Triple-Driven Data Modeling Methodology in Data Warehousing: A Case Study

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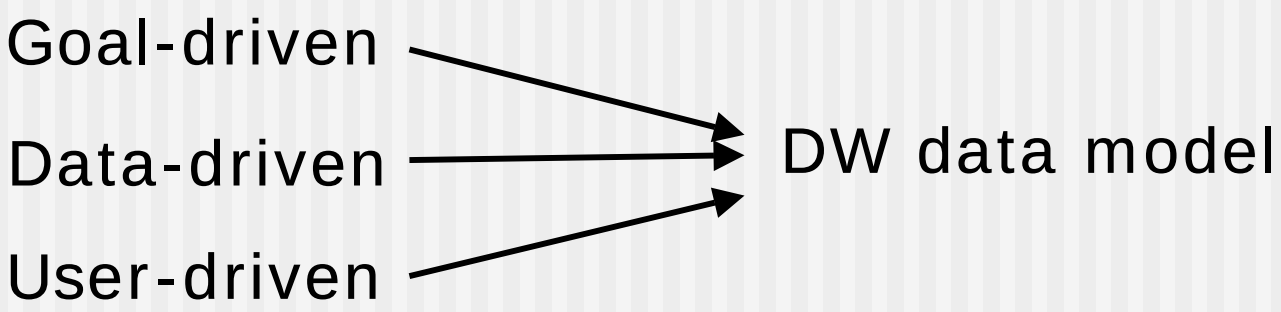
Triple-driven: why and how?

- **Motivation**
  - Existing methods are used in isolation
  - Data models from single principle are incomplete, which cannot obtain satisfaction
- **Solution**



Outline

- Background
  - Motivation & related work
  - Objectives
  - CLIC DW case study
- Proposed Methodology
- Discussion
- Conclusions

Motivation

- **Open Problems & Challenges**
  - DW conceptual modeling is still under user's dissatisfactions (*DMDW'03*)
  - Lack of comprehensive documentation and dissemination of requirement engineering methods (*DaWaK'05*)
- **What leads to this?**

Related work

- **Existing Data-driven**
  - Emphasis: integrate, reorganize source schemas
  - Lack: match data sources with information requirements
- **Existing Goal-driven**
  - Emphasis: decompose business process
  - Lack: embody business goals into design elements
- **Existing User-driven**
  - Emphasis: facilitate user participations
  - Lack: translate user requirements into design elements

The three methods are complementary and should be used in parallel to achieve optimal design

Our objectives

- Tackle four research questions
  - **Triple-driven**: How to integrate the three existing approaches to warehouse design
  - **Data-driven**: How to identify warehouse elements from operational data sources
  - **Goal-driven**: How to embody corporate strategy and business objectives
  - **User-driven**: How to translate user requirements into appropriate design elements

