Chapter 1

SQL Server 2005 Express Overview

In This Chapter

▶ Introducing SQL Server 2005 Express (SSE)

▶ Determining whether SSE is right for you

▶ Discovering the features of SSE

▶ Understanding how SSE works

▶ Getting going with SQL Server 2005 Express

*F*rom the developer's or user's perspective, SQL Server 2005 Express strikes a nice balance between price (free) and performance (powerful). In this chapter, I offer up some insight into this new product.

To begin, I give you some context to understand how this capable, yet entry-level product came about, along with how it fits in with the rest of the SQL Server product family. Next, you see who the ideal user is for SQL Server 2005 Express, along with a list of some of the product's most compelling features (as well as what's not present). Finally, I show you the kind of tools that you'll want to acquire so you can get started building applications and working with your SQL Server 2005 Express data.

Jumping on Board the SQL Server Express

Once upon a time, if you wanted to store information on a computer, you had to write your own low-level, highly specialized program that organized this data, and also allowed you to update and retrieve the data. This was very cumbersome, time-consuming, and error-prone. Eventually, a host of specialized companies sprang up to provide standardized, industrial-strength products known as databases.

A *database* is a special kind of software application whose main purpose is to help people and programs store, organize, and retrieve information. This

frees up application developers to focus on the business task at hand, rather than being responsible for supervising the intricacies of data management.

As more time passed, a new breed of database companies arose. With names like Oracle, Informix, and Sybase, these vendors (and many others) developed a particular kind of database, known as a relational database. *Relational databases* are particularly well designed for storing information in tabular format, which further helped software developers as they built a whole new class of enterprise applications.

Microsoft also entered the relational database fray some years back with the SQL Server database. Once thought of as a relatively lightweight database vendor, Microsoft has continually refined SQL Server to the point where it can compete for the largest and most complicated database-driven applications. Of course, all these capabilities and power have made the SQL Server database platform somewhat intimidating and confusing for many developers and users, especially those that are building and using simpler solutions.

To address this problem, beginning with the SQL Server 2005 product family, Microsoft has created several different versions of SQL Server. Known as *editions*, each of these versions addresses a different class of database environment. Despite this segmentation, all editions are built on the same underlying technology platform. The main difference among the editions is that the simpler, less far-reaching versions don't have all the features and storage capacity that you find in their larger (and more complex) siblings. Here's a list of all the SQL Server 2005 editions:

- ✔ **Enterprise:** This is the most robust edition of SQL Server 2005. It includes a host of features that make it a good choice for a 24/7, mission-critical database server platform. Just a few of these features include

    - Advanced business intelligence analytics

    - Robust data transformation logic

    - High availability capabilities

    This product also has two developer-focused versions, which contain all the Enterprise features but are licensed differently. These are SQL Server 2005 Developer Edition and SQL Server 2005 Evaluation Edition.

- ✔ **Standard:** With much of the feature set of its big brother, this edition is fine for the vast majority of database applications. The main difference is that this edition is somewhat lighter in both its business intelligence and high availability feature sets.

- ✔ **Workgroup:** Aimed at smaller, departmental applications, this still-powerful edition of SQL Server 2005 introduces some limitations

that are not likely to be issues for these smaller computing environments. Some of these restrictions include

- Hardware and database size constraints

- Diminished high availability

- Reduced business intelligence

✔ **Express:** Now it's time to look at the star of this show. This is the simplest and easiest to use database offering in the SQL Server 2005 product family. On top of that accolade, it's also free to download and redistribute (with some licensing restrictions).

This is the right edition for you if any of the following describe you:

- A software developer (seasoned or brand-new) wanting to learn about relational databases.

- A packaged application provider looking to embed a free, yet sturdy database with your solution.

- An end user with a lot of information to store, but not a lot of cash to buy a database.

