PART II

DATABASE DEVELOPMENT PROCESS

CHAPTER 3

SIGNIFICANCE OF THE DATABASE ENVIRONMENT

CHAPTER OBJECTIVES

- Appreciate the significance of information as a key asset for an organization
- Understand the context in which the database system is critical
- Review who the users are and what types of information they need
- Grasp the benefits of information sharing and note how the database system enables sharing
- Clearly see why database systems are indispensable for modern enterprises

When an organization launches a database system, it takes on a systematic development effort. The effort includes substantial planning and feasibility studies. Because of the significance of the database system, a concerted method is needed for a successful implementation. For many organizations, a database project is something entirely new and not resembling anything previously undertaken. In Chapter 4, we will study the organized methodology applied to development of database systems. We will walk through the various development phases. Many different skills are needed for the development effort. You will note each activity and task required to bring about a transformation of an organization to be dependent on its database system.

Why do you have to go through such elaborate, detailed, and methodical effort to develop a database system? Why do organizations expend all the energy and resources to create a database environment? Is the effort necessary, and is the payback worthwhile? Most certainly, yes. A database environment is absolutely

essential for the effectiveness and, sometimes, even for the very survival of an organization. Let us view the database environment in the context of the organization that it serves. Where exactly does the database fit in the organization? And for what purpose? If the database exists for the purpose of providing information to the users within the organization, who are these users? What types of information do they want? If the database environment enables information sharing, what benefits accrue to the users? Is a database system indispensable for today's enterprise? If so, why and how? Let us find answers to such questions.

ORGANIZATIONAL CONTEXT

Consider why a database environment must exist in an organization. Each organization has its goals and objectives, the very reason for its existence. People in the organization perform various functions to achieve the goals and objectives. A banking company exists to provide banking services to customers. A medical center exists to provide health care services to patients. A manufacturing company exists to make products and sell them. Primarily, in each of these companies, a database system is there to support the core business of the company by making the necessary information available.

Companies need information to run their businesses. The database system provides that information. Simplistic as this may sound, the relevance of a database system in an organization needs to be explored and appreciated. At this stage, while we are preparing to study the development of database systems, the contextual place of a database system in an organization is especially critical. We need to appreciate the reasons for the special efforts for developing database systems. First, let us observe what happens in each organization and how the database system is tied to what happens there.

Core Business

Notice the numerous activities in a company. For example, look at the activities in a car rental business. Different departments are engaged in various activities. Consider one department in this company. What are the activities in the department that manages the fleet? This department studies the demand for different types of cars. The department examines the usage and status at individual branches. It places orders to replace cars that need to be retired soon. All these and many more activities within the fleet management department happen for the purpose of supporting the core business of the car rental company, which is renting cars to customers. Take another department in the company. The servicing department's activities are focused on keeping each car in top condition. Each car must be thoroughly checked after each rental and maintained. Again, the activities of the servicing department, although different from those of fleet management, are still happening for the purpose of supporting the core business of the car rental company, namely, renting cars to customers.

Consider another organization, say, a medical center. Here the core business is treating patients—inpatients and outpatients. The pharmacy department in the medical center keeps stock of the required drugs and dispenses them to the patients

in the wards and to the outpatients. The laboratory examines blood samples, performs tests on the samples, and provides results to the physicians and surgeons. In all of their activities, although varied, the pharmacy and the laboratory support the core business of the medical center, which is patient care.

However we might expand the list of companies for consideration, we will observe that each company has a core business and that the diverse activities of various departments in the company are performed for the purpose of supporting the core business. All activities center upon the core business.

Here is a sample of the core businesses of a few types of organizations:

- *Retail grocery store*—buy groceries from vendors and sell to retail customers
- *Stock brokerage*—buy and sell stocks and bonds for individuals and institutions
- *Auction company*—enable customers sell and buy goods through auctions
- *Computer consulting*—provide consulting services
- *Airlines*—provide air transportation to customers
- *Car dealership*—buy and sell cars
- *Department store*—buy and sell consumer goods
- *University*—provide higher learning to students

How does the core business of an enterprise get done? How does the core business of buying and selling cars get done by a car dealership? How is the core business, namely, patient care, of a medical center accomplished? Each department in the enterprise performs processes to achieve the objectives of the enterprise to get the core business done. Let us examine the processes and see the connection to the database system.

Primary Processes

When you consider organizations and their core businesses, it ultimately comes down to the fact that each core business is somehow related to providing either services or goods. The type of service depends on the individual organization. A medical center provides health care services; a banking institution makes financial services available. Similarly, the nature of the goods is determined by the individual organization. An automobile manufacturer makes cars and trucks; a pharmaceutical company produces drugs and medical accessories.

The core business is to provide goods or services. To whom? To customers. How does an organization accomplish the provision of goods or services? Who in the organization is part of this activity of providing goods and service? Everyone. The functions of each person and every department are directed toward accomplishing the purpose of the core business. Many distinctive processes carried out by the departments support the core business. These primary processes fulfill the purpose of the core business. Figure 3-1 illustrates this principle of core business accomplished through business processes within the organization.

Let us take a concrete example. Consider the case of an airline company. Providing air transportation to customers is the core business. One of the organizational units of the airline company is the ticketing department or the ticketing counter at the airport. This unit is involved with many processes that support the
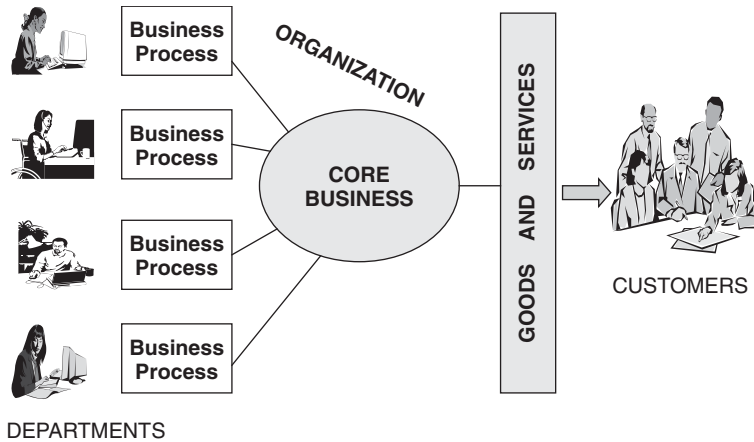
Figure 3-1 Business processes supporting core business.