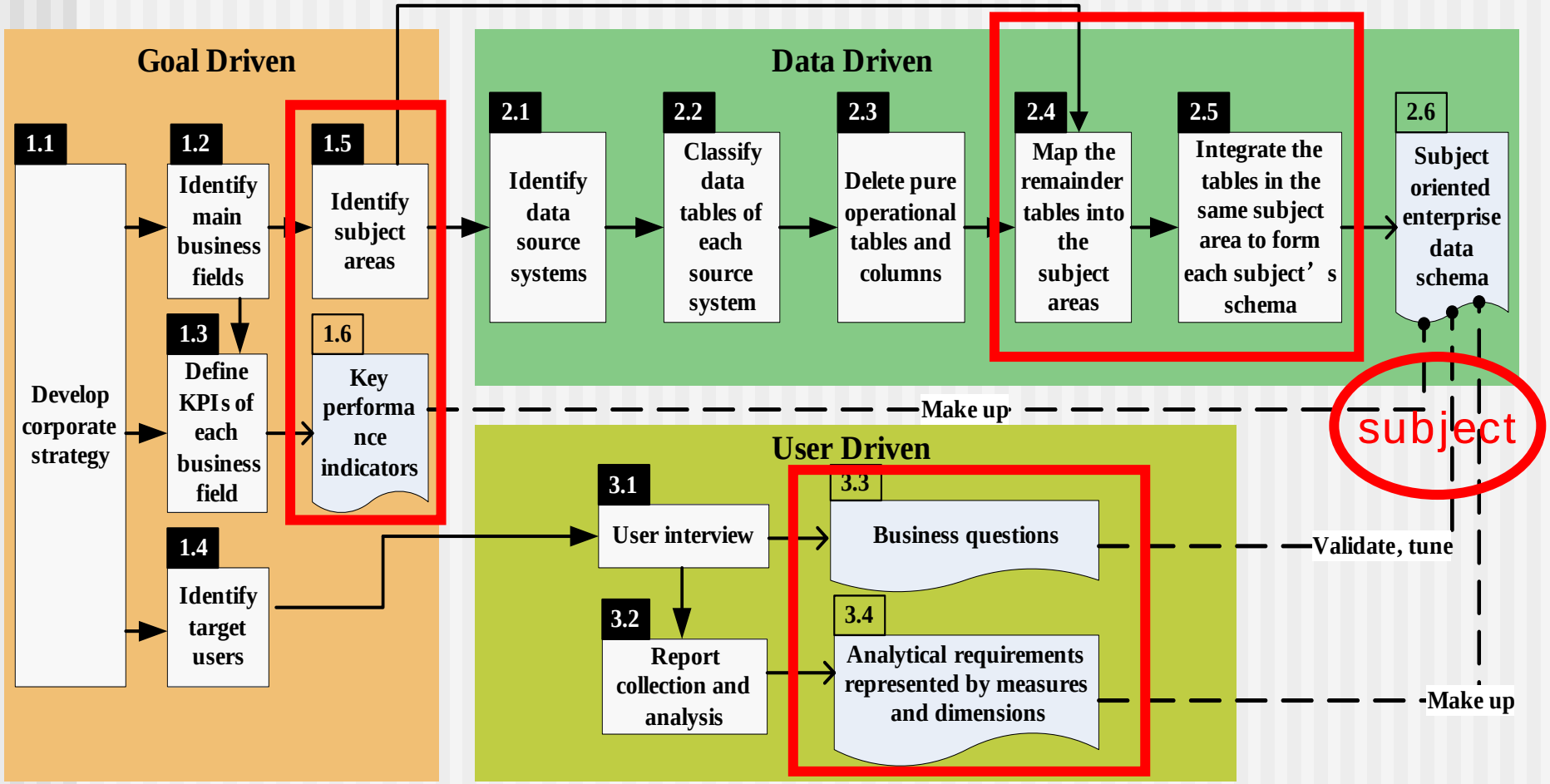
The CLIC DW Planning Project

- **Objective**
  - Develop data model for a central DW
- **Diversity needs for the DW**
  - Centralize the data scattered
  - User querying, reporting, analysis, decision
- **2 core application systems**
  - Cbps system: core business process system
  - Callcenter system: customer consultation, complaint, inquiry...

Outline

- Background
- Proposed Methodology
  - Framework
  - Goal-Driven
  - Data-Driven
  - User-Driven
  - Combine triple-driven
- Discussion
- Conclusions

Framework


Goal Driven
Data Driven
User Driven
1.1
Develop corporate strategy
1.2
Identify main business fields
1.3
Define KPIs of each business field
1.4
Identify target users
1.5
Identify subject areas
1.6
Key performance indicators
2.1
Identify data source systems
2.2
Classify data tables of each source system
2.3
Delete pure operational tables and columns
2.4
Map the remainder tables into the subject areas
2.5
Integrate the tables in the same subject area to form each subject's schema
2.6
Subject oriented enterprise data schema
Make up
subject
3.1
User interview
3.2
Report collection and analysis
3.3
Business questions
3.4
Analytical requirements represented by measures and dimensions
Validate, tune
Make up

