Information Systems Infrastructure and Architecture

An information infrastructure consists of the physical facilities, services, and management that support all shared computing resources in an organization. There are five major components of the infrastructure: computer hardware, software, networks and communication facilities (including the Internet and intranets), databases, and information management personnel. Infrastructures include these resources as well as their integration, operation, documentation, maintenance, and management.

Information Technology Architecture

Information technology architecture* is a high-level map or plan of the information assets in an organization including the physical design of the building that holds the hardware. It is both a guide for current operations and a blueprint for future directions. The IT architecture integrates the entire organization’s needs for information, the IT infrastructure, and all applications. The IT architecture is analogous to the architecture of a house. An architecture plan describes how the house is to be constructed; including how the various components of the house, 

* Information technology architecture needs to be distinguished from computer architecture. For example, the architecture for a computer may involve several processors, or it may have special features to increase speed such as reduced instruction set computing (RISC). Our interest here is in information architecture only.
such as electrical systems, are to be integrated. Similarly, the IT architecture shows how all aspects of information technology in an organization fit together. Figure 33 illustrates the IT architecture of a travel agency.

![Architecture of an online travel agency](image)

**FIGURE 33 Architecture of an online travel agency**

**Information Technology Infrastructure**

An organization’s information technology (IT) infrastructure consists of the physical facilities, IT components, IT services, and IT personnel that support the entire organization. Starting from the bottom of Figure 34, we see that IT components are the computer hardware, software, and communications technologies that provide the foundation for all of an organization’s information systems. As we move up the pyramid, we see that IT personnel use IT components to produce IT
services, which include data management, systems development, and security concerns.

**Computer-Based Information Systems**

The IT architecture and IT infrastructure provide the basis for all information systems in the organization. An information system (IS) collects, processes, stores, analyzes, and disseminates information for a specific purpose. A computer-based information system (CBIS) is an information system that uses computer technology to perform some or all of its intended tasks. Although not all information systems are computerized, most are. For this reason, the term “information system” is typically used synonymously with “computer based information system.”
Major Capabilities of Computer-Based Information Systems

- Perform high-speed, high-volume, numerical computations.
- Provide fast, accurate communication and collaboration within and among organizations.
- Store huge amounts of information in an easy-to-access, yet small, space.
- Allow quick and inexpensive access to vast amounts of information, worldwide.
• Facilitate the interpretation of vast amounts of data.
• Increase the effectiveness and efficiency of people working in groups in one place or in several locations, anywhere.
• Automate both semiautomatic business processes and manual tasks.

Application Programs

An application program is a computer program designed to support a specific task or process. Each functional area or department within a business organization employs dozens of application programs. Note that application programs are synonymous with applications.

For instance, the human resources department sometimes uses one application for screening job applicants and another for monitoring employee turnover. The collection of application programs in a single department is usually referred to as a departmental information system. For example, the collection of application programs in the human resources area is called the human resources information system (HRIS). One can see in Figure 34 how a variety of applications enables Commerce Bank to successfully serve its customers.

Creating the IT architecture is a cyclical process, which is driven by the business architecture. Business architecture describes organizational plans, visions, objectives and problems, and the information required to support them.

The potential users of IT must play a critical role in the creation of business architecture, in order to have both business architecture and IT
architecture that meets the organization’s long-term needs. We can use the architecture of a house as an analogy. When preparing a conceptual high-level drawing of a house, the architect needs to know the requirements of the dwellers and the building constraints (time, money, materials, etc.). In preparing IT architecture, the designer needs similar information. This initial information is contained in the business architecture.

Once the business architecture is finished, the system developer can start a five-step process of building the IT architecture, as shown in Figure 35. Notice that translating the business objectives into IT architecture can be a very complex undertaking. Let us look now at various basic elements of IT architecture.
Managing Information Resources

Information resources are a general term that includes all the hardware, software (information systems and applications), data, and networks in an organization. In addition to the computing resources, numerous applications exist, and new ones are continuously being developed. Applications have enormous strategic value. Firms rely on them so heavily that, in some cases, when they are not working (even for a short time), an organization cannot function. In addition, these
information systems are very expensive to acquire, operate, and maintain. Therefore, it is essential to manage them properly.

However, it is becoming increasingly difficult to manage an organization’s information resources effectively. The reason for this difficulty comes from the evolution of the MIS function in the organization. When businesses first began to use computers in the early 1950s, the information systems department (ISD) owned the only computing resource in the organization, the mainframe. At that time, end users did not interact directly with the mainframe.

