

# Chapter 1

## Introduction

For years, during my teaching database programming and Visual Basic.NET programming in my college, I found that it was too difficult to find a good textbook for this topic, so I had to combine a few different professional books together as references to teach this course. Most of those books are specially designed for programmers or software engineers, which cover a lot of programming strategies and huge blocks of codes, which is a terrible headache to college students or beginning programmers who are new to the Visual Basic.NET and database programming. I have to prepare my class presentations and figure out all homework and exercises for my students. I dream that one day I could find a good textbook that is suitable for college students or beginning programmers and help them to learn and master database programming with Visual Basic.NET easily and conveniently. Finally, I decided that I needed to do something for this dream myself after waiting for a long time.

Another reason for me to have this idea is the job market. As you know, most industrial and commercial companies in United States belong to database applications businesses, such as manufactures, banks, hospitals, and retails. Majority of them need professional people to develop and build database-related applications, but not database management and design systems. To enable our students to become good candidates for those companies, we need to create a book like this one.

Unlike most database programming books in the current market, which discuss and present database programming techniques with huge blocks of programming codes from the first page to the last page, this book tries to use a new writing style to show readers, especially to college students, how to develop professional and practical database programs in Visual Basic.NET 2010 by using Visual Studio.NET Design Tools and Wizards related to ADO.NET 4.0, and to apply codes that are autogenerated by using Wizards. By using this new style, the headache caused by using those huge blocks of programming codes can be removed; instead, a simple and easy way to create database programs using the Design Tools can be developed to attract students' learning interest, and furthermore to enable students to build professional and practical database programming in more efficient and interesting ways.

There are so many different database programming books available on the market, but rarely can you find a book like this one, which implemented a novel writing style to

attract the students' learning interests in this topic. To meet the needs of some experienced or advanced students or software engineers, the book contains two programming methods: the interesting and easy-to-learn fundamental database programming method—Visual Studio.NET Design Tools and Wizards, and advanced database programming method—runtime object method. In the second method, all database-related objects are created and applied during or when your project is running by utilizing quite a few blocks of codes.

### **OUTSTANDING FEATURES ABOUT THIS BOOK**

1. A novel writing style is adopted to try to attract students' or beginning programmers' interests in learning and developing practical database programs, and to avoid the headache caused by using huge blocks of codes in the traditional database programming books.
2. Updated database programming tools and components are covered in the book, such as .NET Framework 4.0, LINQ, ADO.NET 4.0, and ASP.NET 4.0, to enable readers to easily and quickly learn and master advanced techniques in database programming and develop professional and practical database applications.
3. A real completed sample database CSE\_DEPT with three versions, Microsoft Access 2007, SQL Server 2008, and Oracle Database 11g XE, is provided and used for the entire book. Step by step, a detailed illustration and description about how to design and build a practical relational database are provided.
4. Covered both fundamental and advanced database programming techniques to convenience both beginning students and experienced programmers.
5. Various actual data providers are discussed and implemented in the sample projects, such as the SQL Server and Oracle data providers. Instead of using the OleDb to access the SQL Server or Oracle databases, the real SQL Server and Oracle data providers are utilized to connect to the Visual Basic.NET 2010 directly to perform data operations.
6. Provides homework and teaching materials, and these allow instructors to organize and prepare their courses easily and rapidly, and enable students to understand what they learned better by doing something themselves.
7. Good textbook for college students and good reference book for programmers, software engineers, and academic researchers.

### **WHO THIS BOOK IS FOR**

This book is designed for college students and software programmers who want to develop practical and commercial database programming with Visual Basic.NET and relational databases, such as Microsoft Access, SQL Server 2008, and Oracle Database 11g XE. Fundamental knowledge and understanding on Visual Basic.NET and Visual Studio.NET IDE is assumed.

### **WHAT THIS BOOK COVERS**

Nine chapters are included in this book. The contents of each chapter can be summarized as below.

