Enterprise Computing

Mark P. Sena
Xavier University

I. INTRODUCTION

In the 1990s, most large organizations changed their approach to building computing systems. Rather than developing software to meet the requirements of a particular business function or process, organizations have increasingly implemented packaged integrated business software known as enterprise systems. The business world’s embrace of enterprise systems was among the most important development in the corporate use of information technology in the 1990s. The process of implementing, configuring, maintaining, and operating enterprise systems is known as enterprise computing.

Enterprise systems have experienced remarkable growth in the past decade. In 1994, the market for enterprise systems was little more than $200 million annually. The market for enterprise systems is now several billion dollars per year. Major companies now believe that these systems are necessary to compete. The software is now so pervasive that firms that once referred to their information technology according to
their hardware architecture (e.g., “IBM shop”) now call themselves “SAP shops,” “PeopleSoft shops,” etc.

Despite the rapid growth and reported benefits of enterprise systems, many unanswered questions about the field remain. Adopting an enterprise system entails dealing with major organizational issues. Choosing and implementing a package is a difficult process for most firms. Major implementations can cost millions of dollars. Some organizations have blamed their enterprise systems for performance problems or even bankruptcy. Once implemented, the software can dictate important changes to business processes.

Recently, organizations have looked for ways to gain additional value from their enterprise systems. These systems are now viewed as a necessary foundation for major corporations to conduct electronic commerce, to manage supply chains, to build enterprise data warehouses, to conduct business intelligence, and to manage customer relationships. The remainder of this chapter is organized as follows. Section II explores the conditions that led to the popularity of enterprise computing. Section III examines the functions that ERP systems perform, focusing on SAP R/3. Section IV provides an overview of other enterprise systems that complement the core ERP functions. Section V investigates the enterprise system project activities of vendor selection and system implementation. Section VI examines the benefits that organizations can achieve via enterprise computing. Finally, Section VII provides a summary and concluding comments.

II. CONDITIONS LEADING TO THE PROLIFERATION OF ENTERPRISE SYSTEMS

Enterprise computing was among the most important developments in information technology in the 1990s. The rapid growth of the field has been remarkable. Nearly every Fortune 500 firm has implemented some form of enterprise system. Given the formidable costs and risks associated with implementing and operating enterprise systems, the reasons why enterprise systems became attractive to organizations merit further attention.

As a starting point, it may be useful to examine the state of business computing in the days before enterprise systems became so prevalent. Prior to the proliferation of enterprise systems, organizations typically developed customized systems to meet the needs of each functional area. In most companies, systems evolved in a fragmented manner resulting in data that was not kept in a single repository and processes that were not fully integrated. This lack of integration caused considerable inefficiency in the form of storing redundant data, entering and formatting data from one system to another, and so on. With this approach, organizations experienced increasing difficulty and expense in information systems development and maintenance. Chief information officers recognized that many of their large development projects failed to deliver required user functionality within the projected time frame and within the budgeted cost.

As organizations developed these business support systems, events were occurring in the field of information technology that caused executives to reexamine their approach to implementing computing systems. Advances such as client-server computing and graphical user interfaces increased the demand for systems with more user-friendly features. Local-area and global networks emerged that enabled diverse users to share data and resources. Many firms that had developed mainframe-based systems realized that they lacked the expertise to develop these new systems and that the expense of developing systems on this platform would be formidable.

Because multiple firms have similar functional systems (e.g., payroll, accounting), commercial software firms emerged that offered standardized functional software packages. Such software solved the problem of each firm creating its own system but compounded the problem of incompatible data formats and processes. For example, a firm that purchased a standardized payroll system was faced with the task of integrating the data with its existing systems and its users were forced to deal with disparate user interfaces.

In the middle to late 1990s, organizations became increasingly concerned about the year 2000 (Y2K) problem. Managers were faced with decisions about whether to begin the process of fixing the date problems within their functional systems or to purchase and replace the systems. Enterprise systems offered an alternative solution for organizations that chose not to fix their software. In the latter part of the decade, however, the Y2K problem was cited as a reason for declining growth in enterprise systems because many organizations committed resources to fixing the Y2K bug.

