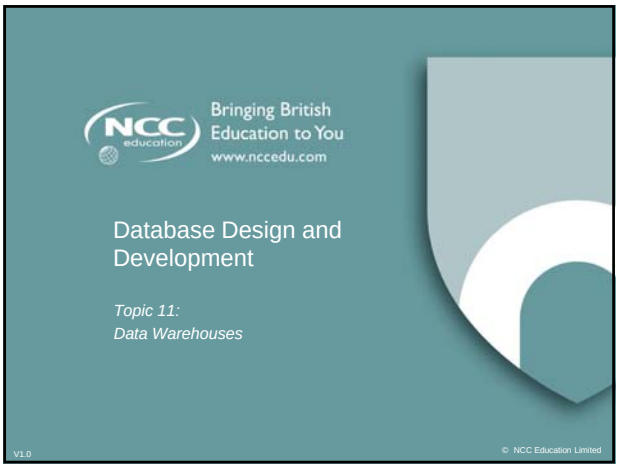
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Database Design and Development
Topic 11:
Data Warehouses
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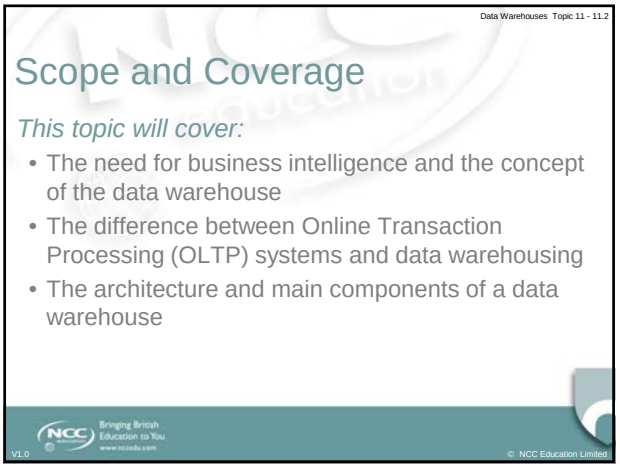
Data Warehouses Topic 11 - 11.2
Scope and Coverage
This topic will cover:
• The need for business intelligence and the concept of the data warehouse
• The difference between Online Transaction Processing (OLTP) systems and data warehousing
• The architecture and main components of a data warehouse
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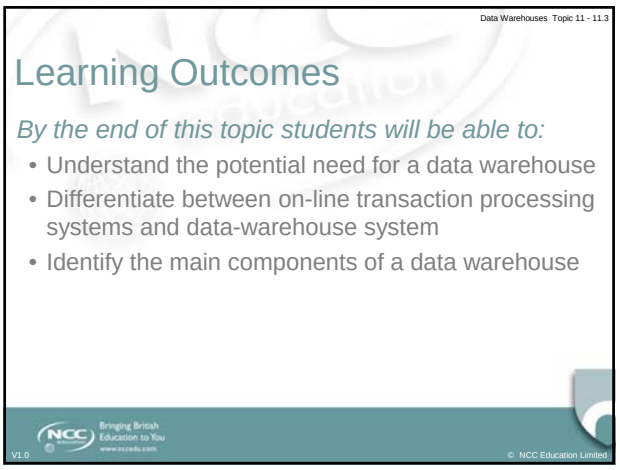
Data Warehouses Topic 11 - 11.3
Learning Outcomes
By the end of this topic students will be able to:
• Understand the potential need for a data warehouse
• Differentiate between on-line transaction processing systems and data-warehouse system
• Identify the main components of a data warehouse
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Why need a Data Warehouse? - 1

- Two types of database processing
- OLTP - On-line transaction processing.
  - It is a class of program that facilitates and manages transaction-oriented applications.
  - It is used for supporting daily busyness.
- OLAP - On-line analytical processing
  - It is a way of viewing data in a multidimensional format.
  - It is used for supporting decision making.

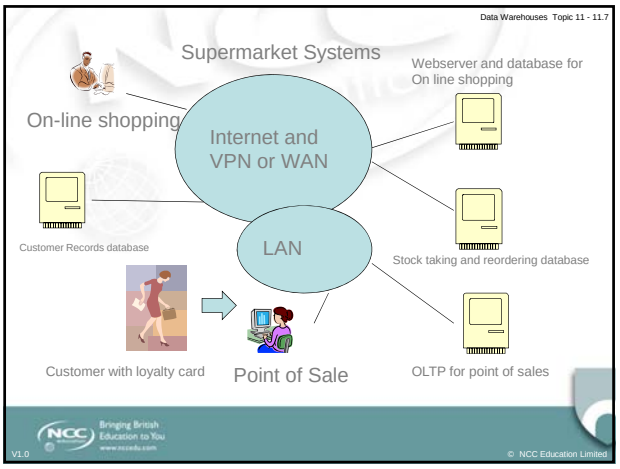
Why need a Data Warehouse? - 2

- The need for business intelligence
  - competitive environment
  - strategic planning
  - decision making
- Proliferation of different systems

