

Today's competitive business is cross-functional, dynamic, and global. Since the early 1990s, most organizations have tried to remove the functional barriers that had existed for decades. The business process reengineering gurus and others have convinced management that compartmentalization is inefficient and ineffective in today's interconnected world. To compete effectively in today's market, organizations have to be customer focused and cost efficient. This demands cross-functional integration among the accounting, marketing, and other departments of the organization. This has led to the creation of business units (BU) within organizations that integrate personnel from the various functional units to work together on a variety of projects within an organization. Business units are dynamic suborganizations created and eliminated depending on need. BUs can be in existence for a few weeks or a few years, which makes it impossible physically to locate the personnel in an adjacent geographical space. This demands that the information systems be flexible and fluid across the departmental boundaries. In addition, it requires that systems are accessible anyplace and anytime. These business requirements ultimately created the need for enterprise systems to support the multifunctional needs of the organization.

## ENTERPRISE RESOURCE PLANNING SYSTEMS

### What Is An ERP?

Enterprise resource planning (ERP) systems are the specific kind of enterprise systems to integrate data across and be comprehensive in supporting all the major functions of the organization. In this book, enterprise systems are referred to as ERP systems mainly because the term ERP is more popular and commonly understood in the IT industry. ERPs, shown in Figure 1-2, are basically integrated information systems that support such enterprise functions as accounting, financial, marketing, and production requirements of organizations. This allows for real-time data flows between the functional applications.

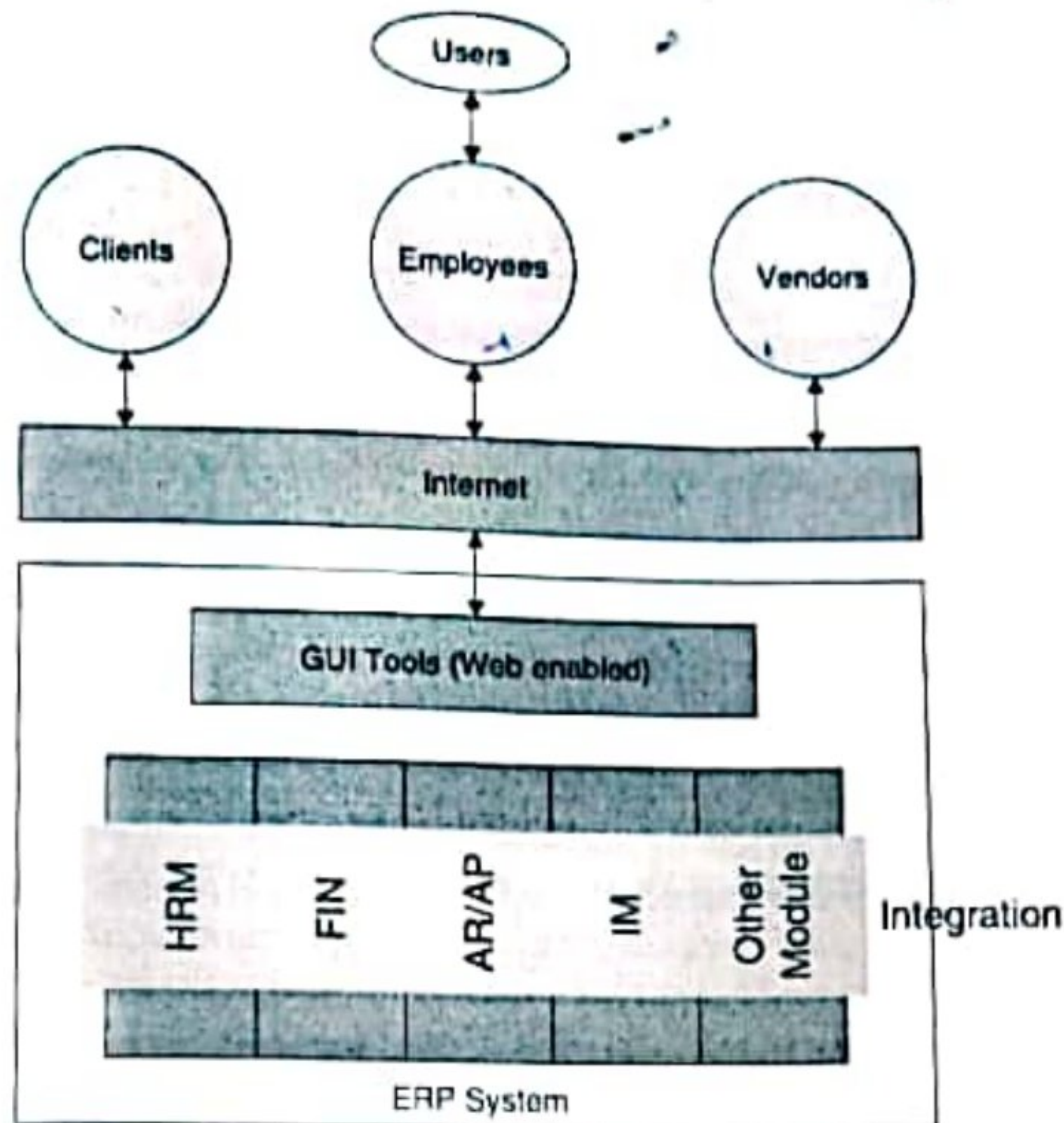
ERP systems are comprehensive software applications that support critical organizational functions. As shown in Figure 1-2, they integrate both the various functional aspects of the organization and the systems within the organization with those of its partners and suppliers. Furthermore, these systems are "Web enabled," meaning that they work using Web clients, making them accessible to all of the organization's employees, clients, partners, and vendors from anytime and anyplace, thereby promoting the BUs' effectiveness.