Another way to examine the evolution of business computing toward enterprise software is from an operations management perspective. In the 1960s the focus of manufacturing systems was on inventory control. As material requirements planning (MRP) became prominent in the 1970s, firms were able to trans-
late the master schedule of end items into time phased requirements for subassemblies, components, and raw materials procurement. In the 1980s, the concept of manufacturing resources planning (MRP-II) extended MRP to shop floor and distribution management activities. In the 1990s, MRP-II was further extended to include engineering, finance, human resources, and other activities in the business enterprise. Consequently, the term, enterprise resource planning (ERP) was coined.

As a result of the preceding circumstances, enterprise systems became extremely popular. Leading the way in the movement is SAP, founded in 1972 by five former IBM employees. During their work as consultants for IBM, SAP's founders recognized that each client was developing the same or similar computer systems. As a result, the group set out to develop and market standardized enterprise software that would integrate all business processes. In 1979, the company released the R/2 software system for mainframe computers. This was followed in 1992 by the R/3 client–server system that is now deployed for millions of users around the world.

III. ERP FUNCTIONS

ERP is software that integrates and automates traditional back-office functions such as finance, human resources, and operations. To more closely examine the functions provided by these systems, we detail the component modules of SAP R/3, the leading ERP software. SAP R/3 consists of three major functions: financials, logistics, and human resources. Software offered by such vendors as Oracle Applications, PeopleSoft, J. D. Edwards, and Baan offer similar functionality. Table I summarizes the major ERP functions.

A. Financials

The SAP R/3 financials function includes five major modules. The Financial Accounting module allows organizations to process and track financial accounting transactions. It includes such functions as general ledger, accounts receivable and payable, fixed asset accounting, and legal consolidation. The Controlling component enables functions for internal cost

<table>
<thead>
<tr>
<th>Table I</th>
<th>ERP Functionality (SAP R/3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financials</td>
<td>Financial Accounting (general ledger, accounts receivable and payable, fixed asset accounting, legal consolidation)</td>
</tr>
<tr>
<td></td>
<td>Controlling (overhead cost accounting, cost center accounting, overhead orders, activity-based costing, product cost controlling, cost object controlling, profitability analysis)</td>
</tr>
<tr>
<td></td>
<td>Investment Management (corporate-wide budgeting, appropriation requests, investment measures, fixed assets settlement, depreciation forecasts)</td>
</tr>
<tr>
<td></td>
<td>Treasury (cash management, treasury management, market risk management, funds management)</td>
</tr>
<tr>
<td></td>
<td>Enterprise Controlling (executive information system, profit center accounting, consolidation functions, Business Cockpit)</td>
</tr>
<tr>
<td>Logistics</td>
<td>Sales and Distribution (sales support, order entry, pricing, credit checking, availability checking, contract and scheduling agreements, shipping management, billing, sales information system)</td>
</tr>
<tr>
<td></td>
<td>Production Planning and Control (sales and operations planning, demand management, material requirements planning, production control)</td>
</tr>
<tr>
<td></td>
<td>Materials Management (purchasing—quotations, outline agreements, vendor evaluation—and inventory management, warehouse management, invoicing, inventory control, purchasing information system)</td>
</tr>
<tr>
<td></td>
<td>Quality Management (statistical process control, control charting, quality notifications, task assignment, quality information system)</td>
</tr>
<tr>
<td></td>
<td>Plant Maintenance (document planning, processing and history of maintenance tasks, maintenance information system)</td>
</tr>
<tr>
<td></td>
<td>Logistics Information System (monitoring, reporting logistics information)</td>
</tr>
<tr>
<td></td>
<td>Project System (work breakdown structures, cost and schedule planning, monitoring of resources, business workflow, project information system)</td>
</tr>
<tr>
<td>Human resources</td>
<td>Payroll</td>
</tr>
<tr>
<td></td>
<td>Benefits Administration</td>
</tr>
<tr>
<td></td>
<td>Time Management</td>
</tr>
<tr>
<td></td>
<td>Employee Self-Service</td>
</tr>
<tr>
<td></td>
<td>Manager’s Desktop</td>
</tr>
</tbody>
</table>
accounting. It includes overhead cost accounting, cost center accounting, overhead orders, activity-based costing, product cost controlling, cost object controlling, and profitability analysis. The Investment Management component supports strategic decisions for capital spending. It includes such functions as corporate-wide budgeting, appropriation requests, investment measures, fixed assets settlement, and depreciation forecasts. The Treasury component enables users to structure financial assets to ensure liquidity and minimize risk. It includes applications for cash management, treasury management (management of financial deals), market risk management, and funds management. The Enterprise Controlling module monitors company success factors and performance indicators. It consists of an executive information system, profit center accounting, and consolidation functions. These functions enable diverse financial data to be consolidated, combined with external data, and monitored using a “Business Cockpit” that measures performance and enables analysis (drilling) of selected data.

