BUSINESS INTELLIGENCE SEMANTIC MODEL

APPLIED MICROSOFT SQL SERVER 2012 ANALYSIS SERVICES

Tabular Modeling

SAMPLE

Teo Lachev

WITH VIDEO DEMOS

Applied Microsoft SQL Server 2012 Analysis Services

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preface

At SQL Pass 2010 in November 2010, Microsoft announced that in the forthcoming release of SQL Server, PowerPivot has been extended with features for organizational BI under a new name – Business Intelligence Semantic Model (BISM). This news took many BI professionals, including your humble correspondent, by surprise. Prior to PASS, Microsoft disclosed that organizational business intelligence (BI) would be a major focus in Denali, which I interpreted to mean that they'd add enhancements to multidimensional cubes, only to find out that all the buzz was about PowerPivot and BISM.

I have to admit that I was disappointed at first. I felt that Microsoft was shifting their focus in the wrong direction. Not surprisingly, there was a plenty of negativity from influencers and the community. Some pronounced UDM dead. Others sneered at BISM as a toy. To its credit, Microsoft was quick to cover the collateral damage and to clarify the BISM positioning. They made it clear that BISM doesn't intend to replace OLAP and multidimensional cubes. Later, at TechEd North America 2011 in Atlanta, Microsoft rebranded BISM as an umbrella name for both the multidimensional (Multidimensional) and tabular (Tabular) paths to further reinforce this message.

So, how did I convert from a Tabular critic to its aficionado and decided to write a book about it? During the year after PASS, I've exchanged plenty of e-mails with the product groups and Microsoft was patient enough to listen to me and address my concerns. Their answers helped me to "get it" and see the big picture through more optimistic lenses. Tabular is essentially a fresh start for Microsoft in the BI space. It has a great potential because it aims to simplify OLAP, and it makes BI even more accessible – "to the masses, by the masses", as the popular Microsoft slogan goes. Its elegancy and versatility open new opportunities outside the core OLAP model, especially in the area of personal BI and team BI.

At the same time, however, I think that Microsoft got overexcited with Tabular and tilted too fast toward. They were missing the required balance at the expense of Multidimensional. Multidimensional has a very large install base, and it's still the preferred choice for data warehousing and OLAP. I personally believe that the Tabular journey will be evolutionary and that the market will decide the adoption pace.

This book attempts to restore that balance. I worked closely with Microsoft's Analysis Services team to provide an authoritative (yet independent) view of this technology to help you understand where and how to use it. Over the past two years, I've gathered plenty of real-life experience from BI solutions that used PowerPivot in one form or another. I've taught private and public classes and presented Tabular at conferences and local community chapters.

I decided to write this book to share with you the knowledge I harvested from my work with Tabular and to help you use it appropriately and efficiently. As its name suggests, the main objective of *Applied Microsoft SQL Server 2012 Analysis Services (Tabular Modeling)* it so to teach you the practical skills to implement Tabular-centric solutions for personal, team, and organizational BI.

Although this book is designed as a comprehensive guide to this technology, it's likely that you might have further questions or comments. As with my previous books, I am committed to help my readers with book-related questions via the book discussion forums on my company's web site, www.prologika.com. Happy modeling with Tabular!

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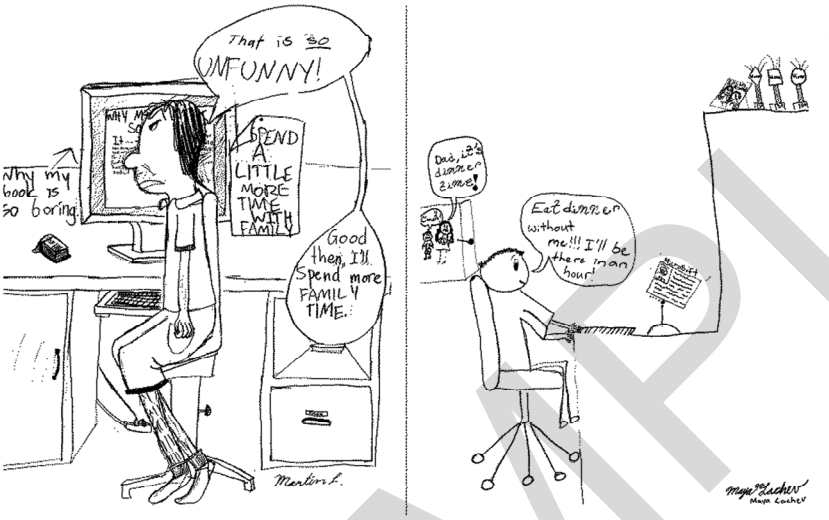
acknowledgements