core business. One primary process is ticketing and seat reservation. Review the tasks in this business process:

- Ascertain the customer's present travel requirements
- Find suitable discounted plans
- Check possible routing options and connecting flights
- Verify seat availability
- Reserve seats on selected flight routes
- Record meal and other preferences
- Issue ticket
- Collect airfare
- Print itinerary

The ticketing and seat reservation process consists of tasks performed—all part of the core business of providing air transportation to customers. You may continue your review with other processes such as passenger check-in, luggage handling, promotional campaigns, aircraft maintenance, crew scheduling, frequent flyer operations, and so on. Apart from the primary processes, an organization conducts secondary or incidental processes. In a major organization, you will find hundreds of different processes, all of them, however, performed under the overall purpose of the core business.

Information as a Major Asset

Go back to the example of the airline company and the process of ticketing and seat reservation. How does the company carry out this process? To accomplish this process, the organization makes use of assets and resources. Look at the terminal building and the ticketing counter itself. Observe all the equipment and materials needed to perform this process. What about the people needed to complete the
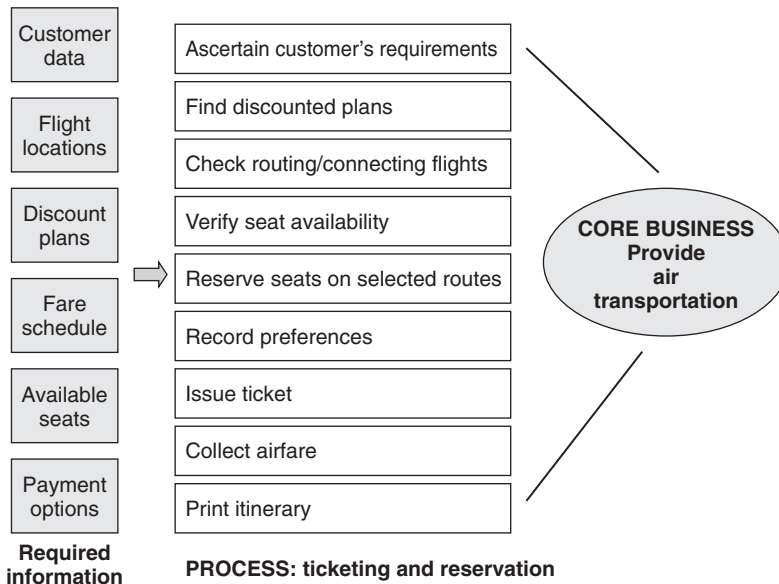
Required information	PROCESS: ticketing and reservation
Customer data	Ascertain customer's requirements
Flight locations	Find discounted plans
Discount plans	Check routing/connecting flights
Fare schedule	Verify seat availability
Available seats	Reserve seats on selected routes
Payment options	Record preferences
	Issue ticket
	Collect airfare
	Print itinerary

CORE BUSINESS
Provide
air
transportation

Figure 3-2   Information for ticketing and seat reservation process.

process? The people, buildings, equipment, and materials are all part of the assets and resources necessary for performing the process. Given these assets and resources, can the process be completed? Is anything else essential for carrying out the process?

Now examine the individual tasks of ticketing and seat reservation process. Let us say that the customer wants to make a trip from New York to Miami on a Monday. Are there any promotional discount plans? Now the ticketing agent must find and offer a suitable discount plan, if available. Although the agent has the desk, equipment, and other resources, he or she needs information about the available discount plans. Only with proper information, can the agent find and offer a suitable discount plan.

Next proceed to the task of checking possible routing options and connecting flights. To perform this task, the agent needs information about the different routing options and connecting flights on Mondays. After going through the routing options and flight times, let us say that the customer has picked a specific routing option. Go further to the next task in the process: verifying seat availability. What information does the agent need to complete this task? Of course, the agent must have information about seat availability in each leg of the journey. Our review continues with all the tasks of the process. You will note that the agent needs different types of information for every task of the process. Figure 3-2 shows information needed for the ticketing and seat reservation process. Notice the various types of information necessary for the process.

We have considered just one process in the airline company. Even for this one process, various types of critical information are essential to finish the process. What about the numerous other processes in the company, all geared to provide air transportation to customers? Each of the processes is carried out through several tasks.

Each of the tasks requires information. We observe an emerging pattern. To carry out the various processes, the company needs resources and assets such as buildings, equipment, materials, people, and money. But that is not all. The company also needs information to accomplish its processes. Information is a major asset like any other tangible and intangible assets of the company to be used for performing the multitude of processes. The key asset of information supports an organization's core business.

DB System in the Organization

Return to the example of the airline company. We noted the information essential for performing the ticketing and seat reservation process. Reviewing the tasks once again, let us mark the elements of information needed to complete each task of the process:

- Ascertain the customer's present travel requirements—*customer information, departure and destination locations, travel date*
- Find suitable discounted plans—*available discount plans*
- Check possible routing options and connecting flights—*possible legs of the journey, connecting flights, and times*
- Verify seat availability—*seat availability in each segment*
- Reserve seats on selected flight routes—*customer seating preferences, vacant seats in each flight segment*
- Record meal and other preferences—*available preferences and options*
- Issue ticket—*customer information, fare schedule, taxes, airport dues, etc.*
- Collect airfare—*payment options, customer payment preferences, payment type, date, amount*
- Print itinerary—*customer information, flights and times, special preferences, assigned seating, and booking status*

Following this method of ascertaining the information needs for each task in a process, we will be able to put down the needs for the tasks in all the processes. The result will be a large compilation of all the elements of information needed in the company to support its core business through various processes. The large collection of information needs will constitute a variety of information types. How do you organize all of the elements of information? How do you store the seemingly disparate pieces of information, manage these, and provide quick access for carrying out individual tasks? This is where the database system of the company comes into the picture. The database system organizes all the information into cohesive data structures, stores data efficiently, manages and maintains data storage, and affords data access whenever information is needed to perform a specific task. Figure 3-3 indicates how the database system of an airline company supports the core business and its processes.