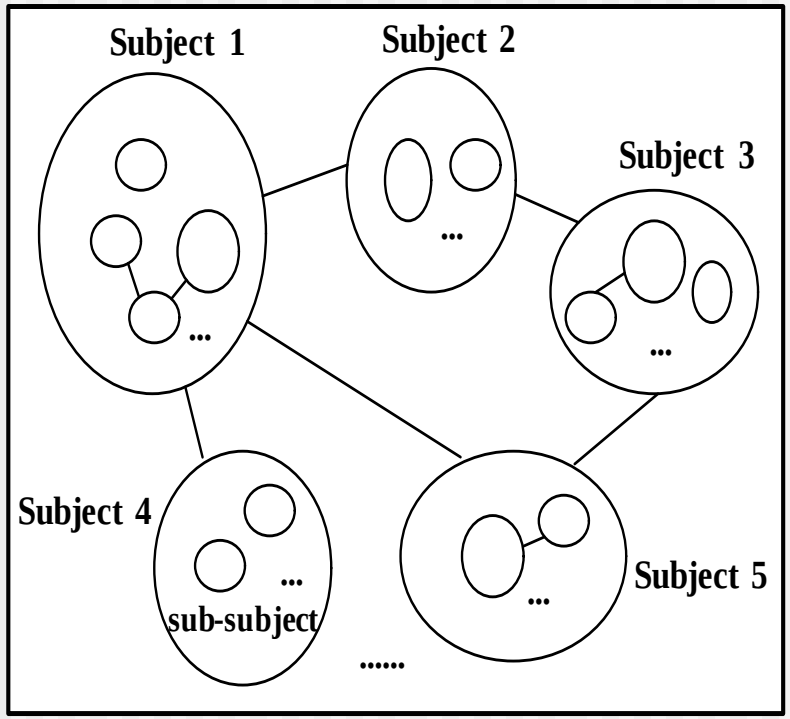
Goal-Driven

- Main tasks
  - Identify main business fields
    - CRM, RM, ALM, F&PM
  - Identify subjects
  - Define KPIs (Key Performance Indicators)
  - Identify users
    - Query users
    - report users
    - analytical users
    - data miners

Goal-Driven: Identify subjects

- **Subject**
  - Object that will be analyzed in each business field
  - High information class
- **Subject Level**
  - subject->sub-subject..
- **Guideline**
  - number of the subjects in each level is about 10, not more than 20 (manageable for human)

Subjects, sub-subjects & relations



Goal-Driven: Define KPIs

KPIs of Customer Relationship Management

KPIs	***Definition***
Customer Satisfaction Index	*The quality of the services given by a department from the view of customers in the targeted segments.*
Customer Retention Rate	*The ability of a company's department to retain customers in the targeted measurement segments.*
Revenue Per Customer	*The profitability on target customer segments.*
Customer Acquisition Rate	*The ability of a company's center/department to acquire customers in the target segments.*

