IS660J

Lecture 4

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Agenda

- Inventory – revisit our retail example
  - Value Chain
  - Inventory Models
  - Integration
  - DW Bus Architecture
    - Conformed Facts & Conformed Dimensions
- Procurement
  - Purchasing Models
  - Slowly changing dimensions

Inventory

Value Chain

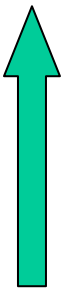
- Figure 3.1
- Goal is to monitor the performance results of key processes
  - Each process produces unique metrics with unique grains and dimensions → each process spawns one or more fact tables

Inventory Models

1. Inventory periodic snapshot (ie. daily inventory levels)
2. Inventory transactions (impacts to inventory levels as products move thru the warehouse)
3. Inventory accumulating snapshot (status)

Recall - 4 Step Dimensional Design Process

1. Select the business process to model (high impact and accessible data)
2. Declare the grain of the business process (atomic data)
3. Choose the dimensions that apply to each fact table row – discrete, textlike attributes
4. Identify the numeric facts that will populate each fact table row – continuously valued



Inventory Periodic Snapshot

- Most common inventory schema
- Chain profitability – Retail - Right product is in the right store at the right time. Min. out of stocks and reduce overall inventory carrying costs
  - Fact table – daily grain by product at each individual store; much more dense than retail sales fact table → how much history do we retain in a daily grain?
  - Source – operational inventory system
  - Dimensions – Date, Product and Store
    - Are these dimensions exactly the same as the Retail Sales schema? Product – Minimum Reorder Qty; Store - may want square footage measured in refrigerated, frozen and open-air.

Inventory Periodic Snapshot

Facts

quantity on hand – semiadditive – can be accumulated across some but not all dimensions;

quantity sold – additive

Together these facts can be used to calc. inventory turns over time (total qty sold / daily avg qty on hand) and day's supply (quantity on hand / average quantity sold).

inventory at cost and inventory at latest selling price – additive

Together can be used to calc. GMROI (std measure to judge the quality of investment in inventory).

GMROI = (total qty sold * (value at latest selling price – value at cost)) / daily average qty on hand * value at the latest selling price

Or

GMROI = Number of Turns * Gross Margin

Figure 3.3

Inventory Periodic Snapshot

Reporting

- SQL AVG function cannot be used
  - 3 products x 4 stores x 7 dates
    - SQL AVG divide total by 84 when it should be divided by 7
    - Instead - 2 pass query (or an embedded SQL call)

Inventory Transactions

Complementary to Inventory Periodic Snapshot

Record every transaction (manipulation) that affects inventory in a warehouse

Measure the frequency and timing of specific transaction types

- See questions on pg 75

From the warehouse (vs. retail) perspective

- See list of transactions on page 74
- See Figure 3.4

Grain – 1 row per inventory transaction

Inventory Accumulating Snapshot

- 1 row for a shipment of a particular product to the warehouse.
- Track the disposition (status) of the product shipment until it has left the warehouse
- Distinguish product shipments!!!
- Figure 3.5
- More in Chapter 5

Value Chain Integration

- Retailer's value chain
- End-to-end perspective
- Politics
- Drill Across – dimension table attributes are the same across data marts
- Figure 3.6

Data Warehouse Bus Architecture

The Data Warehouse Bus Architecture is composed of "a master suite of conformed dimensions" and standardized definitions of facts. Business process data marts throughout an enterprise can "plug into" this bus to receive the dimension and fact tables they need. The Bus thus supports the various processes and associated data marts that measure key aspects of the processes.

The logical union of these data marts is said to be the data warehouse. And each data mart is said to be a subset of that data warehouse.

See Figures 3.7 and 3.8

Conformed Dimensions

- EDW is comprised of many data marts
- In order for DMs to use the same dimensions (ie. product) in joins with fact tables, the dimension must be the same – consistent keys, consistent attribute names, consistent attribute definitions, and consistent attribute definitions.

Procurement

Procurement

- Further develop the value chain
- Applicable to anyone who acquires products or services for either use or resale; Effective procurement of products for resale in our retail example is critical.
- Several models
- How do we deal with organizational changes in our dimensions?
  - Products realign
  - Customers move
  - Sales Reps realign, territories change

Background

- Demand planning drives efficient materials management
- Negotiating contracts
- Issuing purchase reqs
- POs to track receipts
- Authorizing payments
- See business questions on pg 90
  - Vendor performance; bulk pricing; ect.

4 step process

First pass

1. Yes, procurement is the business process we want to model.
2. Grain – one row per procurement transaction
3. Dimensions – date, product, vendor, contract terms, procurement transaction type
4. Facts – Procured units and transaction price

See Figure 4.1

Further review uncovers …

Users describe the various procurement transactions differently

Sourced differently

Transaction types have different dimensionality.

Control numbers → Degenerate dimensions

Hmm … Do we build one blended fact table or several based on transaction type?

Do we build one blended fact table or several based on transaction type?

- User analysis requirements → Query complexity
- Separate processes? Probably.
- Separate sources? Yes.
- Different dimensions? Some.

Therefore, we decide to implement multiple transaction facts tables – see Figure 4.4.2

Slowly changing dimensions

- 3 basic approaches
- Hybrid approaches
- Text examples

Conclusion

- Next week, Order Management (Chapter 5)