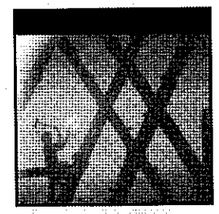

The Data Model Resource Book Revised Edition Volume 2

A Library of Universal Data Models by Industry Types

Len Silverston

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Advance Praise for *The Data Model Resource Book, Revised Edition, Volume 2*

"In addition to being an excellent resource for data modelers, this book will help managers, business analysts, and architects gain a high-level understanding of various industries and integration challenges facing IT professionals. Len's concepts, insights, and models provide a valuable contribution to data architecture."

Regina Pieper
Enterprise Architect, Sun Microsystems

"Len Silverston has produced an enormously useful two-volume compendium of generic (but not *too* generic) data models for an extensive set of typical enterprise subject areas, and for various industries that any data modeler will likely encounter at some point in his or her career. The material is clearly written, well organized, and goes below the obvious to some of the more perverse and difficult information requirements in an enterprise. This is an invaluable resource for doing one's homework before diving into any modeling session; if you can't find it here, there is certainly a very similar template that you can use for just about any situation with which you might be faced."

William G. Smith
President, William G. Smith & Associates

"In today's fast-paced e-oriented world, it is no longer acceptable to bury business constraints in hard-to-change data structures. Data architects must comprehend complex requirements and recast them into data architecture with vision for unforeseen futures. Len's models provide an outstanding starting point for novice and advanced data architects for delivering flexible data models. These models position an organization for the business rule age. Their proper implementation and customization allows the organization to externalize and manage business policies and rules so that the business can proactively change itself. In this way, the data architecture, based on Len's models and procedures for customizing them, becomes by design the foundation for business change."

Barbara von Halle
Founder, Knowledge Partners, Inc.
Co-author of Handbook of Relational Database Design

"These books are long overdue and a must for any company implementing universal data models. They contain practical insights and templates for implementing universal data models and can help all enterprises regardless of their level of experience. Most books address the needs for data models but give little in the way of practical advice. These books fill in that void and should be utilized by all enterprises."

Ron Powell
Publisher, DMReview

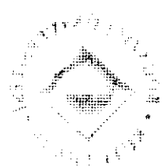
"I was first introduced to *The Data Model Resource Book* three years ago when I was hired by a firm who wanted an enterprise data model. This company did not believe the dictum that 'all companies are basically the same'; they felt they were somehow unique. After a little analysis with Len Silverston's help, we found that we were actually quite a bit the same: we had customers, accounts, employees, benefits, and all the things you'd find in any corporation. All we had to do was adapt the *product* component of Len's book and we were ready to move ahead with a great framework for all of our data. A CD-ROM that accompanies the book provided scripts to build the model in Oracle very quickly. We then began mapping all of our detailed data types to the enterprise model and, voila, we could find a place for all of those various spellings and misspellings of Account Number.

"Volume 2 of this revised edition provided even more exciting features: models of industry-specific data. I began to see interesting patterns that permeated this volume. For example, a reservation is a reservation, whether you're an airline, a restaurant, or a hotel. (We even have something similar in the oil industry—the allocation.)

"Another concept from the book that has changed my thinking and vocabulary is the word 'party.' I recently managed a project in which an employee could also function as a customer and as an on-line computer user. The team was in disagreement regarding a name for this entity; but after checking *The Data Model Resource Book*, we realized that here we had a party playing three roles.

"Whether your job is to jump-start a data warehouse project or borrow ideas for any subject area in your next operational database, I highly recommend *The Data Model Resource Books, Revised Edition, Volumes 1 and 2*, as your bible for design."

Ted Kowalski
Equilon Enterprises LLC
Author of Opening Doors: A Facilitator's Handbook



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Foreword

Len Silverston has been a proponent of universal data models (also called generic data models, or data model patterns) for as long as I have known him. I have other friends that argue the case for "specific models" as opposed to "generic models." I am sure that there are trade-offs on both sides of the argument, as you would find trade-offs with any complex engineering solution.

However, when it comes to Len's most recent book, *The Data Model Resource Book, Revised Edition, Volume 2*, this generic model argument is not even an issue! It doesn't make any difference how you come down on the argument, and it doesn't make any difference if you consider Len's models to be generic or specific in nature. Any way you look at it, it is a lot easier and faster to start with something somebody else has already put down on paper than to have to start with a blank sheet of paper and create something from scratch yourself!

Len has made a major contribution to us in publishing the set of industry models in this book. It is clear that he has done a lot of research in preparing to write the book, and it is also clear that he has capitalized on his vast experience in implementing the universal models. He has created enterprise-wide models for eight different industries, which in various combinations and permutations may well satisfy the bulk of what is needed by any specific Enterprise in virtually any industry!

