

# Enterprise Resource Planning

V. Kem, Soude K.T

## ERP

**Enterprise resource planning (ERP)** systems integrate internal and external [management information](#) across an entire organization, embracing [finance/accounting](#), [manufacturing](#), sales and service, [customer relationship management](#), etc. ERP systems automate this activity with an integrated [software](#) application. Their purpose is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders.

ERP systems can run on a variety of [computer hardware](#) and [network](#) configurations, typically employing a [database](#) as a repository for information.

### Origin of "ERP"

In 1990 [Gartner Group](#) first employed the [acronym](#) ERP as an extension of [material requirements planning](#) (MRP), later [manufacturing resource planning](#) and [computer-integrated manufacturing](#). Without supplanting these terms, ERP came to represent a larger whole, reflecting the evolution of application integration beyond manufacturing. Not all ERP packages were developed from a manufacturing core. Vendors variously began with accounting, maintenance and human resources. By the mid-1990s ERP systems addressed all core functions of an enterprise. Beyond corporations, governments and non-profit organizations also began to employ ERP systems.

### Expansion

ERP systems experienced rapid growth in the 1990s because the [year 2000 problem](#) and introduction of the [Euro](#) disrupted legacy systems. Many companies took this opportunity to replace such systems with ERP. This rapid growth in sales was followed by a slump in 1999 after these issues had been addressed.

ERP systems initially focused on automating [back office functions](#) that did not directly affect [customers](#) and the general public. [Front office functions](#) such as customer relationship management (CRM) dealt directly with customers, or [e-business](#) systems such as e-commerce, e-government, e-telecom, and e-finance, or [supplier relationship management](#) (SRM) became integrated later, when the Internet simplified communicating with external parties. <sup>[[citation needed](#)]</sup>

"ERP II" was coined in the early 2000s. It describes web-based software that allows both employees and partners (such as suppliers and customers) real-time access to the systems. The role of ERP II expands from the resource optimization and transaction processing of traditional ERP to leveraging the information involving those resources in the enterprise's efforts to collaborate with other enterprises, not just to conduct e-commerce buying and selling. Compared to the first generation ERP, ERP II is said to be more flexible rather than confining the capabilities of the ERP system within the organization, it is designed to go beyond the corporate walls and interact with other systems. "Enterprise application suite" is an alternate name for such systems.

#### Components

---

- Transactional database
- Management portal/[dashboard](#)
- [Business intelligence](#) system
- Customizable reporting
- External access via technology such as [web services](#)
- [Search](#)
- [Document management](#)
- Messaging/chat/[wiki](#)
- [Workflow management](#)

---

[Best practices](#) are incorporated into most ERP systems. This means that the software reflects the vendor's interpretation of the most effective way to perform each business process. Systems vary in the convenience with which the customer can modify these practices. Companies that implemented industry best practices reduced time-consuming project tasks such as configuration, documentation, testing and training. In addition, best practices reduced risk by 71% when compared to other software implementations.

The use of best practices eases compliance with requirements such as [IFRS](#), [Sarbanes-Oxley](#), or [Basel II](#). They can also help comply with de facto industry standards, such as [electronic funds transfer](#). This is because the procedure can be readily codified within the ERP software and replicated with confidence across multiple businesses who share that business requirement.

## Modularity

---

Most systems are modular to permit automating some functions but not others. Some common modules, such as finance and accounting, are adopted by nearly all users; others such as human resource management are not. For example, a service company probably has no need for a manufacturing module. Other companies already have a system that they believe to be adequate. Generally speaking, the greater the number of modules selected, the greater the integration benefits, but also the greater the costs, risks and changes involved. <sup>[citation needed]</sup>

## Connectivity to plant floor information

---

ERP systems connect to real-time data and transaction data in a variety of ways. These systems are typically configured by [systems integrators](#), who bring unique knowledge on process, equipment, and vendor solutions.

**Direct integration**—ERP systems have connectivity (communications to plant floor equipment) as part of their product offering. This requires the vendors to offer specific support for the plant floor equipment that their customers operate. ERP vendors must be expert in their own products, and connectivity to other vendor products, including competitors.

**Database integration**—ERP systems connect to plant floor data sources through staging tables in a database. Plant floor systems deposit the necessary information into the database. The ERP system reads the information in the table. The benefit of staging is that ERP vendors do not need to master the complexities of equipment integration. Connectivity becomes the responsibility of the [systems integrator](#).

**Enterprise appliance transaction modules (EATM)**—These devices communicate directly with plant floor equipment and with the ERP system via methods supported by the ERP system. EATM can employ a staging table, Web Services, or system-specific program interfaces ([APIs](#)). The benefit of an EATM is that it offers an off-the-shelf solution.

**Custom-integration solutions**—Many system integrators offer custom solutions. These systems tend to have the highest level of initial integration cost, and can have a higher long term maintenance and reliability costs. Long term costs can be minimized through careful system testing and thorough documentation. Custom-integrated solutions typically run on workstation or server class computers.

## Implementation

---

ERP's scope usually implies significant changes to staff work processes and practices. Generally, three types of services are available to help implement such changes—consulting, customization,

and support. Implementation time depends on business size, number of modules, customization, the scope of process changes, and the readiness of the customer to take ownership for the project. Modular ERP systems can be implemented in stages. The typical project for a large enterprise consumes about 14 months and requires around 150 consultants. Small projects can require months; multinational and other large implementations can take years. Customization can substantially increase implementation times.

### **Process preparation**

Implementing ERP typically requires changes in existing business processes. Poor understanding of needed process changes prior to starting implementation is a main reason for project failure. It is therefore crucial that organizations thoroughly analyze business processes before implementation. This analysis can identify opportunities for process modernization. It also enables an assessment of the alignment of current processes with those provided by the ERP system. Research indicates that the risk of business process mismatch is decreased by:

- linking current processes to the organization's strategy;
- analyzing the effectiveness of each process;
- understanding existing automated solutions.

