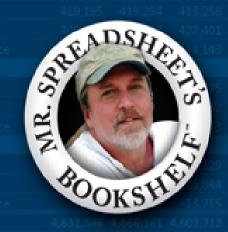
Microsoft®

Business Intelligence Tools for Excel Analysts

Michael Alexander Jared Decker Bernard Wehbe



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Microsoft® **Business Intelligence Tools**for Excel® Analysts

by Michael Alexander, Jared Decker, Bernard Wehbe

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Microsoft® Business Intelligence Tools for Excel® Analysts

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Microsoft Business Intelligence Tools for Excel Analysts

Table of Contents

About the Authors

Introduction

What You Need to Know

What the Icons Mean

How This Book Is Organized

Part I: Leveraging Excel for Business Intelligence

Part II: Leveraging SQL Server for Business Intelligence

Part III: Delivering Business Intelligence with SharePoint and Excel Services

Part IV: Appendixes

About the Companion Web Site

<u>Part I: Leveraging Excel for Business</u> <u>Intelligence</u>

<u>Chapter 1: Important Database Concepts</u>

<u>Traditional Limits of Excel and How Databases</u> <u>Help</u>

Scalability

<u>Transparency of analytical processes</u>

Separation of data and presentation

<u>Database Terminology</u>

Databases

Tables

Records, fields, and values

Queries

How Databases Are Designed

<u>Step 1: The overall design — from concept to</u> reality

Step 2: Report design Step 3: Data design

Step 4: Table design

Chapter 2: PivotTable Fundamentals

Introducing the PivotTable

Anatomy of a PivotTable Creating the basic PivotTable

Customizing Your PivotTable

Changing the PivotTable layout

Renaming the fields

Formatting numbers

Changing summary calculations

Suppressing subtotals

Hiding and showing data items

Hiding or showing items without data

Sorting your PivotTable

Understanding Slicers

Creating a standard slicer

Formatting slicers

Controlling multiple PivotTables with one

slicer

Creating a Timeline Slicer

Understanding the Internal Data Model

Building out your first Data Model

Using your Data Model in a PivotTable

Chapter 3: Introduction to Power Pivot

Understanding the Power Pivot Internal Data Model

Linking Excel Tables to Power Pivot

Preparing your Excel tables

Adding your Excel tables to the Data Model

Creating Relationships Among Your Power Pivot **Tables**

<u>Creating a PivotTable from Power Pivot Data</u>

Enhancing Power Pivot Data with Calculated Columns

Creating a calculated column

Formatting your calculated columns

Referencing calculated columns in other calculations

Hiding calculated columns from end users

<u>Utilizing DAX to Create Calculated Columns</u>

<u>Identifying DAX functions that are safe for</u> calculated columns

Building DAX-driven calculated columns

<u>Understanding Calculated Fields</u>

<u>Chapter 4: Loading External Data into</u> Power Pivot

Loading Data from Relational Databases

Loading data from SQL Server

<u>Loading data from Microsoft Access</u> databases

<u>Loading data from other relational database systems</u>

Loading Data from Flat Files

Loading data from external Excel files

Loading data from text files

Loading data from the clipboard

Loading Data from Other Data Sources

Refreshing and Managing External Data Connections

Manually refreshing your Power Pivot data

Setting up automatic refreshing

Preventing Refresh All

Editing your data connection

<u>Chapter 5: Creating Dashboards with</u> <u>Power View</u>

Activating the Power View Add-In

Creating a Power View Dashboard

Creating and working with Power View charts

Visualizing data in a Power View map

<u>Changing the look of your Power View</u> dashboard

<u>Chapter 6: Adding Location Intelligence</u> with Power Map

<u>Installing and Activating the Power Map Add-In</u>
Loading Data into Power Map

Choosing geography and map level

Handling geocoding alerts

Navigating the map

Managing and Modifying Map Visualizations

Visualization types

Adding categories

Visualizing data over time

Adding layers

Adding Custom Components

Adding a top/bottom chart

Adding annotations and text boxes

Adding legends

Customizing map themes and labels

<u>Customizing and Managing Power Map Tours</u>

Understanding scenes

Configuring scenes

Playing and sharing a tour

Sharing screenshots

Chapter 7: Using the Power Query Add-In

<u>Installing and Activating the Power Query Add-</u> In

Downloading the Power Query Add-In

Power Query Basics

Searching for source data

Shaping the selected source data

<u>Understanding query steps</u>

Outputting your query results

Refreshing Power Query data

Managing existing queries

<u>Understanding Column and Table Actions</u>

Column level actions

Table actions

Power Query Connection Types

<u>Creating and Using Power Query Functions</u>

Creating and using a basic custom function

Advanced function example: Combining all Excel files in a directory into one table