ERP system's goal is to make information flow be both dynamic and immediate, therefore increasing the usefulness and value of the information. In addition, an ERP system acts as a central repository eliminating data redundancy and adding flexibility. A few of the reasons companies choose to implement ERP systems is the need to "increase supply chain efficiency, increase customer access to products and services, reduce operating costs, respond more rapidly to a changing marketplace, and extract business intelligence from the data."

Another goal of ERP system is to integrate departments and functions across an organization onto a single infrastructure that serves the needs of each department. This is a difficult, if not an impossible, task considering that employees in the procurement department will have very different needs than will employees in the accounting department. Each department historically has its own computer system optimized for the particular ways that the department does its work.

<sup>2</sup> Robinson, S. (December 10, 2004). A Developer's Overview of ERP. [www.developer.com/design/print.php/3446551](http://www.developer.com/design/print.php/3446551) (accessed February 15, 2006).





**FIGURE 1-2** Integrated Systems—ERP

An ERP system, however, combines them all together into a single, integrated software environment that works on a single database, thereby allowing various departments to share information and communicate with each other more easily. To achieve this high level of integration, however, departments may sometimes give up some functionality for the overall benefit of being integrated. The central idea behind data integration is that clean data can be entered once into the system and then reused across all applications.)

In summary, ERP systems are the mission-critical information systems in today's business organization. They replace an assortment of systems that typically existed in those organizations (e.g., accounting, finance, HR, transaction processing systems, materials planning systems, and management information systems). In addition, they solve the critical problem of integrating information from various sources inside and outside the organization's environment and make it available, in real time, to all employees and partners of the organization. We will discuss further ERP systems and their implications to organizations both before and after their implementation later in this book.

## Evolution of ERP

During the 1960s and 1970s, most organizations designed silo systems for their departments. As the production department grew bigger, with more complex inventory management and production scheduling, they designed, developed, and implemented centralized production



updated separately on every new version of the software. Thus, every time an organization has to upgrade the ERP system, the IT staff will have to upgrade the application and upgrade the modifications. Modifications will have to be reengineered into the system when they are incompatible with the new version.