Now, let's get pragmatic. Starting with a universal data model does not absolve anyone of the responsibility of knowing his or her own enterprise intimately, at even an excruciating level of detail! Nor does it absolve anyone from the responsibility of learning how to build data models!! What you have to do is start with the universal model and then, understanding data modeling and understanding your own enterprise, make the necessary modifications to make the universal model your own.

By starting with an enterprise-wide universal model, you will save yourself one heck of a lot of work—that is, time and money—trying to create the model yourself. What's more, you're more likely to produce a higher quality model than if you started from scratch, since you can be assured that you won't overlook key components of the model. Even if you are implementing a single appli-

cation—that is, you are not attempting to build an Enterprise-wide model—you are still way ahead of the game using one of Len's models. Because his models are enterprise-wide in nature, he has already anticipated other applications' semantic requirements for the entities you are embarking on implementing. If you use his more broadly defined, enterprise-wide structures, you will save yourself the time and cost of having to scrap and rebuild your application later or the untold frustrations that arise in management when the data in your application is not consistent with the data in ensuing applications.

This is a very helpful book, whether you are building Enterprise Architectures or whether you are just implementing applications . . . whether you like generic models or whether you like more specific models. If you have any idea of the profound enterprise significance of data models and the challenges of creating them from scratch, this is a book for you!

John A. Zachman
Glendale, California
2001

Acknowledgments

I wrote this book because I deeply feel that universal data models can provide effective solutions to many important data management and integration issues. However, this book would not have been possible without the insights and knowledge gained through my rewarding interactions and relationships with clients over the past 20 years. I am extraordinarily grateful to these clients who allowed me to provide service for them, while expanding my knowledge of business and information management. Their use, implementation of, and modifications to universal data model constructs have greatly contributed to the content of this book. From among the many people that have contributed, I want to thank Regina Pieper, Howard Jenkins, Rob Jakoby, Chris Nickerson, Jay Edson, Dean Boyer, Joe Misiaszek, Paul Zulauf, Steve Seay, Ken Haley, Ted Kowalski, Mike Brightwell, Dan Adler, Linda Abt, Joe Lakitsky, Trent Hampton, Kevin Morris, Karen Vitone, Tracy Muesing, Steve Lark, and Chuck Dana. I also want to thank the many client organizations that have added to and supported the universal data model paradigm.

I am very thankful to the people who added to the content of this current edition of the book. A person that made a significant contribution is Bob Conway, who took time to review these models out of a very busy consulting schedule and who scrupulously reviewed the models, making insightful suggestions as only Bob could have done. I greatly appreciate the work that Burt Holmes has done in implementing these universal data models with numerous clients and in providing valuable feedback regarding changes required for practical implementation of these models. I am very grateful to Natalie Arsenault, who provided ongoing ideas about the Universal Data Models based upon her extensive data modeling background and who also drafted the financial services and insurance chapters. I want to thank Mike Rampson, who drafted the Web chapter and provided invaluable insight into data structures to capture Internet information. I thank David Templeton, Gail Barrier, and Scott Bavis, who reviewed the financial services and insurance chapters, and Victor Korea for his review of the telecommunications models.

There were mentors that helped guide me and helped me see this work through completion. I am grateful to Richard Flint for his inspiration, guidance, and encouragement to follow my visions. I am very thankful to John DeMartini for helping me to view my life more holistically and for inspiring me to continually learn and write about holistic, integrated systems.

I feel honored to have been able to work on this book with Bob Elliott, the finest editor I know, at John Wiley & Sons, and I appreciate his excellent vision, management, editing, and support for this book as well as his ongoing encouragement to me. I want to thank Emilie Herman from John Wiley & Sons for taking care of a great number of tasks at Wiley in publishing this book.

I am thankful to my mom, Dede Silverston, a writer herself, who inspired and supported me in my writing; my dad, Nat Silverston, who has been a great father; my brother and great friend, Steve Silverston, who has lifted my spirits and been there for me; and my sister, Betty Silverston, who has such a big heart. Most of all, I am blessed to have had the support, patience, and love of my beautiful wife, Annette, and daughters, Danielle and Michaela, throughout the trial and tribulations of writing this book.

About the Author

Len Silverston is an author, lecturer, consultant, and pioneer in the field of data management. He has devoted the last 20 years to helping organizations build and integrate information systems, using his unique approaches to develop information architectures, design databases, and solve data management issues.

Mr. Silverston has been an invited speaker at numerous national and international conferences and has written many articles on database design and data warehousing in publications such as *Data Management Review* and Data Warehouse Institute's *Journal of Data Warehousing*.

