

CS660 – Database systems

Unit 5 - Variations in Database Systems

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Agenda



Object-Oriented vs. Web-Based DB Systems



Data Warehousing & Distributed DBs



Business Intelligence & ROI



Decision-Making & Strategic Impact



Individual Project



Introduction to Evolving Database Needs



Retail store
growth and online
strategy



Increasing data
demands



Need for scalable,
analytical systems



Object- Oriented DBMS



Stores objects
as persistent
entities

Encapsulation,
inheritance,
reusability



Web- Based Database Systems



Common: MySQL,
PostgreSQL



Dynamic
interaction via
web scripts



Supports scalable
web applications



Differences and Retail Impact



OODBMS: tightly
coupled to
applications



Web DBMS:
flexible and
scalable



Retail needs real-
time access

What is a Data Warehouse?



CENTRALIZED,
SUBJECT-ORIENTED



SUPPORTS
HISTORICAL ANALYSIS



DRIVES STRATEGIC
PLANNING

Data Marts Overview

Subset of DW
for a
department

Used by
marketing,
sales, HR

Faster access
for focused
analysis

Schema Adjustments for DW

Use star or snowflake schema

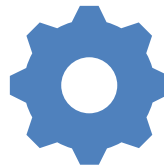
Fact tables + dimension tables

Denormalized for performance

Storage & Performance Planning



On-prem vs. cloud
solutions



Optimize for query
response



Indexing and
partitioning strategies

Distributed DBMS Overview



Data spread across
locations



Redundancy and
reliability



Needs sync and
consistency protocols

Distributed DB Pros & Cons

Weighing Benefits Against Implementation Challenges

+ Fault tolerance, scale

- Complexity, latency

Replication strategies needed

Design Changes for Distribution

Schema & Architecture Modifications for Distributed Systems



Partitioning
strategy



Conflict resolution



Distributed
transactions

BI Opportunities

Unlocking Value Through Data-Driven Insights



External Data for BI

Enriching Analytics with Third-Party Data Sources

Competitor pricing

The diagram consists of three horizontal bars, each with a rounded left end and a rectangular extension to the right. The top bar is red and labeled 'Competitor pricing'. The middle bar is gold and labeled 'Demographics'. The bottom bar is green and labeled 'Economic data'. Each bar is connected to a vertical line on the left, which then connects to a horizontal line that extends to the right, forming a continuous path for each category.

Demographics

Economic data

BI Tool Integration

Strategies for Seamless Platform Connectivity

Power BI

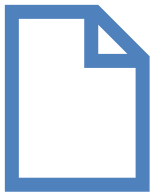
The diagram illustrates the integration of three BI tools. Each tool name is inside a colored rounded rectangle (red for Power BI, gold for Tableau, and green for SAS Visual Analytics). From the left side of each rectangle, a line of the same color extends leftwards, then turns downwards, then rightwards, and finally upwards to connect to a common vertical line on the far left. This visualizes how all three tools can connect to a single data source.

Tableau

SAS Visual Analytics

ETL Process

Extract, Transform, Load Data Integration Fundamentals



Extract



Transform



Load

BI in Decision-Making

From Data to Strategic Action



Demand
forecasting



Customer
retention



Sales planning

Examples of BI Outcomes

Real-World Success Stories Across Industries



INFORMED INVENTORY
RESTOCKING



EFFECTIVE
PROMOTIONS



TARGETED CAMPAIGNS

3-Year ROI from BI

Year 1:
\$15,000

Year 2:
\$30,000

Year 3:
\$55,000

Competitive Advantage



TAILORED CUSTOMER
EXPERIENCES

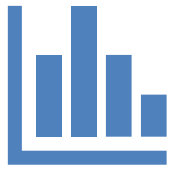


LOCAL MARKET
INSIGHTS



FASTER REACTION TO
TRENDS

Improved Productivity



Less manual
reporting



Faster insights



Empowered
managers

BI Case Example

Global Equipment Manufacturer Case Study



BI helped increase first year savings of \$8.5M



ROI: 265% within the first year.

Stakeholder Benefits



Executive visibility



Operational clarity



Strategic
alignment

Data Capture Challenges

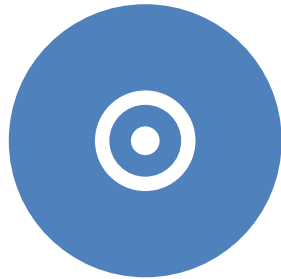


UNCAPTURED
TRANSACTIONS



FIX: IMPROVE SOURCE
LOGGING

Storage Resource Planning



High disk needs



Solution: Cloud +
compression

Source System Errors

Dirty or
inconsistent
data

Fix: Data
profiling

Solving DW Problems

Missing data
→ ETL checks

Storage
demand →
cloud

Source issues
→ profiling
tools

Aligning with Mission



GOAL: SERVE CUSTOMERS
BETTER



GOAL: ENHANCE
OPERATIONS

Meeting Retail Goals



CUSTOMER
SATISFACTION



DATA-DRIVEN
DECISIONS



INVENTORY
ACCURACY

Individual Project

Future Database System Implementation Plan (4–5 pages)

- What fundamental differences exist between object-oriented and object-relational database systems and Web-based database systems?
 - Would these differences impact your retail store?
- Include details of what changes would need to be introduced to the database if it were used to build a data mart or a data warehouse.
- Include details of what considerations would need to be made if the database were to become a distributed database.
- What specific types of business intelligence could be gathered from the database?
 - How would this information assist in the decision-making process for your retail store?
- How would your retail store benefit from data warehousing in the following areas?
 - Return on investment on business intelligence initiatives (Provide a 3-year estimate.)
 - Competitive advantage (based on local or target area)
 - Increased productivity of decision-makers (related to business process decision-making)
- How would you address the following data warehousing problems if they occurred in your retail store?
 - Required data were never captured.
 - There is a high demand for disk space and other resources.
 - There are hidden problems with source systems.
- Provide your analysis as to how this part of the project fulfills the mission and one or more goals of the case study organization.
- All sources should be cited both in-text and in References using APA format.