COURSE NAME:
DATA WAREHOUSING & DATA MINING

LECTURE 4
TOPICS TO BE COVERED:
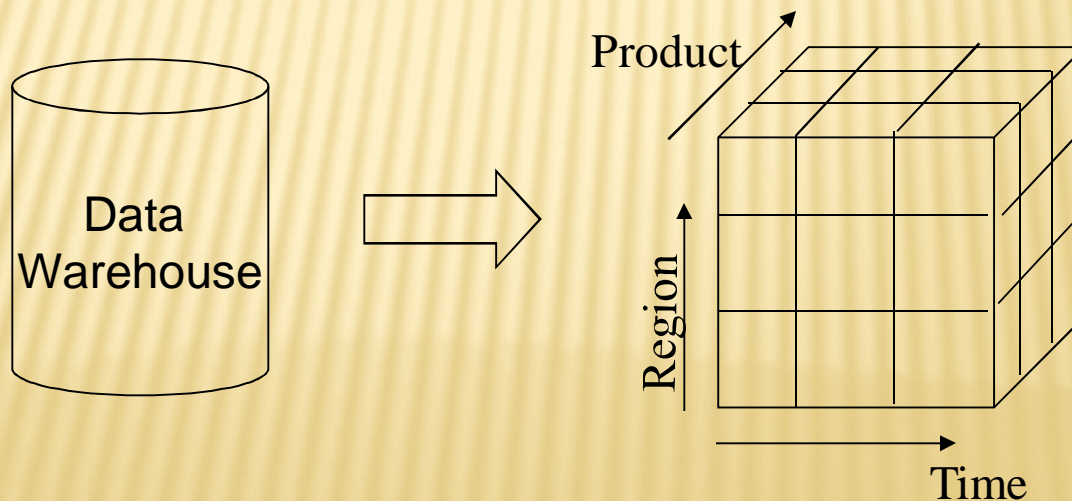
- Online Analytical Processing
- Multidimensional data mode
- Data cubes
- Data warehouse process & architecture
- OLTP vs OLAP
- ROLAP vs MOLAP
- types of OLAP servers
- 3-Tier data warehouse architecture

OLTP AND OLAP

- OLTP (on-line transaction processing)
  - Major task of traditional relational DBMS
  - Day-to-day operations: purchasing, inventory, banking, manufacturing, payroll, registration, accounting, etc.
- OLAP (on-line analytical processing)
  - Major task of data warehouse system
  - Data analysis and decision making

ONLINE ANALYSIS PROCESSING(OLAP)

- ✖ It enables analysts, managers and executives to gain insight into data through fast, consistent, interactive access to a wide variety of possible views of information that has been transformed from raw data to reflect the real dimensionality of the enterprise as understood by the user.

- On-line analytical processing (OLAP) can be performed in data warehouses/marts using the multidimensional data model.
- Typical OLAP operations include rollup, drill-down, slice-and-dice, pivot (rotate).
- OLAP operations can be implemented efficiently using the data cube structure.

× Data warehouses and OLAP tools are based on a multidimensional data model. This model views data in the form of a data cube.

OLAP CUBE

City	Product	Time	Units	Dollars
All	All	All	113	251.26
Mumbai	All	All	64	146.07
Mumbai	White Bread	All	38	98.49
Mumbai	Wheat Bread	All	13	32.24
Mumbai	Wheat Bread	Qtr1	3	7.44
Mumbai	Wheat Bread	March	3	7.44