B. Logistics

The SAP R/3 logistics function includes seven major modules. The Sales and Distribution module includes functions for sales support that allow users to manage information on sales leads, sales calls, inquiries, quotations, marketing campaigns, and competitor products. In literature for prior versions of R/3, SAP positioned Sales and Distribution as a fourth functional category. The module enables order entry with pricing that includes surcharges, discounts, price lists, customer agreements, and credit limit functionality. It conducts availability checking and supports contract and scheduling agreements. A shipping management function enables transportation planning, processing, monitoring, and controlling. A billing function enables automatic invoicing via mail, fax, or EDI. Finally, a sales information system supports reporting and analysis of relevant information.

The Production Planning and Control application enables the planning, executing, and control of production. It includes modules for sales and operations planning that enable plans to be formed based on expected sales or other key figures. A demand management module breaks down the figures into product level and creates a demand program. An MRP module then calculates quantities and procurement dates for necessary materials. The application also includes production control modules based on production method (production order processing, repetitive manufacturing, or KANBAN production control).

The Materials Management module is intended to optimize the procurement process and logistics pipeline in an organization. The purchasing function develops purchase orders from requisitions based on reorder levels, forecast data, requirements from other modules, or departmental requests. It also includes functions for quotations, outline agreements, and vendor evaluations. Its functions enable electronic authorizations and purchase order monitoring. The inventory management function supports common types of receipts, issues, and stock transfers in addition to special stocks such as batches or consignment stocks. It supports various inventory evaluation methods. The warehouse management function enables firms to process goods movements and maintain current records of all materials stored. It supports interfaces with handheld terminals, bar-code scanners, and other technologies. The evaluated receipt settlement function creates automatic invoices based on posted goods receipts. Finally, a purchasing information system and inventory control functions enable users to choose data for reports, conduct analyses, identify trends, support purchasing decisions.

The Quality Management application helps firms monitor quality and assist in compliance with international standards. It includes functions to predefine control data and quality requirements and functions to conduct statistical process control and control charting. The module includes quality notifications based on complaints against vendors, internal problem reports, or customer complaints. It also makes use of SAP’s business workflow to assign task improvement activities to responsible parties. Additionally, a Quality Management information system enables managers at different levels to plan, monitor, evaluate, and control quality.

The Plant Maintenance application supports the planning and execution of maintenance activities with regard to system availability, costs, material, and personnel deployment. The system enables integration with such external systems as geographical information systems, CAD systems, or plant data collection systems. The module allows users to document the planning, processing, and history of maintenance tasks such as inspection, servicing, and repair activities. A catalog system allows users to define causes, activities, and tasks. Like other modules, a maintenance information system supports business reporting, presentation development, and analysis of maintenance data.

In addition to the functional information systems within each logistics module, SAP R/3 includes a Lo-
gistics Information System that brings together information from each of the other modules enabling reporting and analysis of integrated logistical information.

In support of organizational projects ranging from investment management, marketing, research and development, and others, SAP R/3 includes a Project System module. The system allows users to define work breakdown structures to organize project tasks. It includes cost and schedule planning functions that integrate with other R/3 modules. The system checks and monitors the availability of funds, capacities, materials, and other resources. The system is supported by SAP’s business workflow functionality for communication and messaging. It also includes a project information system for planning, reporting, and analysis of projects.