<u>Part II: Leveraging SQL for Business</u> <u>Intelligence</u>

Chapter 8: Essential SQL Server Concepts

SQL Server Components

SQL Server Relational Database Engine

SQL Server Management Studio

Connecting to a Database Service

SQL Server Security

Server access

Database access

Database object access

Working with Databases

<u>Creating a database</u>

Database maintenance

Working with Tables and Views

Creating a table

Creating a view

Data Importing and Exporting

Chapter 9: Introduction to SQL

SQL Basics

The Select statement

The From clause

Joins basics

The Where clause

Grouping

The Order By clause

Selecting Distinct records

Selecting Top records

Advanced SQL Concepts

The Union operator

Case expression

Like operator

Subqueries

Advanced joins

Advanced grouping

Manipulating data

<u>Chapter 10: Creating and Managing SQL Scripts</u>

Design Concepts

Stay organized

Move data in one direction

<u>Divide data according to metrics and</u>

attributes

Consider data volumes up front

Consider full data reload requirements

Set up logging and data validation

Working with SQL Scripts

Data extraction scripting

Data preparation scripting

Data delivery scripting

Error handling

Creating and altering stored procedures

Indexing and Performance Considerations

<u>Understanding index types</u>

Creating an index

Dropping an index

Additional tips and tricks

SQL Solutions to Common Analytics Problems

Creating an Active Members Report

Creating a Cumulative Amount Report

Creating a Top Performers Report

Creating an Exception List Report

<u>Chapter 11: Calling Views and Stored</u> <u>Procedures from Excel</u>

Importing Data from SQL Server

<u>Passing Your Own SQL Statements to External</u> Databases

Manually editing SQL statements

Running stored procedures from Excel

Using VBA to create dynamic connections

<u>Creating a Data Model with Multiple SQL Data</u> Objects

<u>Calling Stored Procedures Directly from Power</u> Pivot

<u>Chapter 12: Understanding Reporting</u> <u>Services</u>

Reporting Services Overview

Developing a Reporting Services Report

<u>Defining a shared data source</u>

<u>Defining a shared dataset</u>

<u>Deploying Reports</u>

The deployment process

Accessing reports

SSRS security

Managing Subscriptions

Chapter 13: Browsing Analysis Services OLAP Cubes with Excel

What Is an OLAP Database and What Can It Do?

Understanding OLAP Cubes

<u>Understanding dimensions and measures</u>

<u>Understanding hierarchies and dimension</u>

<u>parts</u>

Connecting to an OLAP Data Source

<u>Understanding the Limitations of OLAP</u>

PivotTables

Creating Offline Cubes

<u>Using Cube Functions</u>

Adding Calculations to Your OLAP PivotTables

Creating calculated measures

Creating calculated members

Managing your OLAP calculations

Performing what-if analysis with OLAP data

<u>Chapter 14: Using the Data Mining Add-In</u> <u>for Microsoft Office</u>

<u>Installing and Activating the Data Mining Add-</u> In

Downloading the Data Mining Add-In

Pointing to an Analysis Services database

Analyze Key Influencers

Detect Categories

Fill From Example

Forecast

Highlight Exceptions

Scenario Analysis

<u>Using the Goal Seek Scenario tool</u> <u>Using the What-If Scenario tool</u>

Prediction Calculator

Interactive cost and profit inputs

Score Breakdown

Data table

Profit for Various Score Thresholds

<u>Cumulative Misclassification Cost for Various</u>

Score Thresholds

Shopping Basket Analysis

Part III: Delivering Business Intelligence with SharePoint and Excel Services

<u>Chapter 15: Publishing Your BI Tools to</u> SharePoint

Understanding SharePoint

Why SharePoint?

