

relational database model

The organization of data in a database in two-dimensional tables called relations; a data element in any one table can be related to any piece of data in another table as long as both tables share a common data element.

The Relational Model The most recently developed database structure, the **relational database model**, was developed to overcome the limitations of the other two models in representing data relationships. The relational model represents all data in the database in simple two-dimensional tables called relations. The tables appear similar to flat files, but the information in more than one file can be easily extracted and combined.

The strength of the relational model is that a data element in any one file or table can be related to any piece of data in another file or table as long as both tables share a common data element. IBM's DB2 and Oracle from the Oracle Corporation are examples of mainframe relational database management systems. Microsoft Access is a PC relational database management system. (Oracle also has a PC version.)

Figure 6.11 illustrates how personnel in work departments would be treated by a relational database. The relational database consists of four tables or files: a department file (Department), an employee file (Employee), a performance rating file (Performance), and a job assignment file (Job). Each file or table consists of columns and rows. Each column represents a different field, and each row represents a different record in the file. The database was arranged this way because most of the time these files or tables are updated and accessed independently. When information is needed from more than one table, however, it can be combined by using DBMS commands. Therefore, a request to show which department is associated with a particular job assignment and the department's name and location could easily be satisfied by a relational database model.

The standard data manipulation language for relational database management systems is SQL (Structured Query Language). SQL was developed by IBM in the mid-1970s for mainframe and minicomputer environments and was commercially introduced in 1979. It has been incorporated into some PC environments. In SQL, we can combine information from several tables or files using the operations SELECT, FROM, and WHERE.

The basic structure of an SQL query for retrieving data is as follows:

```
SELECT <columns>  
FROM <tables>  
[WHERE <condition>]
```

FIGURE 6.11

A Relational Database: The Most Flexible Approach to Data Retrieval

A relational database arranges data into tables, or relations. A data element in one table can be related to any data element in any other table as long as the two tables share a common data element. Thus, in the example here, the employee table can be combined with the job assignment table because each table has a field containing a job code. Similarly, the employee table can be combined with the performance rating table because each holds an employee ID field.

Table (Relation)

Dept Code	Dept Name	Dept Location	Cost Center
398	Shipping	Warehouse 2	B1209
447	Accounting	Office Building 1	C4428
112	Purchasing	Office Building 2	C1133

Employee

Employee ID	Employee Name	Address	Age	Hire Date	Term Date	Salary	Job Code
113223394	David Sniffen	11 Scenic Dr, Rye, NY 11233	33	02/04/90		22,000	S88
432669764	Paula Hayes	22 Brook St, Croton, NY 10520	67	05/03/49	04/30/90	27,000	C42
135770964	Mark Hastings	6 Nordica, Elmsford, NY 11677	44	11/01/85		66,000	M55
445890264	Robert Flynn	3 Oak Pl, Harrison, NY 10767	55	11/01/77		46,000	M77

Job Assignment

Job Code	Job Description	Date Created	Salary Range	Dept Code
C42	Clerk	01/01/45	13,000-29,000	447
S88	Shipping Clerk	05/01/49	15,000-25,000	398
M55	Manager	01/01/45	40,000-150,000	112

Performance Rating

Employee ID	Performance Rating	Evaluation Date
113223394	2	12/14/98
432669764	3	11/23/98
135770964	1	12/07/98
445890264	2	12/14/98

FIGURE 6.12

A Sample Query Using SQL

SQL (Structured Query Language) is a popular data manipulation language for retrieving information from relational databases. Here we see an SQL query to obtain information by joining two different tables.

```
SELECT Job.Job__Code,Job__Description,Job.Dept__Code,Dept__Name,  
Dept__Location  
FROM Job,Department  
WHERE Job.Dept__Code = Department.Dept__Code
```

The SELECT command identifies the columns or data fields to retrieve. The FROM clause specifies the tables or files from which to retrieve this information. The WHERE clause restricts the information output to only those records or rows matching a specified condition.

Figure 6.12 illustrates a typical SQL query to extract data from the Department and Job tables illustrated in Figure 6.11. The two tables share a common field, Dept_Code, which identifies each department. In the SQL query, the department code field in the Job table, called Job.Dept_Code, is given a prefix of Job to distinguish it from the department code field (Department.Dept_Code) in the Department table. The query described in Figure 6.12 joins the Department and Job tables to form a new table with the required information.