Mastering the SAP® Business Information Warehouse, Second Edition
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Leveraging the Business Intelligence Capabilities of SAP NetWeaver

Kevin McDonald
Andreas Wilmsmeier
David C. Dixon
W.H. Inmon

Wiley Publishing, Inc.
For

Theodora and Malcolm

Rita, Theresa, and Arne

Karl
Kevin McDonald is a consultant and entrepreneur. He co-founded and was the CEO of COMPENDIT, Inc., a consulting services firm acquired by Inforte Corp. in 2004. He was an Ernst and Young Entrepreneur of the Year regional finalist and was recognized by *Entrepreneur* magazine for having created a “Hot 100” fastest-growing new business. He has instructed, implemented, and designed enterprise decision-processing systems for dozens of clients. Prior to co-founding COMPENDIT, Kevin was the Director of New Dimension Technology and a corporate spokesperson for SAP, where he had worked in both America and Germany. He was program manager during the successful market launch of SAP Business Information Warehouse (SAP BW), and he authored the SAP BW product map that was first used to define the scope and development direction for the software.

Kevin started his career at Baxter Healthcare, where he held positions in both IT and finance functions. He has authored numerous articles about SAP’s Business Intelligence Solution for The Data Warehouse Institute’s newsletter, and he has made presentations on business intelligence at DCI’s Data Warehouse World, HP World, ERP World, TDWI conferences, ASUG, SAP TechEd, SAP Sapphire, Decision Processing 98 and 99, and Informatica World. Kevin is an advisor to the Cognos Innovation Center and may be contacted at kevin.mcdonald@renditionx.com.
Andreas Wilmsmeier is a managing director of Inforte Deutschland. Andreas has been a member of the initial SAP BW core development team, where he has been responsible for designing and implementing parts of the Staging Engine (for example, the Staging BAPI). Andreas has been consulting SAP BW clients since the initial customer shipment of SAP BW 1.2A in early 1998 and has continued to contribute to the development of SAP BW by providing feedback from the field and to the development of business content for the financial services and defense industries.

After receiving his diploma in computer science and business economics, Andreas started his career in developing data warehouse and Internet solutions. Prior to working for Inforte, Andreas ran the German subsidiary of COMPENDIT until its acquisition by Inforte in early 2004.

His knowledge of data warehousing, data mining, and knowledge management has been showcased at numerous international conferences, including SAP Sapphire, SAP TechEd, ASUG, Cebit in Hanover, Germany, and Systems in Munich, Germany. Andreas has authored articles in the *SAP Technical Journal* (now featured on intelligentERP.com) and the German-language *E/3 Magazine*. Andreas may be contacted at andreas.wilmsmeier@inforte.com.

David Dixon is a vice president with Inforte’s SAP Practice, where he is responsible for ensuring the quality of Inforte solutions and project deliveries. A recognized authority in business intelligence, he has extensive full-lifecycle project experience in architecting and implementing complicated global solutions for Fortune 100 companies. David has also worked with the SAP SEM and SAP BI development teams on numerous occasions in support of the latest products.

Prior to joining Inforte, David worked for COMPENDIT, a consulting firm acquired by Inforte in March 2004, where he was a founding team member. Prior to joining COMPENDIT, he was a Platinum Consultant with SAP. David started his career as a Financials and Controlling (FI/CO) consultant with SAP in 1995, specializing in all of the SAP reporting and analysis applications and tools. An accomplished speaker, he has presented at industry-leading SAP and BI events, including SAP TechEd, ASUG, and TDWI. He may be contacted at david.dixon@inforte.com.
Bill Inmon is thought of as the “father of the data warehouse” and is co-creator of the “corporate information factory.” He has more than 28 years of experience in database technology management and data warehouse design. He is known globally for his seminars on developing data warehouses and has been a keynote speaker for every major computing association and many industry conferences, seminars, and trade shows. Bill has written about a variety of topics on building, usage, and maintenance of the data warehouse and the corporate information factory. More than 500 of his articles have been published in major computer journals such as Datamation, ComputerWorld, and Byte magazine. Bill is currently a columnist with Data Management Review and has been since its inception. He has published 39 books.