On the other hand, if the organization decides to implement the ERP system "as-is" (also called *vanilla implementation*), disruptions will occur with the functioning of the organization. Employees, business partners, and clients will have to be retrained in the new business processes (in addition to the ERP system). This does generate resistance from the users, adding to the training expense for the implementation. Thus, management must pay very close attention to the organizational consequences of modifying or not modifying the ERP software to match the organization's business process. This is not an easy decision. A wrong decision can bring down the entire organization, whereas a right decision can reap enormous benefits. We will later discuss several ERP implementation examples (e.g., Hershey Foods, Microsoft, and Cisco Systems) that will highlight the consequences of early management decisions on their organization. A good understanding of ERP technology and its implementation process can significantly improve efficiency and effectiveness of the organization's business processes.

### ERP System Components

(As shown in Figure 1-3, an ERP system, like its information system counterpart, has similar components such as hardware, software, database, information, process, and people. These components work together to achieve an organization's goal of enhanced efficiency and effectiveness in their business processes.)

(An ERP system depends on hardware (i.e., servers and peripherals), software (i.e., operating systems and database), information (i.e., organizational data from internal and external resources), process (i.e., business processes, procedures, and policies), and people (i.e., end users and IT staff) to perform the input, process, and output phases of a system. The basic goal of ERP, like any other information system, is to serve the organization by converting data into useful information for all the organizational stakeholders.)

(The key components for an ERP implementation are hardware, software, database, processes, and people. These components must work together ~~successfully~~ for the implementation to be successful. The implementation team must carefully evaluate each component in relation to the others while developing an implementation plan. Hardware, software, and data play a significant role in an ERP system implementation. Failures are often caused by a lack of