TIP

To get the lowdown on the differences among each SQL Server 2005 edition, go to

```
www.microsoft.com/sql/prodinfo/features/compare-
            features.mspx
```

TIP

As you evaluate potential uses for SQL Server Express 2005, note that you can use it for all sorts of applications, from traditional, desktop-based rich client software as well as browser-based solutions that are available over the Internet.

SQL Server 2005 Express is just one component of a larger collection of entry-level products aimed at helping developers and hobbyists use Microsoft's technologies to deliver powerful and flexible computing solutions. These products, all of which are part of Visual Studio 2005 Express include the following:

✔ Visual Web Developer 2005 Express

✔ Visual Basic 2005 Express

✔ Visual C# 2005 Express

✔ Visual C++ 2005 Express

✔ Visual J# 2005 Express

All these products work seamlessly with SQL Server 2005 Express. If you're interested in taking advantage of these products, have a look at Chapters 19 and 20.

The SQL Server 2005 Express Environment

Although it's the most junior member of the family, SQL Server 2005 Express has more than enough capabilities and power to support the majority of database-driven applications. You should be aware of these key features — along with some limitations — as you build your solution:

- ✔ **Robust technology platform:** SQL Server 2005 Express is built on the same underlying technology platform as all the Microsoft SQL Server products. This significantly increases this product's effectiveness and stability.

- ✔ **Interoperability and upgradeability:** Because SQL Server 2005 Express is built on the underlying SQL Server 2005 platform, you can easily develop solutions that work with any SQL Server 2005 edition. In addition, you can straightforwardly migrate from this entry-level edition to a more full-featured edition without changing your database design or altering any application or stored procedure/trigger code.

- ✔ **Memory:** With memory costs dropping significantly over time, many administrators now stock their computers with large amounts of RAM. However, regardless of how much memory you have, SQL Server 2005 Express doesn't take advantage of any more than 1GB of RAM.

- ✔ **Automatic performance tuning:** This is one feature that SQL Server 2005 Express shares with the other database editions. It lightens the administrative load by automatically updating the database's configuration based on system activities and other profiling data.

  However, no automation can free you from the performance implications of an inefficient database or application construction: You are still responsible for designing your database structure and software logic with speed in mind.

- ✔ **Database size:** This is probably the most significant limitation of SQL Server 2005 Express, because any given database can't be bigger than 4GB. Although this limitation won't be a problem for many applications, certain data-intensive solutions can test it. Of course, you are free to have multiple databases that are each 4GB.

- ✔ **Full security capabilities:** Here's another area where this edition and the more costly versions of SQL Server 2005 basically have no differences. This means that you can take advantage of a broad band of security features as you go about developing your solutions. These range from authentication and auditing all the way through public key management and encryption.

✔ **Multi-processors:** Running a computer with more than one central processing unit (CPU) is a great way to increase performance and throughput. However, SQL Server 2005 Express only takes advantage of one CPU, regardless of how many are available.

✔ **Administrative tools:** Microsoft offers the excellent SQL Server Management Studio Express graphical tool to help you monitor and manage your database. It's available for free download from Microsoft's Web site.

✔ **Visual Studio integration:** Although SQL Server 2005 Express is considered an entry-level product, you're free to use the full power of Microsoft's flagship development platform, Visual Studio. This product is fully integrated with all the SQL Server 2005 database offerings, including Express. Figure 1-1 shows you what this looks like, in the context of building a C# class file.

