SS G515 - Data Warehousing: Introduction

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Today's Topics

- Data Marts
- Approached to Design Data Warehouses
  - Inmon's
  - Kimball's

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Data Marts

- What is a data mart?
- Advantages and disadvantages of data marts
- Issues with the development and management of data marts

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Data Marts

- A subset of a data warehouse that supports the requirements of a particular department or business process
- Data Mart is a subset of corporate-wide data warehouse that is of value to a specific groups of users. Its scope is confined to specific, selected groups, such as marketing data mart.
- Characteristics include:
  - Does not always contain detailed data unlike data warehouses
  - More easily understood and navigated
  - Can be dependent or independent

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Data Marts

- Data Mart: A scaled-down version of the data warehouse
- A data mart is a small warehouse designed for the department level.
- It is often a way to gain entry and provide an opportunity to learn
- Major problem: if they differ from department to department, they can be difficult to integrate enterprise-wide

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Reasons for Creating Data Marts

- Proof of Concept for the DW
- Can be developed quickly and less resource intensive than DW
- To give users access to data they need to analyze most often
- To improve query response time due to reduction in the volume of data to be accessed

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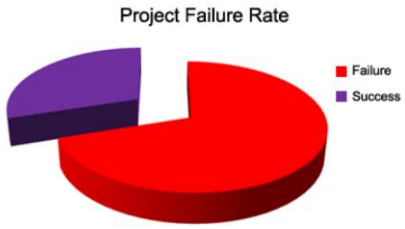
Why do Data Warehouse projects fail?



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Why do Data Warehouse projects fail?

- Unreliable or unattainable user requirements
- Quality of the data that feeds the source system
- Changing source or target requirements
- Poor development productivity
- HighTCO (Total Cost of Ownership)
- Poor documentation
- **"…over 50% of data warehouse projects fail or go wildly over budget–they blame data quality…"The real problem is project approach.**

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Why do Data Warehouse projects fail?

- Fail due to lack of attention to Data Quality Issues
- More than half only have limited acceptance
- Consistency and Accuracy of Data
- Most businesses fail to use business intelligence (BI) strategically
- IT organizations build data warehouses with little to no business involvement

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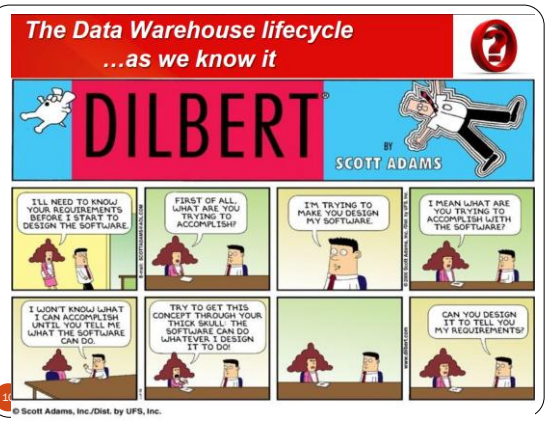

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Business Ownership

- The data warehouse should be owned by the business –not IT
- A successful project depends upon creating a partnership with the business
- Prioritization of project phases or agreement on a data dictionary to should be agreed by the business
- Without a strong, high level business sponsor(s) the project is likely to hit problems
- If sponsorship is present then the data warehouse project can be broken down into a set of smaller projects

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Divide and Conquer

- A "big bang" approach to data warehousing has almost always ended in disaster
- The project phases and the order in which they are developed should be decided by the data warehouse sponsors
- Momentum is paramount for keeping the required focus
- Rapid prototyping and tight development cycles are vital for successful warehouse
- Keep in view the bigger picture
- Use smaller phases to fund the project adequately

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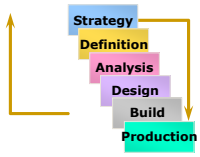
"Big Bang" Approach: Advantages and Disadvantages

- Advantages:
  - warehouse built as part of major project (eg: BPR)
  - Having a "big picture" of the data warehouse before starting the data warehousing project
- Disadvantages:
  - Involves a high risk, takes a longer time
  - Runs the risk of needing to change requirements
  - Costly and harder to get support for from users