Another SQL Server release and yet another book! Writing this one has been a lot of fun and a lot of work. It would not have been a reality without the help of many people to whom I am thankful. First and foremost, I'd like to thank my family for their ongoing support. They had to tolerate my long absence and put up with more than they had to. To my family I owe my greatest thanks.



Here is how my 8-year old son, Martin, and 11-year old daughter, Maya, portrait their absent father during his book writing project.

As an MVP, I've been privileged to enjoy close relationships with the SQL Server product groups. If it wasn't for their support, this book wouldn't have been a reality. Not only did they not mind my constant pestering and nagging, but they were even more eager to help me understand the "dark side" of Tabular! Akshai Mirchandani, Amir Netz, Ashvini Sharma, Cathy Dumas, Dave Wickert, Denny Lee, Edward Melomed, Jeffrey Wang, Julie Strauss, Kasper de Jonge, Marius Dumitru, Thomas Keiser, and T.K. Anand have contributed plenty of their time to educate me. The "insiders" lists rock! Special thanks to Akshai Mirchandani, Cathy Dumas, and Nickolai Medveditskov, for reviewing parts of the book and for helping ensure that it's technically accurate.

Writing a technical book while the product is still in development is like trying to hit a moving target because the product is constantly changing. Kudos to my technical reviewers, Burzin Mehernosh Daruwalla, Greg Galloway, Jen Underwood, and Norma O'Harra, for meticulously reviewing the manuscript and for proving feedback on how to improve it.

Thanks to my editor, Ed Price, from the SQL Server User Education team, for not losing faith that my incoherent readings could turn into something readable. Thank you for taking an extra mile and going beyond just checking the grammar. Your commitment and work was outstanding!

Finally, thank *you* for purchasing this book! I sincerely hope that you'll find it as enjoyable to read as it has been for me to write!

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about the book

The book doesn't assume any prior experience with Microsoft Analysis Services or PowerPivot. It's designed as an easy-to-follow guide for navigating the personal-team-organizational BI continuum with Tabular. It starts by introducing you to the Microsoft BI platform and to the Business Intelligence Semantic Model (BISM). You need to know that each chapter builds upon the previous ones, to introduce new concepts and to extend the sample Adventure Works model that you'll implement in the exercises. Therefore, I'd recommend you read the chapters and do the exercises in the order they appear in the book.

Part 1, *Personal Business Intelligence*, teaches business users how to implement personal BI models with PowerPivot. Chapter 2, *Personal BI Basics*, lays out the foundation of personal BI, and it provides the necessary technical background to understand PowerPivot models. In Chapter 3, *Importing the Data*, you'll witness the impressive data acquisition capabilities of PowerPivot. In Chapter 4, *Refining the Model*, you'll explore and enhance the raw model to make it suitable for reporting. Chapter 5, *Analyzing Data*, shows you how to build interactive Excel pivot reports to gain data insights. And, in Chapter 6, *Implementing Calculations*, you'll further extend the model with useful business calculations.

Part 2, *Team Business Intelligence*, teaches business users and IT professionals how to take advantage of the SharePoint document management and collaboration features to share PowerPivot models with other team members. Chapter 7, *Team BI Basics*, introduces you to the SharePoint Products and Technologies and teaches you how to install and configure PowerPivot for SharePoint. Written for business users, Chapter 8, *SharePoint Insights*, walks you through the steps for authoring interactive and operational reports. In Chapter 9, *Managing PowerPivot for SharePoint*, IT administrators will learn how to manage published models, configure data refresh, secure user access, and monitor the server utilization and PowerPivot activity.

