

### ERP

Enterprise resource planning (ERP) systems attempt to integrate several data sources and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules.

The two key components of an ERP system are a common database and a modular software design. A common database is the system that allows every department of a company to store and retrieve information in real-time. Using a common database allows information to be more reliable, accessible, and easily shared. Furthermore, a modular software design is a variety of programs that can be added on an individual basis to improve the efficiency of the business. This improves the business by adding functionality, mixing and matching programs from different vendors, and allowing the company to choose which modules to implement. These modular software designs link into the common database, so that all of the information between the departments is accessible in real time.

### Origin of the term

MRP vs. ERP — Manufacturing management systems have evolved in stages over the past 30 years from a simple means of calculating materials requirements to the automation of an entire enterprise. Around 1980, over-frequent changes in sales forecasts, entailing continual readjustments in production, as well as the unsuitability of the parameters fixed by the system, led MRP (Material Requirement Planning) to evolve into a new concept : Manufacturing Resource Planning (or MRP2) and finally the generic concept Enterprise Resource Planning (ERP)

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The initials ERP originated as an extension of MRP (material requirements planning then manufacturing resource planning). ERP systems now attempt to cover all basic functions of an enterprise, regardless of the organization's business or charter. Non-manufacturing businesses, non-profit organizations and governments now all utilize ERP systems.

To be considered an ERP system, a software package must provide the function of at least two systems. For example, a software package that provides both payroll and accounting functions could technically be considered an ERP software package.

However, the term is typically reserved for larger, more broadly based applications. The introduction of an ERP system to replace two or more independent applications eliminates the need for external interfaces previously required between systems, and provides additional benefits that range from standardization and lower maintenance (one system instead of two or more) to easier and/or greater reporting capabilities (as all data is typically kept in one database).

Examples of modules in an ERP which formerly would have been stand-alone applications include: Manufacturing, Supply Chain, Financials, Customer Relationship Management (CRM), Human Resources, Warehouse Management and Decision Support System.

### Overview

Some organizations — typically those with sufficient in-house IT skills to integrate multiple software products — choose to implement only portions of an ERP system and develop an external interface to other ERP or stand-alone systems for

their other application needs. For example, one may choose to use human resource management system from one vendor, and the financial systems from another, and perform the integration between the systems themselves.

This is very common in the retail sector[citation needed], where even a mid-sized retailer will have a discrete Point-of-Sale (POS) product and financials application, then a series of specialized applications to handle business requirements such as warehouse management, staff rostering, merchandising and logistics.

Ideally, ERP delivers a single database that contains all data for the software modules, which would include:

### Manufacturing

Engineering, Bills of Material, Scheduling, Capacity, Workflow Management, Quality Control, Cost Management, Manufacturing Process, Manufacturing Projects, Manufacturing Flow  
Supply Chain Management

Inventory, Order Entry, Purchasing, Product Configurator, Supply Chain Planning, Supplier Scheduling, Inspection of goods, Claim Processing, Commission Calculation  
Financials

General Ledger, Cash Management, Accounts Payable, Accounts Receivable, Fixed Assets  
Projects

Costing, Billing, Time and Expense, Activity Management  
Human Resources

Human Resources, Payroll, Training, Time & Attendance, Rostering, Benefits

Customer Relationship Management

Sales and Marketing, Commissions, Service, Customer Contact and Call Center support  
Data Warehouse and various Self-Service interfaces for Customers, Suppliers, and Employees

Enterprise Resource Planning is a term originally derived from manufacturing resource planning (MRP II) that followed material requirements planning (MRP).[3] MRP evolved into ERP when "routings" became a major part of the software architecture and a company's capacity planning activity also became a part of the standard software activity.[citation needed] ERP systems typically handle the manufacturing, logistics, distribution, inventory, shipping, invoicing, and accounting for a company. Enterprise Resource Planning or ERP software can aid in the control of many business activities, like sales, marketing, delivery, billing, production, inventory management, quality management, and human resource management.

ERP systems saw a large boost in sales in the 1990s as companies faced the Y2K problem in their legacy systems. Many companies took this opportunity to replace their legacy information systems with ERP systems. This rapid growth in sales was followed by a slump in 1999, at which time most companies had already implemented their Y2K solution.

ERPs are often incorrectly called back office systems indicating that customers and the general public are not directly involved. This is contrasted with front office systems like customer relationship management (CRM) systems that deal directly with the customers, or the eBusiness systems such as eCommerce, eGovernment, eTelecom, and eFinance, or supplier relationship management (SRM) systems.

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ERPs are cross-functional and enterprise wide. All functional departments that are involved in operations or production are integrated in one system. In addition to manufacturing, warehousing, logistics, and information technology, this would include accounting, human resources, marketing, and strategic management.