Let us recapitulate the concepts regarding the place and purpose of the database system in an organization. Let us summarize briefly how the database system fits into the context of an organization.
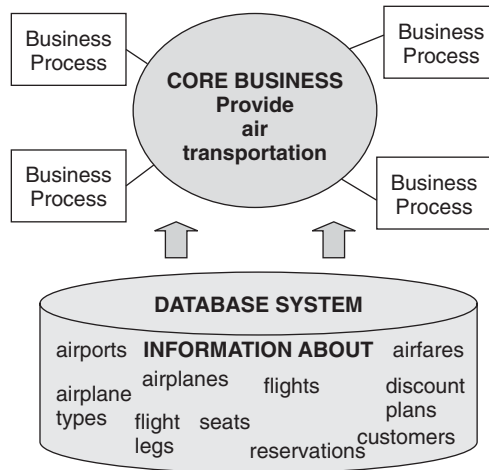
Figure 3-3   DB system supporting core business in airline company.

- Every organization is engaged in a core business.
- The organization achieves the purposes of its core business through primary processes.
- Each process is carried out through a set of related tasks.
- Apart from other resources and assets, each task requires information for its performance.
- Putting all the processes and the component tasks together, an organization needs a large collection of information elements.
- Information is, therefore, a major asset for an organization.
- The database system in an organization exists to provide the information needs in all the processes.

INFORMATION REQUIREMENTS

Information is a key asset absolutely essential for performing the business processes in an organization. By this time, you should be convinced of this significant principle, which is almost axiomatic. We have also seen how the database system in an organization supplies the much-needed information. As the complexities of business grow resulting in the demand for sophisticated types of information in high volumes, a database proves to be the optimal means for information delivery. Well, if the database delivers information, to whom is it supplying information? To the users—the employees and agents working to execute processes for the achievement of the organization's core business.

Who are these people needing information? Where are they situated? What functions do they perform within the organization? What are their responsibility levels? To fully appreciate the significance of the database environment in an organization, we need to explore these questions. What are the information requirements of users
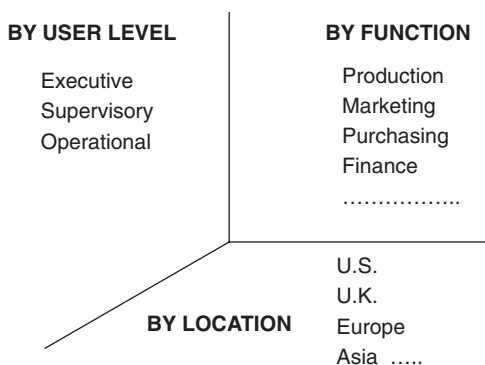
BY USER LEVEL

Executive
Supervisory
Operational

BY FUNCTION

Production
Marketing
Purchasing
Finance
……………..

U.S.
U.K.
BY LOCATION   Europe
Asia …..

Figure 3-4   Community of users.

at different responsibility levels, performing various distinct functions, and located in multiple places?

Figure 3-4 indicates how the user community in an organization may be divided into groups in three different ways. This kind of division helps us understand the differences in the types of information various user groups require and to note the differences in methods of information delivery to them.

Remember that information is required to carry out the business processes. So, if you want to understand the information requirements of each user group, you must review the processes and the relevant tasks performed by each group.

At User Levels

Dividing users into groups based on their responsibilities in an organization seems to be the most natural method for forming groups. Note the division of users into three groups based on their responsibility levels: executive, managerial, operational. If you are an operations person, you work with current data to carry out your processes. You process a customer order, make an airline reservation, send an invoice, issue payroll checks, or balance inventory. You perform the processes that run the day-to-day business. On the other hand, the processes carried out by the other two levels are not so directly connected to the everyday operations.

Supervisory processes relate to monitoring operations and exercising control. Supervisors need information in the form of summaries and exception reports. Executives establish long-term plans, set the overall direction, and make strategic decisions. Their processes need historical data revealing trends and business conditions. Executive processes must have data that can be used for analyzing past performance and future trends.

Here is a summary of information requirements and how the enterprise database serves the needs:

For operational level. Current data on all the entities relevant to the organization. Examples of such business entities: customer, supplier, order, invoice, aircraft type, employee, and so on. Users at the operational level need data at the lowest level of

detail. They require data about an individual customer, a single order, a particular invoice, a single sale, or seat availability in a specific flight to complete their business processes. The organization's database serves this group of users with detailed, current data.

For supervisory level. Current data in summarized formats. Supervisory staff needs information on the overall functioning of their departments. Supervisors require periodic reports summarizing the data about their departments. They are responsible for making sure that everything in their departments is done right and on time. Supervisors monitor the various processes that take place in their departments and control the way their processes get completed. A supervisor in a sales department must have weekly and monthly summary reports on the performance of salespersons against targets. If some event happens that is out of the ordinary, the supervisor has to know about it to take corrective action. The organization's database serves this group with summary data and triggers to alert to exceptional events.

For executive level. Executives are not concerned with the details of how each process in every department gets done. They do not need detailed data about every order, every shipment, or every invoice. Nor do they need summary reports at short, regular intervals. Most of the information necessary for executives is not routine or regularly scheduled. Information must enable them to analyze the overall performance of each major division and of the organization as a whole. For spotting trends, planning the organization's direction, and formulating company policies, executives make use of historical data in addition to current data. The organization's database serves this group of users with large volumes of past and current data, summarized as needed in ad hoc fashion.