- Chapter 1 provides an introduction and summarization to the whole book.
- Chapter 2 provides a detailed discussion and analysis of the structure and components about relational databases. Some key technologies in developing and designing database are also given and discussed in this part. The procedure and components used to develop a practical relational database with three database versions, such as Microsoft Access 2007, SQL Server 2008, and Oracle Database 11g XE, are analyzed in detail with some real data tables in our sample database CSE\_DEPT.
- Chapter 3 provides an introduction to the ADO.NET, which includes the architectures, organizations, and components of the ADO.NET. Detailed discussions and descriptions are provided in this chapter to give readers both fundamental and practical ideas and pictures in how to use components in ADO.NET to develop professional data-driven applications. Two ADO.NET architectures are discussed to enable users to follow the directions to design and build their preferred projects based on the different organizations of the ADO.NET. Four popular Data Provides, such as OleDb, ODBC, SQL Server, and Oracle, are discussed in detail. The basic ideas and implementation examples of DataTable and DataSet are also analyzed and described with some real coding examples.
- Chapter 4 provides a detailed discussion and analysis about the Language Integrated Query (LINQ), which includes LINQ to Objects, LINQ to DataSet, LINQ to SQL, LINQ to Entities, and LINQ to XML. An introduction to the LINQ general programming guide is provided at the first part in this chapter. Some popular interfaces widely used in LINQ, such as IEnumerable, IEnumerable(Of T), IQueryable and IQueryable(Of T), and Standard Query Operators (SQO), including the deferred and nondeferred SQO, are discussed in that part. An introduction to LINQ Query is given in the second section in this chapter. Following this introduction, a detailed discussion and analysis about the LINQ queries that were implemented for different data sources is provided in detail.
- Starting from Chapter 5, the real database programming techniques with Visual Basic.NET, such as data selection queries, are provided and discussed. Two parts are covered in this chapter: Part I contains the detailed descriptions in how to develop professional data-driven applications with the help of the Visual Studio.NET design tools and wizards with some real projects, and this part contains a lot of hiding codes that are created by Visual Basic.NET automatically when using those design tools and wizards. Therefore, the coding for this part is very simple and easy. Part II covers an advanced technique, the runtime object method, in developing and building professional data-driven applications. Detailed discussions and descriptions about how to build professional and practical database applications using this runtime method are provided combined with four real projects.
- Chapter 6 provides detailed discussions and analyses about three popular data insertion methods with three different databases—Microsoft Access 2007, SQL Server 2008, and Oracle:
  1. Using TableAdapter's DBDirect methods TableAdapter.Insert() method.
  2. Using the TableAdapter's Update() method to insert new records that have already been added into the DataTable in the DataSet.
  3. Using the Command object's ExecuteNonQuery() method.This chapter is also divided into two parts: Methods 1 and 2 are related to Visual Studio.NET design tools and wizards, and therefore are covered in Part I. The third method is related to runtime object and therefore it is covered in Part II. Nine real projects are used to illustrate how to perform the data insertion into three different databases: Microsoft Access 2007, SQL Server 2008, and Oracle Database 11g XE. Some professional and practical data validation methods are also discussed in this chapter to confirm the data insertion.

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- Chapter 7 provides discussions and analyses on three popular data updating and deleting methods with seven real project examples:
  1. Using TableAdapter DBDirect methods, such as TableAdapter.Update() and TableAdapter.Delete(), to update and delete data directly against the databases.
  2. Using TableAdapter.Update() method to update and execute the associated TableAdapter's properties, such as UpdateCommand or DeleteCommand, to save changes made for the table in the DataSet to the table in the database.
  3. Using the run time object method to develop and execute the Command's method ExecuteNonQuery() to update or delete data against the database directly.This chapter is also divided into two parts: Methods 1 and 2 are related to Visual Studio .NET design tools and wizards and therefore are covered in Part I. The third method is related to runtime object and it is covered in Part II. Seven real projects are used to illustrate how to perform the data updating and deleting against three different databases: Microsoft Access, SQL Server 2008, and Oracle Database 11g XE. Some professional and practical data validation methods are also discussed in this chapter to confirm the data updating and deleting actions. The key points in performing the data updating and deleting actions against a relational database, such as the order to execute data updating and deleting between the parent and child tables, are also discussed and analyzed.
- Chapter 8 provides introductions and discussions about the developments and implementations of ASP.NET Web applications in Visual Basic.NET 2010 environment. At the beginning of Chapter 8, a detailed and complete description about the ASP.NET and the .NET Framework is provided, and this part is especially useful and important to students or programmers who do not have any knowledge or background in the Web application developments and implementations. Following the introduction section, a detailed discussion on how to install and configure the environment to develop the ASP.NET Web applications is provided. Some essential tools, such as the Web server, IIS, and FrontPage Server Extension 2000, as well as the installation process of these tools, are introduced and discussed in detail. Starting from Section 8.3, the detailed development and building process of ASP.NET Web applications to access databases are discussed with six real Web application projects. Two popular databases, SQL Server and Oracle, are utilized as the target databases for those development and building processes.
- Chapter 9 provides introductions and discussions about the developments and implementations of ASP.NET Web services in Visual Basic.NET 2010 environment. A detailed discussion and analysis about the structure and components of the Web services is provided at the beginning of this chapter. Two popular databases, SQL Server and Oracle, are discussed and used for three pairs of example Web service projects, which include:
  1. WebServiceSQLSelect and WebServiceOracleSelect
  2. WebServiceSQLInsert and WebServiceOracleInsert
  3. WebServiceSQLUpdateDelete and WebServiceOracleUpdateDelete