Bill founded and took public a Silicon Valley company, Prism Solutions, in 1991. Prism Solutions became Ardent Software, which was acquired by Informix, renamed Ascential Software, and acquired by IBM. The software he created is still used by hundreds of companies today. More recently, Bill decided to publish his vast data warehousing information resources on his Web site at www.billinmon.com. The Web site has now grown to support millions of visitors a month. Bill consults with a large number of Fortune 1000 clients, offering data warehouse design and database management services.
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Today’s challenging business environment calls for a flexible approach to business processes that integrates and embeds analytics. In 1997, SAP started developing its own enterprise data warehouse and business intelligence solution, the SAP Business Information Warehouse. Nine years later, these capabilities find themselves at the center of SAP NetWeaver. This new breed of software not only provides mature business intelligence capabilities; it openly enables organizations to flexibly model, expose, and optimize business processes.

The Business Intelligence capabilities of NetWeaver now play a central role in nearly every solution brought to market by SAP. SAP NetWeaver enables customers to accurately forecast and strategically analyze information for better customer service, optimized business operations, and improved corporate performance. By embedding these analytic capabilities and advanced technologies, SAP customers may realize maximum benefits as quickly as possible while maintaining the flexibility to change their business processes over time.

The writing and publishing of this book’s second edition reflects the success of and the growing adoption of SAP NetWeaver. Thousands of customers are already using the business intelligence capabilities in productive applications — sourcing data from SAP and non-SAP systems alike, some with thousands of users and terabyte-sized databases.

*Mastering the SAP Business Information Warehouse* links theoretical enterprise data warehousing concepts to customer requirements, and details the options for implementing powerful analytic engines. It speaks to data warehousing specialists, as well as those who have implemented ERP solutions. The authors of this book all have long-term experience in data warehousing, reporting, and analytic applications. Their perspective on SAP comes from years of implementations and working with our development teams on enhancing the offering.
Integral to the success of any business scenario is the availability of resources and guides that describe how to successfully deploy professional solutions. You need this information from people who have been in the trenches, who have implemented successful projects, and who can speak from experience, not simply theory. This book provides you with the best of three worlds: an understanding of business intelligence, application of these concepts to SAP NetWeaver, and the authors' own expertise in setting strategies and deploying solutions.

So, sit back, enjoy this book from cover to cover, and use it as a reference during your implementations.

—Dr. Heinz Haefner
Senior Vice President SAP
NetWeaver Development
SAP AG, Walldorf
From the first edition: First, we would like to thank Bob Elliott and Emilie Herman of Wiley for their guidance and patience through the authoring process and for providing us the opportunity to share what we have learned about SAP in this book. The copyediting team at Wiley has helped create a common voice and a consistency throughout the chapters that we may not have been able to accomplish on our own. We would also like to thank our co-author, Bill Inmon, who joined the authoring team shortly after the project started. He provided the needed stimulus to take the project to completion.

Writing a book about a software component that has hundreds of people dedicated to evolving the product as quickly as possible presented an interesting challenge. There were many individuals and teams at SAP AG, SAP Portals, SAP America, and SAP International that provided invaluable feedback and support, without which this book may never have happened. The list below does not come close to acknowledging all the people who supported us in our lives, careers, and on this project.

A special thank you goes to Klaus Kreplin, Dr. Werner Sinzig, and Lothar Kallweit for their guidance and mentoring through the years. The SAP BW development and product management teams, namely Heinz Häfner, Lothar Henkes, Claudia Weller, Gunther Rothermel, and from the marketing department, Sabine Eggl, provided great support in straightening out the SAP BW architecture sections in the book. We’d also like to thank Mark A. Smith for his eleventh-hour briefing on the SAP Business Intelligence Solution and his insight over the years as we have often debated the future of the industry.

For the second edition: First, we would like to thank Bob Elliott, Kevin Shafer, and the rest of the Wiley team for providing us with the opportunity and sup-
port needed to write a second edition to this book, as well as to Bryan Katis for allowing us to convince him that he had time tech edit this edition. We could not have completed this edition without his near-daily support.