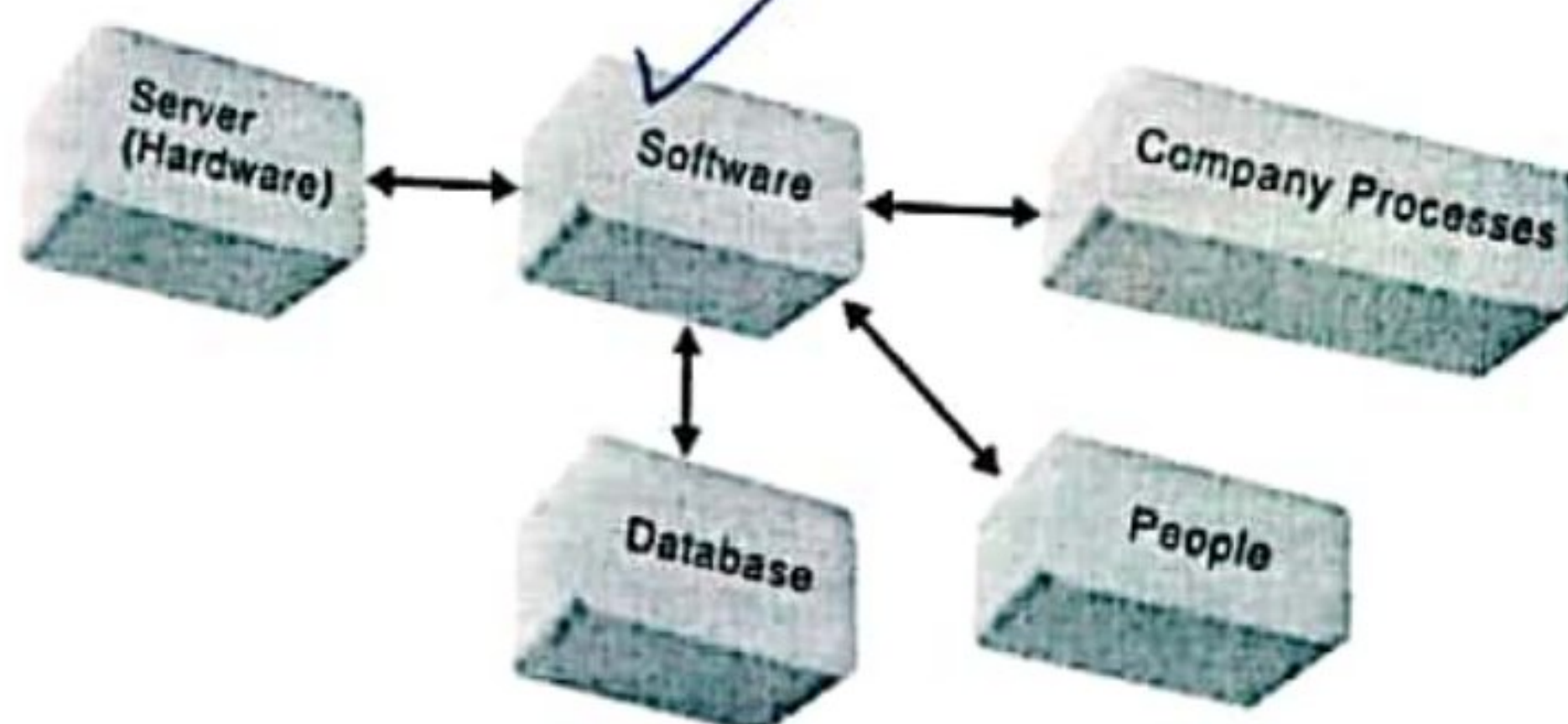


FIGURE 1-3 ERP Components



successful in aligning and integrating accounting, finance, human resource, and manufacturing technologies by aligning business processes with information processing logic and in transforming these organizations from pure hierarchical structures to matrix and other hybrid or flexible organizational structures. Thus, even though *e-Business* caused a lot of disruptions in business, ERP helped these businesses survive by allowing them to adapt quickly to these disruptions.

3. Finally, the early focus of *e-Business* was on communication (e-mail), collaboration (calendar, scheduling, group support), marketing and promotion (Web sites), and electronic commerce. These can all be considered front-office functions that involve user and/or customer interactions. In contrast, the focus of ERP systems was mainly on data sharing, systems integration, business process change, and improving decision making through the access of data from a single source. These functions can all be considered back-office functions helping the operational efficiencies of employees, vendors, and suppliers. For example, e-commerce, which facilitates selling of products online, requires tremendous back-end support, namely, fulfillment of the online order. This task can be efficient if an organization has an ERP system in place.

The above reasons show why these two technologies have successfully cohabitated in organizations for the last decade, thereby refuting the earlier claims that one will replace the other. Even in intranet applications, the functionality is one of ERP applications only, and it is delivered via Internet-based protocols. Today, both technologies are evolving toward a single model in which ERP vendors provide e-commerce and e-Business modules as part of the system. In future, e-business Web site implementation will become a part of ERP implementation.

### Benefits and Limitations of ERP

ERP systems require a <sup>huge</sup> substantial investment from an organization in terms of cost, time, and people. These investments can run into millions of dollars over several years and involve hundreds of people from the organization. No organization will be willing to invest a huge amount of resources unless the benefits outweigh the costs. The benefits and limitations of ERP can be looked at from a systems and business viewpoint; similarly, like other IT projects, the returns can be tangible and intangible, as well as short term and long term. The management within an organization that implements an ERP system has to account for the benefits and limitations of this system from all viewpoints and focus on the big picture to justify the huge investments in this system to the stakeholders. A strong commitment from management is critical for the success of ERP systems. This commitment will not be internalized unless a thorough analysis of benefits and limitations is communicated.

**The system benefits and limitations of ERP systems are as follows:**

- ✓ Integration of data and applications across functional areas of the organization (i.e., data can be entered once and used by all applications in the organization, improving accuracy and quality of the data).
- ✓ Maintenance and support of the system improves as the IT staff is centralized and is trained to support the needs of users across the organization.
- ✓ Consistency of the user interface across various applications means less employee training, better productivity, and cross-functional job movements.
- ✓ Security of data and applications is enhanced due to better controls and centralization of hardware, software, and network facilities.