Each Web service contains different Web methods that can be used to access different databases and perform the desired data actions, such as Select, Insert, Update, and Delete, via the Internet. To consume those Web services, different Web service client projects are also developed in this chapter. Both Windows-based and Web-based Web service client projects are discussed and built for each kind of Web service listed above. A total of 18 projects, including the Web service projects and the associated Web service client projects, are developed in this chapter. All projects have been debugged and tested and can be run in any Windows operating system, such as Windows 2000, XP, Vista, and Windows 7.

## HOW THIS BOOK IS ORGANIZED AND HOW TO USE THIS BOOK

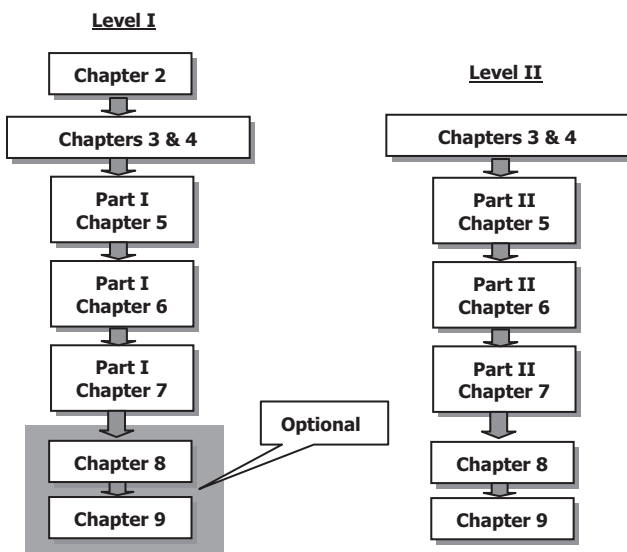
This book is designed for both college students who are new to database programming with Visual Basic.NET and professional database programmers who has professional experience on this topic.

Chapters 2, 3, and 4 provide the fundamentals on database structures and components, ADO.NET and LINQ components. Starting from Chapter 5, and then to Chapters 6 and 7, each chapter is divided into two parts: fundamental part and advanced part. The data driven applications developed with design tools and wizards provided by Visual Studio.NET, which can be considered as the fundamental part, have less coding loads, and, therefore, they are more suitable to students or programmers who are new to the database programming with Visual Basic.NET. Part II contains the runtime object method, and it covers a lot of coding developments to perform the different data actions against the database, and this method is more flexible and convenient to experienced programmers event a lot of coding jobs is concerned.

Chapters 8 and 9 give a full discussion and analysis about the developments and implementations of ASP.NET Web applications and Web services. These technologies are necessary to students and programmers who want to develop and build Web applications and Web services to access and manipulate data via Internet.

Based on the organization of this book we described above, this book can be used as two categories, such as Level I and Level II, which is shown in Figure 1.1.

For undergraduate college students or beginning software programmers, it is highly recommended to learn and understand the contents of Chapters 2, 3, and 4 and Part I of Chapters 5, 6, and 7 since those are fundamental knowledge and techniques in database programming with Visual Basic.NET 2010. For Chapters 8 and 9, it is optional to instructors, and it depends on the time and schedule.



**Figure 1.1.** Two study levels in the book.

For experienced college students or software programmers who have already some knowledge and techniques in database programming, it is recommended to learn and understand the contents of Part II of Chapters 5–7, as well as Chapters 8 and 9, since the runtime data objects method and some sophisticated database programming techniques, such as joined-table query, nested stored procedures, and Oracle Package, are discussed and illustrated in those chapters with real examples. Also, the ASP.NET Web applications and ASP.NET Web services are discussed and analyzed with 24 real database program examples for SQL Server 2008 and Oracle Database 11g XE.