In Functional Divisions

We have noted a primary method of dividing users into three groups based on their level of responsibilities. At each responsibility level, users work within functional divisions. If one of your users is a supervisor, he or she performs the business processes as part of a specific department. He or she is a supervisor in the accounting division, the marketing division, or the product division. Within a major division, the user is a supervisor of a single unit, say the order processing department within the accounting division. The types of business processes differ from division to division. The information needs, therefore, vary from division to division. Grouping users by functional division proves to be a helpful method.

   What is the significance of the enterprise database when we group users by functional divisions? How does it serve users in various functional divisions? Although there are operational level users in all divisions, the types of processes they complete require different categories of data. For example, an operational level user in the accounting division may create invoices to be mailed out to customers. An operational level user in the marketing division may compile quarterly sales targets to be sent to salespersons. An operational level user in the production department may assemble production flow statistics to be sent to the production manager. All three users need detailed data from the database. However, what each user needs from the database varies according to his or her function. Similar differences in

data requirements apply to supervisory and executive level users attached to diverse divisions.

Viewed from the context of functional divisions, the organization's database system supplies the information needs of users in the following ways:

- Provides each department within each division with data specific to each process in that department.
- Enables every department to perform its processes.
- If necessary, allows one department to use data collected by another.
- Collectively, provides data for processes of all functions of the organization.
- In essence, affords data for the carrying out the core business of the organization.

At Geographic Regions

Today's organization has a worldwide presence. As the world has become smaller because of improved communication facilities and rapid transportation methods, it is easy for businesses to expand globally. It is not uncommon for many companies to have offices in the U.S., the U.K., Europe, and Asia.

In a global company with worldwide offices, where are your users? Who are the users that need to be serviced by the company's database? One user may be located in Chicago, another in London, one in Paris, another in Milan, and yet another in Hong Kong. All users in the company need information to perform their various processes. Although the processes may be similar to the ones performed by users in operational, supervisory, and executive levels in domestic companies, the information needed in a global organization by the same type of users is conditioned by local requirements. The user in Hong Kong is more interested in the customers from China. The user in Paris depends on the information about sales to French customers to complete his or her process.

Information needs of users in various geographic regions of a company may be classified into two categories as indicated below.

Local Information   Consider a user in the accounting division of the Paris office of a company with worldwide branches. To prepare an invoice to cover a sale to a French customer, the user needs information about that French customer, the product, units supplied, the price, shipping charges, and French tax rates. When you examine these pieces of information, you will note that these are not needed by a user in Hong Kong to prepare an invoice for a Chinese customer.

Names and addresses of customers in France, shipping charges within France, and French tax rates are examples of local information for the users in the French region. In the same way, names and addresses of customers in China, shipping charges within China, and Chinese tax rates are examples of local information for the users in the Chinese region. Users in each geographic region require local information to perform their business processes. The nature and extent of local information varies from region to region. Some regions may require a substantial volume of local information, more than other regions.

Global Information   In the example of local invoicing considered above, product information comprises product codes, product descriptions, stock keeping units, unit prices, and any standard discounts. Whether a company's product is supplied to a French customer or a Chinese customer, the product code, description, stock keeping unit, and unit price are usually the same. These pieces of information are not specific to individual regions, but they apply to all users globally throughout the company. This is global information.

Global information includes pieces of information common to all users in all geographic regions. In a company with international customers, customer information may be both global and local. Global information includes information about all international customers who buy from many geographic locations of the company. Information about local customers is part of the local information for that region. In an airline company, international flight schedules are part of global information. In an international bank, money transfer methods are part of global information. In a worldwide fast-food franchise, the ingredients in the proprietary recipe are global information.

In companies with users in multiple geographic regions, the organization's database environment provides both local and global information to the users for performing their business processes.

Providing Information

You have noted that an organization's database environment provides information to users at different levels of responsibilities, in various functional divisions, and at many geographic regions. It seems that the database supplies to a very wide user base. This is true. When you consider the users grouped by the three major categories, there must be a vast collection of information in the organization's database. How does the database enable each segment of users to perform its processes? How is the information provided?

Whether the users are part of different functional divisions or operate in multiple geographic regions, they are basically operational, supervisory, or executive users. Therefore, if we consider how the database caters to the needs of the users categorized by user levels, we will cover the needs of all users. We can do so by examining the types of computer applications used by the users at the different responsibility levels. Broadly, we can classify computer systems into operational and informational systems.

Operational Systems. These systems make the wheels of business turn. Such systems are used to run day-to-day operations of the company. They support the basic business processes such as taking an order, processing a claim, making a shipment, generating an invoice, receiving cash, or reserving an airline seat. Examples of operational systems are the checking account system in a bank, the factory shop-floor system in a manufacturing business, the reservation system in an airline company, the credit-checking system in a credit bureau, and the sales system in a retail grocery chain.

Informational Systems. These systems let the users watch the wheels of business turn. Such systems are used for analyzing the results of the operations and for

making strategic decisions. They enable users to get answers to requests such as: "Show me the top-selling products," "Show me the problem regions," "Tell me why," "Let me see other related data," "Show me the highest margins," and "Alert me when a region sells below targets." Examples of informational systems include marketing management information systems, credit analysis, credit card fraud detection, profitability analysis, and market share analysis.

The database environment supports operational and informational systems with appropriate data. Users at different responsibility levels use these systems for performing their business processes.

- Operational level users perform all their processes with operational systems.
- Supervisory level users mostly make use of summary information provided by operational systems. Occasionally, informational systems supply some information to supervisory users.
- Executive level users almost totally rely on informational systems. Usually, informational systems are fed by separate databases especially designed for analysis.

INFORMATION SHARING

We have already seen that information sharing is one of the major advantages of database systems. Sharing takes place among the various groups of users. In earlier days of computing, each user group within an organization created its own files and no other group could share the information contained in those files. The reason for this is obvious. File-oriented systems were developed and built to serve individual departments. An order entry system was implemented to support only the processes of the order entry department. Even though the files created in the order entry system contained order data that could be of use to the marketing department, data about the orders could not be shared. All of this changed with the introduction of database systems. The organization's database stores the data created by all departments in an orderly and combined fashion.