Writing this book presented an interesting challenge. Much like an artist painting the horizon, every time we wanted to get closer to our subject matter, it kept moving away from us. There were many individuals at SAP helping us to accurately detail our horizon. A special thank you goes to Marc Bernard, Scott Cairncross, Heinz Hafner, Tobias Hagen, Lothar Henkes, Rainer Holtké, and Stefan Sigg. The SAP Regional Implementation Groups (RIGs) have rounded out our thoughts in several areas related to system administration and performance. Finally, thank you to Chris Reitz for sharing his EDW project experience and contributing to Chapter 5.

A very special thank you to Julia for her support, Theodora for keeping her little fingers off the keyboard, and Malcolm for sleeping through the night; and to Rita, Theresa, and Arne for their support and patience throughout the authoring process. Stefan Krauskopf and Mohammad Mazhar — we couldn’t have done it without you. A lifetime’s worth of thank you to Karl H. Dixon for his teachings, written examples, and the loving memories he has left his family and friends.

A final thanks to the readers of the first edition for your kind words and insightful suggestions.
While we have seen only a few IT shops that rely exclusively on SAP software, the percentage of business processing conducted via SAP software has steadily increased. More and more corporations have successfully implemented SAP. These organizations may have started their projects in isolated divisions, but over the past decade, larger portions of the business are being run on SAP software. We see many organizations adopting IT philosophies that have SAP software as the default solution. It is not uncommon to hear a CFO comment, “You better have a very good reason not to use the SAP software we already paid for.” These organizations have moved beyond automating and integrating business processes and want to optimize their business performance, reduce the slack in their supply chains, and realize the potential value of their customer relationships.

Parallel to the ERP and business process reengineering evolution was the evolution of informational processing, now commonly referred to as business intelligence. The explosive growth in data captured by organizations (in part because of the rapid adoption of Internet technologies) has made available an increasing amount of business information. This, combined with the increased pace in the way business is conducted, has created significant demand for efficient decision-making processes. The data warehouse was conceived to enable such processes.

SAP has brought to market NetWeaver software that has created a tremendous opportunity for organizations to lay a common technical foundation on which flexible business processes may be defined, executed, and altered as part of larger composite applications. The line between transaction processing and decision processing has disappeared. SAP NetWeaver was the eraser. Organizations that implement SAP NetWeaver will find they are able to quickly deploy business processes that span systems and company boundaries, that
embed predictive analytics and apply prescriptive business rules, and that increase the velocity and effectiveness of decision-making.

Why did we write this book? At the time we wrote the first edition, many books on SAP focused on step-by-step instructions for accomplishing a given configuration task and spoon-fed readers with checklists, transaction codes, and code samples. Our goal was to bridge the gap between these low-level books and the high-level books that focused on data-warehousing architectures but did not necessarily explain how SAP software could be used to realize such architectures. Our goal, then, was to create a reference that exposed the various implementation options available in SAP BW by defining the fundamental architecture and concepts to enable readers to understand and use those options. With the second edition, we have updated the content to cover the BI capabilities of NetWeaver2004s.

This second edition should inspire readers to implement these options in order to strategically analyze information and accurately forecast optimized operations, better customer service, and improved bottom-line performance. SAP BI has richness in functionality that extends beyond the capacity of any one person to know in detail every option available in the software and the potential consequences that implementing one option may have on another. The product’s maturity and importance to SAP NetWeaver compelled us to update the first edition and once again share our knowledge from within the industry.

We have taken the approach that technology is there to serve business and have counterbalanced technical sections with commentary on how a particular option may be used to drive business value. Mastering the SAP Business Information Warehouse looks at options for modeling, deploying, populating, accessing, analyzing, presenting, planning, and administering data and information in SAP NetWeaver. This book is our contribution to accelerating the search for actionable information.

Who Should Read This Book

We are assuming that you, the project team member, are familiar with mySAP ERP, although you may not be as familiar with data warehousing, business intelligence, or SAP NetWeaver.