## HOW TO USE THE SOURCE CODE AND SAMPLE DATABASES

All source codes in each real project developed in this book are available. All projects are categorized into the associated chapters that are located at the folder **DBProjects** that is located at the site [ftp://ftp.wiley.com/public/sci\\_tech\\_med/practical\\_database\\_vb](ftp://ftp.wiley.com/public/sci_tech_med/practical_database_vb). You can copy or download those codes into your computer and run each project as you like. To successfully run those projects on your computer, the following conditions must be met:

- Visual Studio.NET 2010 or higher must be installed in your computer.
- Three databases' management systems, Microsoft Access 2007 (Microsoft Office 2007), Microsoft SQL Server 2008 Management Studio Express, and Oracle Database 11g Express Edition (XE) must be installed in your computer.
- Three versions of sample database, CSE\_DEPT.accdb, CSE\_DEPT.mdf, and Oracle version of CSE\_DEPT, must be installed in your computer in the appropriate folders.
- To run projects developed in Chapters 8 and 9, in addition to conditions listed above, an Internet Information Services (IIS), such as FrontPage Server Extension 2000 or 2002, must be installed in your computer, and it works as a pseudoserver for those projects.

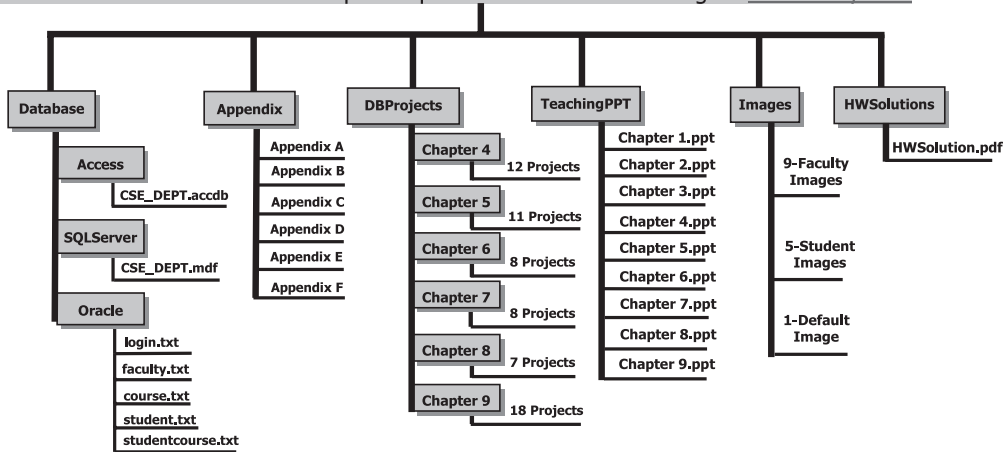
All book related teaching and learning materials, including the sample databases, example projects, appendices, faculty and student images, as well as sample Windows forms and Web pages, can be found from the associated folders located at the Wiley ftp site [ftp://ftp.wiley.com/public/sci\\_tech\\_med/practical\\_database\\_vb-net-2e](ftp://ftp.wiley.com/public/sci_tech_med/practical_database_vb-net-2e), as shown in Figure 1.2.

These materials are categorized and stored at different folders in two different sites based on the teaching purpose (for instructors) and learning purpose (for students):

1. **Appendix Folder:** Contains all appendices that provide useful references and practical knowledge to download and install database, database server and management systems and develop actual database application projects.
  - **Appendix A:** Provides detailed descriptions about the download and installation of Microsoft SQL Server 2008 R2 Express.
  - **Appendix B:** Provides detailed descriptions about download and installation of Oracle Database 11g Express Edition (XE).
  - **Appendix C:** Provides detailed discussions in how to use three sample databases: CSE\_DEPT.accdb, CSE\_DEPT.mdf, and Oracle version of CSE\_DEPT.