C. Human Resources

SAP R/3’s Human Resources function includes modules for payroll, time management, benefits administration, and an employee self-service center. In addition to comprehensive payroll functionality, SAP’s Payroll module supports government regulation compliance, various calculation methods, data transfer templates, and other services. The Benefits Administration module handles various benefit programs and plans. The Time Management module includes automatic time collection, calculation, reporting, and integration with payroll, financials, and other functions. The Employee Self-Service module empowers employees to view and maintain personal information via Web-based technology or voice-response systems. Human Resources is supported by a Manager’s Desktop function that brings together human resources information and enables managers to perform administrative functions such as expense reports, salary changes, and employee transfers, etc. It also enables reporting and ad hoc analysis of human resources information.

IV. ERP EXTENSIONS

Despite continued growth of the overall ERP market in the late 1990s, ERP vendors (PeopleSoft, Baan, and others) experienced declines in revenue growth leading to sharp drops in stock market prices for firms in the sector. In turn, vendors have sought new directions by building on the core ERP systems that so many firms have implemented. Meanwhile, many organizations that implemented ERP in recent years are beginning to look at ways to capitalize on their investment. New applications such as sales force automation, customer relation management, data mining, and supply chain management systems are being built onto ERP platforms to engage customers and drive profits.

To gauge the direction in which ERP vendors are heading, we examine the recent initiatives by ERP market leader SAP. This inspection serves to illustrate the ways in which vendors are expanding their offerings from the transaction-oriented back-office functionality of ERP to areas that serve other needs of organizations. Although our illustration focuses on SAP’s offerings, its competitors (e.g., Baan, PeopleSoft, third-party vendors) offer similar types of products. In fact, other vendors (e.g., i2 for supply chain management or Siebel for customer relationship management) are the market leaders in these industries. SAP’s product line and functionality, however, are similar to those of industry leaders and can be used to illustrate how these systems complement core ERP systems.

To expand on its core R/3 system and industry solutions (e.g., automotive industry, aerospace), SAP has developed offerings in the areas of electronic commerce (EC), supply chain management (SCM), customer relationship management (front office), and business intelligence. Table II summarizes these initiatives.

A. Electronic Commerce

Electronic commerce applications can be organized into four broad areas: interorganizational (business-to-business), intraorganizational (within business), customer-to-business, and electronic intermediaries. SAP has developed products for each of these classes. For customer-to-business EC, SAP offers the SAP Online Store, which provides functions for product catalogs, shopping basket management, customer registration, quotation and availability checks, payment transactions, order status, and international capabilities.

For interorganizational EC, SAP has developed the Business-to-Business Procurement solution. This system capitalizes on many of the advantages associated with using the World Wide Web. It facilitates online purchasing by enabling suppliers to publish catalogs on the Web using an open-systems architecture via business application programming interfaces (BAPIs) that are XML-enabled (Extensible Markup Language). The system enables real-time integration
between buyers and sellers and contains reporting capabilities to conduct vendor performance tracking and cost center analysis.

An example of an intraorganizational EC initiative is SAP’s Employee Self-Service application. This product enables employees to use a Web browser to interface with SAP R/3’s human resources functions to perform such tasks as reviewing and updating personal information and benefits, conducting time reporting, filing expense reports, and using the employee directory, etc. Each of the initiatives in the three EC areas is enhanced by the ability to link the functions to the core SAP R/3 system.

Intermediaries (or electronic brokers) are economic agents that stand between the parties of a contract (or transactions), namely, buyers and sellers, and perform functions that enable the fulfillment of that contract. Recently, SAP has developed a new EC strategy to extend ERP via an Internet portal site. Through the site, called MySAP.com, SAP plans to host a digital marketplace that packages third-party content (e.g., news, financial information). The portal is intended to become a full-scale application that enables users to purchase goods from parties via the site. Eventually, SAP plans to make many of its core applications available via the Internet, presenting new opportunities to link ERP with EC.