In a database system, all of the enterprise data is in one place. People in the organization need not go to different storage areas or files to get information. Applications developed in a database environment center on the database. Each department has equal access to the database. This ability to share information has brought about a shift in the very thinking of the people in the different departments. Database systems have altered ideas about ownership of data. Order entry departments no longer consider data about customer orders to be their exclusive property. Now, data entered into organization's database by any department becomes available to all departments. Figure 3-5 illustrates information sharing in a database environment.

Why Share Information?

Go back to the order entry example. Orders come into the order entry department. While processing an order, that department verifies customer credit, checks stock,
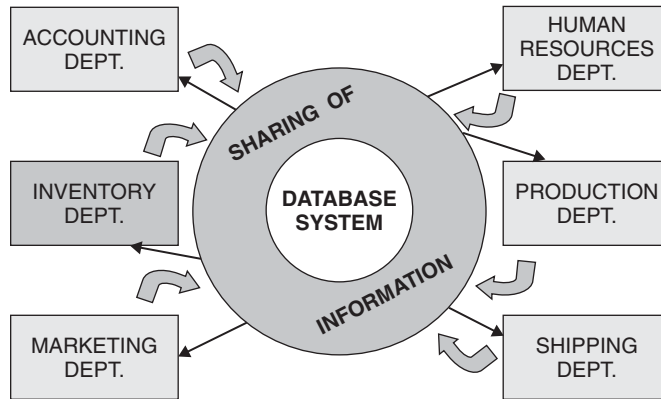
Figure 3-5   Information sharing among departments.

ascertains the appropriate shipping method, and determines prices and discounts. The order entry clerk then records all the data about the order in the company's database. Why must the data entered by the order entry clerk be shared with other departments?

Effective Customer Service   When the customer has a question regarding prices or the status of the order, the order entry department has to provide answers. When part of the order must be back ordered because of out-of-stock condition, the order entry department ensures that the back-ordered items are shipped later. If the order entry department is responsible for the complete processing of each order, why is it necessary for order data to be shared with other departments? After all, does not the order entry department carry out every process relating to orders? If so, what use do other departments have for order data?

In today's business conditions, it is not entirely true that the order entry department performs every process relating to orders. With strong emphasis on customer service, many departments need to have information about orders. Modern businesses place a lot of importance to customer service—for very good reasons. Good and prompt service to customers makes a company stand out among the competition. Consider order data against this business background. When a salesperson contacts his or her customer, the salesperson needs information about what and how much the customer had ordered, information about the status of all recent orders, and information on when the back orders are likely to be fulfilled. If a customer wants clarification on the prices and discounts of an order, the customer service department needs access to order data to provide a proper response. The company warehouse needs data about each order to prepare the shipments. Many departments need to share order information to offer unified service to every customer.

Data Recording and Data Usage   Think about the core business of any organization. You know that each department in every division performs specific business processes; all of these processes contribute to the overall core business. The diverse processes—all together—make up the entire core business. To perform each of these processes, users need information from the enterprise database.

Another fact, equally important, is that while performing each of the processes, users also record fresh data in the database. For example, to complete the order entry process, the order entry clerk needs product data from the database. While processing an order, the clerk in turn creates and records order data. This twofold aspect of using data and recording data affords a sense of unification among the processes and makes the core business of the organization a cohesive whole.

Information—Common Asset You are already very much aware that information is a major asset for an organization. Assets and resources in an organization are needed to run the business. Plant and equipment are utilized for production of goods. Cash is used to pay the company's bills. Compare information to the other assets in the organization. The other assets are used for specific purposes by specific departments. The production department makes use of plant and equipment for manufacturing products. The accounting department pays bills with cash. Information, as an asset, differs from other types of assets. Corporate information in the company database is not made of separable parts. It is a unified whole set of data, ordered and integrated, for the purpose of supporting the company's core business. The company database contains information common to all—created by all and used by all. Information is a common corporate asset that must be shared easily by all divisions and departments.

Major Benefits

Before we consider the major benefits of information sharing, let us be clear about what the information is that users are sharing. Who records the information in the corporate database in the first place? As you know, each department is responsible for certain business processes. While performing the specific processes each department creates data, and this data gets recorded in the database. In effect, all users share information that is recorded through the performance of the various business processes.

Let us now summarize the major benefits of information sharing within an organization.

Synergy of Collective Information. When data are combined in a database environment, the effect is synergistic. In other words, the combined data are more valuable than the sum of individual parts. In a file-oriented system, each department creates and uses data in its own files. The order entry department uses the data in its files, the marketing department the data in its files, and the production department the data in its files. When you put order data, marketing data, and product data in the database, each department still has access to its own files. But more than that, each department has access to other files as well. The benefits each department derives from its own data are complemented by the advantages of having access to other files. This concept of data integration means that the benefits from the collection of all parts of the data are more than sum of the benefits from each single part of the data.

Complete Information. Because of information sharing, each department has access to complete information about each business entity and business process.

When a customer order is received, the order entry department initiates recording of order data. The order fulfillment department adds fulfillment data. The shipping department records shipment data. All of these data complete the information on an order. When users share information through a database, they have complete information about each order.

Consistent Information. When you record each data element only once and store it in only one place in the database, you reduce data redundancy. What is the advantage of eliminating data redundancy? When one department is looking for information about a particular invoice, every other department looking for information about that invoice will find the same information. If the total amount of the invoice is $2000, everyone retrieving that information from the database will find the amount to be $2000. In a database environment, all users will share consistent information. Chances of errors in reporting and calculations are greatly reduced when users share information that is consistent.

Better Customer Service. Sharing of complete and consistent information results in better customer information. When a customer contacts the customer service department, the service representative has access to complete information about the order relating to which the customer has questions. The service representative also has access to prior orders, the customer's buying patterns, and the customer's outstanding balances. The service representative can help the customer with proper responses because of information sharing.