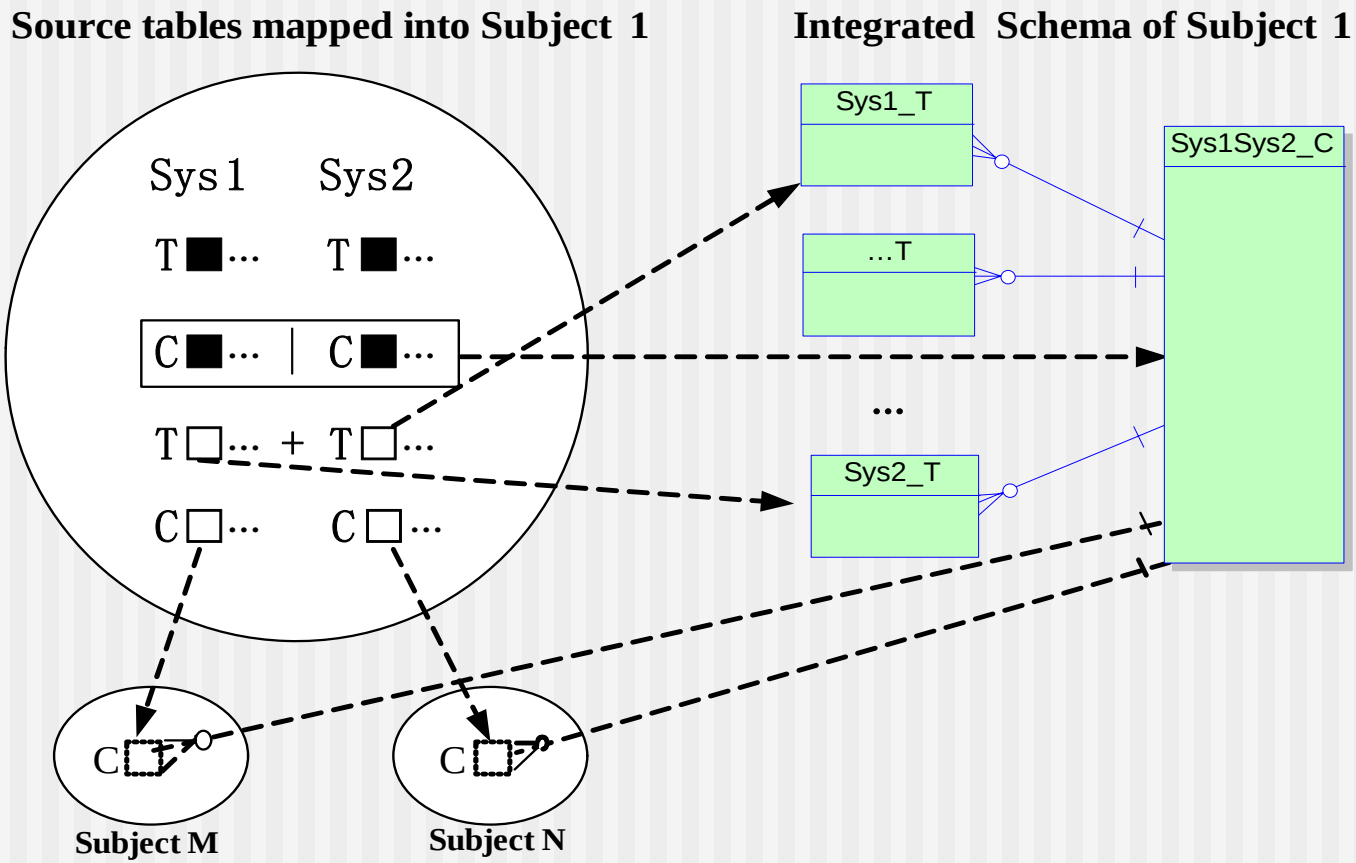
Data-Driven

- Main tasks
  - Identify candidate data sources
  - Classify data source tables
    - Transaction tables
    - Component tables
    - Report tables
    - Classification tables
    - Control tables
  - Delete pure operational tables & columns
  - Map the remainder tables into the subjects
  - Integrate the tables in the same subject

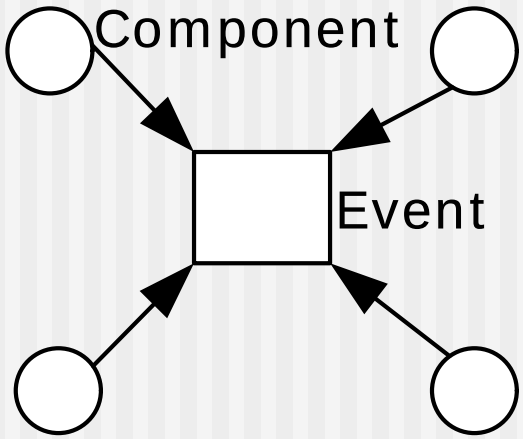
Data-Driven: Map tables into subjects

Candidate Systems	Remainder Tables	Subject 1	Subject 2	…	Subject N
System1	Transaction Table1	■	□		
	Component Table1	■	□		
	…				
System2	Transaction Table1	□	■		□
	Component Table1	□	■		
	…				