OLAP OPERATIONS

Drill Down
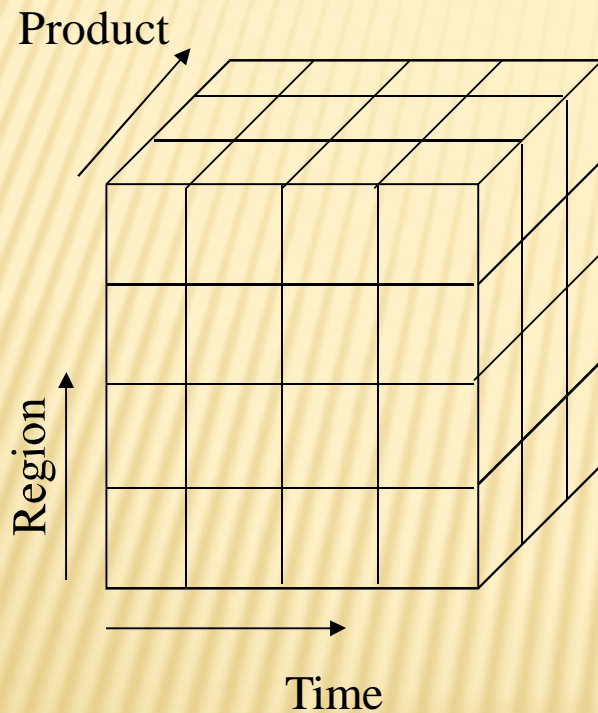
Product

Region

Time

Category e.g Electrical Appliance

⤷ Sub Category e.g Kitchen

⤷ Product e.g Toaster

OLAP OPERATIONS

Drill Up
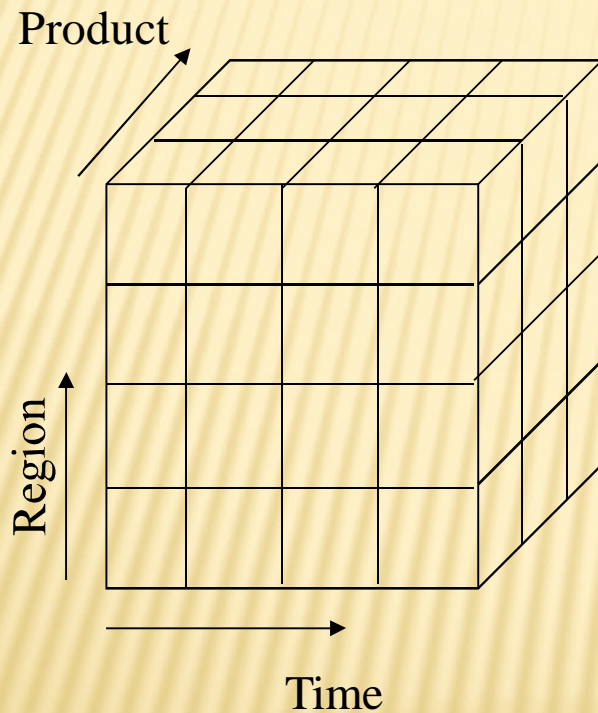
Product

Region

Time

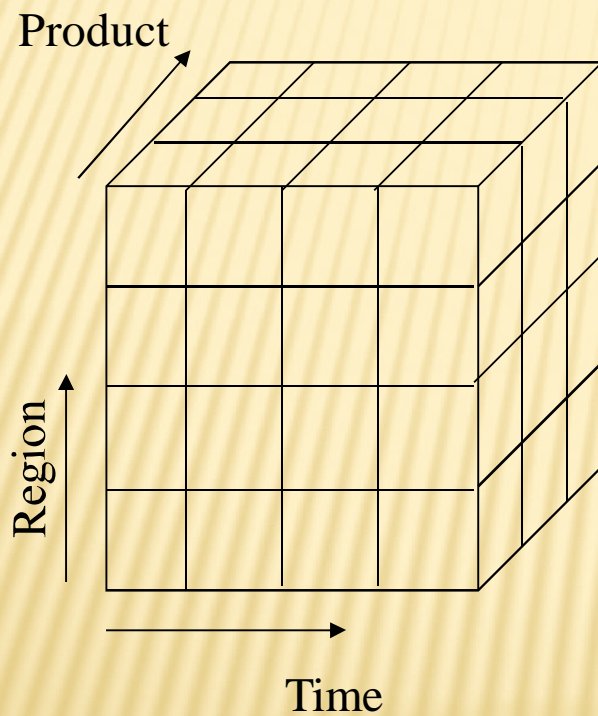Category e.g Electrical Appliance