Today, computers are located throughout the organization, and almost all employees use computers in their work. This system is known as end user computing. As a result of this change, the ISD no longer owns the organization’s information resources. Instead, a partnership has developed between the ISD and the end users. The ISD now acts as more of a consultant to end users, viewing them as customers. In fact, the main function of the ISD is to use IT to solve end users’ business problems.

Which IT Resources Are Managed and by Whom

As we just saw, the responsibility for managing information resources is now divided between the ISD and the end users. This arrangement raises several important questions:

✓ Which resources are managed by whom?
✓ What is the role of the ISD, its structure, and its place within the organization?
What is the appropriate relationship between the ISD and the end users?

In this section we provide brief answers to these questions. There are many types of information systems resources. In addition, their components may come from multiple vendors and be of different brands. The major categories of information resources are hardware, software, databases, networks, procedures, security facilities, and physical buildings. These resources are scattered throughout the organization, and some of them change frequently. Therefore, they can be difficult to manage.

To make things more complicated, there is no standard menu for how to divide responsibility for developing and maintaining information resources between the ISD and end users.

Instead, that division depends on many things: the size and nature of the organization, the amount and type of IT resources, the organization’s attitudes toward computing, the attitudes of top management toward computing, the maturity level of the technology, the amount and nature of outsourced IT work, and even the country in which the company operates.

Generally speaking, the ISD is responsible for corporate-level and shared resources and the end users are responsible for departmental resources.
It is important that the ISD and the end users work closely together and cooperate regardless of who is doing what. Let us begin by looking at the role of the ISD within the organization.

**The Role of the IS Department**

The role of the director of the ISD is changing from a technical manager to a senior executive, who is often called the chief information officer (CIO). The role of the ISD is also changing from a purely technical one to a more managerial and strategic one. For example, the ISD is now responsible for managing the outsourcing of projects and for creating business alliances with vendors and IS departments in other organizations.

Because its role has expanded so much, the ISD now reports directly to a senior vice president of administration (Previously it reported to a functional department such as accounting). In its new role, the ISD must be able to work closely with external organizations such as vendors, business partners, consultants, research institutions, and universities.

Inside the organization, the ISD and the end-user units must be close partners. The ISD has the responsibility for setting standards for hardware and software purchases, as well as for information security. The ISD also monitors user hardware and software purchases, and it serves as a gatekeeper concerning software licensing and illegal downloads (e.g., music files).
Table 9 Information Technology Jobs

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<tr>
<th>Position</th>
<th>Job Description</th>
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<tr>
<td>Chief Information Officer</td>
<td>Highest-ranking IS manager; responsible for strategic planning in the organization</td>
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<td>IS Director</td>
<td>Responsible for managing all systems throughout the organization and day-to-day operations of the entire IS organization</td>
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<tr>
<td>Information Center Manager</td>
<td>Manages IS services such as help desks, hot lines, training, and consulting</td>
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<tr>
<td>Applications Development Manager</td>
<td>Coordinates and manages new systems development projects</td>
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<tr>
<td>Project Manager</td>
<td>Manages a particular new systems development project</td>
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<tr>
<td>Systems Manager</td>
<td>Manages a particular existing system</td>
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<tr>
<td>Operations Manager</td>
<td>Supervises the day-to-day operations of the data and/or computer center</td>
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<tr>
<td>Programming Manager</td>
<td>Coordinates all applications programming efforts</td>
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<tr>
<td>Systems Analyst</td>
<td>Interfaces between users and programmers; determines information requirements and technical specifications for new applications</td>
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<tr>
<td>Business Analyst</td>
<td>Focuses on designing solutions for business problems; interfaces closely with users to show how IT can be used innovatively</td>
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<tr>
<td>Systems Programmer</td>
<td>Writes the computer code for developing new applications or maintaining existing applications</td>
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<td>Emerging Technologies Manager</td>
<td>Forecasts technology trends and evaluates and experiments with new technologies</td>
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<td>Network Manager</td>
<td>Coordinates and manages the organization’s voice and data networks</td>
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<td>Database Administrator</td>
<td>Manages the organization’s databases and oversees the use of database management software</td>
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<td>Auditing or Computer Security Manager</td>
<td>Manages ethical and legal use of information systems</td>
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<td>Webmaster</td>
<td>Manages the organization’s World Wide Web site</td>
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<td>Web Designer</td>
<td>Creates World Wide Web sites and pages</td>
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