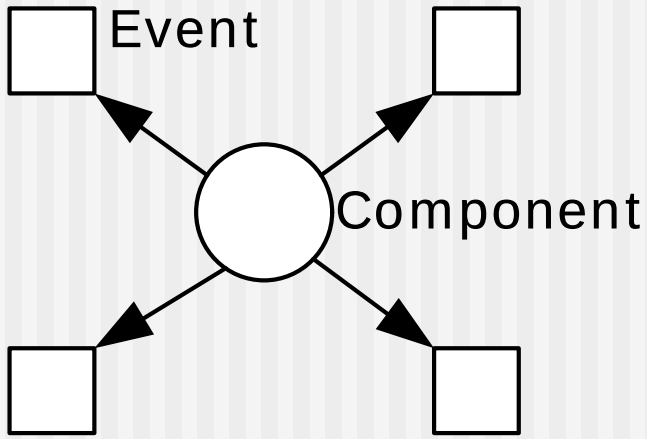
Data-Driven: Integrate tables in the same subject



Star schema VS. anti-star schema



star schema



anti-star schema

Anti-star schema shifts attention to a component object, not an event, which leads to delicate analysis of an object according to its behaviors

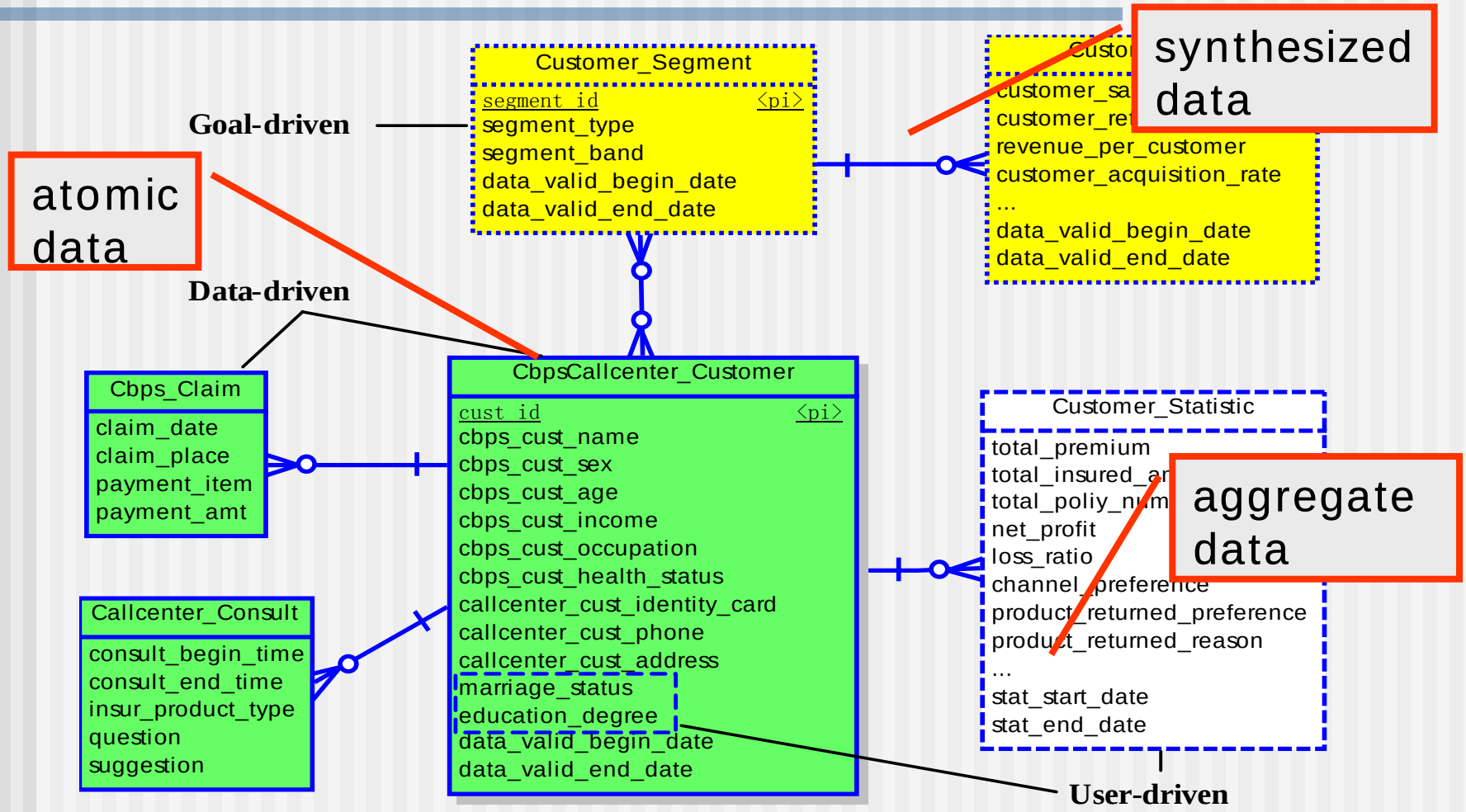
User-Driven

- Main tasks
  - User interview ->Business questions
    - Which customers are most profitable based upon premium revenue?
    - Which channels customers like most?
    - What are the top five reasons that customers return products?
  - Reports collection and analysis
    - Analytical requirements represented by measures and dimensions

User-Driven: Analytical requirements

- Measures:
  - count, premium, insured amount, policy numbers, net profit, loss ratio...
- Dimensions:
  - sex (male, female, unknown)
  - income (<1000, 1000-5000, 5000-10000, 10000-20000, >20000)
  - marriage status (married, unmarried, divorced)
  - education degree (<primary school, high school, >undergraduate)