ERP II means open ERP architecture of components. The older, monolithic ERP systems became component oriented.[citation needed]

EAS — Enterprise Application Suite is a new name for formerly developed ERP systems which include (almost) all segments of business, using ordinary Internet browsers as thin clients.[citation needed]

### Before

Prior to the concept of ERP systems, it was not unusual for each department within an organization to have its own customized computer system. For example, the human resources (HR) department, the payroll department, and the financial department might all have their own computer systems.

Typical difficulties involved integration of data from potentially different computer manufacturers and systems. For example, the HR computer system (often called HRMS or HRIS) would typically manage employee information while the payroll department would typically calculate and store paycheck information for each employee, and the financial department would typically store financial transactions for the organization. Each system would have to integrate using a predefined set of common data which would be transferred between each computer system. Any deviation from the data format or the integration schedule often resulted in problems.

### After

ERP software, among other things, combined the data of formerly separate applications. This simplified keeping data in synchronization across the enterprise, it simplified the computer infrastructure within a large organization, and it standardized and reduced the number of software specialties required within larger organizations.

### Best Practices

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Further information might be found on the talk page or at requests for expansion.

Best Practices were also a benefit of implementing an ERP system. When implementing an ERP system, organizations essentially had to choose between customizing the software or modifying their business processes to the "Best Practice" function delivered in the vanilla version of the software.

Typically, the delivery of best practice applies more usefully to large organizations and especially where there is a compliance requirement such as IFRS, Sarbanes-Oxley or Basel II, or where the process is a commodity such as electronic funds transfer. This is because the procedure of capturing and reporting legislative or commodity content can be readily codified within the ERP software, and then replicated with confidence across multiple businesses who have the same business requirement.

Where such a compliance or commodity requirement does not underpin the business process, it can be argued that determining and applying a Best Practice actually erodes competitive advantage by homogenizing the business as compared to everyone else in the industry sector.

### Implementation

Because of their wide scope of application within a business, ERP software systems are typically complex and usually impose significant changes on staff work practices.[citation needed] Implementing ERP software is typically not an "in-house" skill, so even smaller projects are more cost effective if specialist ERP implementation consultants are employed.[citation needed] The length of time to implement an ERP system depends on the size of the business, the scope of the change and willingness of the customer to take ownership for the project.[citation needed] A small project (e.g., a company of less than 100 staff) may be planned and delivered within 3-9 months; however, a large, multi-site or multi-country implementation may take years.[citation needed]

To implement ERP systems, companies often seek the help of an ERP vendor or of third-party consulting companies. These firms typically provide three areas of professional services: consulting, customization and support.

Data migration is one of the most important activities in determining the success of an ERP implementation. Since many decisions must be made before migration, a significant amount of planning must occur. Unfortunately, data migration is the last activity before the production phase of an ERP implementation, and therefore receives minimal attention due to time constraints. The following are steps of a data migration strategy that can help with the success of an ERP implementation:

- a) Identifying the data to be migrated.
- b) Determining the timing of data migration.
- c) Generating the data templates.
- d) Freezing the tools for data migration.
- e) Deciding on migration related setups.
- f) Deciding on data archiving.

### Process preparation

ERP vendors have designed their systems around standard business processes, based upon best business practices. Different vendor(s) have different types of processes but they are all of a standard, modular nature. Firms that want to implement ERP systems are consequently forced to adapt their organizations to standardized processes as opposed to adapting the ERP package to the existing processes. Neglecting to map current business processes prior to starting ERP implementation is a main reason for failure of ERP projects. It is therefore crucial that organizations perform a thorough business process analysis before selecting an ERP vendor and setting off on the implementation track. This analysis should map out all present operational processes, enabling selection of an ERP vendor whose standard modules are most closely aligned with the established organization. Redesign can then be implemented to achieve further process congruence. Research indicates that the risk of business process mismatch is decreased by:

1. linking each current organizational process to the organization's strategy;
2. analyzing the effectiveness of each process in light of its current related business capability;
3. Understanding the automated solutions currently implemented.

A disadvantage usually attributed to ERP is that business process redesign to fit the standardized ERP modules can lead to a loss of competitive advantage. While documented cases exist where this has indeed materialized, other cases show that following thorough process preparation ERP systems can actually increase sustainable competitive advantage.

### Configuration

Configuring an ERP system is largely a matter of balancing the way you want the system to work with the way the system lets you work. Begin by deciding which modules to install, then adjust the system using configuration tables to achieve the best possible fit in working with your company's processes.

Modules - Most systems are modular simply for the flexibility of implementing some functions but not others. Some common modules, such as finance and accounting are adopted by nearly all companies implementing enterprise systems; others however such as human resource management are not needed by some companies and therefore not adopted. A service company for example will not likely need a module for manufacturing. Other times companies will not adopt a module because they already have their own proprietary system they believe to be superior. Generally speaking the greater number of modules selected, the greater the integration benefits, but also the increase in costs, risks and changes involved.

Configuration Tables – A configuration table enables a company to tailor a particular aspect of the system to the way it chooses to do business. For example, an organization can select the type of inventory accounting – FIFO or LIFO – it will employ or whether it wants to recognize revenue by geographical unit, product line, or distribution channel.