Databases Designed for OLTP are not Suitable for OLAP

- Content
- Accessibility
- Form
- Performance
- Availability

- ***Data Warehouse is a solution***


Data Warehouses Topic 11 - 11.7
Supermarket Systems
Webserver and database for On line shopping
On-line shopping
Internet and VPN or WAN
Customer Records database
LAN
Stock taking and reordering database
Customer with loyalty card
Point of Sale
OLTP for point of sales
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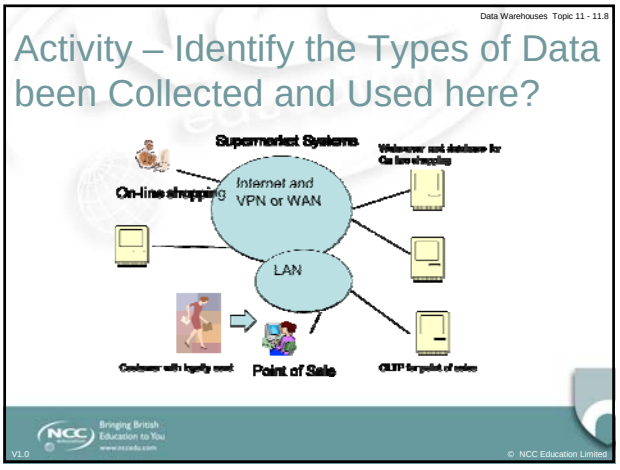
Data Warehouses Topic 11 - 11.8
Activity – Identify the Types of Data been Collected and Used here?
Supermarket Systems
On-line shopping
Internet and VPN or WAN
LAN
Point of Sale
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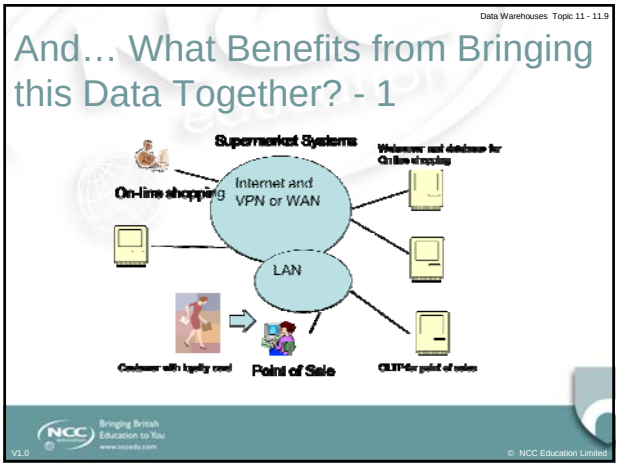
Data Warehouses Topic 11 - 11.9
And… What Benefits from Bringing this Data Together? - 1
Supermarket Systems
On-line shopping
Internet and VPN or WAN
LAN
Point of Sale
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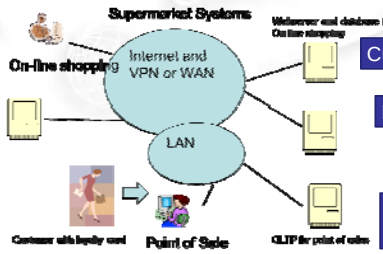
Data Warehouses Topic 11 - 11.10

And… What Benefits from Bringing this Data Together?



- Sales Trends
- Customer Buying habits
- Regional variations
- Variations by time
- Goods generating profit

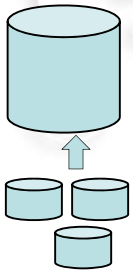
Data Warehouses Topic 11 - 11.11

Transform “Data” into “Information”

- Data Warehouse provides a multidimensional view of an organization’s operational (OLTP) data to help user make more informed, fast decisions.