<u>Understanding Excel Services for SharePoint</u>

Limitations of Excel Services

Publishing an Excel Workbook to SharePoint

Publishing to a Power Pivot Gallery

Managing Power Pivot Performance

Limit the number of columns in your Data

Model tables

Limit the number of rows in your Data Model

Avoid multi-level relationships

Let your back-end database servers do the

crunching

Beware of columns with non-distinct values

Avoid the excessive use of slicers

<u>Chapter 16: Leveraging PerformancePoint</u> <u>Services</u>

Why PerformancePoint?

PerformancePoint strengths

PerformancePoint limitations

Authoring Dashboards

Getting started

Launching the Dashboard Designer

Adding a data connection

Adding content

Publishing dashboards

<u>Using PerformancePoint Dashboards</u>

Interacting with filters

Dashboard navigation

Dashboard interactive capabilities

Part IV: Appendixes

<u>Appendix A: Understanding the Big Data</u> Toolset

Big Data SQL Offerings

Amazon Redshift

Hortonworks Hive

Cloudera Impala

IBM Big SQL

Google BigQuery

Facebook Presto SQL

Defining a Big Data Connection

Connecting to Big Data Tools with Excel

Modifying your connection

Using your connection

<u>Appendix B: Considerations for Delivering</u> Mobile BI

Mobile Deployment Scenarios and Considerations

Mobile devices

Browser-based deployments on mobile

devices

Running apps on mobile devices

Office 365

SQL Server Reporting Services

SharePoint 2010 and 2013

End User License Agreement

Introduction

Over the last few years, the concept of self-service business intelligence (BI) has taken over the corporate world. Self-service BI is a form of business intelligence in which endusers can independently generate their own reports, run their own queries, and conduct their own analyses, without the need to engage the IT department.

The demand for self-service BI is a direct result of several factors:

- ➤ More power users: Organizations are realizing that no single enterprise reporting system or BI tool can accommodate all of their users. Pre-defined reports and high-level dashboards may be sufficient for some casual users, but a large portion of today's users are savvy enough to be considered power users. Power users have a greater understanding data analysis and prefer to perform their own analysis, often within Excel.
- ➤ Changing analytical needs: In the past, business intelligence primarily consisted of IT-managed dashboards showing historic data on an agreed upon set of key performance metric. Managers today are demanding more dynamic predictive analysis, the ability to iteratively perform data discovery, and the freedom to take the hard left and right turns on data presentation. These managers often turn to Excel to provide the needed analytics and visualization tools.
- ➤ **Speed of BI:** Users are increasingly dissatisfied with the inability of IT to quickly deliver new reporting and metrics. Most traditional BI implementations fail specifically because the need for changes and answers to new questions overwhelmingly outpace the IT

department's ability to deliver them. As a result, users often find ways to work around the perceived IT bottleneck and ultimately build their own shadow BI solutions in Excel.

Recognizing the importance of the self-service BI revolution and the role Excel plays in it, Microsoft has made substantial investments in making Excel the cornerstone of its self-service BI offering. These investments have appeared starting with Excel 2007; to name a few: the ability to handle over a million rows, tighter integration to SQL Server, pivot table slicers, and the Power Pivot Add-in.

With the release of Excel 2013 and the Power BI suite of tools (Power Pivot, Power Query, Power Map, and Power View), Microsoft has aggressively moved to make Excel a player in the self-service BI arena.

The Power BI suite of tools ushers in a new age for Excel. For the first time, Excel is an integral part of the Microsoft BI stack. You can integrate multiple data sources, define relationships between data sources, process analysis services cubes, and develop interactive dashboards that can be shared on the web. Indeed, the new Microsoft BI tools blur the line between Excel analysis and what is traditionally IT enterprise-level data management and reporting capabilities.

With these new tools in the Excel wheelhouse, it's becoming important for business analysts to expand their skillset to new territory, including database management, query design, data integration, multidimensional reporting, and a host of other skills. Excel analysts have to expand their skillset knowledge base from the one dimensional spreadsheets to relational databases, data integration, and multidimensional reporting,

Microsoft Business Intelligence Tools for Excel Analysts is aimed squarely at business analysts and managers who find it increasingly necessary to become more efficient at working with big data tools traditionally reserved for IT professionals. This book guides you through the mysterious world of PowerPivot, SQL Server, and SharePoint reporting. You find out how to leverage the rich set of tools and reporting capabilities to more effectively source and incorporate business intelligence and dashboard reports. Not only can these tools allow you to save time and simplify your processes, they can also enable you to substantially enhance your data analysis and reporting capabilities.