Sub Category e.g Kitchen

Product e.g Toaster

OLAP OPERATIONS

Slice and Dice

Product

Region

Time

Product=Toaster

Region

Time
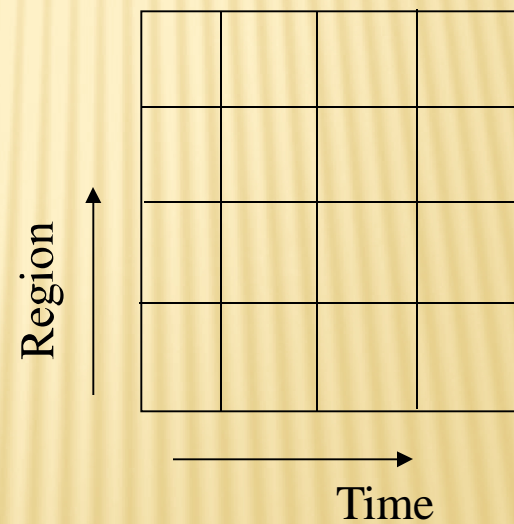
OLAP OPERATIONS
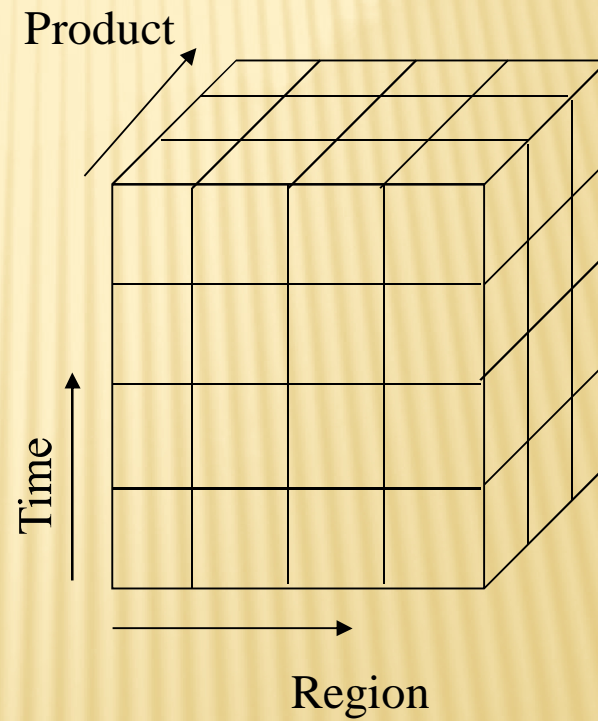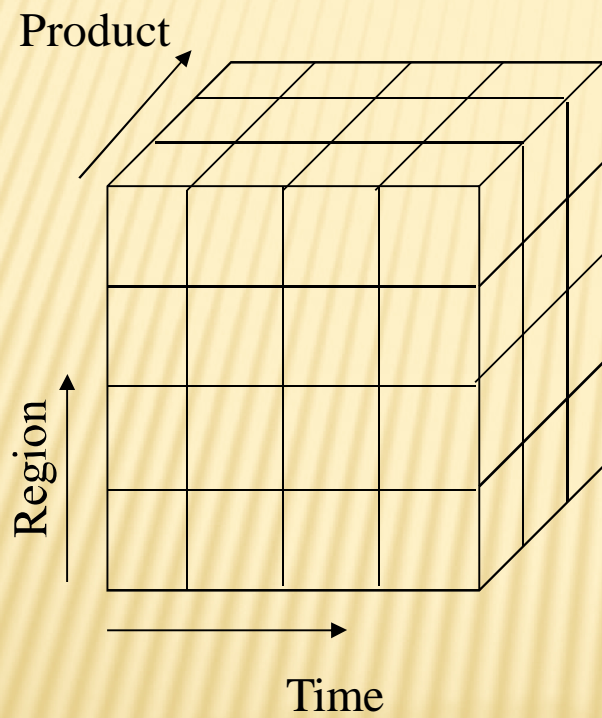
Pivot

