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Allen G. Taylor is a 28-year veteran of the computer industry and the author of 17 computer-related books, including *SQL For Dummies.* In addition to writing, he is a database consultant and seminar leader in database design and application development. Allen lives with his family on a small farm outside of Oregon City, Oregon. You can contact Allen at `agt@transport.com`.

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Dedication

This book is dedicated to my wife, Joyce C. Taylor, who continues to encourage me, even though she believes I spend too much time staring into a computer monitor.

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Introduction

Because you are reading this, I assume that you have recently become interested in database. Perhaps you would like to impress your friends by casually tossing out some big words that they have never heard before — words such as semantic object model, denormalization, or maybe even tuple. Perhaps your boss at work has just informed you that your department will be computerizing its records and that you have been assigned to build the database. Whatever your motivation, this book will get you started down the path to becoming a true database guru. When you reach that exalted level, impressing your friends with big words will pale in significance compared to what you will be able to do with your organization's most important information.

Ever since computers became powerful enough to support them, databases have been at the core of both commercial and scientific data processing. The domain of database processing includes any problem or task that must deal with large amounts of data. Most database systems in existence today, and practically all new systems being implemented, make use of relational database technology, the subject of this book.

About This Book

This book takes you step by step through the conceptualization, design, development, and maintenance of relational database systems. It gives you a solid grounding in database theory and then shows how to reduce that theory to practice using two of the more popular database management systems in use today: Microsoft Access and Microsoft SQL Server. Major topics covered include

- Understanding database architecture and how it has evolved
- Recognizing how database technology affects everyday life
- Using a structured approach to database development
- Creating an appropriate data model
- Creating a reliable relational design
- Implementing a relational design
- Keeping a database secure
- Putting your database on the Internet

My objective with this book is to give you the information you need to build a robust database system that will do what you want it to do. When designed correctly, a database system will give you the performance, flexibility, and reliability to meet your needs, both now and in the future.

Who Should Read This Book?

Anyone tasked with the development of a software system that incorporates a database element, or anyone managing the people who do such development, should read this book. Any person in any organization that uses database technology (that should be just about anybody who works anywhere) can benefit from understanding the concepts I explain in this book.

Databases have penetrated every nook and cranny of our highly connected, information-intensive society. The more you understand about how they function and the differences between well-designed and poorly designed databases, the better you will be able to decide the best way to use your organization’s database resources.

Foolish Assumptions

In order to write this book, I had to make some assumptions about who would be reading it and what their level of expertise would be. Based on feedback I have received from readers of *SQL For Dummies* , I know that accurately targeting readership is incredibly difficult. I expect that some readers will be gaining their first exposure to databases, while others will be professional database developers. I have tried to make

the book understandable to the first group, while at the same time making it a useful guide to the second group.

How This Book Is Organized

This book contains seven major parts. Each part consists of several chapters. It makes sense to read the book from beginning to end because later material builds on an understanding of what has gone before. You may decide to skip either the Access chapter or the SQL Server chapter if they do not apply to you. However, the implementation details that I describe in those chapters will be similar to what you will encounter in other development environments, and thus will probably be valuable to you anyway.

Part I — Basic Concepts

Part I establishes the context for the rest of the book. It describes the position of data and databases in the world today and then describes how to systematically design and develop a database system incorporating a database and one or more applications that operate on that database. This part also describes challenges that often arise in the course of a database development project, and how you can best address them.

Part II — Data Modeling: What Should the Database Represent?

In any database development project, you must address a few key questions — for example: What exactly should the database represent, and to what level of detail? Answers to these questions come from finding out who will use the proposed system and how they will use it. Finding out the needs and expectations of the users, and then transforming those needs and expectations into a formal, structured data model forms the core of Part II. Getting this part right is absolutely critical to the successful completion of a development project.

Part III — Database Design

After you have a model of the proposed system that is satisfactory to everyone concerned, you need to convert that model into a database design. In order for your design to be reliable as well as functional, you need to decide how best to transform complex relationships among data items into simpler relationships that are not subject to the data corruption problems that often accompany complexity. Part III highlights the complexities you are likely to encounter, and in each case describes how best to transform them into a simpler form that eliminates the problems.

Part IV — Implementing a Database

Part IV starts with a database design, developed using the techniques that I explain in Part III, and shows step by step how to convert that design into a database using some of the more popular database development tools available today. First, I cover the process using Microsoft Access 2000. Then, I show you how to implement the same design using the SQL Server 2000 DBMS. Finally, I explain how to implement the design using straight SQL code, without the help of any fancy development tools. I clearly delineate the strengths and weaknesses of each approach as I describe each method.

Part V — Implementing a Database Application

The *application* is the part of a database system that the users see and interact with. It is the application that answers whatever questions the users pose to the database.

The implementation of a database application can differ greatly from one development environment to another. On the one hand, Access gives developers an integrated forms wizard and report writer and the ability to create a complete application without writing a single line of procedural code. On the other, a developer can write a database application using only procedural code with embedded SQL statements, without the aid of a DBMS such as Access. SQL Server falls somewhere in the middle. You can use external forms generator and report writer packages along with procedural code to operate on an SQL Server database. You can also employ a hybrid approach in which you use some or all of these facilities. The ability to use all these tools gives you the ultimate in flexibility, but also requires the highest level of expertise.

Part VI — Using Internet Technology with Database

Databases are most useful when resident on networks available to multiple people. That usefulness is multiplied when the number of users increases, as it does when the database is accessible over the Internet or a large organizational intranet. In Part VI, I discuss network architectures, the kinds of threats to data integrity that network operation causes, and the particular threats that are peculiar to the Internet. In general, good countermeasures to these threats exist, but developers and database administrators must be aware of the threats so they can apply the countermeasures effectively.

Part VII — The Part of Tens

Part VII distills the messages of the preceding six parts, providing concise summaries of the main things to keep in mind when designing and building systems based on relational database technology. If you keep these principles in mind, you can't go too far wrong.

Conventions Used in This Book

In this book, I use several typographical conventions. I use monofont type for code that appears within a regular paragraph of text — for example, to tell you about an `access denied` error message. I use command arrows (⇒) to present menu commands in the most concise manner possible. For example, if I didn't use command arrows, I would have to give you instructions like this: "In the menu bar, choose File. Then, in the resulting menu, choose Open." With the command arrow, all that verbiage boils down to this: "Choose File⇒Open."

Icons Used in This Book

Throughout the pages of this book, I use these icons to highlight particularly helpful information.

Tips save you time and keep you out of trouble.

You really should pay attention whenever you see this icon. A major danger is described, along with the best way to avoid it.

This material is not absolutely necessary for a good understanding of the concepts being presented, but is often interesting to know.

Generally, the text marked with this icon is material that you will need later. Make a mental note of it.

Where to Go From Here

Enough preliminaries! Dig into the real meat of this book — what databases are and how to build them. Understanding those two things is rapidly becoming a requisite for just about anyone involved in commerce, science, or anything else that involves the storage and processing of data. Start with Chapter 1. It gives you the perspective you need to understand where database technology came from and where it stands today.