✔ **Full-text searching:** This feature helps you index and then query large blocks of text-based information. Although it's not present in SQL Server 2005 Express, you will find it in SQL Server 2005 Express with Advanced Services. Regardless of which version you use, your application can still store and work with this kind of information; the method you use might vary, however.
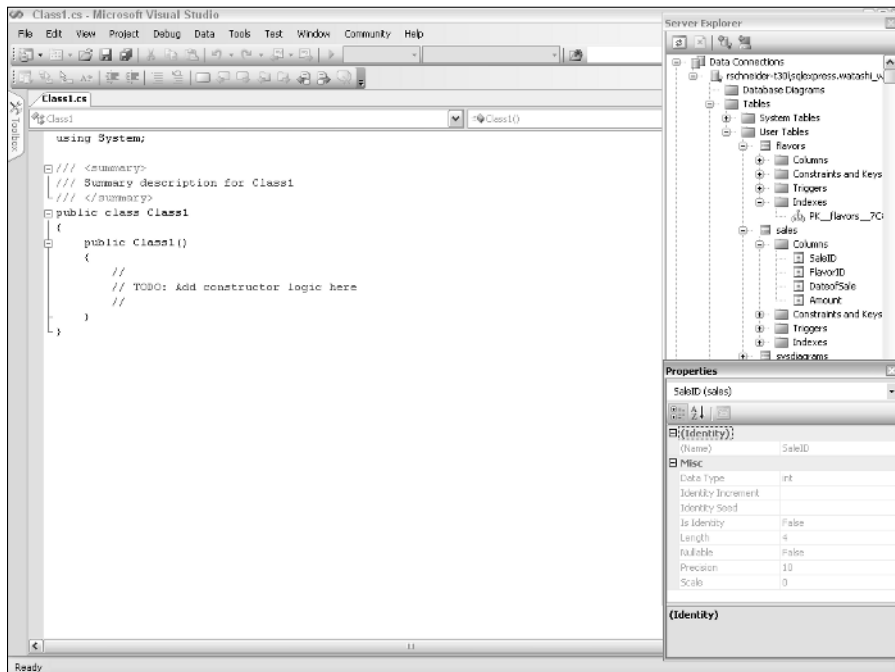

Figure 1-1:
SQL Server 2005 Express information available from inside Visual Studio.

✔ **High availability features:** The entire SQL Server 2005 product family offers numerous technologies to help keep your database up and running at all times. However, Express doesn't offer these capabilities, all of which reduce down time or help improve performance:

- Online restore
- Database mirroring
- Partitioning
- Failover clustering
- Online indexing

If you're building a mission critical application and continual uptime is of vital importance to you, you may want to deploy your solution on one of the other SQL Server 2005 editions.

✔ **Rich programming language choices:** The entire SQL Server 2005 product line supports the Microsoft Common Language Runtime (CLR). This means that you can develop internal database logic such as stored procedures and triggers in any one of a number of popular programming languages, rather than in SQL Server's internal programming language: Transact-SQL.

✔ **Analysis services:** The more advanced editions of SQL Server 2005 feature business analytic logic that you can use to help make sense of your information. This is especially true if your environment sports massive volumes of data that need to be crunched to come up with recognizable patterns. The bad news is that this is not present in SQL Server 2005 Express. However, the good news is that chances are that if these kinds of data are found in your organization, you'll have already purchased one of the many third-party business intelligence products.

✔ **Report server:** Users always want more information out of their database. With SQL Server 2005's reporting services, you can set up a wide range of developer-driven and user-driven reports. You can then integrate and deliver these communiqués through a series of different presentation technologies. Happily, you'll find these capabilities present in SQL Server 2005 Express with Advanced Services, which should help please those finicky users. If you're curious about how these features work, take a look at Chapter 18 for the details.

✔ **Integration services:** These features allow you to write powerful integration logic that can take information from a broad range of other data storage locations and then store it inside SQL Server. The same holds true for outbound data. Unfortunately, you won't find these services present in SQL Server 2005 Express. Luckily, this doesn't mean that you can't integrate data among disparate systems; it just means that you may have to do some more work to achieve the same results.

✔ **Notification services:** This refers to the capability, found only in the more feature-rich editions of SQL Server 2005, to build sophisticated publish-and-subscribe applications. Once created, these applications

can properly react to a wide variety of events, notifying all interested parties that an event has occurred. SQL Server 2005 Express does let you take advantage of replication, but only as a subscriber.