Business and IT professionals of large organizations who are considering implementing SAP will also find this book useful, as the BI capabilities in NetWeaver are the underpinning for every business solution that they sell.

How This Book Is Organized

As we note in the “Acknowledgments” for the second edition, writing about SAP software is extremely difficult because it is constantly changing. Not only
is functionality added in new releases, but features, functions, and even entire products are renamed, repositioned, or morphed into new offerings. This is very much the case with SAP BW. SAP BW is now referred to as a capability (or, more specifically, as a business intelligence capability) of SAP NetWeaver. We have (as a matter of convenience and comfort to the reader) continued to use the term “SAP BW” when addressing BI capabilities. As we wrote the second edition, we made difficult choices on what to include and not include as it relates to the broader NetWeaver platform. We decided to add a chapter dedicated to detailing the platform. The content in the second edition has been updated to reflect NetWeaver2004s and the embedded SAP BW version 7.0.

This book may be thought of as consisting of four parts, meant to reflect the process an organization goes through during an implementation of the software. We begin with an introduction to business intelligence and SAP NetWeaver, which is meant to provide a backdrop for readers who may come from more of a mySAP ERP implementation background than a data warehousing background. Chapter 1 is an introduction to business intelligence and how enterprises tackle such challenges as:

- Extracting data from online transaction processing systems
- Eliminating poor data quality
- Structuring data in such a way that history may be recorded and recalled

From these needs arose the idea of combining both traditional data with documents to offer organizations a collaborative platform for analyzing information and optimizing business performance. Today, this is called business intelligence.

While business intelligence is not new, the toolsets available to realize such are constantly changing. We have entered a time when technical integration is a worry of the past, and semantic and process integration are at the forefront.

In Chapter 1, we examine SAP’s offerings. You will quickly see what SAP realized around 1996: that ERP systems are not designed for analytical processing. We explain the challenges of reporting and analyzing data in the ERP system.

Readers familiar with data warehousing, the evolution of SAP, and information processing may wish to start reading the book at Chapter 2, where we discuss SAP NetWeaver and all of its capabilities. In this chapter, we define the major architectural components and set the context for the business intelligence capabilities described throughout the remainder of the book.

From data extraction to the analysis of information and creation of Web applications, readers will start to understand the breadth and depth of functionality in SAP while reading Chapter 3. We also map SAP to the corporate information factory (CIF). You will quickly see the characteristics SAP has in common with non-SAP data warehousing platforms, as well as the unique features found in NetWeaver.
The second part of this book focuses on metadata and the options available to information modelers as they work to deliver value data. Chapter 4 explains the information model and how this collection of metadata objects (which describe business processes, business objects, information containers, and their mutual relationships, as well as how the scope, granularity, and semantics of information available in the system) are important parts of a proper deployment of a business intelligence solution.

New to the second edition is Chapter 5, where we define and compare the layers found in enterprise data warehouse implementations. We look at the characteristics of each layer, including the staging area, ODS, Data Warehouse, and InfoMart, and detail the differences among them. The modeling options, as well as example topologies, are also elucidated. We end the chapter with a section on governance and the organizational design needed to support an enterprise data warehouse.

The third section of the book focuses on the services available in the SAP BW used to realize such an information model (Chapters 6 through 10). These include the following:

- Extraction, transfer, and loading (ETL) services
- Data storage services
- Information analysis and distribution
- Services supporting integrated planning and information presentation

Chapter 6 leads readers through identifying the SAP sources of data, extracting data from these sources, applying the transformations required, and storing the transformed data in a way that best supports reporting and analysis. In other words, this chapter presents the functionality provided by the ETL aspects of the business intelligence capabilities of NetWeaver. This is often the most time-consuming part of building a data warehouse solution. In the CIF framework, this is referred to as “sourcing and manufacturing of data and information.” The options described in Chapter 6 will enable readers to take an information model and instantiate it in SAP software. Chapter 6 also describes how to integrate and transform data so that it may be stored in the various constructs (such as DataStore Objects, InfoCubes, and Master Data).