What You Need to Know

The goal of this book is to give you a solid review of the business intelligence functionally that is offered in the Microsoft BI suite of tools. These tools include: Power Pivot, Power View, Power Map, Power Query, SQL Server Analysis Services, SharePoint, and PerformancePoint.

Throughout the book, we discuss the each particular topic in terms and analogies with which business analysts would be familiar. After reading this book, you will be able to:

- Use Power Pivot to create powerful reporting mechanisms
- ➤ Automate data integration with Power Query
- ➤ Use SQL Server's built-in Functions to analyze large amounts of data
- ➤ Use Excel pivot tables to access and analyze SQL Server Analysis Services data
- ➤ Create eye-catching visualizations and Dashboards with Power View

- ➤ Gain insight and analytical power with Data Mining tools
- > Publish dashboards and reports to the web

What the Icons Mean

Throughout the book, icons appear to call your attention to points that are particularly important.



We use Note icons to tell you that something is important— perhaps a concept that may help you master the task at hand or something fundamental for understanding subsequent material.



Tip icons indicate a more efficient way of doing something or a technique that may not be obvious. These will often impress your officemates.



we're describing can cause problems if you're not careful.

How This Book Is Organized

The chapters in this book are organized into four parts. Although each part is an integral part of the book as a whole, you can read each part in any order you want, skipping from topic to topic.

Part I: Leveraging Excel for Business Intelligence

Part I is all the business intelligence tools found in Excel. Chapter 1 starts you off with the fundamental database management concepts needed to work with the Microsoft BI tools. Chapter 2 provides an overview of PivotTables — the cornerstone of Microsoft BI analysis and presentation. In Chapters 3 and 4, you discover how to develop powerful integrated reporting mechanisms with Power Pivot. Chapters 5 and 6 shows you the basics of using Power View and Power Map to develop interactive visualizations and dashboards. Chapter 7 rounds out Part 1 with an exploration of data integration and transformation using Power Query.

Part II: Leveraging SQL Server for Business Intelligence

Part <u>II</u> focuses on leveraging Microsoft's SQL Server database tools to enhance your ability to develop business intelligence solutions. Chapters <u>8</u>, <u>9</u>, and <u>10</u> provide the fundamentals you need to manage data, create queries, and develop stored procedures in Microsoft SQL Server. Chapter <u>11</u> picks up from there, showing you how to incorporate SQL Server analyses into your Excel reporting models. Chapter <u>12</u> introduces you to SQL Reporting Services, showing you an alternative to Excel reports. In Chapter <u>13</u>, you discover how to browse and analyze Microsoft SQL Analysis Services

OLAP cubes. You wrap up Part II with Chapter 14 where you get a look at the Data Mining Add-In for Excel.

Part III: Delivering Business Intelligence with SharePoint and Excel Services

In Part III, you gain some insights on the role SharePoint plays in the Microsoft business intelligence strategy. Chapter 15 demonstrates how to leverage SharePoint and Excel Services to publish your reporting solutions to the Web. Chapter 16 wraps up your tour of the Microsoft business intelligence tools with a look at the PerformancePoint dashboard development solution for SharePoint.

Part IV: Appendixes

Part <u>IV</u> includes some peripheral material that completes the overall look at the business intelligence landscape. Appendix A provides a comparison of the currently available big data toolsets on the market today. Appendix B details some of the considerations for moving business intelligence solutions to mobile devices.

About the Companion Web Site

This book contains example files available on the companion Web site that is arranged in directories that correspond to the chapters. You can download example files for this book at the Web site:

www.wiley.com/go/bitools

PART I: Leveraging Excel for Business Intelligence

Chapter 1: Important Database Concepts

Chapter 2: PivotTable Fundamentals

Chapter 3: Introduction to Power Pivot

Chapter 4: Loading External Data into Power Pivot

Chapter 5: Creating Dashboards with Power View

Chapter 6: Adding Location Intelligence with Power Map

Chapter 7: Using the Power Query Add-In

Chapter 1: Important Database Concepts

In This Chapter

- Using a database to get past Excel limitations
- Getting familiar with database terminology
- Understanding relational databases
- How databases are designed

Although Excel is traditionally considered the premier tool for data analysis and reporting, it has some inherent characteristics that often lead to issues revolving around scalability, transparency of analytic processes, and confusion between data and presentation. Over the last several years, Microsoft has recognized this and created tools that allow you to develop reporting and business intelligence by connecting to various external databases. Microsoft has gone a step further with Excel 2013, offering business intelligence (BI) tools like Power Pivot natively; it effectively allows you to build robust relational data models within Excel.