✔ **Backup/recovery options:** Because backup and recovery are a vital part of any data integrity and reliability plan, SQL Server 2005 offers administrators a choice among several different recovery models, each of which has its own strengths and weaknesses. However, your data-archiving choices are somewhat more reduced for SQL Server 2005 Express. You can still set up a very robust backup and recovery strategy; it's just not as full featured as in the more advanced editions of SQL Server. In particular, because the SQL Server Agent is not present, you won't be able to schedule jobs or configure alerts and operators.

Where Does SQL Server Express 2005 Work Best?

SQL Server 2005 Express brings a lot to the table, but when does it make sense to choose it as your data storage platform? I answer this question in this section.

Small office/Home office (SOHO)

Small offices and home offices (SOHO) are often caught between a rock and a hard place when dealing with software and solutions. Either the technology is underpowered and simplistic, not quite meeting their needs, or it's expensive, overly complex, and resource intensive.

SQL Server 2005 Express strikes a nice balance between simplicity and power, while holding the cost as low as you can possibly get. Plus, because many small businesses one day find themselves morphed (or acquired) into larger enterprises, making this database server the cornerstone of your data storage architecture means that you never outgrow your database: You can easily upgrade to SQL Server 2005 Enterprise.

On top of that, the fact that SQL Server 2005 Express is a true relational database management platform means that you can store and track just about anything in your database. Some particularly good applications include

✔ Inventory details

✔ Sales statistics

✔ Financial metrics

When you have this information safely ensconced in your SQL Server 2005 Express database, you're free to use all sorts of tools and technologies to help make sense of your data. For example, you might store details about all the individual transactions that your organization performs, and then use business intelligence or other data analysis tools to help identify trends from your sales results.

WARNING!

While you're free to store anything you like in your SQL Server 2005 Express database, be aware that any individual database has a maximum storage limit of 4GB for your information. If you find yourself approaching that ceiling, you need to archive some of your older data to make room for newer knowledge.

Distributed enterprise

With the rise of low cost, high-speed Internet connections, many more organizations are realizing benefits from distributed computing. For the distributed enterprise of any size, SQL Server 2005 Express offers a good balance between the low maintenance requirements of an entry-level database like Microsoft Access, and the capabilities of a robust, server-based database.

In addition to these features, you can administer multiple remote SQL Server 2005 Express sites from one location via the SQL Server Management Studio Express.

Another useful capability of SQL Server 2005 Express is its ability to participate as a client in a replication architecture. This means that you could have a single, high-end edition of SQL Server distributing its data among numerous SQL Server 2005 Express clients. These clients could, in turn, support read-only applications like reporting or business intelligence. This type of architecture spreads the processing load across multiple machines, and helps eliminate bottlenecks.

Finally, another good illustration of distributed computing is to use SQL Server 2005 Express as a local database and then aggregate its information to a central server for safekeeping and analysis. For example, suppose that you're building a retail application that will support dozens of locations, none of which will have a database administrator. You could install a traditional, low-end database in each store, but you need to take advantage of a true relational database management system's features, such as advanced security, stored procedures, or triggers. You also need to gather and consolidate this data for reporting purposes. This is a good use for SQL Server 2005 Express: It offers enough power for enterprise-class applications without demanding teams of highly trained administrators for its daily care and feeding.

If you're curious about all that you can do in a distributed computing environment, check out Chapter 6.

Independent Systems Vendor/Original Equipment Manufacturer (ISV/OEM)

ISVs and OEMs have first-hand experience that the cost of embedded technology can eat into profits. That's not a problem with SQL Server 2005 Express: Free generally doesn't have much of an impact on margins. However, don't be fooled by the price: This is a full-featured database, built on the SQL Server platform.

If you base your applications and solutions around SQL Server 2005 Express, you're not locked in: If your customers need extra horsepower and capabilities, they can quickly and painlessly upgrade to a more powerful edition of SQL Server.

The beauty of basing your solutions on a single relational database management product family is that you can do your development on the more advanced editions of SQL Server, using robust tools like Visual Studio, and then easily deploy your application onto the lightweight SQL Server 2005 Express.