ERP implementation is considerably more difficult (and politically charged) in decentralized organizations, because they often have different processes, business rules, data semantics, authorization hierarchies and decision centers. This may require migrating some business units before others, delaying implementation to work through the necessary changes for each unit, possibly reducing integration (e.g. linking via [Master data management](#)) or customizing the system to meet specific needs.

A potential disadvantage is that adopting "standard" processes can lead to a loss of competitive advantage. While this has happened, losses in one area are often offset by gains in other areas, increasing overall competitive advantage.

### **Configuration**

Configuring an ERP system is largely a matter of balancing the way the customer wants the system to work with the way it was designed to work. ERP systems typically build many changeable parameters that modify system operation. For example, an organization can select the type of inventory accounting—[FIFO or LIFO](#)—to employ, whether to recognize revenue by geographical unit, product line, or distribution channel and whether to pay for shipping costs when a customer returns a purchase.

## Customization

ERP systems are theoretically based on industry best practices and are intended to be deployed "as is". ERP vendors do offer customers configuration options that allow organizations to incorporate their own business rules but there are often functionality gaps remaining even after the configuration is complete. ERP customers have several options to reconcile functionality gaps, each with their own pros/cons. Technical solutions include rewriting part of the delivered functionality, writing a homegrown bolt-on/add-on module within the ERP system, or interfacing to an external system. All three of these options are varying degrees of system customization, with the first being the most invasive and costly to maintain. Alternatively, there are non-technical options such as changing business practices and/or organizational policies to better match the delivered ERP functionality.

Key differences between customization and configuration include:

- Customization is always optional, whereas the software must always be configured before use (e.g., setting up cost/profit center structures, organisational trees, purchase approval rules, etc.)
- The software was designed to handle various configurations, and behaves predictably in any allowed configuration.
- The effect of configuration changes on system behavior and performance is predictable and is the responsibility of the ERP vendor. The effect of customization is less predictable, is the customer's responsibility and increases testing activities.
- Configuration changes survive upgrades to new software versions. Some customizations (e.g. code that uses pre-defined "hooks" that are called before/after displaying data screens) survive upgrades, though they require retesting. Other customizations (e.g. those involving changes to fundamental data structures) are overwritten during upgrades and must be reimplemented.

Customization Advantages:

- Improves user acceptance
- Offers the potential to obtain competitive advantage vis-à-vis companies using only standard features.

Customization Disadvantages:

- Increases time and resources required to both implement and maintain. [\[25\]](#)

- Inhibits seamless communication between suppliers and customers who use the same ERP system uncustomized.<sup>[citation needed]</sup>
- Over reliance on customization undermines the principles of ERP as a standardizing software platform

### **Extensions**

ERP systems can be extended with third-party software. ERP vendors typically provide access to data and functionality through published interfaces. Extensions offer features such as:<sup>[citation needed]</sup>

- archiving, reporting and republishing;
- capturing transactional data, e.g. using [scanners](#), tills or [RFID](#)
- access to specialized data/capabilities, such as syndicated marketing data and associated trend analytics.
- advanced planning and scheduling (APS)

### **Data migration**

Data migration is the process of moving/copying and restructuring data from an existing system to the ERP system. Migration is critical to implementation success and requires significant planning. Unfortunately, since migration is one of the final activities before the production phase, it often receives insufficient attention. The following steps can structure migration planning:

- Identify the data to be migrated
- Determine migration timing
- Generate the data templates
- Freeze the toolset
- Decide on migration-related setups
- Define [data archiving](#) policies and procedures.

Comparison to special-purpose applications

---

### **Advantages**

The fundamental advantage of ERP is that integrating the myriad processes by which businesses operate saves time and expense. Decisions can be made more quickly and with fewer errors. Data becomes visible across the organization. Tasks that benefit from this integration include:

- Sales forecasting, which allows inventory optimization
- Chronological history of every transaction through relevant data compilation in every area of operation.

- Order tracking, from acceptance through fulfillment
- Revenue tracking, from [invoice](#) through cash receipt
- Matching [purchase orders](#) (what was ordered), inventory receipts (what arrived), and [costing](#) (what the vendor invoiced)

ERP systems centralize business data, bringing the following benefits:

- They eliminate the need to synchronize changes between multiple systems—consolidation of finance, marketing and sales, human resource, and manufacturing applications
- They bring legitimacy and transparency in each bit of statistical data.
- They provide a comprehensive enterprise view (no "islands of information"). They make real-time information available to management anywhere, any time to make proper decisions.
- They protect sensitive data by consolidating multiple security systems into a single structure.

#### **Disadvantages**

- Customization is problematic.
- Re-engineering business processes to fit the ERP system may damage competitiveness and/or divert focus from other critical activities
- ERP can cost more than less integrated and/or less comprehensive solutions.
- High switching costs associated with ERP can increase the ERP vendor's negotiating power which can result in higher support, maintenance, and upgrade expenses.
- Overcoming resistance to sharing sensitive information between departments can divert management attention.
- Integration of truly independent businesses can create unnecessary dependencies.
- Extensive training requirements take resources from daily operations.
- Due to ERP's architecture (OLTP, On-Line Transaction Processing) ERP systems are not well suited for production planning and supply chain management (SCM)

The limitations of ERP have been recognized sparking new trends in ERP application development, the four significant developments being made in ERP are, creating a more flexible ERP, Web-Enable ERP, Interenterprise ERP and e-Business Suites, each of which will potentially address the failings of the current ERP.