Support for Business Processes. We come back to the business processes that various departments perform to carry out the mission of an organization. Clearly, each department requires information to complete its processes. Processes cannot be performed without information. A substantial part of the information needed for completing a particular process comes from other processes performed elsewhere in the organization. Sharing of information enables users to complete all the business processes.

Enabling Uniform Applications. Information sharing is a first step toward uniform computer applications to support the different business processes. All information in a database environment comes from the organization's database. Nonredundant data are stored with uniform standards in the database. The formats are uniform; the naming conventions are standardized. In a database environment, the database feeds data to all applications. Applications are developed around the database. Therefore, it is easier to develop uniform applications for various groups of users. Inventory control and order entry applications can easily have the same input formats, similar output reports, and standard navigation in the user interface.

Promotion of Collaboration. Information sharing promotes an atmosphere of collaboration among the several divisions and departments. All share the same data. Turf wars over data ownership are greatly minimized. Both information sharing and uniform applications motivate users across departments to come together and collaborate. When users complete processing through collaboration, productivity increases and shows up in improved profitability.

Information Sharing Schemes

To relate users to the database environment in an organization, we suggested above some ways for dividing them into groups. Users fell into natural groups based on their responsibility levels, business functions, and locations. Data sharing involves each group making use of data created by other groups. If a group in the accounting division creates data about invoices and stores the data in the database, other groups in the marketing and planning divisions share this data. When you examine the contents of the database, you will note that various user groups create specific segments of the database either by recording or updating data in the course of their processes.

When each user group needs data from the database to perform its business processes, the content and format of the data are relevant. Some user groups need very detailed data; others want summaries. Some user groups require data about single business objects such as customer, order, or invoice; others must have data about multiple objects. Data content and format are essential factors facilitating information sharing.

How does the database enable information sharing? How do data content and format play significant roles in information sharing? What are the information schemes? How exactly does information sharing happen? We will go back to the ways in which we grouped users and consider each method of grouping and note how information sharing takes place within each set of groups.

Among Functional Departments   This is where organizations gain the most advantage from information sharing. This was also the primary problem area in file-oriented systems with data files restricted to each functional department. When information is shared among departments performing distinct functions, all for carrying out the objectives of the core business, organizations obtain the greatest benefits.

Let us consider the customer service department—a department crucial for customer retention. This department, by itself, does not create and enter too much data into the database. Perhaps the department records basic data on each customer contact. On the other hand, it needs data created and entered by other departments to perform customer service functions. Imagine a customer calling the customer service department to check on his or her orders and to ask other questions about some specific products. The customer service department must be able to respond and provide the following types of information: breakdown of sales to the inquiring customer, product stock, back order status, billing clarifications, and so on. Some of the information relates to detailed data, and a few other types of information are based on summary data. Where does the customer service department get information to serve the customer? The department relies on data created by other departments. It has to share the information produced by other departments.

Figure 3-6 illustrates information sharing in a specific case.

Note how the customer service department makes use of data created by other departments. Also, observe the types of data entered into the database by these other departments and how the types of data enable the customer service department to perform its processes.
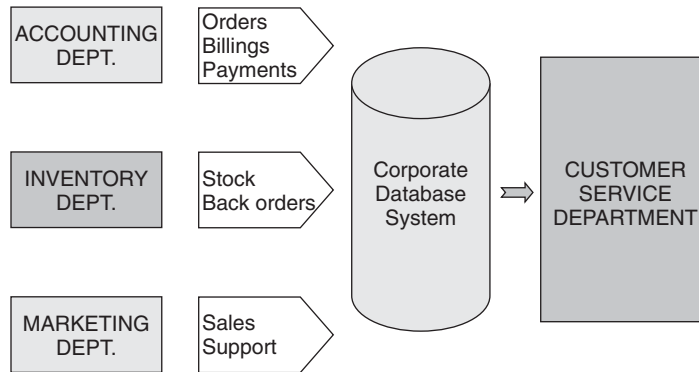
Figure 3-6   Information sharing for customer service.

Among User Levels   We considered three responsibility levels of users—operational, supervisory, and executive. Generally, all users fit into these three broad categories. Information sharing signifies that data created by one user group are shared by another group. What is the implication of information sharing among user levels? Is this sharing different from other sharing schemes?

Information sharing among operational, supervisory, and executive levels tends to be one-way: Executives make use of data entered by supervisory and operational levels, and supervisors utilize data stored by operational-level users. Operational-level users share the data created by them with supervisors and executives, and supervisors, in turn, share their data with executives. This is because operational-level users are responsible for entering the bulk of the data in the enterprise database.

Supervisors perform processes for monitoring and controlling business operations. For these processes, they need summary data that are derived from the detailed data created by operational-level users. Special procedures within applications summarize data in the manner required by supervisory staff.

Executives mostly need very high-level summaries to see how the division as a whole is performing. Data produced by operational staff must be summarized further to meet the needs of executives. In addition, executives have their business analysts working on special projects. These special projects require both summary and detailed data.

Across Geographic Regions   We have noted that in an organization spread across multiple regions, corporate information may be segmented into global and local categories. Local information at a region refers to the information restricted to the business processes at that region. Each region generates its own local information. Local information of one region may not be useful to any other region. What we have reckoned as local information is generally not shared across geographic regions.

Let us proceed to look at what is considered global information in multiregional organizations. Customer data is usually part of global information. In a worldwide company or even a domestic company with many regions, customers residing in one

region do purchase different goods and services from different regions of the same company. Each region generates data about the customers in that region.

Regional units may specialize in distinct types of products and services. If so, product data would also be part of global information. Each region produces data about the products and services created in that region. A specific product made in one region may be sold to customers in a second region. The second region must, therefore, be able to share data about that product with the first region.

Sharing of global information forms the major part of information sharing across geographic regions. The categorization of information into global and local depends on the organizational setup and business conditions of each organization. The type of data considered to be global information in one company may be deemed to be local information elsewhere. Nevertheless, in each company the types of data reckoned as global information in that company get to be shared by users across geographic regions.