As an added benefit to OEMs and ISVs, SQL Server 2005 Express lets you store your data in a single, easily transferred file. Known as an `.mdf` file, this structure combines the simplicity of a low-end flat file with the power of a true relational database management system. You should note, however, that you have to deploy the SQL Server Express 2005 server, even if you only intend to deploy `.mdf` files with your solution.

Getting Down to Business with SQL Server 2005 Express

In previous sections, I show you all that you get with your free download of SQL Server 2005 Express Edition. If you're wondering how you can get started using the product, that's what this section is all about. To begin, I point out some things to ponder as you plan and deploy your database. Next, I talk about all the programming tools at your disposal for building a SQL Server 2005 Express-based application. Finally, I show how you can configure and monitor your database.

What happened to MSDE?

For those of you who have followed the entry-level SQL Server database for some time, you're probably wondering what happened to the previous offering from Microsoft.

Known as MSDE (which stands for Microsoft Desktop Engine or Microsoft Data Engine,

depending on who answers the phone in Redmond), this database was more complicated to administer, less feature rich, and had smaller capacity than its replacement, SQL Server 2005 Express.

Planning your database

The first thing to keep in mind as you contemplate what to keep in your SQL Server 2005 Express database is that this is not a stripped-down, feature-limited, stand-alone product. It's true that Express does have significant limitations to the amount of information you can store in the database (see "The SQL Server 2005 Express Environment" earlier in this chapter for more details about that), and that certain key high-volume features are not present.

TIP

Before you get heavily into using this edition, you should make sure that none of these limitations are showstoppers for you. Remember that the majority of these constraints shouldn't impact you during development; they're only an issue at runtime.

Even though this edition has feature restrictions, SQL Server 2005 Express works with all the same types of information as its more fully featured siblings, and you can easily migrate to a more powerful edition. It also supports all the same application programming interfaces (APIs), as well as the same stored procedure and trigger capabilities.

This means that as a designer, you can build your SQL Server 2005 Express database with confidence, knowing that you aren't painted into a corner by missing capabilities, nor the solution you design is forever consigned to this entry-level database. This works the other way as well: You can design your solution on a more powerful edition of SQL Server 2005, and then deploy it onto SQL Server 2005 Express, as long as it doesn't require any of the features that are only found in the more expensive editions of the product.

TECHNICAL STUFF

One feature that's particularly attractive for distributed application developers and vendors is the Xcopy deployment capability of SQL Server 2005 Express. This lets you easily bundle your application and database (`.mdf`) file and then copy them to another machine. Because everything is already pre-packaged, you don't need to manually configure these other platforms, as long as they have a running instance of SQL Server 2005 Express. When your

application launches, the database server automatically attaches the `.mdf` file to the local instance. This architecture results in an easily implemented portability strategy.

Building SQL Server 2005 Express applications

You have a wide variety of electives when building a solution that stores its information in this database. To begin, as I described earlier in this chapter, Microsoft is making the Visual Studio Express products affordable and easy to use to create database-driven applications. If you're new to application development, checking out these products is definitely worth your while. In fact, take a look at Chapters 19 and 20, which cover Visual Basic 2005 Express and Visual Web Developer 2005 Express, respectively. For a sneak preview, Figure 1-2 shows how closely Visual Basic 2005 Express works with SQL Server 2005 Express.