Incremental Approach to Warehouse Development



- Multiple iterations
- Shorter implementations
- Validation of each phase

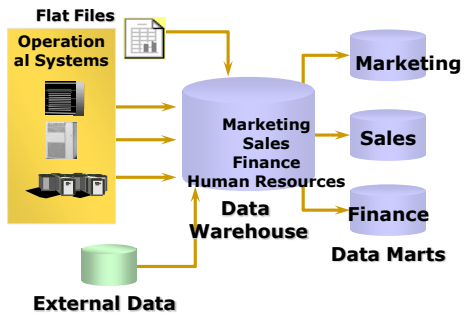
Benefits of an Incremental Approach

- Delivers a strategic data warehouse solution through incremental development efforts
- Provides extensible, scalable architecture
- Quickly provides business benefits and ensures a much earlier return of investment
- Allows a data warehouse to be built based on a subject or application area at a time
- Allows the construction of an integrated data mart environment

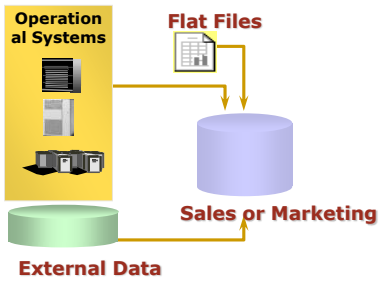
Data Mart

- A subset of a data warehouse that supports the requirements of a particular department or business function.
- Characteristics include:
  - Do not normally contain detailed operational data unlike data warehouses.
  - May contain certain levels of aggregation

Dependent Data Mart



Independent Data Mart



Reasons for Creating a Data Mart

- To give users more flexible access to the data they need to analyse most often.
- To provide data in a form that matches the collective view of a group of users
- To improve end-user response time.
- Potential users of a data mart are clearly defined and can be targeted for support

Reasons for Creating a Data Mart

- To provide appropriately structured data as dictated by the requirements of the end-user access tools.
- Building a data mart is simpler compared with establishing a corporate data warehouse.
- The cost of implementing data marts is far less than that required to establish a data warehouse.

Data Marts Issues

- **Data mart functionality**
- **Data mart size**
- **Data mart load performance**
- **Users access to data in multiple data marts**
- **Data mart Internet / Intranet access**
- **Data mart administration**
- **Data mart installation**

Kimball vs Inmon

- *Bill Inmon's paradigm:* Data warehouse is one part of the overall business intelligence system. An enterprise has one data warehouse, and data marts source their information from the data warehouse. In the data warehouse, information is stored in 3rd normal form.
- *Ralph Kimball's paradigm:* Data warehouse is the conglomerate of all data marts within the enterprise. Information is always stored in the dimensional model.

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Kimball vs Inmon

- *Bill Inmon:* Endorses a Top-Down design

  Independent data marts cannot comprise an effective EDW. Organizations must focus on building EDW
- *Ralph Kimball:* Endorses a Bottom-Up design

  EDW effectively grows up around many of the several independent data marts – such as for sales, inventory, or marketing

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Kimball vs Inmon: War of Words

"...The data warehouse is nothing more than the union of all the data marts...,"
Ralph Kimball, December 29, 1997.

"You can catch all the minnows in the ocean and stack them together and they still do not make a whale,"
Bill Inmon, January 8, 1998.

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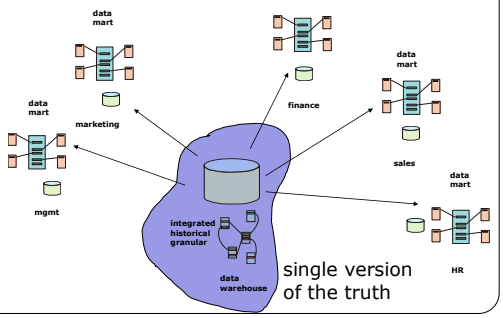
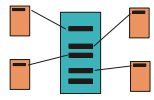
the essence of the difference between Inmon and Kimba

the question being answered – what is the single version of the truth? what is corporate data?



from an architectural perspective

star schema (Kimball)



relational based data warehouse (Inmon)

Inmon's Corporate Information Factory (CIF) and the Kimball Data Warehouse Bus (BUS)

In an article for the Business Intelligence Network, Mr. Inmon writes:

"... Independent data marts may work well when there are only a few data marts. But over time there are never only a few data marts ...
Once there are ... a lot of data marts, the independent data mart approach starts to fall apart. There are many reasons why ...
independent data marts built directly from a legacy/source environment fall apart:

- •There is no single source of data for analytical processing ...;
- •There is no easy reconcilability of data values ...;
- •There is no foundation to build on for new data marts ...
- •An independent data mart is rarely reusable for other purposes;
- •There are too many interface programs to be built and maintained;
- •There is a massive redundancy of detailed data in each data mart ... because there is no common place where that detailed data is collected and integrated;
- •There is no convenient place for historical data;
- •There is no low level of granularity guaranteed for all data marts to use;
- •Each data mart integrates data from the source systems in a unique way, which does not permit reconcilability or integrity of the data across the enterprise; and
- •The window for extracting data from the legacy environment is stretched with each independent data mart requiring its own window of time for extraction ..."