### B. Supply Chain Management

A supply chain is a system through which organizations acquire raw material, produce products, and deliver products and services to their customers. The market for supply chain software has rapidly grown into a multibillion industry. Until recently, SAP endorsed third-party vendors, such as i2, that develop SCM software as plug-in applications for firms that use ERP systems. However, as the market became lucrative, SAP developed its own supply chain initiative. Its product has three major components: Advanced Planner and Optimizer (APO), Business-to-Business Procurement, and Logistics Execution System (LES).

SAP’s APO system is intended to allow users to model and monitor supply chains “globally, accurately, and dynamically.” The system contains five major applications: Advanced Planner and Optimizer (APO), Business-to-Business Procurement, and Logistics Execution System (LES).

SAP’s APO system is intended to allow users to model and monitor supply chains “globally, accurately, and dynamically.” The system contains five major applications: Advanced Planner and Optimizer (APO), Business-to-Business Procurement, and Logistics Execution System (LES).
Enterprise Computing

what-if simulation to synchronize activities and plan material flow along the supply chain with the intent of supporting purchasing, production, and distribution decisions. Production Planning and Detailed Scheduling combines graphical planning tables with constraint-based optimization tools and planning functionality that includes multiplant planning, materials and capacity checking, simulation capabilities, and other functions. Finally, the Global Available-to-Promise module enables users to simultaneously check multilevel component and capacity availability to match supply with demand.

The second component of SAP’s supply chain initiative is the Business-to-Business Procurement solution. As detailed previously, this application is marketed jointly by SAP as a part of its supply chain and electronic commerce initiatives. The solution aims to provide Web-enabled, real-time integration between buying and sellers for procurement of maintenance, repair, and operating (MRO) supplies and services. MRO is a popular term for nonproduction goods and services, such as office supplies, computer equipment, repair parts, and maintenance services.

The third supply chain management component is the SAP Logistics Execution System. This system extends the warehouse management and transportation capabilities present in the core R/3 system. Warehousing functions include the monitoring, planning, and analysis of warehouse performance, inbound and outbound processing, modeling and optimizing of storage space, and interfaces with warehouse automation technologies. Transportation functions include shipment scheduling, routing, and processing, freight cost management, and monitoring and reporting of transportation information networks.

C. Customer Relationship Management (Front Office)

SAP’s Customer Relationship Management function is intended to automate business processes associated with sales, marketing, and customer service and to integrate knowledge from these sources with core R/3 business functions. SAP’s initiative includes three major functions. SAP Marketing provides tools and functionality to plan, execute, evaluate, and integrate marketing programs. It includes techniques such as segmentation analysis, database marketing analysis, and market research. The system enables analysis of market share from point-of-sale data and tracking of the effectiveness of marketing campaigns. SAP Sales provides functions for order processing, customer contact management, sales call management, inquiries and quotations. It provides postsale support such as order tracking and complaint management. It also includes a customer cockpit for analysis of customer interactions. SAP Service coordinates self-service functions, including a call-center-based customer support center, parts and service delivery, and invoicing. It includes functions for installation management, return material authorization, depot repair, scheduling and dispatching, service agreements, mobile service, call management, and communications support.

D. Business Intelligence

Like its supply chain solution, SAP initially allowed third-party vendors to supply decision support tools that allow organizations to analyze data from the core ERP system, but SAP recently developed a series of systems to perform these functions. Their offerings include the SAP Business Information Warehouse (BW), SAP Knowledge Management (KM), and SAP Strategic Enterprise Management (SEM).

SAP BW is data warehouse software that performs presentation, analysis, data storage and management, transformation and loading, data extraction, data administration, and system administration. The presentation function includes interfaces for standardized report generation, ad hoc queries, a catalog of available reports, Microsoft Excel extraction, Web distribution, and graphical data visualization. The analysis function contains an OLAP (online analytical processing) engine that enables slicing, drill down, statistical reporting, and other OLAP functions. The system allows users to drill into the operational transaction data in addition to accessing data warehouse contents. Additionally, the software provides functions for data storage and management (storing multidimensional views of data), extraction, transformation and loading (procedures for extracting, cleaning, and validating data), data administration (creating schema, cubes, mapping, etc.), and systems administration (scheduling, monitoring systems, security, capacity planning).