A SAMPLE DATA CUBE
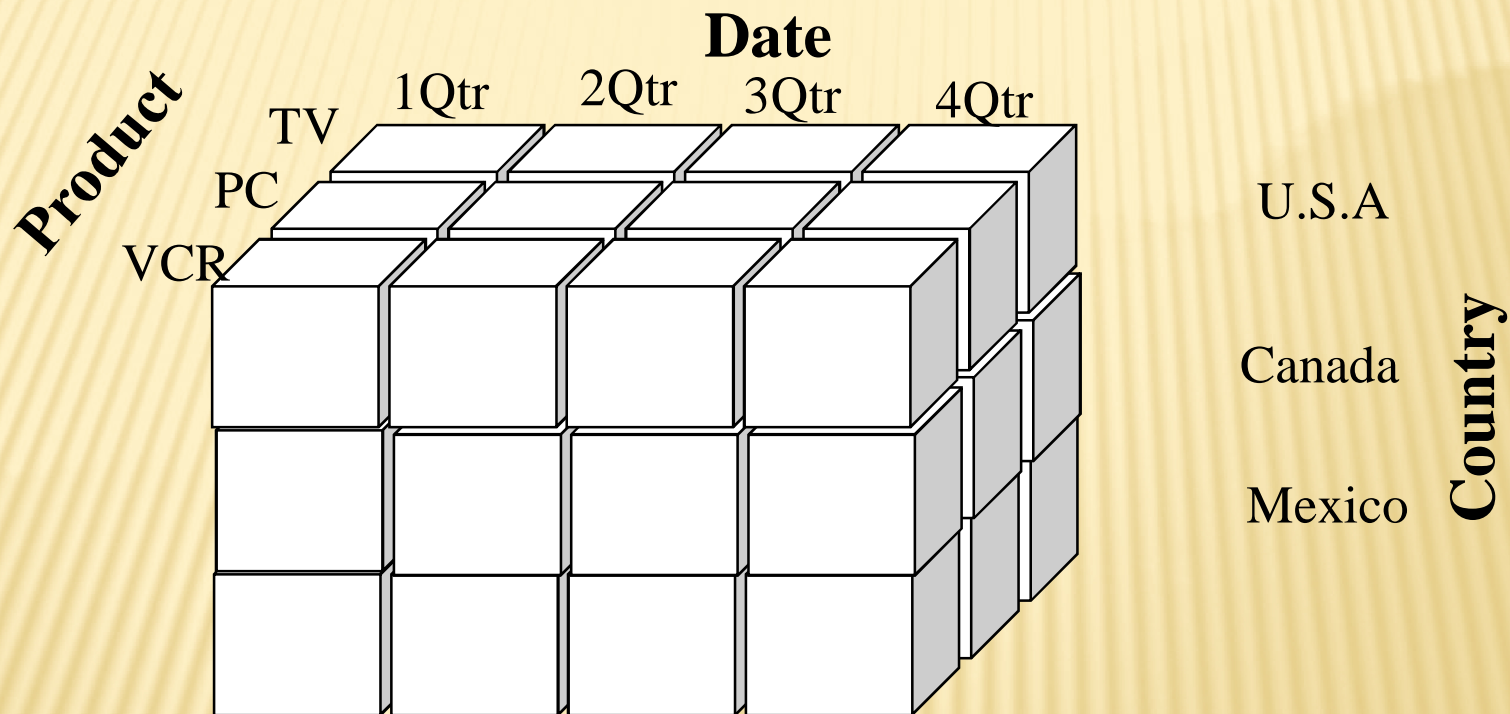
SLICE AND DICE

Sales of 3Qtr in USA

Sales of PC of 3Qtr in USA

Date

Sales in USA

Product

1Qtr 2Qtr 3Qtr 4Qtr

TV
PC
VCR

U.S.A