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Kimball vs. Inmon

There is no right or wrong between these two ideas, as they represent different data warehousing philosophies. In reality, the data warehouse in most enterprises are closer to Ralph Kimball's idea. This is because most data warehouses started out as a departmental effort, and hence they originated as a data mart. Only when more data marts are built later do they evolve into a data warehouse.

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Data Warehousing Process

- Enterprise-wide warehouse, top down, the Inmon methodology
- Data mart, bottom up, the Kimball methodology
- When properly executed, both result in an enterprise-wide data warehouse

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Data warehouse versus data mart.

DATA WAREHOUSE	DATA MART
Corporate/Enterprise-wide	Departmental
Union of all data marts	A single business process
Data received from staging area	Star-join (facts & dimensions)
Queries on presentation resource	Technology optimal for data access and analysis
Structure for corporate view of data	Structure to suit the departmental view of data
Organized on E-R model	

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Building a Data Warehouse

- Questions to be asked:
  - Top-down or bottom-up approach?
  - Enterprise-wide or departmental?
  - **Which first—data warehouse or data mart?**
  - Build pilot or go with a full-fledged implementation?
  - Dependent or independent data marts?

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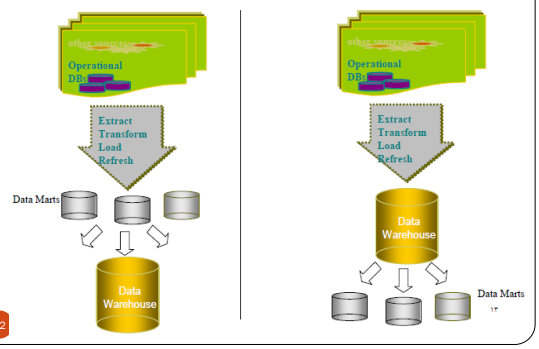
Bottom-Up Versus Top-Down Approach



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Data Warehouse or Data Mart First?

- Top-Down vs. Bottom-Up Approach
- Advantages of Top-Down
  - A truly corporate effort, an enterprise view of data
  - Inherently architected-not a union of disparate DMs
  - Single, central storage of data about the content
  - Central rules and control
  - May be developed fast using iterative approach

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Data Warehouse or Data Mart First?

- Disadvantages of Top-Down
  - Takes longer to build even with iterative method
  - High exposure/risk to failure
  - Needs high level of cross functional skills
  - High outlay without proof of concept
  - Difficult to sell this approach to senior management and sponsors

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Data Warehouse or Data Mart First?

- Advantages of Bottom-Up Approach
  - Faster and easier implementation of manageable pieces
  - Favorable ROI and proof of concept
  - Less risk of failure
  - Inherently incremental; can schedule important DMs first
  - Allows project team to learn and grow

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Data Warehouse or Data Mart First?

- Disadvantages of Bottom-Up Approach
  - Each DM has its own narrow view of data
  - Permeates redundant data in every DM
  - Difficult to integrate if the overall requirements are not considered in the beginning
- Kimball's approach is considered as a Bottom-Up approach, but he disagrees