SAP divides its KM initiative into three categories, Knowledge Development, Knowledge Transfer, and SAP Content. Knowledge Development includes tools and consulting services to assist organizations in developing knowledge management programs. Consultants assist organizations in defining needs and planning content requirements. Authoring tools help users create (or convert) company information, training
materials, documentation, system simulations, and performance tests into a knowledge repository. The Knowledge Transfer process enables web-based replication of information objects (e.g., documents, presentations) and indexing and retrieval of knowledge content. SAP Content extracts and synthesizes knowledge from the core ERP system in the form of business knowledge, product knowledge, training materials, and documentation. Supporting all functions in the KM initiative is the Knowledge Warehouse (Info DB V.4), which provides the repository and suite of tools to facilitate authoring, translation, distribution, delivery, and retrieval.

SAP SEM is a set of software that enables executives and senior managers to consolidate financial data, conduct corporate planning and simulate business impacts, monitor corporate performance, automate collection of business information, and maintain stakeholder relationships. The software contains five major components. Business Consolidation enables financial consolidation and value-based accounting. Business Planning and Simulation supports the creation of dynamic and linear business models, simulation of scenarios, analysis of scenario results, and rolling forecasts. Corporate Performance Monitor uses industry-specific and customer-developed performance indicators that are linked to a Balanced Scorecard or Management Cockpit to continuously monitor performance all levels relative to strategic targets. Business Information Collection supports automated and semiautomated collection of business information from internal and external sources, including an automatic search of Internet information. Stakeholder Relationship Management facilitates the communications with stakeholders regarding business strategy. The module also collects structured feedback from stakeholders and integrates them with the Corporate Performance Monitor and Business Planning and Simulations modules.

V. ENTERPRISE SYSTEM PROJECTS: VENDOR SELECTION AND SYSTEM IMPLEMENTATION

When an organization decides to implement an enterprise system, it is a major undertaking with great potential impact. Many important decisions must be made along the way. First, an organization must consider whether it will benefit from purchasing such a system. Lonzinsky offers the following questions that organizations should ask themselves when conducting such analysis. These guidelines focus on the information quality that organizations derive from current systems and the ability of the current systems to meet operational goals.

- Are the company’s current systems incorporated into the company’s business and linked to operational and management activities or do they simply record what has happened for later analysis?
- Are data that are presently available reliable as generated by current systems or does the company rely on reconciliation, revisions, and manual adjustments to make numbers useful?
- Is the company’s evaluation of its financial position based directly on results obtained from the current system or from resources derived from its reports (requiring extensive additional effort)?
- Are business processes (finance, accounting, receiving, inventory, etc.) naturally integrated or do these functions operate independently, requiring effort to ensure consistent information flow?
- Is the number of persons involved in support activities comparable to other companies in the industry with similar business volumes?
- Are response time and necessary information for client requests satisfactory?
- Does the company’s experience with suppliers, recorded by current systems, add value when it comes time to negotiate new contracts?
- Are current systems really used in the company’s planning process?
- How much does it cost the company to maintain existing systems at the present level of contribution to the business? Is this cost-benefit relationship satisfactory?
- How much would it cost to migrate from the present situation to an environment of ideal systems based on software packages?
- How much would it cost to maintain such an ideal environment?

After an organization arrives at a decision to acquire an enterprise system, it must begin the process of choosing the most appropriate software to meet its needs. Generally, organizations will form a committee to conduct this analysis. Lonzinsky suggests several factors to be considered in comparing prospective software. These factors suggest that an organization should gather information about vendor support, product strengths and weaknesses, implementation considerations, and the vendor’s commitment to improving the product.
Enterprise Computing

- Type of support provided by vendor
- Qualifications of vendor’s support personnel
- Extent to which alterations can be made to customize package to user needs
- Reliability of the product
- Vendor response times when called to resolve problems
- Product performance
- Strengths of product functionality
- Product's functional and technical limitations
- Time required to implement package
- Improvements made to package since acquired (or developed) by vendor.