DB System as Enabler

Let us recall the definition of a database system.

> A database is an *ordered collection* of *related data elements* intended to meet *the information needs* of an organization and designed to be *shared* by multiple users.

As an ordered collection of related data elements meeting the information needs of an organization, the database system enables information to be shared among groups of users. The following points amplify the role of the database system in information sharing.

Common Data Pool. The database provides a common storage pool to keep all of an organization's data. When the database is centralized, all data are kept in one location. Even a distributed database is a still a common set of the organization's data conveniently placed at different sites.

Integrated Data. Before data are placed in a database, redundancies and duplications are removed. Integration of data prevents inconsistencies from creeping into the database. When user groups share integrated data, they work with one set of data and present unified and consistent information to customers.

Uniform Access. Database systems promote uniform applications that standardize methods of data access and usage. With standard data access methods, users find it easier to get information from processes other than their own. Uniform data access reduces user training.

Simplified Sharing. In file-oriented systems, information sharing proved to be extremely difficult. Users had to contend with disparate data formats, variations in computing platforms, and differences in file access methods. Database systems have simplified information sharing to a very large degree.

Figure 3-7 depicts the facets of information sharing in an organization and clearly presents the role of the database system enabling information sharing.
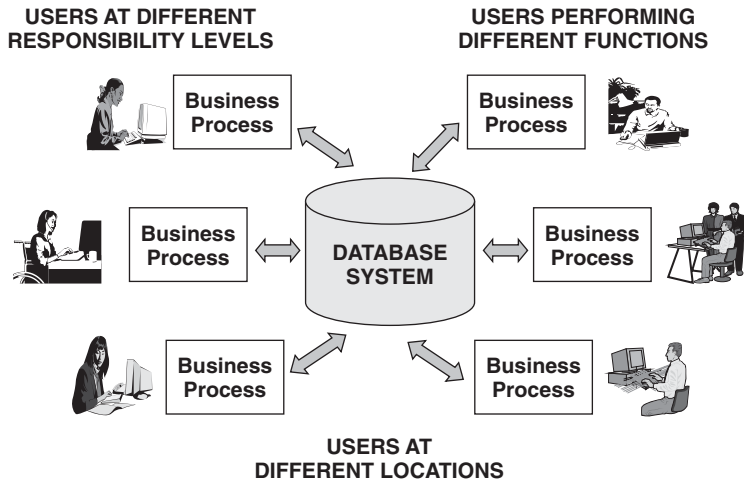
Figure 3-7   Information sharing: DB system as enabler.

PIVOTAL ROLE OF THE DATABASE SYSTEM

Let us pause and review our discussions so far. The database system in an organization supports the numerous business processes that take place there to achieve the objectives of the organization's core business. You have noted that the database system is indispensable for the business processes.

The database system provides the information essential for the successful performance of business processes. Users at different responsibility levels, in various functional departments, and at multiple locations—all need information from the database to complete their business processes. Modern enterprises depend on collaboration among departments; the database system makes collaboration possible by enabling departments to share vital information among themselves.

Data Storage

The database in an organization serves as the primary repository for corporate information. In a company, data in different formats may be held within individual departments in private files and spreadsheets. The accounting department may keep budget numbers in departmental files. The marketing department may hold sensitive information about some key clients in their individual files. Nevertheless, the vast bulk of the organization's data resides in its corporate database.

Note the following aspects of storage of data and observe how the corporate database supports the organization by storing data.

Data about business objects. The organization's database stores data about all the business objects that are relevant to the organization. For a medical center, the database stores data about patients, physicians, diseases, diagnosis, treatments, medications, patient visits, patient stays, and so on. For a banking institution, the database collects data about customers, checking accounts, savings accounts, loans, bank with-

drawals, deposits, money transfers, and so on. For each type of organization, the database in that organization gathers data about its pertinent objects.

Data for business processes. It is worthwhile to repeat that the database stores data for the purpose of being useful for completing the business processes of the organization. Where are the data stored for completing a reservation of an airline seat? Where are the data stored for completing an auto insurance claim? Where are the data recorded for completing stocktaking in an industrial warehouse? In the databases of the respective organizations.

Suitable for all user levels. The database in an organization stores data in various summary and detailed formats suitable for users at the operational, supervisory, and executive levels.

Valid and consistent data. Data stored in a database are free from duplications and inconsistencies. The database keeps a data element in only one place. Every data element conforms to established standards and conventions. Thus the organization's database holds valid and consistent data.

Easily accessible data. Data in the enterprise database are meant for sharing among various groups of users. Therefore, the database keeps data as easily accessible to all groups as possible.

Secure data. Database administrators carefully safeguard the enterprise database because information contained in it forms a key corporate asset. The database, therefore, stores data in a secure and protected environment.

Scalable and expandable. As the number of users and the usage increase, the database can be expanded in size. Also, storage can be scaled up to faster and more sophisticated media.

Information Delivery

You do not store data in your organization's database to preserve it and keep it safe in a protected environment. Of course, your users value the information greatly and would like the database storage to be guarded well. Nevertheless, a database exists for the purpose of delivering information to the users to conduct their day-to-day operations and perform their business processes. Proper information delivery is crucial to these processes.

The enterprise database system plays a significant role in delivering information to user groups. It has to make information available in the ways users want it, in the places they need it, and for the purposes for which they require it. Note the following points with regard to information delivery and the role of the database system.

One place for information. Unlike earlier file-oriented systems, a database system sets up one place from which information may be fetched or delivered. The data-

base approach eliminates variations and ambiguities as to sources of information for various business processes. Information needed for all business processes resides in one logical place, although under certain conditions individual data files may be stored in multiple physical locations as in the case of distributed databases.

Information delivery tools. The database system comes with its own set of tools for information access and delivery. Query processors and report writers enable easy information access.

Empowering users. In a database environment, sophisticated users can write their own queries and format their own reports. Such users gain control over their information access; to a large extent, they need not depend on the information technology department to get information for them.