With the introduction of these BI tools, it's becoming increasingly important for you to understand core database fundamentals. Unlike traditional Excel concepts, where the approach to developing solutions is relatively intuitive, good database-driven development requires a bit of prior knowledge. There are a handful of fundamentals you should know before jumping into the BI tools. These include database terminology, basic database concepts, and database best practices.

The topics covered in this chapter explain the concepts and techniques necessary to successfully use database environments and give you the skills needed to normalize data and plan and implement effective tables.

If you're already familiar with the concepts involved in database design, you may want to skim this chapter. If you're new to the world of databases, spend some time in this chapter gaining a thorough understanding of these important topics.

Traditional Limits of Excel and How Databases Help

Managers, accountants, and analysts have had to accept one simple fact over the years: Their analytical needs had outgrown Excel. They all met with fundamental issues that stemmed from one or more of Excel's three problem areas: scalability, transparency of analytical processes, and separation of data and presentation.

Scalability

Scalability is the ability for an application to develop flexibly to meet growth and complexity requirements. In the context of Excel, scalability refers to Excel's ability to handle everincreasing volumes of data. Most Excel aficionados are quick to point out that as of Excel 2007, you can place 1,048,576 rows of data into a single Excel worksheet. This is an overwhelming increase from the limitation of 65,536 rows imposed by previous versions of Excel. However, this increase in capacity does not solve all of the scalability issues that inundate Excel.

Imagine that you're working in a small company and using Excel to analyze your daily transactions. As time goes on, you build a robust process complete with all the formulas, PivotTables, and macros you need to analyze the data that is stored in your neatly maintained worksheet.

As your data grows, you start to notice performance issues. Your spreadsheet becomes slow to load and then slow to calculate. Why does this happen? It has to do with the way Excel handles memory. When an Excel file is loaded, the entire file is loaded into RAM. Excel does this to allow for

quick data processing and access. The drawback to this behavior is that each time something changes in your spreadsheet, Excel has to reload the entire spreadsheet into RAM. A large spreadsheet takes a great deal of RAM to process even the smallest change. Eventually, each action you take in your gigantic worksheet will result in an excruciating wait.

Your PivotTables will require bigger *pivot caches* (memory containers), almost doubling your Excel workbook's file size. Eventually, your workbook will become too big to distribute easily. You may even consider breaking down the workbook into smaller workbooks (possibly one for each region). This causes you to duplicate your work.

In time, you may eventually reach the 1,048,576-row limit of your worksheet. What happens then? Do you start a new worksheet? How do you analyze two datasets on two different worksheets as one entity? Are your formulas still good? Will you have to write new macros?

These are all issues that need to be dealt with.

You can find various clever ways to work around these limitations. In the end, though, they are just workarounds. Eventually you will begin to think less about the most effective way to perform and present analysis of your data and more about how to make something "fit" into Excel without breaking your formulas and functions. Excel is flexible enough that you can make most things "fit" into Excel just fine. However, when you think only in terms of Excel, you're limiting yourself, albeit in an incredibly functional way.

In addition, these capacity limitations often force you to have the data prepared for you. That is, someone else extracts large chunks of data from a large database, then aggregates and shapes the data for use in Excel. Should you always depend on someone else for your data needs? What if you have the tools to "access" vast quantities of data without relying on others to provide data? Could you be more valuable to the organization? Could you focus on the accuracy of the analysis and the quality of the presentation instead of routing Excel data maintenance?

A relational database system (like Access or SQL Server) is a logical next step. Most database system tables take very few performance hits with larger datasets and have no predetermined row limitations. This allows you to handle larger datasets without requiring the data to be summarized or prepared to fit into Excel. Also, if a process becomes more crucial to the organization and needs to be tracked in a more "enterprise-acceptable" environment, it's easier to upgrade and scale up if that process is already in a relational database system.