Hecht offers additional suggestions for choosing enterprise software. First, a firm must determine whether to choose a single vendor (integrated solution) or a best-of-breed solution. The integrated approach offers many benefits (e.g., common user interface, integrated knowledge and processes). However, integrated implementations require more consensus among business functions. Hecht also notes that “many products are functionally a mile wide but an inch deep.” This implies that some enterprise software contains modules that are not as elaborate as those offered specifically for a particular function.

Given the impact of enterprise software on an organization, selecting the most appropriate vendor is vital. Many organizations struggle with this process. Gartner Group has identified four major stumbling blocks to successful vendor selection: (1) Time—project teams (for vendor selection) can consume up to 20 employees for 14 months. (2) Cost—in addition to employee time, acquisition cost can account for up to 30% of overall cost. Other costs include personnel and travel expense in defining criteria, developing the RFP, gathering and validating data, and interviewing vendors. (3) Finding objective data—companies that lack a rigorous selection process may be subject to political agendas or “gut feelings.” This implies that some enterprise software contains modules that are not as elaborate as those offered specifically for a particular function.

Given the impact of enterprise software on an organization, selecting the most appropriate vendor is vital. Many organizations struggle with this process. Gartner Group has identified four major stumbling blocks to successful vendor selection: (1) Time—project teams (for vendor selection) can consume up to 20 employees for 14 months. (2) Cost—in addition to employee time, acquisition cost can account for up to 30% of overall cost. Other costs include personnel and travel expense in defining criteria, developing the RFP, gathering and validating data, and interviewing vendors. (3) Finding objective data—companies that lack a rigorous selection process may be subject to political agendas or “gut feelings.”

While selected publications and Web sites offer comparisons of various vendors, the market changes rapidly as new products and versions of software are introduced. Thus, rather than focus on the results of such investigation, perhaps more importance should be placed on the criteria that have been used to evaluate vendors.

Gartner Group offers some broad comparisons of the major ERP vendors on two comprehensive dimensions: functionality and technical architecture. Among the major vendors, J. D. Edwards is given the highest rating for functionality followed by Oracle, SAP, PeopleSoft, and Baan. In terms of technical architecture, SAP is rated highest followed closely by Baan and J. D. Edwards. Slightly below these three are Oracle and PeopleSoft. Each of the major vendors is rated in the top half of the dimension for technical architecture, and only Baan falls slightly outside of the upper portion in terms of functionality.

Gartner Group also rates vendor performance on two functional areas, manufacturing and general accounting. J. D. Edwards is rated highest in accounting followed by Oracle, PeopleSoft, SAP, and Baan. In manufacturing, J. D. Edwards, SAP, and Baan are rated nearly even followed by Oracle then PeopleSoft.

Once an organization chooses a vendor, it must embark on the arduous process of implementing the system. The impact of failing to succeed in this implementation can be great. ERP systems have a chance of substantially hurting a business due to implementation or performance problems. There are several reports of such failures. FoxMeyer claims that its failed system led the firm to bankruptcy. Dell Computer, Mobile Europe, Dow Chemical, and Applied Materials are among the firms that spent millions before ultimately abandoning the implementation. Even successful implementations frequently require tens of millions of dollars. As a result, it is not surprising that much of the ERP practitioner literature has focused on implementation issues.

Because of the complexity of implementing an enterprise system, nearly every major project is outsourced, in part, by consulting firms that specialize in such implementations. Most consulting firms specialize in implementing software from one or more particular vendors. Vendors such as SAP and PeopleSoft have formed partnerships with selected consultants to manage installations. Vendors have also developed methodologies, such as SAP’s “ASAP” program, designed to streamline the difficult process of installing enterprise systems. These programs may be particularly useful for mid sized firms that cannot commit the resources available to larger firms.