Chapter 7 picks up the information logistics process where Chapter 6 leaves off and highlights the main services provided in SAP BW that access data, turn it into meaningful business information, and deliver it to the analysis services. The chapter has been organized in three main sections: SAP BW information access, analysis services, and distribution services. We also have included a section on the application programming interfaces (APIs) options, with which custom applications or third-party tools may interface. A significant section of this chapter has been dedicated to the analytic process designer and the predictive analytics capabilities found therein.
Chapter 8 describes the Business Explorer tools, including BEx Report Designer, BEx Analyzer, BEx Mobile, and BEx Web Application Designer.

Chapter 9 is an entirely new chapter that covers the concepts of integrated planning. Here we discuss the concepts of planning, including some of the best and worst practices we have seen. The chapter covers three main areas of planning: process, data, and technology.

Because NetWeaver is a platform for building analytic applications, we have reformulated and dedicated a chapter to business analytics in the second edition, whereas the first edition included two chapters (one on Business Content and one on analytic applications). This reformulated Chapter 10 details the architecture and three different examples of analytic applications. The three analytic applications covered are customer relationship analytics, supply chain analytics, and financial analytics. We use the analogy of building blocks to help describe Business Content, in the sense that Business Content includes the extraction for data sources, transformation of that data, storage in a schema, and the queries and applications that access and present the information. These building blocks are foundational to analytic applications. The usability of Business Content is assessed and the challenges to its growth critiqued.

The last section focuses on the administration and performance options for the software component (Chapters 11 and 12). In this section, administration tasks — both process-oriented tasks and system-oriented tasks — are described.

Chapter 11 begins by describing process-oriented tasks, which consist of application processes such as scheduling, monitoring, and troubleshooting of data loads, as well as archiving. System-oriented tasks consist of security measures, transports, and upgrades. There are many different application processes besides data loading, such as index maintenance, building aggregates, and batch scheduling of reporting jobs. All these application processes can have complex dependencies.

Also in Chapter 11, SAP BW security is explained from a design perspective, detailing the decisions to make when building authorizations, such as making them user-based versus role-based, or object-centric versus data-centric. We continue the administration section by describing the options in the change management system with specific attention on the transportation of metadata from a development system to quality assurance and production. We conclude Chapter 11 by looking at the considerations for a multilayered application environment when performing an upgrade.

From an end user’s perspective, the data warehouse is only as good as the last query. Performance should be carefully planned and given constant attention. However, because of the discontinuous, unpredictable user behavior characteristic of an information consumer, this may prove to be a challenging task. In Chapter 12, we describe the performance management process and the BI Accelerator. We have divided this discussion into two parts: performance planning and performance management.
During the system development process, performance planning is essential. Performance planning lays the foundation for overall system performance. It involves reviewing information models; designing an appropriate information logistics model and system landscape; implementing efficient transformations; defining parallel, collision-free data loads and data maintenance process chains; and managing user expectations.

Performance management, on the other hand, is part of production system administration. It entails monitoring all processes and resources in the system. We describe how the system may be tuned by defining aggregates, adjusting operating system parameters, determining database management system settings, and configuring hardware. Like many of the options that we describe in the book, performance planning and performance management deal with trade-offs. The trade-offs in this case are among disk and memory space, flexibility, loading time, and retrieval time.

Throughout the book, we have included images, lists, notes, and tips to help you implement your own solutions. This book is not a step-by-step list of configuration settings, and it is not intended to be a substitute for hands-on learning. You do not become a black belt in karate by reading a book. The same is the case with mastering SAP. We encourage you to log in to a test system, configure the services described in this book, and assess the trade-offs.

What’s on the Web Site

The accompanying Web site for this book can be found at www.wiley.com/compbooks/mcdonald. It contains updates to the technology and the book.

From Here

In the third century B.C., Greek writer Plutarch may have put it best when he wrote, “The mind is not a vessel to be filled, yet a spark to be lighted.” It is our hope that readers of this book will discover the options available in SAP NetWeaver and uncover a new means to improve business performance. We hope you enjoy the book as we open with Chapter 1 and an introduction to business intelligence.