**FOR INSTRUCTORS:**

Instructor materials are available upon request from the book's listing on [www.wiley.com](http://www.wiley.com)



**FOR STUDENTS:**

[ftp://ftp.wiley.com/public/sci\\_tech\\_med/practical\\_database\\_vb](ftp://ftp.wiley.com/public/sci_tech_med/practical_database_vb)

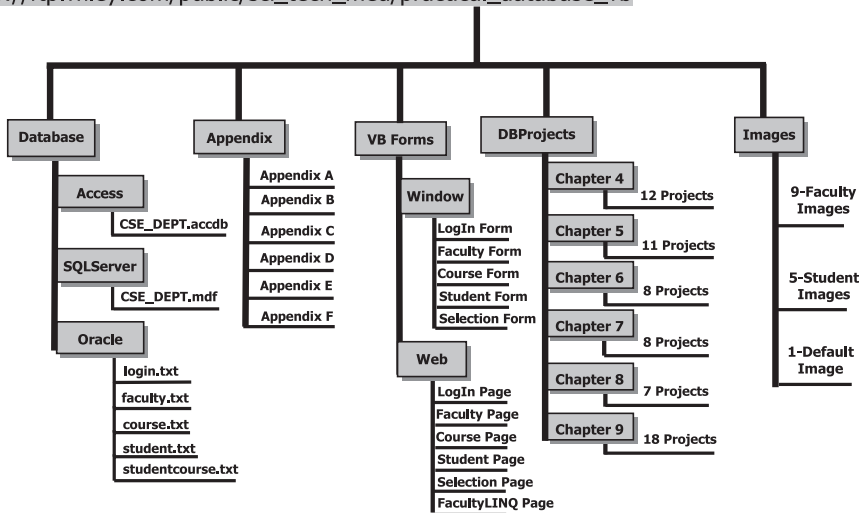


Figure 1.2. Book-related materials on website.



- **Appendix D:** Provides detailed discussions in how to create a user database in Oracle Database 11g XE using Unload and Load methods.
  - **Appendix E:** Provides detailed discussions in how to add Existing Oracle Stored Procedures into the VB Project Using the DataSet Configuration Wizard.
  - **Appendix F:** Provides detailed discussions in how to download and install a third-party Oracle Database driver **dotConnect 6.30**.
2. **Database Folder:** Contains three types of sample databases, CSE\_DEPT, such as CSE\_DEPT.accdb (Microsoft Access 2007), CSE\_DEPT.mdf (SQL Server 2008), and Oracle version of CSE\_DEPT. These sample databases are located at three subfolders, **Access**, **SQLServer**, and **Oracle**. Refer to Appendix F to get details in how to use these databases for your applications or sample projects.
  3. **DBProjects Folder:** Contains all sample projects developed in the book. Projects are categorized and stored at different chapter subfolder based on the book chapter sequence. Readers can directly use the codes and GUIs of those projects by downloading them from the DBProjects folder at the Wiley ftp site.
  4. **Images Folder:** Contains all sample faculty and student image files used in all sample projects in the book. Readers can copy and paste those image files to their projects to use them.
  5. **VB Forms Folder:** Contains all sample Windows-based forms and Web-based pages developed and implemented in all sample projects in the book. All Windows-based Forms are located at the Window subfolder, and all Web-based Pages are located at the Web subfolder. Readers can use those Forms or Pages by copying and pasting them into their real projects.
  6. **TeachingPPT Folder:** Contains all MS-PPT teaching slides for each chapter.
  7. **HWSolutions Folder:** Contains selected solutions for the homeworks developed and used in the book. The solutions are categorized and stored at the different chapter subfolder based on the book chapter sequence.

Folders 1~5 belong to learning materials for students; therefore they are located at the student site: [ftp://ftp.wiley.com/public/sci\\_tech\\_med/practical\\_database\\_vb](ftp://ftp.wiley.com/public/sci_tech_med/practical_database_vb). Folders 1~7 belong to teaching materials for instructors; they are located at the Wiley teaching site and available upon requests by instructors.

## INSTRUCTORS AND CUSTOMERS SUPPORTS

The teaching materials for all chapters have been extracted and represented by a sequence of Microsoft Power Point files, each file for one chapter. The interested instructors can find those teaching materials from the folder TeachingPPT that is located at the site <http://www.wiley.com>, and those instructor materials are available upon request from the book's listing on <http://www.wiley.com>.

A selected homework solution is also available upon request from the book's listing on <http://www.wiley.com>.

E-mail support is available to readers of this book. When you send an e-mail to us, please provide the following information:

- The detailed description about your problems, including the error message and debug message, as well as the error or debug number if it is provided.



- Your name, job title, and company name.
- How long you expect to get the answer to your questions.

Please send all questions to the e-mail address: [baidbbook@gmail.com](mailto:baidbbook@gmail.com).

Detailed structure and distribution of all book-related materials in the Wiley site, including the teaching materials for instructors and learning materials for students, are shown in Figure 1.2.