Len Silverston is the founder and owner of Universal Data Models, LLC (www.universaldatamodels.com), a Colorado-based firm providing consulting and training to help enterprises customize and implement universal data models and develop holistic, integrated systems. Universal Data Models, LLC, has helped many diverse organizations develop data architectures and designs in a fraction of the typical time through its extensive repository of reusable data models and data warehouse designs. The company offers several seminars that provide tools to deliver higher quality databases and information systems in less time.

Mr. Silverston lives in Castle Rock, Colorado, with his wife Annette and his daughters, Danielle and Michaela. He holds a master's degree in Computer Science from Renssellear Polytechnic Institute with a specialization in database management systems.

He can be reached at lsilverston@univdata.com.

About the Contributors

Natalie Arsenault has worked for major Fortune 100 companies in database administration, design, and modeling for most of her 20-year career. Her current work supports an enterprise data framework that is consistently leveraged throughout the company. She is involved with data standards, meta data planning, and is a member of the enterprise technical architecture team.

Ms. Arsenault has been a conference speaker at several international conferences on data modeling, and her colleagues seek her expertise.

Mike Rampson (mrampson@paravance.com) is the CIO of Par Avance, Inc., a firm specializing in providing software and service solutions for e-commerce, product support, and other online business challenges. Mike has extensive cross-industry experience with designing integrated applications and operating environments that enable businesses to move online.

Introduction

Why Is There a Need for This Book?

When organizations develop custom information systems or strive to integrate their existing systems, they spend a significant amount of time and effort developing data models. Most of the time, organizations start from scratch when developing these data models because there are not many available sources for common data models that can be reused.

A tremendous amount of time and money could be saved by using "templates" or, to coin a phrase, "Universal Data Models" providing common data structures that are applicable across many business applications and industries.

The first book, *The Data Model Resource Book: Volume 1*, provided some Universal Data Model templates for common subject data areas that *apply generally to most businesses*. The book offered data structures to model people, organizations, products, orders, shipments, invoicing, work effort management, accounting, budgeting, and human resources. This represents a significant tool for developers to use to save time and money.

Many people have asked, why not extend the concept of the first edition of *The Data Model Resource Book* to provide models for specific industries? While most people find the first book very useful, there is still more work in modifying

the models to work for specific industries. Organizations want to have reusable data models for their own industry, such as for financial services firms, manufacturers, travel-related enterprises, health care organizations, telecommunications companies, and insurance providers.

This book can save readers even more time and money when developing data models as they can reuse concepts and specific data structures for the industry or application that applies to them. Data modeling professionals can use the data structures as a method for quality assuring their own models and determining if there is a better way to model these structures.

Each chapter will provide an overview of an industry and the type of information that is critical to running that type of business. Then the book will provide graphical data models, along with narrative text describing how to best model the information needs for the industry. Finally, chapters will also include some star schema designs to assist in developing data analysis solutions for each type of industry.

Both Volumes 1 and 2 of *The Data Model Resource Book, Revised Edition*, have companion electronic products (sold separately) containing the SQL code necessary to implement the models described in the books: a CD-ROM for the generic models in Volume 1; downloadable software products for each of the eight industries covered in Volume 2. Each of the industry models for the Volume 2 electronic products contains the new and modified models that are unique to that industry. These products include the SQL code, in several formats, to implement the generic and industry models from this volume. Note that the Volume 1 and Volume 2 products are sold separately; the CD-ROM provided with this book provides several free sample models for your review and evaluation. See the section "How to Use the Volume 2 Industry Electronic Products," at the end of this book to learn how to purchase and use one or more of the industry downloadable products.

To Integrate or Disintegrate? That Is the Question

A key benefit of this book is the ability to reuse its industry models, saving tremendous amounts of time by not reinventing the wheel doing analysis that has been done before. However, perhaps there is even a more substantial benefit to this book: *The models in this book are designed to facilitate the building of holistic, integrated systems.*

How often have you worked with non-integrated systems? Have you ever gone to the emergency room of a hospital and been asked to fill out a form with

your information when you had, just recently, given that information to another ward of the hospital? Have you ever been called by a sales representative who was completely unaware of the issue for which you had just alerted the customer service department? Have you ever called up a travel organization about the travel bonus points that you had earned and then tried to find out the status of your reservation, only to find out that you need to call a separate phone number for that information? Have you ever dealt with a procurement department in an organization that does not realize (or care) that you are also customer of that organization and perhaps deserve a little more attention?