Canada

Mexico

Country

Sales of PC

Sales of 3Qtr
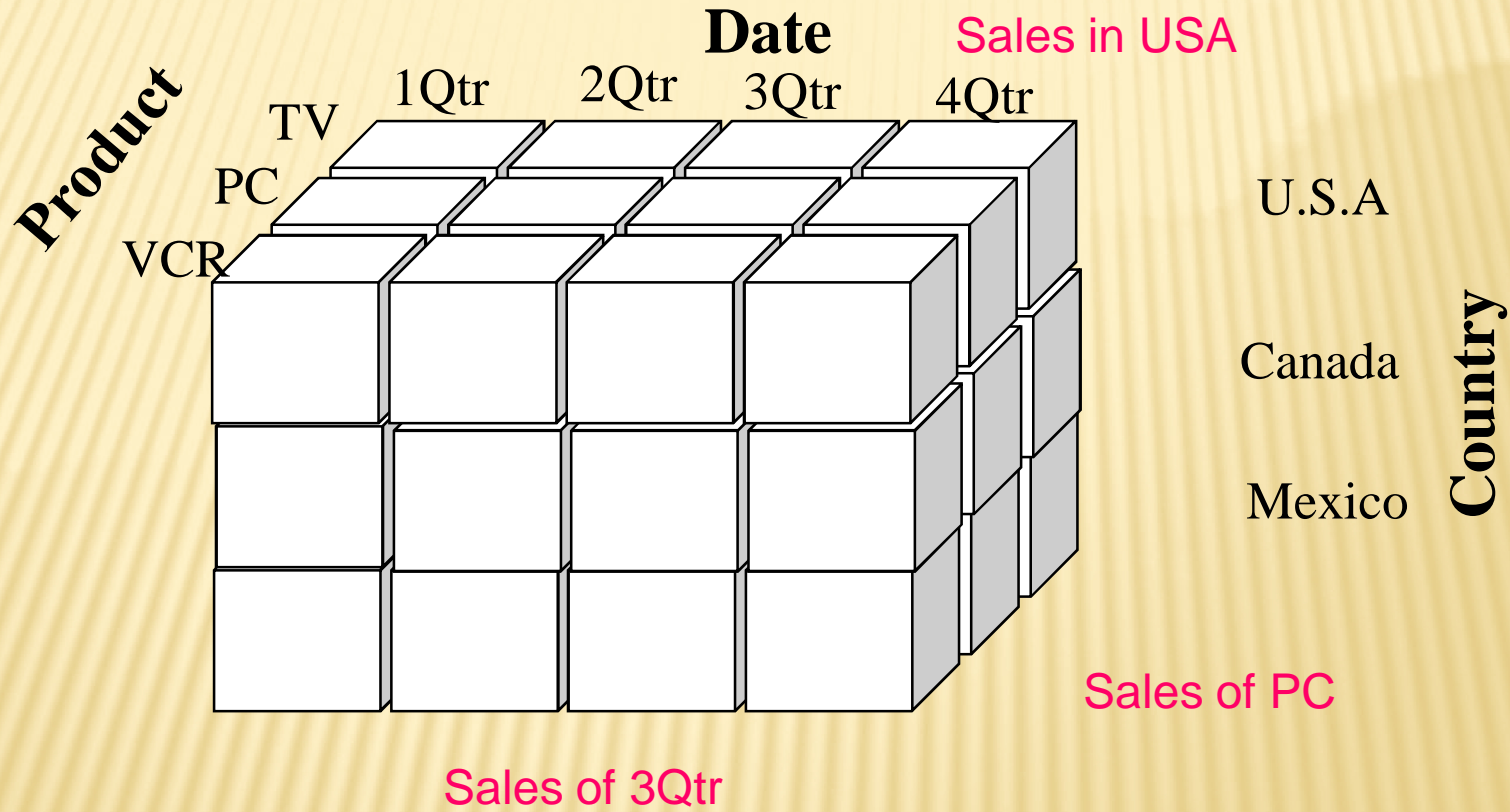
PIVOT (ROTATE):
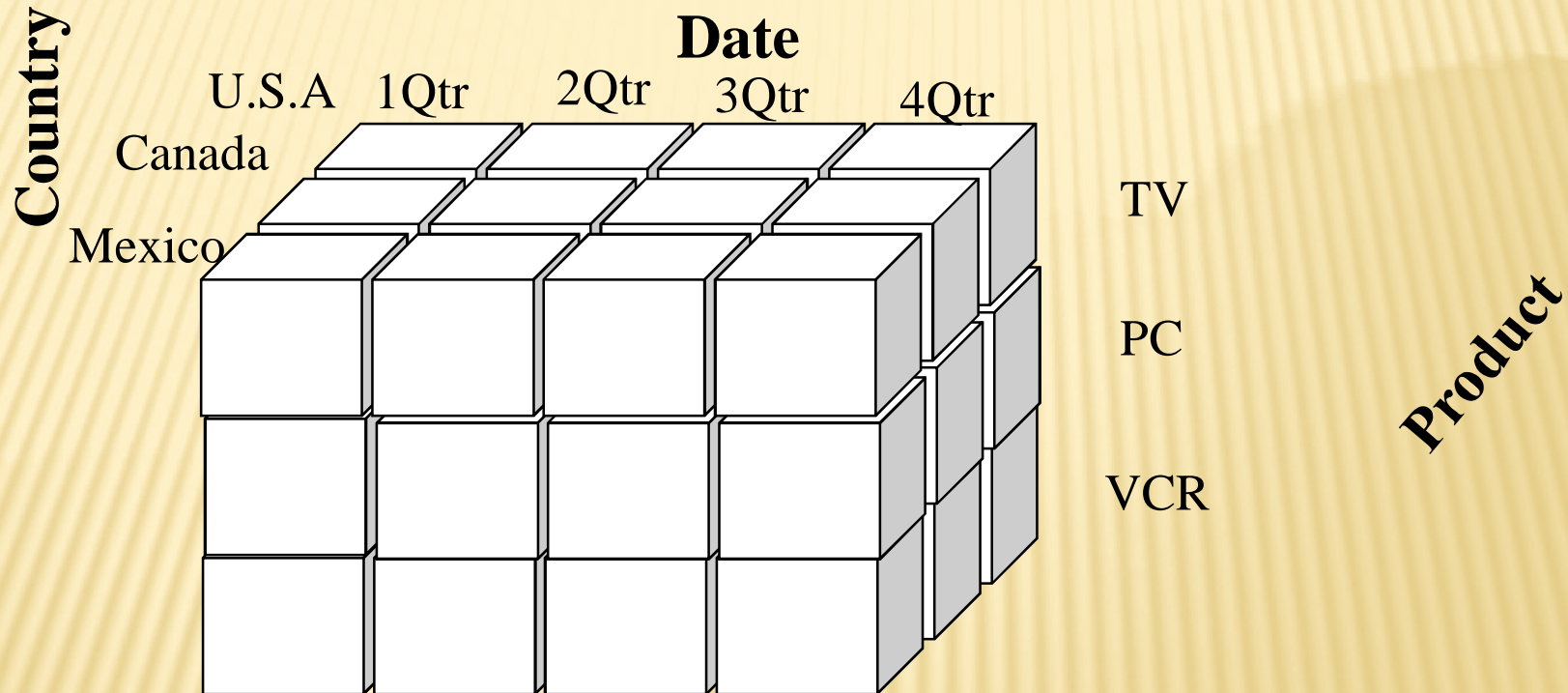
ROLL UP (DRILL-UP) (*DIMENSION REDUCTION EXAMPLE*)