Data Warehouses Topic 11 - 11.12

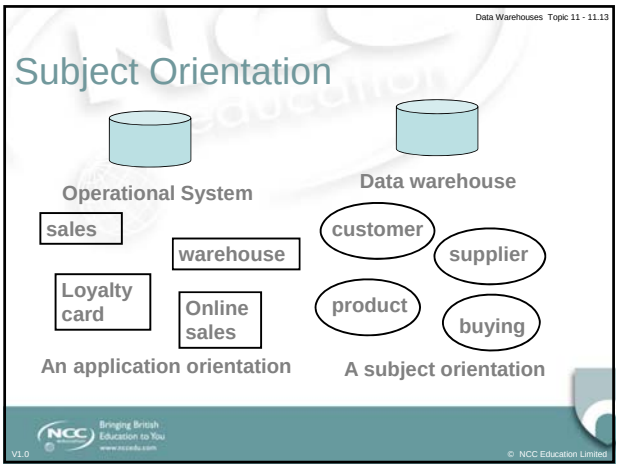
What is a Data Warehouse?



- Subject-oriented
- Integrated
- Time-variant
- Non-volatile

Combining data in support of management’s decisions

Data Warehouse


Data Warehouses Topic 11 - 11.13
Subject Orientation
Operational System
Data warehouse
sales
warehouse
Loyalty card
Online sales
customer
supplier
product
buying
An application orientation
A subject orientation
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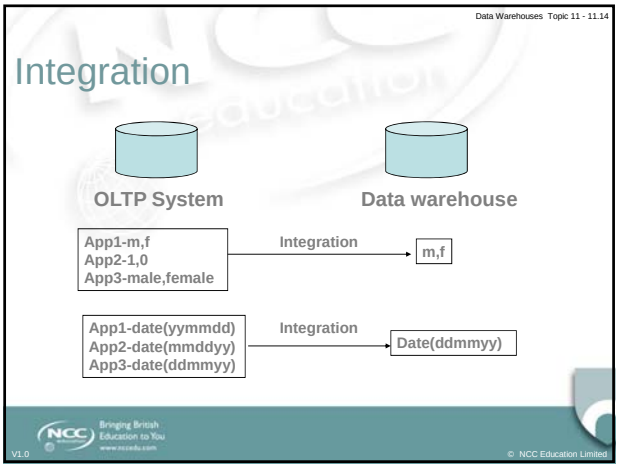
Data Warehouses Topic 11 - 11.14
Integration
OLTP System
Data warehouse
App1-m,f
App2-1,0
App3-male,female
Integration
m,f
App1-date(yymmdd)
App2-date(mmddyy)
App3-date(ddmmyy)
Integration
Date(ddmmyy)
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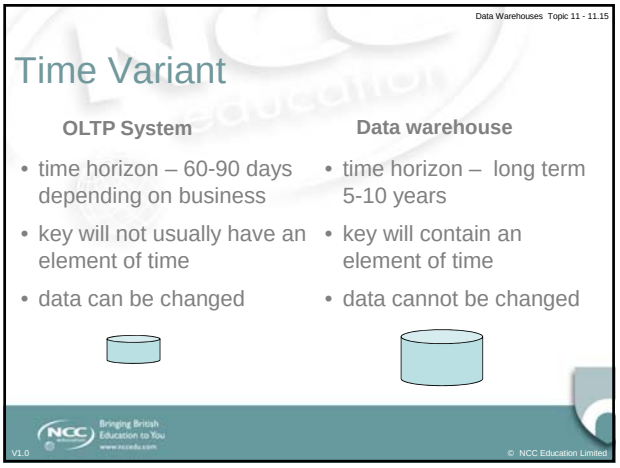
Data Warehouses Topic 11 - 11.15
Time Variant
OLTP System
Data warehouse
• time horizon – 60-90 days depending on business
• key will not usually have an element of time
• data can be changed
• time horizon – long term 5-10 years
• key will contain an element of time
• data cannot be changed
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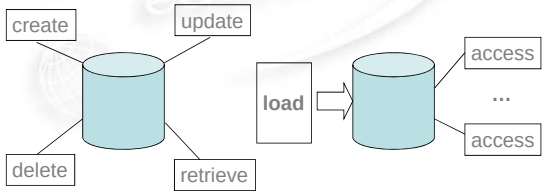
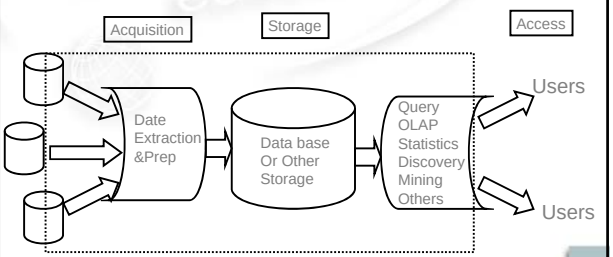
Data Warehouses Topic 11 - 11.16