If you have experienced difficulties such as these when dealing with an organization, there is good likelihood that their systems are set up separately, with systems built for separate departments, without the benefit of weaving each system into the whole in order to facilitate a shared information systems environment across the enterprise. Of course, the enterprise often drives and compensates each department or project to be successful without looking at the whole.

The consequences of not building integrated, holistic systems are huge. If an enterprise (the term *enterprise* will be used for the organization for which the systems are to be designed and built) does not focus on integration, the enterprise will move toward *disintegration.* If the enterprise builds their systems without regard to their overall system, redundant and inaccurate information is bound to occur. Without a holistic approach, each system will most likely define and maintain the same types of data using different formats with different names and with different meanings, leading to confusion and difficulty obtaining information.

With the advent of the Internet and many other technological advances, information is becoming much more available and widespread. This information is valuable, and enterprises that know how to take care of this information and manage it will have a key competitive edge. Can you image the power of being able to see complete profiles of individuals, organizations, products, and their related transactions across the entire enterprise? Enterprises can improve their communications if information is defined and maintained consistently across the enterprise. Integrated systems can lead to more effective service, sales, and strategic analysis for any enterprise.

The data models in Volume 2, as well as the models from Volume 1, are designed to be used to help clarify and see the entire picture of an enterprise's data and how data is related across the enterprise. If the enterprise uses these models as a road map for building integrated data structures, and if the enterprise has the attitude and culture of building integrated, holistic systems, then they can yield tremendous benefits for the enterprise and the people and organizations that the enterprise affects.

Approach of This Book

The approach of this book is quite different from that of most data modeling books. This is not a how-to book on data modeling. Data modeling has been around long enough that most systems professionals know how to model data. This book goes a step beyond and offers practical, reusable data models that can save the reader many thousands of hours in systems development efforts. Industries share many of the same data structures, so why should they reinvent the wheel each time they develop an application?

This book builds on the models and data structures in *The Data Resource Book, Revised Edition, Volume 1*. Volume 1 provided a series of industry Universal Data Models for each phase of an enterprise's business life cycle:

- People and organizations interact and form various relationships.
- Products (services or physical goods) are defined, supplied, priced, costed, and possibly inventoried.
- Commitments to buy products are established between people and/or organizations (may be referred to as orders, agreements, contracts, financial transactions, and so on).
- Shipments transport physical items to their destinations.
- Work efforts are conducted and tracked such as repairs, manufacturing, projects, and services.
- Invoices establish moneys due.
- Budgeting and accounting assist in managing finances.
- Human resources are managed and tracked.

The data models in the first book apply to most enterprise because the preceding processes form the essential aspects of how most business is conducted. The data models represented in the first book identify basic information needs that are applicable across industries. This book shows how the models in the first book can be applied to many industries' unique information requirements.

Rather than repeat the common models found in Volume 1 for each industry, this book provides a table at the beginning of each chapter showing the major changes and additions required to transform the generic data models from Volume 1 into industry-oriented data constructs. Most industries use a very high percentage of the models in Volume 1 and thus the second volume would be quite voluminous if they were repeated for each industry. (The companion Industry Download products for each industry includes the SQL code for the industry-specific data models and data warehouse star schema designs).

Each chapter is roughly organized by the preceding eight major subject data areas (i.e., parties, products, orders, shipments, work efforts, invoices, accounting, and human resources) as well as additional subject data areas that are unique for that industry. Some of the subject data areas are combined into a single section if not much customization is needed. (For instance, accounting and human resources usually do not need much customization for a particular industry.) This book shows the reader how to customize each of the subject data areas for each industry. The combination of the first book's models with the suggested customizations provides industry-specific Universal Data Models that give the user an even greater jump-start to data modeling efforts.

Who Is the Intended Audience for This Book?

This book is written for data modelers, data warehouse designers, data analysts, data administrators, database designers, database administrators, database consultants, and any other information systems professionals who need to be involved in data warehouse designs, data models, database designs, and data integration issues.

Aside from being an invaluable toolkit for systems professionals who focus on this area, this book could also be used as a text for universities teaching data modeling.

Many people prefer to learn by example so this book is both a tremendous toolkit for the experienced practitioner as well as a guide for the novice by showing many well-thought-out examples

General Industry Models versus More Specific Industry Models

A question that came up when formulating the contents of this book was this: Should this book show very specific industry models or more generalized industry models? Should there be separate models for each very specific industry, or should the book have models that can be used across a broader scope of applications and related industries? For example, should there be a separate model for auto insurance, for property and casualty, and for life insurance, or should the book provide generic insurance data models? Similarly, should there be separate models for the airlines business, bus companies, and cruise ship carriers, or should there just be a more general model that provides models for travel enterprises?