Day 1

Dimensional Modeling Concepts

- Dimensional Modeling in Context
    - Business Intelligence Defined
    - Data Warehousing Defined
    - Data Mart Defined
- Dimensional Modeling Basics
    - Dimensional Model Defined
    - Dimensional Modeling Defined
    - Business Metrics and Measures Defined
    - Business Metrics Examples
    - Dimensional Data Models
- Comparing E-R and Dimensional Models
    - A Quick Review of E-R Modeling
    - Introduction to Dimensional Models
    - Relational with Additional Constraints
    - A Basis for Comparison
    - Relational for Transaction Processing
    - Dimensional Data for Business Analysis
    - Conformed Dimensions
- Concepts Summary
    - Review of Some Key Points

Module Two
Requirements Gathering for Dimensional Models

- Business Context for Data Modeling
    - Business Value
    - Business Alignment
    - Business Process Alignment
- Business Questions as Requirements Models
    - A Framework for Business Questions
    - Examples
    - Refining Business Questions
- Fact/Qualifier Analysis
    - From Business Questions to Data Requirements
    - Mapping Business Questions
- Requirements Gathering Summary
    - Process Review

Module Three
Logical Dimensional Data Modeling

- Modeling Meters and Measures
  - A Group of Related Business Measures
- Modeling Dimensions
  - Adding Dimensions from Qualifiers
  - Dimension Hierarchy
  - Refining the Dimensions
  - Completing the Dimensions
- More about Meters and Measures
  - Granularity and the Meter
  - Granularity and the Measures
  - Completing the Meter
- Model Verification
  - Testing the Model
- Logical Modeling Summary
  - Process Review

Module Four
From Logical Model to Star Schema

- Star Schema Dimensions
  - Naming the Dimensions
  - Modeling Dimension Tables
  - Defining Dimension Table Keys
- Star Schema Fact Tables
  - Modeling the Fact Table
  - Defining the Fact Table Key
  - Supporting Calculated Measures
  - Semi-Additive and Non-Additive Facts
- Star Schema Design Challenges
  - Slowly Changing Dimensions
  - Degenerate Dimensions
  - Junk Dimensions
  - Difficult Situations
- Modeling Process Summary
  - From Business Requirements to Star Schema

Module Five
Dimensional Data and Business Analysis

- Delivering Business Value
  - Data Enabled Business Analysis
  - Collecting, Analyzing, and Using Business Metrics
- Effective Dimensional Modeling
  - Critical Success Factors
  - Mistakes to Avoid
  - References and Learning Resources

Day 2

Advanced Dimensional Modeling:
Techniques for Practitioners

Offered by **Chris Adamson** through **TDWI Onsite Education**
The companion course to the book *Star Schema: The Complete Reference.*

Module One
Fundamentals

- Dimensional Modeling
    - o Process measurement
    - o Uses beyond database design
- Information Architectures and Dimensional Data
    - o Inmon's CIF Architecture
    - o Kimball's Dimensional Bus
    - o Stand-alone Data Marts
- Fundamental Terms and Best Practices
    - o Facts and dimensions
    - o Surrogate keys, natural keys and slow change processing
    - o Fundamental concepts including grain, sparsity and additivity
    - o Best practices for fact tables and dimension tables
- Implementations
    - o Relational (star and snowflake)
    - o Multidimensional (cube)
    - o Cubes as primary store
    - o Cubes as derived data stores

Module Two
Multiple Stars

- Multiple star solutions
- Designing multiple fact tables
    - o Identifying multiple processes
    - o Differences in dimensionality
    - o The pitfalls of single fact table design
- Using multiple stars
    - o How not to query multiple fact tables
    - o The concept of drilling across
    - o What you need to know about your query and reporting tools
- Conformance and business value
    - o High impact business questions span processes
    - o The concept of conformance
    - o Ensuring subject areas work together
    - o Enabling incremental implementation

Module Three
Advanced Fact Table Design

- Transaction schemas
    - o Transaction grain
    - o Shortcomings of transaction designs
- Periodic Snapshots
    - o Snapshot grain and period
    - o Semi-additivity, density, and impact on BI
    - o Building both transaction and snapshot schemas
    - o Snapshots and averages
- Accumulating Snapshots
    - o Studying process efficiency
    - o Accumulating metrics in a single row
    - o Lag analysis
    - o Impacts on slow change processing and data integration
    - o Building both transaction and accumulating snapshots
- Factless Fact Tables
    - o Processes that seem to lack metrics
    - o Factless fact tables that track events
    - o Pros and cons of adding constant-value fact
    - o Factless fact tables that track conditions
    - o Comparing conditions to actual events
- Heterogeneous Attributes
    - o Attributes that vary based on category
    - o The impact of modeling a single set of attributes
    - o Core and custom dimensions
    - o Core and custom fact tables
    - o Alternatives to core and custom solutions