An alternative that is gaining popularity is the use of application service providers (ASPs) that not only manage enterprise implementations but also the software, hardware and networking technologies. An ASP owns all or part of the infrastructure on which the applications reside and coordinates the various hardware and networking technologies.
chases, software licensing or development, and network connections. Customers rent the services from the ASP on a per-user, per-month basis. ASPs share costs among many customers, allowing for the possibility of a lower cost structure than traditional solutions.

Many organizations attempt to manage an ERP implementation like any other large-scale information systems project. Traditional approaches to system development require project teams to gather all requirements up front. The process creates incentives to avoid changes later in the project. However, as an integrated system, ERP systems require considerable flexibility and support from business units. The software may require changes to business process rather than software changes.

Cooke and Peterson conducted a survey of SAP adopters that provides several insights for organizations implementing ERP systems. The authors’ findings suggest that successful implementation of SAP depends on executive commitment, clearly defined business objectives, strong project management, and utilization of the best people full time. The study also provides barriers to implementation and factors that impact time and budget. The greatest barriers include skills availability, training, and technical complexity. Similarly, the system complexity is listed as the factor that most contributes to project overrun. Other factors include resistance to change, internal delays, skills availability, and changes in project scope.

VI. POTENTIAL BENEFITS OF ENTERPRISE SYSTEMS

Given the formidable expense and risk of changing an organization’s approach to business by implementing an enterprise system, there must be significant benefits that organizations hope to attain. Cooke and Peterson list eight reasons why companies implement SAP: standardizing company processes, integrating operations or data, reengineering business processes, optimizing supply chain or inventory, increasing business flexibility, increasing productivity/reduce number of employees, supporting globalization strategy, and solving the Y2K problem.

Deloitte Consulting reports that ERP has the potential to deliver significant tactical and bottom-line strategic benefits. They also note that unexpected benefits such as streamlined processes, improved visibility, improved decision making, and enhanced cooperation can be attained.

In terms of motivations for implementing ERP, Deloitte identifies two categories: technical and operational. Technology motivations include systems that are disparate, poor quality of information, difficulty in integrating acquisitions, systems that have become obsolete, and systems that cannot support organizational growth. Operational motivations for implementing ERP include poor business performance, high cost structure, lack of customer responsiveness, complexity or inconsistency of business processes, and inability to support business strategies or to support globalization.

Stemming from these motivations, Deloitte reports several tangible and intangible benefits that are frequently realized from ERP projects. Tangible benefits include inventory reduction, personnel reductions, productivity improvements, order management improvements, financial close cycle reduction, information technology cost reduction, procurement cost reduction, cash management improvement, and transportation and logistics cost reductions. Intangible benefits include improved information and processes, customer responsiveness, integration, standardization, flexibility, and globalization.

However, Deloitte also warns that such benefits may take time to accrue. The study identifies three distinct stages that organizations encounter. After going live, organizations typically experience a dip in performance as they “stabilize.” Following this period, organizations tend to “synthesize,” realizing additional effectiveness from the better decision-making capabilities afforded by ERP. Finally, firms that are able to enter stage 3 “synergize” around their ERP systems and are able to transform their system’s usage into business strategies.

VII. CONCLUSIONS

The proliferation of information technology in the past decade has had a dramatic impact on business and society. While electronic commerce has garnered considerable notoriety, perhaps no other topic has been more important to business computing than ERP. For organizations that adopt them, these systems not only become the foundation of their computing activities but can also fundamentally change the way they conduct their businesses processes. In many industries, ERP systems, along with other types of enterprise systems, are now considered critical for organizations to compete. Effective implementation and operation of enterprise systems can lead to significant benefits. Conversely, failed implementations have been linked with poor business performance and even bankruptcy.
Enterprise computing continues to evolve each year. The past decade brought changes to organizational computing that few could predict. How will organizations in the next decade utilize computer applications? Will application service providers become the preferred method? What about Web-based intermediaries such as MySAP.com? Will ERP applications become standard worldwide? What future applications, such as customer relationship or supply chain management, will emerge? Although the future of enterprise computing is difficult to predict, it is very likely to remain among the most important topics in business, one that can greatly impact the success of an organization.

**SEE ALSO THE FOLLOWING ARTICLES**

**BIBLIOGRAPHY**