Non-Volatile



Data Warehouses Topic 11 - 11.17

The Data Warehouse Functional Model



Data Warehouses Topic 11 - 11.18

Acquisition

- Identifying the necessary data from legacy system (and other data sources).
- Validating that the data is accurate, appropriate, and usable.
- Extracting the data from the original source
- Preparing the data for inclusion into the new environment.
- Staging the information – making the data ready for loading into the warehouse itself

Storage

- Storage is the heart of a data warehouse
- An environment (the data warehouse) is constructed to provide a place from which the data from the source systems can be accessed

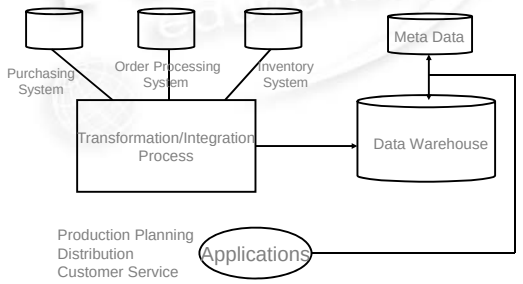
Access Tools

- Query and Reporting Tools
- OLAP Tools
- Statistical Analysis Tools
- Data Discovery / Data mining Tools
- Graphical and Geographic Information Systems

Seven Steps to Building a Data Warehouse

- Determine the needs of the end users
- Identify the necessary data sources
- Analyse the data sources in depth
- Use the information to work out how the data will need to be transformed
- Create the meta data which describes the transformation and integration that to occur
- Create the physical data warehouse and populate from various sources
- Create the end use applications

An Example of A Data Warehouse

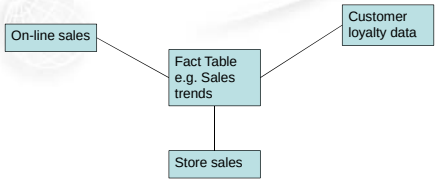


Data Warehouse Schemas

- Star Schemas
- Snowflake schemas
- Starflake schemas

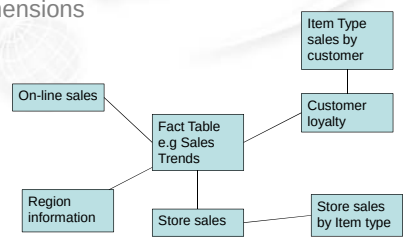
Star Schema

- Central table surrounded by reference tables



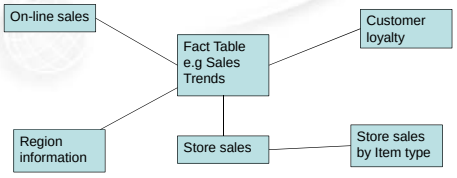
Snowflake Schema

- Each dimension can have a number of its own dimensions



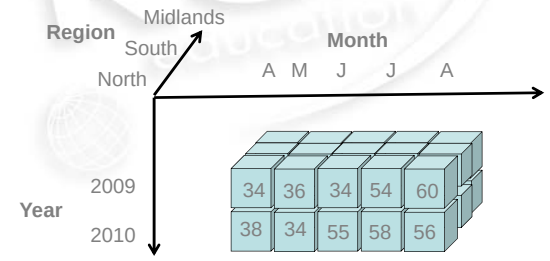
Starflake Schema

- Some de-normalisation



OLAP – On-line Analytical Processing

- Consolidation
- Drilling-down
- Pivoting
- Multi-dimensional data



Multi-dimensional data – sales of Ice cream in thousands

Codd's Rules for OLAP Tools - 1

- Multi-dimensional conceptual view
- Transparency
- Accessibility
- Consistent reporting performance
- Client-server architecture
- Generic dimensionality
- Dynamic sparse matrix handling

Codd's Rules for OLAP Tools - 2

- Multi-user support
- Unrestricted cross-dimensional operations
- Intuitive data manipulation
- Flexible reporting
- Unlimited dimensions

Slide 29

j1 split
jamie.bazley, 01/09/2011

Learning Outcomes

By the end of this unit students will be able to:

- Understand the potential need for a data warehouse
- Differentiate between on-line transaction processing systems and data-warehouse system
- Identify the main components of a data warehouse

Did we meet them?

References

- Benyon-Davies, Paul. *Database Systems* Palgrave Third Edition 2004 Chapters 40 and 41
- Connolly, Thomas M., and Begg, Carolyn E., *Database Systems: A Practical Approach to Design and Implementation* Addision-Wesley, Fourth Edition 2005 Chapter 31, 32 and 33
- Inmon, W.H., "Building the data warehouse" http://inmoncif.com/inmoncif-old/www/library/whiteprs/ttbuild.pdf retrieved 15th August 2011

Topic 11 – Data Warehouses

Any Questions?

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