  - age (< 20, 21-25, 26-30, 30-35, 36-40, 40-50, 50-65, >65)

Combine the triple-driven results



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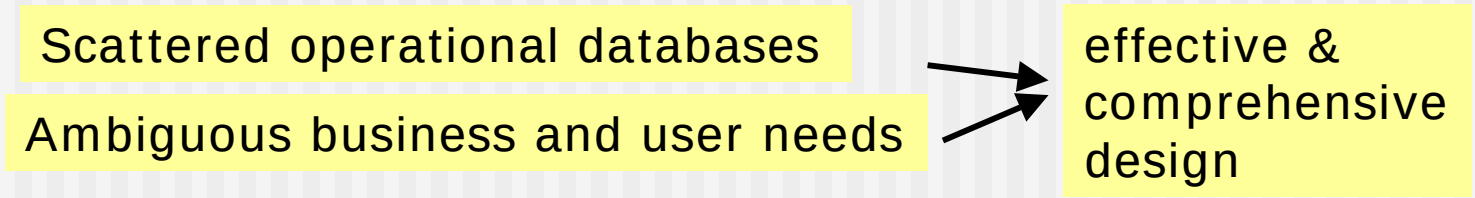
Discussion

- Advantages
  - It ensures actual business value of the DW and stability of the data model
  - It raises acceptance of users towards the DW
  - It ensures the DW is flexible to support the widest range of analysis
  - It leads to a design capturing all specifications
- Impact & Experience: encouraging



Conclusions

- Main contributions
  - **Integrate** three existing single-driven by "subject"
  - **Identify** valuable elements from data sources by mapping tables into "subjects"
  - **Embody** corporate strategy and business objectives into data model by KPIs
  - **Translate** user needs into design elements by report analysis & business questions

Thanks for your attention

If you have any question, please contact the first author :

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