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Dependent Data Marts

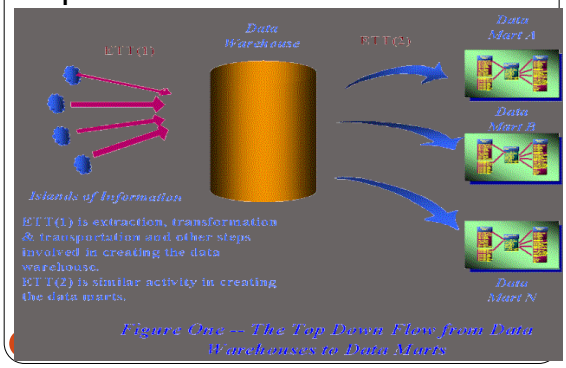


Figure One -- The Top Down Flow from Data Warehouses to Data Marts

Independent Data Marts

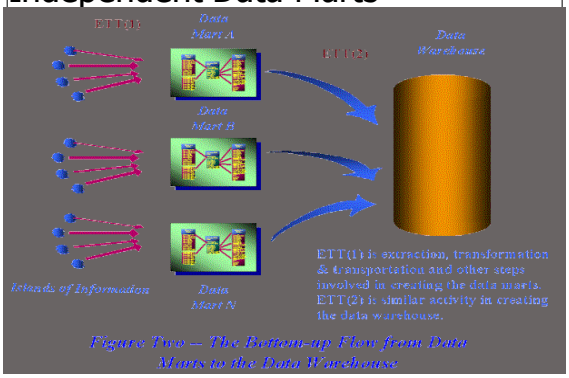


Figure Two -- The Bottom-up Flow from Data Marts to the Data Warehouse

The Bottom-Up Misnomer

Kimball encourages you to broaden your perspective both "vertically" and "horizontally" while gathering business requirements while developing data marts

The Bottom-Up Misnomer

- Vertical
  - Don't just rely on the business data analyst to determine requirements
  - Inputs from senior managers about their vision, objectives, and challenges are critical
  - Ignoring this vertical span might cause failure in understanding the organization's direction and likely future trends

The Bottom-Up Misnomer

- Horizontal
  - Look horizontally across the departments before designing the DW
  - Critical in establishing the enterprise view
  - Challenging to do if one particular department if funding the project
  - Ignoring horizontal span will create isolated, department-centric databases that are inconsistent and can't be integrated
  - Complete coverage in a large organization is difficult
  - One rep. from each dept. interacting with the core development team can be of immense help

Data Warehouse or Data Mart First?

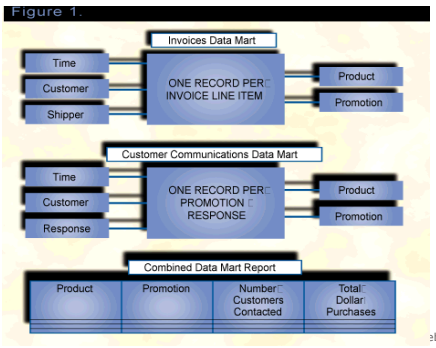
New Practical approach by Kimball

1. Plan and define requirements at the overall corporate level
2. Create a surrounding architecture for a complete warehouse
3. Conform and standardize the data content
4. Implement the Data Warehouse as a series of Supermarts, one at a time

A Word about SUPERMARTS

- Totally monolithic approach vs. totally stovepipe approach
- A step-by-step approach for building an EDW from granular data
- A Supermart s a data mart that has been carefully built with a disciplined architectural framework
- A Supermart is naturally a complete subset of the DW
- A Supermart is based on the most granular data that can possible be collected and stored
- Conformed dimensions and standardized fact definitions

A Word about SUPERMARTS



Pilot Projects: Risk vs. Reward

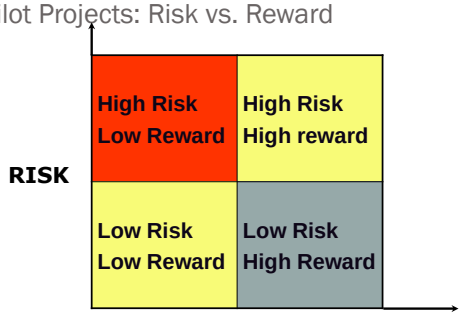
- Start with a pilot implementation as the first rollout for DW
- Pilot projects have advantage of being small and manageable
- Provide organization with a "proof of concept"

Pilot Projects: Risk vs. Reward

Functional scope of a pilot project should be determined based on:

1. The Degree of risk enterprise is willing to take
2. The potential for leveraging the pilot project
   - Avoid constructing a throwaway prototype
   - Pilot warehouse must have actual value to the enterprise

Pilot Projects: Risk vs. Reward



A Practical Approach

❑Most people employ a ***Hybrid approach with*** elements of ***Top-Down and Bottom-Up***
❑ Again, practitioners don't always concentrate on these issues and use this terminology, and just focus on best-practice
❑That would include;
- ❑Build incrementally according to a business function
- ❑ Employ an enterprise perspective
- ❑ Dimensionally model data
- ❑ Utilise conformed dimensional models
- ❑ Employ a Staging Area or Data Warehouse
- ❑ Store atomic data