- ✓ Complexity of installing, configuring, and maintaining the system increases, thereby requiring specialized IT staff, hardware, network, and software resources.
- Consolidation of IT hardware, software, and people resources can be cumbersome and difficult to attain.
- ✓ Data conversion and transformation from an old system to a new system can be an extremely tedious and complex process.
- ✓ Retraining of IT staff and personnel to the new ERP system can produce resistance and reduce productivity over a period of time.

The business benefits and limitations of ERP systems are as follows:

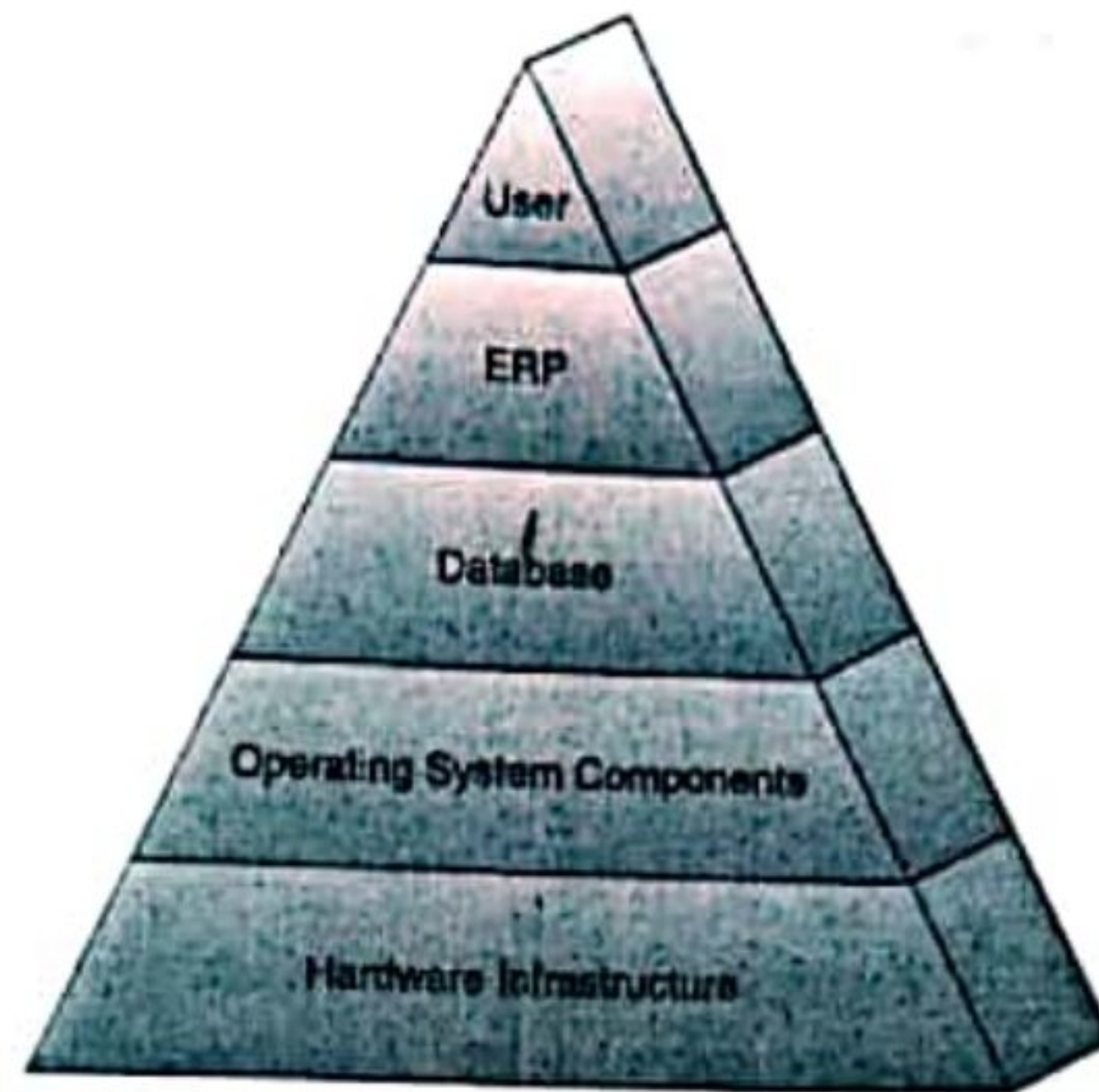
- Increasing agility of the organization in terms of responding to changes in the environment for growth and maintaining the market share in the industry.
- ✓ Sharing of information across the functional departments means employees can collaborate easily with each other and work in teams.
- ✓ Linking and exchanging information in real time with its supply chain partners can improve efficiency and lower costs of products and services.
- Quality of customer service is better and quicker as information flows both up and down the organization hierarchy and across all business units.
- Efficiency of business processes are enhanced due to business process reengineering of organization functions.
- ✓ Retraining of all employees with the new system can be costly and time consuming.
- ✓ Change of business roles and department boundaries can create upheaval and resistance to the new system.
- Reduction in cycle time in the supply chain from procurement of raw materials to production, distribution, warehousing, and collection (see example in Box 1-1).