This tight integration can go a long way toward boosting your productivity. In effect, with these products, Microsoft has broken down the traditional barrier between application and database tools.
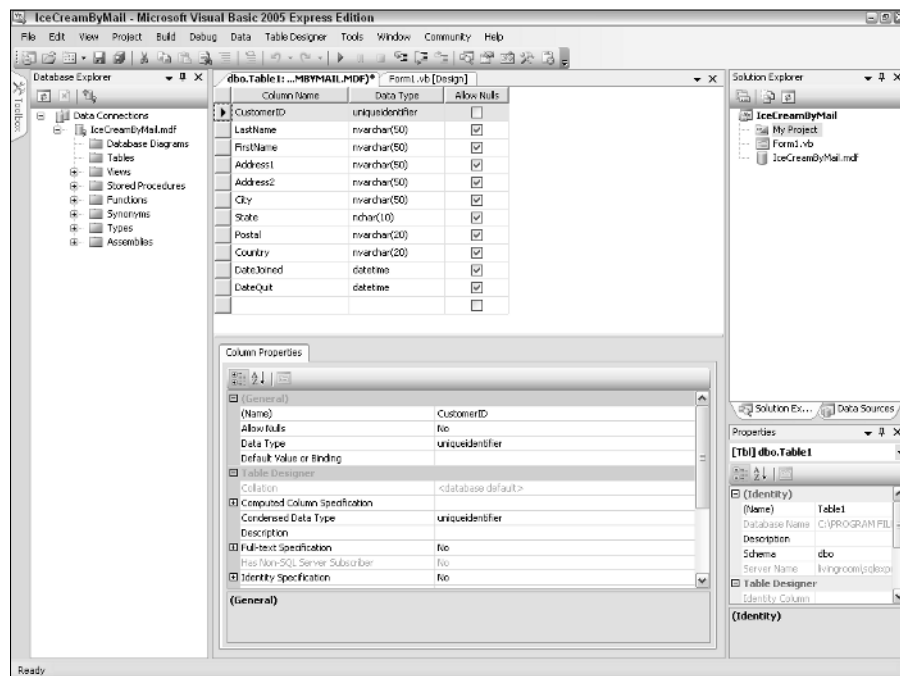
Figure 1-2: Visual Basic 2005 Express and SQL Server 2005 Express.

If you're more inclined to use heavier-weight, more powerful tools, Visual Studio 2005 makes a lot of sense to employ for application development. It's an extremely potent tool that contains a tremendous amount of functionality. It's also very well integrated with all SQL Server 2005 products, not only the Express edition. Naturally, all this power comes with additional complexity and a somewhat steeper learning curve, so you should decide if your application requires all these capabilities.

Of course, Microsoft isn't the only game in town when it comes to application development technologies. You can use several third-party tools (including open source and shareware) to construct a SQL Server-based solution.

Configuring, managing, and monitoring SQL Server 2005 Express

With your database and application built, it's natural to turn your attention to setting configuration parameters and then monitoring the database. Here again, you have no shortage of options.

To begin, SQL Server 2005 Express snaps into the standard Microsoft Computer Management console. This lets you configure and run your database services, which you can see in Figure 1-3.
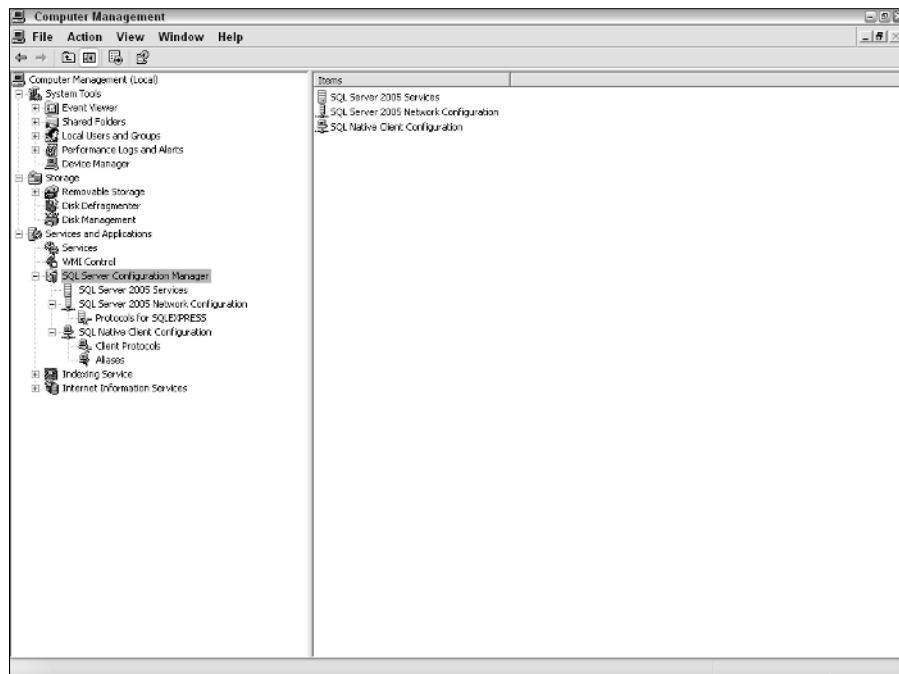