Part 3, *Organizational Business Intelligence*, shows BI pros how to bring tabular models to the enterprise. Chapter 10, *Organizational BI Basics*, introduces you to organizational BI and shows you different ways to implement tabular models. In Chapter 11, *Designing Storage and Security*, you'll learn how to extend your models with scalability, security, and low-latency features. In Chapter 12, *Managing Tabular Models*, you'll wear administrator hats and learn how to manage deployed models and how to perform common management tasks, including backing up databases, scripting objects, deploying changes, automating and programming management jobs.

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source code

Applied Microsoft SQL Server 2012 Analysis Services demonstrates the full capabilities of Tabular for implementing personal, team, and organizational BI models. This requires installing and configuring various software products and technologies. **Table 1** lists the main software that you need for all the exercises in the book. Depending on your computer setup, you might need to download and install other components, as I explain throughout the book.

Table 1 The complete software requirements for practices and code samples in the book

Software	Required	Purpose	Chapters
Excel 2010 with PowerPivot for Excel	Yes	Implementing personal BI models.	2, 3, 4, 5, 6
SharePoint Server 2010 Enterprise with Reporting Services and PowerPivot for SharePoint	Yes	Implementing team BI models	7, 8, 9
Analysis Services Tabular with SQL Server Developer Tools Developer, Business Intelligence, or Enterprise edition	Yes	Implementing organizational BI models	10, 11, 12
SQL Server Database Engine Developer, Standard, or Enterprise 2008 R2 or later with the AdventureWorksDW2008R2 database	Yes	Importing and processing data	All
Analysis Services Multidimensional Developer, Standard, or Enterprise 2008 or later with the Adventure Works DW 2008 cube	No	Importing multidimensional data	3
Reporting Services Developer, Standard, or Enterprise 2008 R2 or later	No	Importing report feeds	3
Visual Studio 2010 Professional	No	Implement C# console application	12

Although the list is long, don't despair! The book includes step-by-step instructions for installing the first three software prerequisites, PowerPivot for Excel, PowerPivot for SharePoint, and Analysis Services in Tabular mode, in Chapters 2, 7, and 10 respectively. The book also provides alternative steps to complete the exercises if you don't install Analysis Services and Reporting Services.

You can download the book source code from the book page at http://bit.ly/thebismbook. After downloading the zip file, extract it to any folder of your hard drive. Once this is done, you'll see a folder for each chapter that contains the source code for that chapter. The source code in each folder includes the changes you need to make in the exercises in the corresponding chapter, plus any supporting files required for the exercises. For example, the Adventure Works.xlsx workbook in the Ch03 folder includes the changes that you'll make during the Chapter 3 practices and includes additional files for importing data. Save your files under different names or in different folders in order to avoid overwriting the files that are included in the source code.

The source code was tested with the Release Candidate 0 (RC0) build of SQL Server 2012 which was released in November 2011. Microsoft announced that this is a production-ready and feature-complete build.

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NOTE The data source settings of the sample models in this book have connection strings to databases and text files. If you decide to test the finished samples, you need to update all the data sources to reflect your specific setup. To do so, open the Adventure Works workbook in Excel, click the PowerPivot ribbon tab (you must have PowerPivot for Excel installed first), and then click the PowerPivot Window button. In the PowerPivot window (Design tab), click the Existing Connections button. Click each connection, and then click Edit. In the Edit Connection dialog box, change the connection settings as needed.

Installing the Adventure Works databases

Most of the code samples use the AdventureWorksDW2008R2 database. This is the R2 build of a Microsoft-provided sample database that simulates a data warehouse. The Product Catalog 2008 report in Chapter 3 also uses the AdventureWorks2008R2 database. However, if you don't have the AdventureWorks2008R2 database or Reporting Services, you can still follow this book because I provide alternative steps to import the required data from the data warehouse database (AdventureWorksDW2008R2). Microsoft has bundled all the Adventure Works databases into a single download.