### BOX 1-1 Microsoft's ERP Implementation

Microsoft's rapid growth in the 1990s created major support problems for the IT staff, which felt it had lost control over the systems they administered. The problems arose due to the number of redundant applications that had been developed to support the company's operation. At one point as many as 90 percent of the 20,000 batch programs that were retrieving and passing data between applications were redundant. The move to a single architecture with SAP improved integration between Microsoft's business units and its suppliers and customers. Microsoft spent 10 months and \$25 million replacing 33 existing systems in 26 sites with SAP. Microsoft claims to have saved \$18 million annually as a result, and Bill Gates (founder of Microsoft) reportedly has expressed great satisfaction with the SAP software.<sup>5,6</sup> The key production benefits of ERP systems were as follows:

- Reduction of planning cycle (95 percent)
- Reduction of delivery times (10–40 percent)
- Reduction of production times (10–50 percent)
- Lower stock levels (10–25 percent)
- Reduction of late deliveries (25–50 percent)
- Increase in productivity (2–5 percent)





**FIGURE 1-4** ERP Components Integration

attention to the business processes and people components. Both people involvement and process integration will need to be addressed from the very early stages in the implementation plan. Staff must be allowed to play a key role in the project from the beginning. As shown in Figure 1-4, each component must be layered appropriately and each layer must support the efficiency of the other layers. The layered approach also provides the ability to change layers without significantly affecting the other layers. This can help organizations lower the long-term maintenance of the ERP application because changes in one layer do not necessarily require changes in other layers.

### ERP Architecture

The architecture of the ERP implementation influences the cost, maintenance, and the use of the system. A flexible architecture is best because it allows for scalability as the needs of the organization change and grow. A system's architecture is a blueprint of the actual ERP system and transforms the high-level ERP implementation strategy into an information flow with interrelationships in the organization. The ERP architecture helps the implementation team build the ERP system for an organization. The role of system architecture is similar to the architecture of a home, which takes the vision of the homeowners with the system components similar to the wiring, plumbing, and furnishings of a home.

The process of designing ERP system architecture is slightly different from other IT architectures. Whereas other IT architectures are driven by organizational strategy and business processes, if purchased, ERP architecture is often driven by the ERP vendor. This is often referred to as *package-driven* architecture. The reason for this reversal is that most ERP vendors claim to have the best practices of their industry's business processes captured in their system logic. This argument has proven very powerful in convincing organizations to spend millions of dollars for the ERP package. In order to leverage this investment and maximize the return on investment, an ERP implementation is driven by the requirements contained in the package.