

- at cloud hardware. The using organization then manages the ERP software on the cloud hardware.
- **SaaS:** Acquire a cloud-based ERP solution. SAP, Oracle, Microsoft, and the other major ERP vendors offer their ERP software as a service. The vendor manages the ERP software and offers it to customers as a service.

During your career, existing in-house ERP solutions are likely to migrate to one of these two modes. Larger installations will likely move to PaaS; smaller and new ERP systems are likely to use SaaS.

ERP Application Programs

ERP vendors design application programs to be configurable so that development teams can alter them to meet an organization's requirements without changing program code. Accordingly, during the ERP development process, the development team sets configuration parameters that specify how ERP application programs will operate. For example, an hourly payroll application is configured to specify the number of hours in the standard workweek, hourly wages for different job categories, wage adjustments for overtime and holiday work, and so forth. Deciding on the initial configuration values and adapting them to new requirements is a challenging collaboration activity. It is also one that you might be involved in as a business professional.

Of course, there are limits to how much configuration can be done. If a new ERP customer has requirements that cannot be met via program configuration, then it needs to either adapt its business to what the software can do or write (or pay another vendor to write) application code to meet its requirements. As stated in Lesson 4, such custom programming is expensive, both initially and in long-term maintenance costs. Thus, choosing an ERP solution with applications that function close to the organization's requirements is critical to its successful implementation.

ERP Databases

An ERP solution includes a database design as well as initial configuration data. It does not, of course, contain the company's operational data. During development, the team must enter the initial values for that data as part of the development effort.

If your only experience with databases is creating a few tables in Microsoft Access, then you probably underestimate the value and importance of ERP database designs. SAP, the leading vendor of ERP solutions, provides ERP databases that contain more than 15,000 tables. The design includes the metadata for those tables, as well as their relationships to each other, and rules and constraints about how the data in some tables must relate to data in other tables. The ERP solution also contains tables filled with initial configuration data.

Reflect on the difficulty of creating and validating data models (as discussed in Lesson 5), and you will have some idea of the amount of intellectual capital invested in a database design of

15,000 tables. Also, consider the magnitude of the task of filling such a database with users' data!

Although we did not discuss this database feature in Lesson 5, large organizational databases contain two types of program code. The first, called a trigger, is a computer program stored within the database that runs to keep the database consistent when certain conditions arise. The second, called a stored procedure, is a computer program stored in the database that is used to enforce business rules. An example of such a rule would be never to sell certain items at a discount. Triggers and stored procedures are also part of the ERP solution. Developers and business users need to configure the operation of such code during the ERP implementation as well.

Business Process Procedures

Another component of an ERP solution is a set of inherent procedures that implement standard business processes. ERP vendors develop hundreds, or even thousands, of procedures that enable the ERP customer organization to accomplish its work using the applications provided by the vendor. Figure 8-15 shows a part of the SAP ordering business process; this process implements a portion of the inbound logistics activities. Some ERP vendors call the inherent processes that are defined in the ERP solution [process blueprints](#).

