



Figure 5-15  
Personal Database System

Meanwhile, Andrea learns that she should buy all 500, so she checks out. Clearly, we have a problem. Both Andrea and Jeffrey have purchased the same 500 soccer balls. One of them is going to be disappointed.

This problem, known as the **lost-update problem**, exemplifies one of the special characteristics of multi-user database processing. To prevent this problem, some type of locking must be used to coordinate the activities of users who know nothing about one another. Locking brings its own set of problems, however, and those problems must be addressed as well. We will not delve further into this topic here, however.

Realize from this example that converting a single-user database to a multi-user database requires more than simply connecting another computer. The logic of the underlying application processing needs to be adjusted as well.

Be aware of possible data conflicts when you manage business activities that involve multi-user processing. If you find inaccurate results that seem not to have a cause, you may be experiencing multi-user data conflicts. Contact your IS department for assistance.

## Enterprise DBMS Versus Personal DBMS

DBMS products fall into two broad categories. **Enterprise DBMS** products process large organizational and workgroup databases. These products support many, possibly thousands, of users and many different database applications. Such DBMS products support 24/7 operations and can manage databases that span dozens of different magnetic disks with hundreds of gigabytes or more of data. IBM's DB2, Microsoft's SQL Server, and Oracle's Oracle Database are examples of enterprise DBMS products.

**Personal DBMS** products are designed for smaller, simpler database applications. Such products are used for personal or small workgroup applications that involve fewer than 100 users, and normally fewer than 15. In fact, the great bulk of databases in this category have only a single user. The professor's Student database is an example of a database that is processed by a personal DBMS product.

In the past, there were many personal DBMS products—Paradox, dBase, R:base, and FoxPro. Microsoft put these products out of business when they developed Access and included it in the Microsoft Office suite. Today, about the only remaining personal DBMS is Microsoft Access.

To avoid one point of confusion for you in the future, the separation of application programs and the DBMS shown in Figure 5-11 is true only for enterprise DBMS products. Microsoft Access includes features and functions for application processing along with the DBMS itself. For example, Access has a form generator and a report generator. Thus, as shown in Figure 5-15, Access is both a DBMS *and* an application development product.

## Q5 How Are Data Models Used for Database Development?

In Chapter 10, we will describe the process for developing information systems in detail. However, business professionals have such a critical role in the development of database applications that we need to anticipate part of that discussion here by introducing two topics—data modeling and database design.

Because the design of the database depends entirely on how users view their business environment, user involvement is critical for database development. Think