Transparency of analytical processes

One of Excel's most attractive features is its flexibility. Each individual cell can contain text, a number, a formula, or practically anything else you define. Indeed, this is one of the fundamental reasons Excel is such an effective tool for data analysis. You can use named ranges, formulas, and macros to create an intricate system of interlocking calculations, linked cells, and formatted summaries that work together to create a final analysis.

The problem with that is there is no transparency of analytical processes, meaning it is extremely difficult to determine what is actually going on in a spreadsheet. If you've ever had to work with a spreadsheet created by someone else you know all too well the frustration that comes with deciphering the various gyrations of calculations and links being used to perform an analysis. Small spreadsheets that perform a modest analysis are painful to

decipher but are usually still workable, while large, elaborate, multi-worksheet workbooks are virtually impossible to decode, often leaving you to start from scratch.

Compared to Excel, database systems might seem rigid, strict, and unwavering in their rules. However, all this rigidity comes with a benefit.

Because only certain actions are allowable, you can more easily come to understand what is being done within structured database objects, such as queries or stored procedures. If a dataset is being edited, a number is being calculated, or any portion of the dataset is being affected as a part of an analytical process, you can readily see that action by reviewing the query syntax or reviewing the stored procedure code. Indeed, in a relational database system, you never encounter hidden formulas, hidden cells, or dead named ranges.

Separation of data and presentation

Data should be separate from presentation; you do not want the data to become too tied into any one particular way of presenting it. For example, when you receive an invoice from a company, you don't assume that the financial data on that invoice is the true source of your data. It is a presentation of your data. It can be presented to you in other manners and styles on charts or on Web sites, but such representations are never the actual source of the data.

What exactly does this concept have to do with Excel? People who perform data analysis with Excel tend to fuse the data, the analysis, and the presentation together. For example, you often see an Excel workbook that has 12 worksheets, each representing a month. On each worksheet, data for that month is listed along with formulas,

PivotTables, and summaries. What happens when you're asked to provide a summary by quarter? Do you add more formulas and worksheets to consolidate the data on each of the month worksheets? The fundamental problem in this scenario is that the worksheets actually represent data values that are fused into the presentation of your analysis. The point here is that data should not be tied to a particular presentation, no matter how apparently logical or useful it may be. However, in Excel, it happens all the time.

In addition, because all manners and phases of analysis can be done directly within a spreadsheet, Excel cannot effectively provide adequate transparency to the analysis. Each cell has the potential of holding hidden formulas and containing links to other cells. In Excel, the line between analysis and data is blurred, which makes it difficult to determine exactly what is going on in a spreadsheet. Moreover, it takes a great deal of effort in the way of manual maintenance to ensure that edits and unforeseen changes don't affect previous analyses.

Relational database systems inherently separate analytical components into tables, queries, and reports. By separating these elements, databases make data less sensitive to changes and create a data analysis environment where you can easily respond to new requests for analysis without destroying previous analyses.

In these days of big data, there are more demands for complex data analysis, not fewer. You have to add some tools to your repertoire to get away from being simply "spreadsheet mechanics." Excel can be stretched to do just about anything, but maintaining such "creative" solutions can be a tedious manual task. You can be sure that the exciting part of data analysis is not in routine data management within Excel. Rather, it is in leveraging of BI

tools to provide your clients with the best solution for any situation.

Database Terminology

The terms *database*, *table*, *record*, *field*, and *value* indicate a hierarchy from largest to smallest. These same terms are used with virtually all database systems, so you should learn them well.

Databases

Generally, the word *database* is a computer term for a collection of information concerning a certain topic or business application. Databases help you organize this related information in a logical fashion for easy access and retrieval. Some older database systems used the term *database* to describe individual tables. Current use of *database* applies to all elements of a database system.

Databases aren't only for computers. There are also manual databases; sometimes they're referred to as manual filing systems or manual database systems. These filing systems usually consist of people, folders, and filing cabinets — and paper, which is the key to a manual database system. In a real manual database system, you probably have in/out baskets and some type of formal filing method. You access information manually by opening a file cabinet, taking out a file folder, and finding the correct piece of paper. Customers fill out paper forms for input, perhaps by using a keyboard to input information that is printed on forms. You find information by manually sorting the papers or by copying information from many papers to another piece of paper (or even into an Excel spreadsheet). You may use a spreadsheet or calculator to analyze the data or display it in new and interesting ways.