Figure 1-3: Configuring SQL Server 2005 Express services.

For further configuring and managing your SQL Server 2005 Express server, you can choose between graphical and character-based tools. As you might expect, graphical tools provide more intuitive, easy-to-understand information about your server.

When it comes to graphical tools, it's hard to beat Microsoft's free, excellent graphical management environment known as SQL Server Management Studio Express. Figure 1-4 shows a sample of what this product looks like.

SQL Server Management Studio Express can do much more than simply show you tables and run queries. One handy tool is the activity monitor, which opens a window onto all database-related activity for your server. Figure 1-5 shows a sample session; you can monitor a tremendous amount of information using this tool.

For those of you who prefer a character-based configuration and management utility, Microsoft continues to ship the SQLCMD utility, which allows for direct entry of SQL statements. Because you find much of the administrative capabilities for SQL Server embedded in stored procedures, you can run just about any management operation from the rather bland SQLCMD interface.
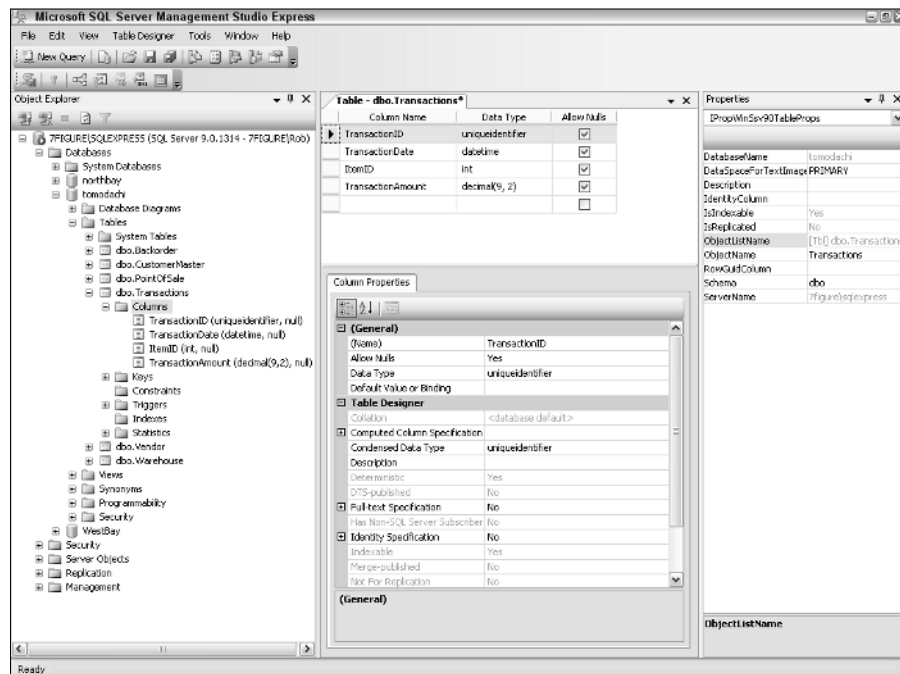

Figure 1-4: Viewing a table in SQL Server Management Studio Express.

Figure 1-5:
The SQL
Server
Manage-
ment Studio
Express
Activity
Monitor.