky proposition (Weston, 1997).

### **Costs and Return of Investment**

The large ERP providers have made many promises, but many user companies are still asking, "what's the payoff?" The answer is still unclear. Implementing wall-to-wall software is not a matter of powering up the computer and installing a program from a CD-ROM. Enterprise Resource Planning is a huge investment in time and money. It can take years of work by numerous managers and cost millions, or in some cases hundreds of millions of dollars. The cost of implementing an ERP application depends on the scope of the effort, size of the enterprise, the ERP application selected, and the Information Technology environment required. Cost for a large system can run to several hundred million dollars. Many large corporations are currently spending between \$5 million and \$200 million to implement an ERP system. (McKinney, 1998).

There are as many success stories as there are failures related to the implementation of ERP systems. In one failure case, Dell Computer cancelled their ERP contract in January 1997 after spending \$115 million dollars (The original cost of the project was estimated at about \$150 million). Dell determined that the system could not deal with the needed sales volume. Likewise, Mobil Europe spent hundreds of millions of dollars on its ERP system only to abandon it when its merger partner objected to the system, and FoxMeyer Drug stated that its ERP system helped drive it into bankruptcy. On the positive side, Autodesk, a leading maker of computer-aided design software claims a success on an ERP implementation. It used to take an average of two weeks to deliver an order to a customer, but now Autodesk ships 98% of its orders within 4 hours. IBM's Storage System division used an ERP to reduce the time required to reprice all of its products from 5 days to 5 minutes, the time to ship a replacement part from 20 days to 3 days, and the time to complete a credit check from 20 minutes to 3 seconds. Fujitsu Microelectronics reduced the cycle time for filling orders from 18 days to a day and a half, and cut the time required to close its financial books from 8 days to 4 days, using an ERP system (Davenport, 1998).

Companies are anticipating immediate returns on efficiencies in production and inventories, with additional returns in other areas being realized over the long term. The greatest return will be one that cannot be easily quantified. This is an integrated system that provides timely information, better customer support, and a competitive edge; it addresses strategic goals and objectives, and takes a company into the 21<sup>st</sup> century. Only time will tell if there are great improvements possible in the bottom line, in strategic competitiveness, in employee and customer satisfaction, and in overall benefits for shareholders/stakeholders.

### **Seven steps to Successful Implementations**

The key to a successful implementation is a solid commitment to the process from the top levels of management. All the senior managers need to discuss the business benefits that are going to be achieved. A realization must be made that this is not a plug in software but a re-engineering of the entire corporation. ERP is a software tool that needs to be used correctly. It must be standardized into one seamless system. For ERP'S success, the functional business people in a company's organization need to concur as to how the company is going improve the processes.

While the technology from various ERP vendors differs substantially, there are some general rules that improve a company's chance of successfully implementing the ERP system (Martin, 1998):

1. **Look at yourself.** The ultimate goal should be to improve your business, not to implement the software. Use cross-functional teams and executive-level input to identify, examine, and rethink existing business processes. Benchmark these processes against those used by the best in your industry.
2. **Plan ahead.** Establish business goals. A big ERP project costs as much as an acquisition and requires the same kind of commitment. Use the best managers on the project. Map out a strategy for getting to the goal. Reengineer existing business processes and/or develop new business processes to support the strategy.
3. **Prove that you need ERP.** Spell out how an ERP system will support overall business strategy and how it will work with your new business processes. If you can't make a case for ERP, you probably do not need it.
4. **Choose partners wisely.** Select the ERP provider that is right for your business needs, not the one with the most popular name.

Talk to existing users, especially those within your industry, about what they like and dislike about their ERP systems. The same rules apply when hiring consultants. Choose only those who understand your business as well as ERP technology.

5. Pick the best man/woman for the job. Create a culture of speed and commitment to ensure that everyone takes deadlines seriously. ERP implementation is tricky. Consultants can help, but no one knows your business like your own people. Stock implementation teams with your company's smartest workers. A good rule is "If an operation can't run without a particular person, you want him on the implementation team." Use change management techniques to cope with the human dimension of the project.
6. Start off slow. A good ERP implementation can help a company run smoother. A bad one can shut a company down. Install ERP on a rolling basis, starting with small but highly visible business units first. The lessons learned can make the rest of implementation run smoother. Early successes will help get buy-in from the executive suite and the plant floor.
7. Change everything but don't underestimate. ERP will open your eyes to information and processes you never thought possible. Be flexible enough to change the way you operate over and over again.

## Conclusion

Today many organizations are under pressure to meet the challenges of increasing competition. They need to be better, cheaper, and faster than the competition. ERP systems have come on the scene with a promise to provide a common database and to integrate business process, providing a seamless enterprise paradigm. ERP systems can save money, can improve efficiency,

and can allow companies to remain competitive. Countless companies have implemented ERP systems and have been able to save millions of dollars in operating costs, reducing cycle times, maintaining continuous improvements, and increasing the overall efficiency of their businesses. Today manufacturers realize that many core processes that run their businesses are often best handled with an enterprise application package that is cheaper and more up-to-date than previous ones. However, integrated systems reduce the need to reconcile data across modules, support more extensive financial analysis, and allow for easier cross training of staff. The Internet represents the next major technology enabler, which will allow a rapid supply chain management even for multiple operations and multiple trading partners. Most ERP system vendors are enhancing their products to become "Internet Enabled" so that customers worldwide can have direct access to the supplier's ERP system (Stevens, 1997). It is very important to keep a good data base system for the customer to come back, and that is what this emerging generation of ERP is all about.

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