Promotes information delivery. The manner in which data structures get organized in the database makes information available by easy combinations of different structures. If you need information to process insurances claims, you can combine data on insurers, policies, covered contingencies, and damages. If you want information to reserve an airline seat, you can combine data on customers, flight schedules, seat availability, rates schedules, and available discounts. This synergy of the data content promotes information delivery.

Foundation for Applications

In a database environment, the data repository forms the underlying basis for developing applications. All applications receive data from the database; data also are recorded and updated through applications. The database appears to sit in the middle surrounded by the various applications. In fact, the database shapes the input and display of data in the applications.

Consider the following factors that make the database environment the foundation for applications.

Input and display of data. Suppose you display customer name and address in the order entry application as well as in the product shipment application. Because customer name and address in both applications come from the same database, the formats, sizes, and data types will be same. Similarly, when you input customer name and address through the marketing application or update the data from the customer service application, you use the same formats, sizes, and data types. The database environment creates uniformity in data input and display across all applications. Departments and users are no longer divided by their applications.

Standardization of applications. You know that it is easier to apply standards and controls in a database environment. You can standardize data names, relationships among data elements, and data input and display formats. You can also establish
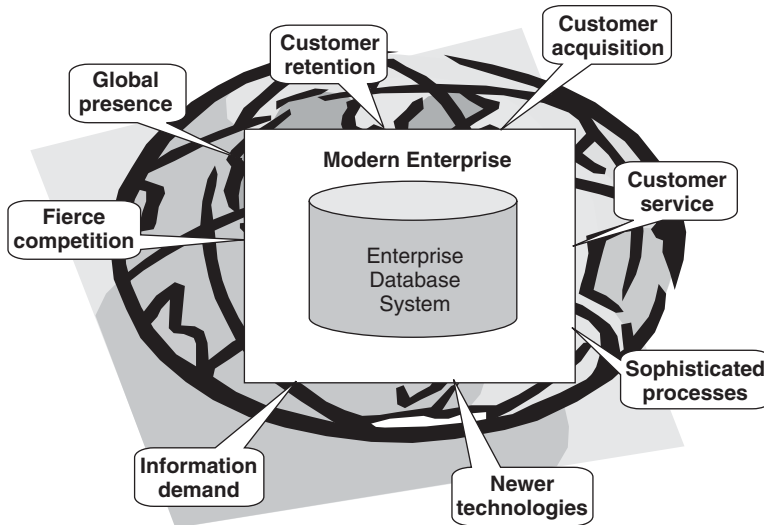
Figure 3-8   Database system in the modern enterprise.

data edits and controls. Standards and controls within a database enable applications to be standardized as well.

Easy cross-training. When an organization has standardized applications, cross-training of users among different applications becomes easy. Users may be made more mobile between departments, and productivity is likely to increase. This benefit is more pronounced in organizations with user groups in multiple locations.

Indispensable for Modern Enterprise

You cannot visualize any modern enterprise existing without a database system. The database has assumed a pivotal role in today's businesses. Contemporary organizations cannot function if they do not integrate and store their data in efficient databases. Figure 3-8 summarizes the features of the modern enterprise and matches them with its information requirements.

Note the following features of modern enterprises:

- Global presence
- Stiffer competition
- More service-oriented businesses than production-oriented businesses
- Importance of customer acquisition and retention
- Higher customer expectations
- Newer and more sophisticated business processes
- Need to exploit and manage newer technologies
- Ever-increasing demand for information

CHAPTER SUMMARY

- Every organization has a core business; several primary processes support the core business.
- Information is a major asset for an organization to complete the processes and accomplish its core business.
- The database system stores and manages the organization's data and provides indispensable information to accomplish the core business.
- The users in an organization may be divided into groups based on responsibility levels, functional units, and geographic regions. The database system provides information to each group of users to carry out its business processes.
- Information sharing in an organization has major benefits; it promotes effective customer service, supports all business processes, enables uniform applications, and creates an atmosphere for collaboration. The database system acts as a primary enabler for information sharing.
- The pivotal role of the database system in an organization covers the areas of data storage, information delivery, and computer applications. Modern organizations cannot survive without database systems.

REVIEW QUESTIONS

1. What do you understand by core business of an organization? Give an example of an organization and its core business.
2. What are business processes in an organization? Give an example of a business process and explain how it supports the overall core business of an organization.
3. List any two primary processes in a medical center. Describe the elements of information supplied by the database system of the medical center to complete these processes.
4. What are the three common levels of responsibility of the users in an organization? What types of information are needed at each level?
5. What do we mean by local and global information in an organization? Give examples.
6. Give any two reasons why information sharing is important in an organization. Explain the reasons.
7. How does the database system enable information sharing among users in different geographic regions of an organization?
8. "The enterprise database system plays a significant role in delivering information to user groups." Describe any two factors justifying this statement.
9. How does a database system promote uniform applications in an organization?
10. "A database system is indispensable for modern enterprises." Do you completely agree? If so, give any two reasons. If not, explain your position.

EXERCISES

1. Match the columns:

1. primary business processes	A. promotes collaboration
2. supervisory users	B. create own queries and reports
3. global information	C. support core business
4. informational systems	D. devoid of inconsistencies
5. collective information	E. need information for control
6. information sharing	F. common for all users
7. integrated data	G. need trend analysis
8. power users	H. analyze operational results
9. standards and controls	I. synergistic effect
10. executive users	J. easy in database environment

2. The core business for a car dealership is buying and selling cars. List some of the major processes supporting this core business. Describe the elements of information needed for two of these processes.

3. You are the new project manager for the database project at a large department store launching its first database. Your CIO has asked you to write a memo to the Executive VP on initiating the project. List the major benefits of a database system in the memo.

4. Describe the ways in which information can be provided to executives and supervisors from the database system of a large retail grocery chain.

5. The database system in an organization promotes information sharing. Discuss how the database system enables information sharing. List the major benefits of information sharing.