Module Four
Design and Data Integration

- The Data Integration Process
    - o Loading a dimension table
    - o Loading fact tables
    - o Key lookup processing
- Designing to aid key management
    - o The impact of slow changes on key lookups
    - o Adding attributes to aid lookup process
- Designing to reduce slow change bottlenecks
    - o The bottlenecks of slow change processing
    - o How dimension checksums aid slow change processing
- Specifying data transformation rules
    - o How to capture standard translations and data quality rules
    - o Why this must be done at design-time
- Invalid or late reference data

- o Receiving valid facts with invalid or missing reference data
- o Adding rows to dimension tables so that facts can be loaded
- o Adjusting facts when reference data arrives
- Adding columns to support QA
  - o Housekeeping columns in dimension tables
  - o Housekeeping dimensions for fact tables

Day 3

Module Five
Advanced Dimension Design

- Understanding hierarchies
  - o Drilling with and without hierarchies
  - o Multiple hierarchies in one dimension
  - o Impact of hierarchies on BI, ETL and DBA perspectives
  - o Why to model hierarchies
  - o Snowflake schemas
- Dimension Reuse
  - o Modeling roles
  - o Querying with roles
- Nulls
  - o Problems introduced by NULL values
  - o Avoiding NULL dimension attributes
  - o Avoiding NULLs with optional relationships
  - o NULL facts

Module Six
Advanced Slow Change Processing

- Time-stamped Dimensions
  - o Why type 2 is not good enough
  - o Time-stamped dimensions (transaction dimensions)
  - o Using with a fact table
  - o Hybrid attributes that behave like facts and dimensions
- Mini-dimensions (Types 4 & 5)
  - o Large and expanding dimension tables
  - o The use of a mini-dimension to stem growth
  - o Impact on schema capability
  - o Type 4 and Type 5 slow changes
  - o Loading the mini-dimension
- Current and Previous (Type 3)
  - o Limited access to unchanged value
- Hybrid Responses
  - o Tracking both Type 1 and Type 2 responses
  - o For dimension Attributes (Type 6)
  - o For entire dimension tables (Type 7)

Module Seven
Bridge Table Design

- The Dimension Bridge
    - o When a single fact needs to reference more than one dimension row
    - o The "flattening" option
    - o The bridge table
        - o Use of the bridge
        - o Avoiding double counting with an allocation factor
        - o Avoiding double counting by hiding the bridge (sandbox)
- The attribute bridge
    - o A dimension attribute repeats for a single dimension row
    - o The attribute bridge
    - o Use of the bridge and avoidance of double-counting
    - o Bridge table vs. factless fact table
- The hierarchy bridge
    - o Recursive relationships (ragged hierarchies, unbalanced hierarchies, variable depth hierarchies and instance hierarchies)
    - o Flattening and backfilling
    - o The hierarchy bridge and its structure
    - o Using the bridge to "roll up" a recursive hierarchy
    - o Using the bridge to "roll down" the hierarchy
    - o ETL implications of hierarchy change and slow changes

Module Eight
Scaling Dimensional Designs

- Scaling and scope
    - o Conformance across subject areas
    - o Conformed dimensions that are not identical
    - o Conformed rollups and overlapping dimensions
    - o An advanced conformance matrix
- Derived schemas and performance
    - o Merged fact tables
    - o Pivoted fact tables
    - o Set operations on fact tables
    - o Sliced or partitioned fact tables
- Aggregate schemas and performance
    - o N-way aggregate design
    - o Aggregate portfolio and impact on throughput
    - o Aggregates and aggregate navigation

Module Nine
Design Tasks and Deliverables

- Design and data architecture
    - o Dimensional design as architecture task

- o Architecture and incremental implementation
- o Implementation without up-front architecture activity
- Design activities
    - o Key design activities
    - o Resources required for design success
    - o Estimating duration of design activities
    - o Requirements, top level design, detailed design and roadmap
- Templates for Capturing Business Requirements
    - o Subject area definition
    - o Metric groups and metric definition
    - o Business hierarchies
    - o Conformance
- Templates for Capturing Design Requirements
    - o Key elements of dimension table design
    - o Key elements of fact table design
    - o Documenting what is not visible
    - o The conformance matrix
    - o The design review
- Detailed design
    - o Attribute level design of fact and dimension tables
    - o Technical design elements (DBA perspective)
    - o Business definitions (business perspective)
    - o Source to target mappings (integration perspective)
- Roadmap
    - o Project definitions
    - o Managing scope of implementations
- Implementation approaches
    - o Time-boxed projects with iteration
    - o Agile projects (with and without up-front discovery)
    - o Typical team member roles for implementation projects

Appendix A
Exercises

- Ten modeling exercises designed to reinforce concepts of each module
    - o Two are completed during the class (one each day)
    - o Students can work through remaining exercises on their own
- Exercise sessions
    - o Students are divided into groups of 4-5 to complete the exercises
    - o Flip chart or white board must be provided for each group
    - o Exercise is discussed by class as a whole upon completion

Appendix B
Exercise Solutions

- Solution pages for each exercise
- Example models and discussion points