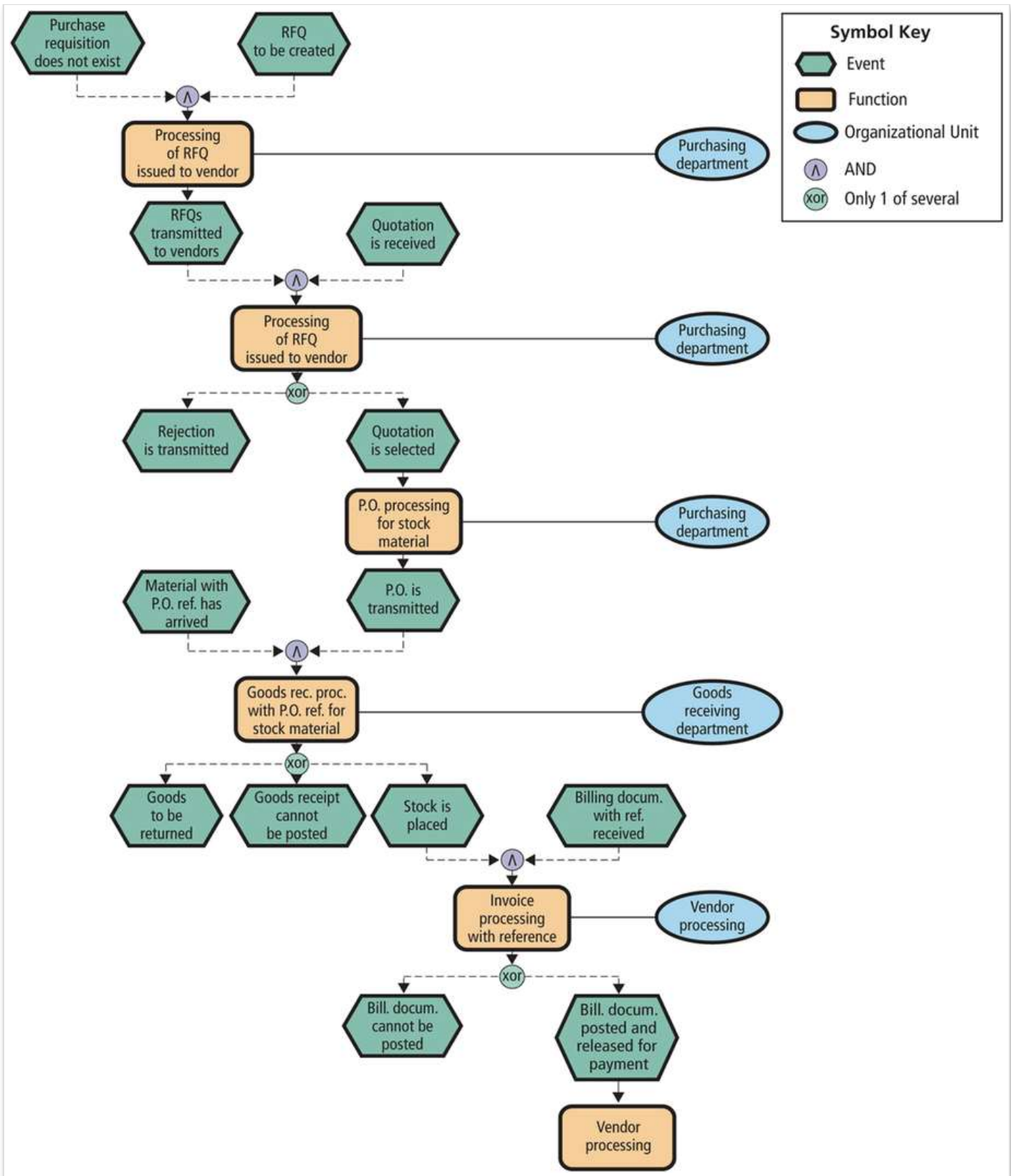


Figure 8-15: SAP Ordering Process

Source: Based on Thomas A. Curran, Andrew Ladd, and Dennis Ladd, SAP R/3 Reporting Business and Intelligence, 1st ed. copyright 2000.

Without delving into the details, you should be able to understand the flow of work outlined in this process. Every function (rounded rectangles in Figure 8-15) consists of a set of procedures

for accomplishing that function. Typically, these procedures require an ERP user to use application menus, screens, and reports to accomplish the activity.

As with application programs, ERP users must either adapt to the predefined, inherent processes and procedures or design new ones. In the latter case, the design of new procedures may necessitate changes to application programs and to database structures as well. Perhaps you can begin to understand why organizations attempt to conform to vendor standards.

Training and Consulting

Because of the complexity and difficulty of implementing and using ERP solutions, ERP vendors have developed training curricula and numerous classes. SAP operates universities, in which customers and potential customers receive training both before and after the ERP implementation. In addition, ERP vendors typically conduct classes on site. To reduce expenses, the vendors sometimes train the organization's employees, called Super Users, to become in-house trainers in training sessions called [train the trainer](#).

ERP training falls into two broad categories. The first category is training about how to implement the ERP solution. This training includes topics such as obtaining top-level management support, preparing the organization for change, and dealing with the inevitable resistance that develops when people are asked to perform work in new ways. The second category is training on how to use the ERP application software; this training includes specific steps for using the ERP applications to accomplish the activities in processes such as those in Figure 8-15.

ERP vendors also provide on-site consulting for implementing and using the ERP system. Additionally, an industry of third-party ERP consultants has developed to support new ERP customers and implementations. These consultants provide knowledge gained through numerous ERP implementations. Such knowledge is valued because most organizations go through an ERP conversion only once. Ironically, having done so, they now know how to do it. Consequently, some employees, seasoned by an ERP conversion with their employer, leave that company to become ERP consultants.

Industry-Specific Solutions

As you can tell, considerable work needs to be done to customize an ERP application to a particular customer. To reduce that work, ERP vendors provide starter kits for specific industries called [industry-specific solutions](#). These solutions contain program and database configuration files as well as process blueprints that apply to ERP implementations in specific industries. Over time, SAP, which first provided such solutions, and other ERP vendors created dozens of such starter kits for manufacturing, sales and distribution, healthcare, and other major industries.

Which Companies Are the Major ERP Vendors?



Although more than 100 different companies advertise ERP products, not all of those products meet the minimal ERP criteria. Of those that do, the bulk of the market is held by the five vendors shown in Figure 8-16.² SAP and Oracle serve the largest organizations. Microsoft, Infor ERP, and Epicor products primarily serve small to midsize companies.

Company	Market Share	Remarks
SAP	20 percent	Market leader in ERP implementations. Expensive. Many consider it to be the gold standard of ERP.
Microsoft	14 percent	Microsoft AX, which is popular in Europe, is primarily used in manufacturing. Other products have smaller revenue. Dynamics CRM is offered as SaaS, but no full ERP solution is offered in the cloud.
Oracle	9 percent	Intensely competitive company with strong technology base. Large customer base. Flexible SOA architecture. Will leverage strong technology base into innovative and effective cloud-based solutions. Strong challenge to SAP market leadership.
Infor ERP	7 percent	Many solutions, not integrated, particularly specialized for manufacturing and supply chain management. Evolving with revolution in 3D printing practices.
Epicor	4 percent	Leading ERP provider for midsize companies. Many applications to provide clients with custom solutions.

Figure 8-16: Characteristics of Top ERP Vendors

Source: Based on Panorama Consulting Solutions, "Clash of the Titans 2019," [Panorama-consulting.com](https://panorama-consulting.com), November 2019.

The ERP market is mature and facing stiff competition from SaaS competitors. According to Statistis MRC, the size of the ERP market is expected to grow from \$34B in 2017 to \$74B in 2026.³ As the ERP market continues to mature, consolidation of vendors is likely, with smaller vendors falling out entirely. In fact, the top 10 vendors own 64 percent of the market share and the top five, listed in Figure 8-16, own 55 percent.⁴

The cloud is having a major impact on ERP vendors. Those with substantial resources (SAP) and deep technical talent (Oracle) are moving their product suites into some version of SaaS, PaaS, or IaaS. Others are unable to convert to the new technology and are gradually losing their customers to those who have converted or to new companies that have only ever offered cloud-based ERP solutions. Among organizations that use ERP, the movement from classical

client/server ERP to the cloud will likely be a major business challenge during the early years of your career.

Knowledge Check