NOTE Microsoft is working on an updated version of the Adventure Works databases for SQL Server 2012. The SQL Server 2012 versions are expected to include incremental changes from the R2 releases. They haven't been tested with this book's code samples. If you decide to install the SQL Server 2012 version of the sample databases, you might find that the practice steps differ somewhat from your setup and that the reports might show different data.

Follow these steps to download the Adventure Works databases:

1. Open the Microsoft SQL Server Product Samples Database webpage on Codeplex (http://www.codeplex.com/MSFTDBProdSamples).
2. Click the SQL Server 2008R2 link. The link URL as of the time of this writing is http://bit.ly/adventureworksR2. Click the AdventureWorks2008R2_SR1.exe link.
3. When Internet Explorer prompts you, click Run to download and execute the setup program.
4. The setup program includes all the Adventure Works databases. In the Adventure Works Community Sample Databases step of the setup, make sure that the "AdventureWorks OLTP 2008R2" and "AdventureWorks Data Warehouse 2008R2" are selected. If you plan to deploy the Adventure Works cube, select also the "AdventureWorks OLAP Standard 2008R2" database if you have SQL Server 2008 (or above) Standard edition. Or, check the "AdventureWorks OLAP Enterprise 2008R2" database if you have SQL Server Developer, Enterprise, or Business Intelligence edition. The setup installs only the project files and it doesn't deploy the cube (the cube deployment steps are provided in the "Installing the Adventure Works cube" section.
5. To verify that the relational databases are installed, open SQL Server Management Studio (SSMS), and then connect to the SQL Server instance that hosts the Adventure Works databases.
6. Expand the Databases folder. You should see the AdventureWorks2008R2 and AdventureWorksDW2008R2 databases.

Installing the Adventure Works cube

In Chapter 3, you import data from the AdventureWorks Analysis Services cube, but I include alternative import steps if installing the cube is not an option. If you decide to import from the cube, install the Analysis Services AdventureWorks solution as follows:

1. Open the AdventureWorks Analysis Services solution (Adventure Works.sln) in Business Intelligence Development Studio (if you have SQL Server 2008 R2) or SQL Server Data Tools (if you have SQL Server 2012). Here is default folder where the Analysis Services solution is located:

```
\Program Files\Microsoft SQL Server\100\Tools\Samples\AdventureWorks 2008 Analysis Services Project
```

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2. In the Solution Explorer, right-click the project node, and then click Properties.
3. In the Property Pages dialog box, click the Deployment tab. In the Server field, type the Analysis Services instance to which the cube will be deployed, such as *localhost* if you've installed Analysis Services on the default instance on your local server. Click OK.
4. In Solution Explorer, right-click the project node, and then click Deploy to deploy the project.
5. In SQL Server Management Studio, connect to the Analysis Services instance (see Step 3).
6. Expand the Databases folder. You should see the Adventure Works DW 2008 database.

Watching the video demos

Designing a tabular model is a click-intensive process. I captured video demos to help you stay on track when a picture is worth more than a thousand words (sometimes you just have to see it to understand). The video demos are bonus material to the book. The play symbol (▶) next to a section title indicates that there is a video demo for this section. Video demos are provided for a subset of the practical exercises and are not intended to exactly match the steps included in the book. The book web page (http://bit.ly/thebismbook) provides a link to the video demos that you can watch online.

Reporting errors

This book has no bugs! Well, that's the goal, anyway. We both know that this statement is over-ambitious to say the least. Please submit bug reports to the book discussion list on http://prologika.com/cs/forums/default.aspx. Confirmed bugs and inaccuracies will be published to the book errata document. A link to the errata document is provided in the book web page.

The book includes links to web resources for further study. Due to the transient nature of the Internet, some links might be no longer valid or might be broken. Searching for the document title is usually sufficient to recover the new link.

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