Group by date, country

- reduced product dimension

Group by *nothing*

- reduced all dimensions

Group by country

- reduced date dimension

ROLL UP (DRILL-UP)

DRILL DOWN (ROLL-DOWN)

Group by country

Date

Product

1Qtr   2Qtr   3Qtr   Qtr

TV
PC
VCR

U.S.A

Canada

Country

Mexico

Group by date, country

ALL

location (cities)
Toronto 395
Vancouver
time (quarters)
Q1 605
Q2

computer

home entertainment

item (types)

location (countries)
USA 2000
Canada
time (quarters)
Q1 1000
Q2
Q3
Q4

computer phone security

home entertainment

item (types)

dice for
(location = "Toronto" or "Vancouver")
and (time = "Q1" or "Q2") and
(item = "home entertainment" or "computer")

roll-up
on location
(from cities
to countries)

location (cities)
Chicago 440
New York 1560
Toronto 395
Vancouver
time (quarters)
Q1 | 605 | 825 | 14 | 400
Q2
Q3
Q4

computer security

home entertainment phone

item (types)

slice
for time = "Q1"

drill-down
on time
(from quarters
to months)

location (cities)
Chicago
New York
Toronto
Vancouver | 605 | 825 | 14 | 400

computer security

home entertainment phone

item (types)

pivot

item (types)
home entertainment | | | | 605
computer | | | | 825
phone | | | | 14
security | | | | 400

New York Vancouver
Chicago Toronto

location (cities)

location (cities)
Chicago
New York
Toronto
Vancouver
time (months)
January 150
February 100
March 150
April
May
June
July
August
September
October
November
December

computer security

home entertainment phone

item (types)