So what happens when the options the system allows just aren't good enough? At this point a company has two choices, both of which are not ideal. It can re-write some of the enterprise system's code, or it can continue to use an existing system and build interfaces between it and the new enterprise system. Both options will add time and cost to the implementation process. Additionally they can dilute the system's integration benefits. The more customized the system becomes the less possible seamless communication becomes between suppliers and customers.

### Consulting Services

Many organizations did not have sufficient internal skills to implement an ERP project. This resulted in many organizations offering consulting services for ERP implementation. Typically, a consulting team was responsible for the entire ERP implementation including planning, training, testing, implementation, and delivery of any customized modules. Examples of customization includes additional product training; creation of process triggers and workflow; specialist advice to improve how the ERP is used in the business; system optimization; and assistance writing reports, complex data extracts or implementing Business Intelligence.

For most mid-sized companies, the cost of the implementation will range from around the list price of the ERP user licenses to up to twice this amount (depending on the level of customization required). Large companies, and especially those with multiple sites or countries, will often spend considerably more on the implementation than the cost of the user licenses -- three to five times more is not uncommon for a multi-site implementation.[citation needed]

### Customization Services

Customization Services involves any modifications or extensions that change how the out-of-the-box ERP system works.

Customizing an ERP package can be very expensive and complicated. Some ERP packages are not designed to support customization, so most businesses implement the best practices embedded in the acquired ERP system. Some ERP packages have very generic features, such that customization occurs in most implementations. It is also often possible to extend the standard ERP package by purchasing third party software to provide additional functionality.

Customization work is usually undertaken as bespoke software development on a time and materials basis.

Customization can be further classified into: Core system customization or custom extensions in custom libraries Core system customization is where customers change the software vendors' proprietary code. This means that the software will no longer be supported by the vendor for the particular function that was customized as the code would be modified to the customers need. The customers IT department will then normally support the code in-house or subcontract a consulting organization to do so.

Custom extensions are where a customer build bolt on custom applications that run parallel to the standard system i.e. custom extended applications. Modules that are extended but core code not changed remain supported but the extensions will have to be supported by the customers IT department or subcontracted consulting organization

### **Maintenance and Support Services**

Maintenance and Support Services involves monitoring and managing an Operational ERP system. This function is often provided in-house using members of the IT department, but may also be provided by specialist external consulting and services companies.

### **Advantages**

In the absence of an ERP system, a large manufacturer may find itself with many software applications that do not talk to each other and do not effectively interface. Tasks that need to interface with one another may involve:

- design engineering (how to best make the product)
- order tracking from acceptance through fulfillment
- the revenue cycle from invoice through cash receipt
- managing interdependencies of complex Bill of Materials
- tracking the 3-way match between Purchase orders (what was ordered), Inventory receipts (what arrived), and Costing (what the vendor invoiced)
- The Accounting for all of these tasks, tracking the Revenue, Cost and Profit on a granular level.

Change how a product is made, in the engineering details, and that is how it will now be made. Effective dates can be used to control when the switch over will occur from an old version to the next one, both the date that some ingredients go into effect, and date that some are discontinued. Part of the change can include labeling to identify version numbers.

Some security features are included within an ERP system to protect against both outsider crime, such as industrial espionage, and insider crime, such as embezzlement. A data tampering scenario might involve a disgruntled employee intentionally modifying prices to below the breakeven point in order to attempt to take down the company, or other sabotage. ERP systems typically provide functionality for implementing internal controls to prevent actions of this kind. ERP vendors are also moving toward better integration with other kinds of information security tools.

### **Disadvantages**

Problems with ERP systems are mainly due to inadequate investment in ongoing training for involved personnel, including those implementing and testing changes, as well as a lack of corporate policy protecting the integrity of the data in the ERP systems and how it is used.

#### Disadvantages

- Customization of the ERP software is limited.
- Re-engineering of business processes to fit the "industry standard" prescribed by the ERP system may lead to a loss of competitive advantage.
- ERP systems can be very expensive leading to a new category of "ERP light" solutions
- ERPs are often seen as too rigid and too difficult to adapt to the specific workflow and business process of some companies—this is cited as one of the main causes of their failure.
- Many of the integrated links need high accuracy in other applications to work effectively. A company can achieve minimum standards, then over time "dirty data" will reduce the reliability of some applications.
- Once a system is established, switching costs are very high for any one of the partners (reducing flexibility and strategic control at the corporate level).

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- The blurring of company boundaries can cause problems in accountability, lines of responsibility, and employee morale.
- Resistance in sharing sensitive internal information between departments can reduce the effectiveness of the software.
- Some large organizations may have multiple departments with separate, independent resources, missions, chains-of-command, etc, and consolidation into a single enterprise may yield limited benefits.
- The system may be too complex measured against the actual needs of the customer.