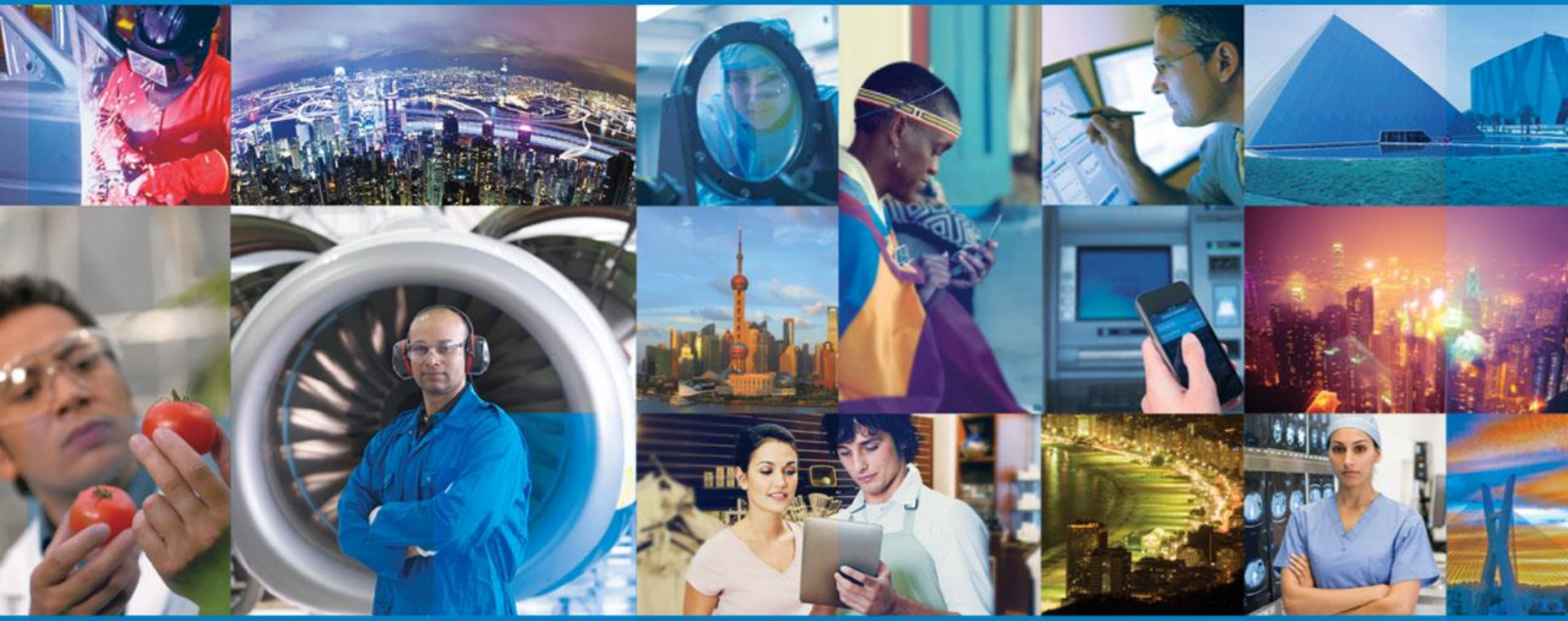
Relational Database Management System



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Course Information

- Course Code: CCFP4.1-RDBMS
- Course Name: Relational Database Management System
- Document Number: RDBMS-01
- Version Number: 4.1

Learning Objectives

- Given application requirements and data model, be able to interpret and implement the model, normalize the relational schema and analyze the applicability of a specific normal form
- Given a business scenario and DB design of a relational database – be able to create/modify the structure and write optimized SQL queries to extract and modify information from tables or views
- Given a business scenario of an Online Transaction – implement the transaction using DB programming language (SQL/PL-SQL)

EasyShop : A snapshot

- 9,000 outlets across the world
- Approximately 40,000 employees working in various outlets
- More than 90,000 items
- More than 3,000 suppliers
- Around 2.5 million customers
- More than a million transactions each day across all outlets

Data

What is Data?	Collection of facts and figures for processing and analysis
How do you organize the data and Why ?	In “Database” Organized data needs “Processing”
What do you think about the “growth” of data?	Employees data grows slowly when compared to transactions
What do you think is the volume of this data?	Huge
What do you think is the size of this data?	Terabytes +
How do you think data is classified ?	Structured and unstructured

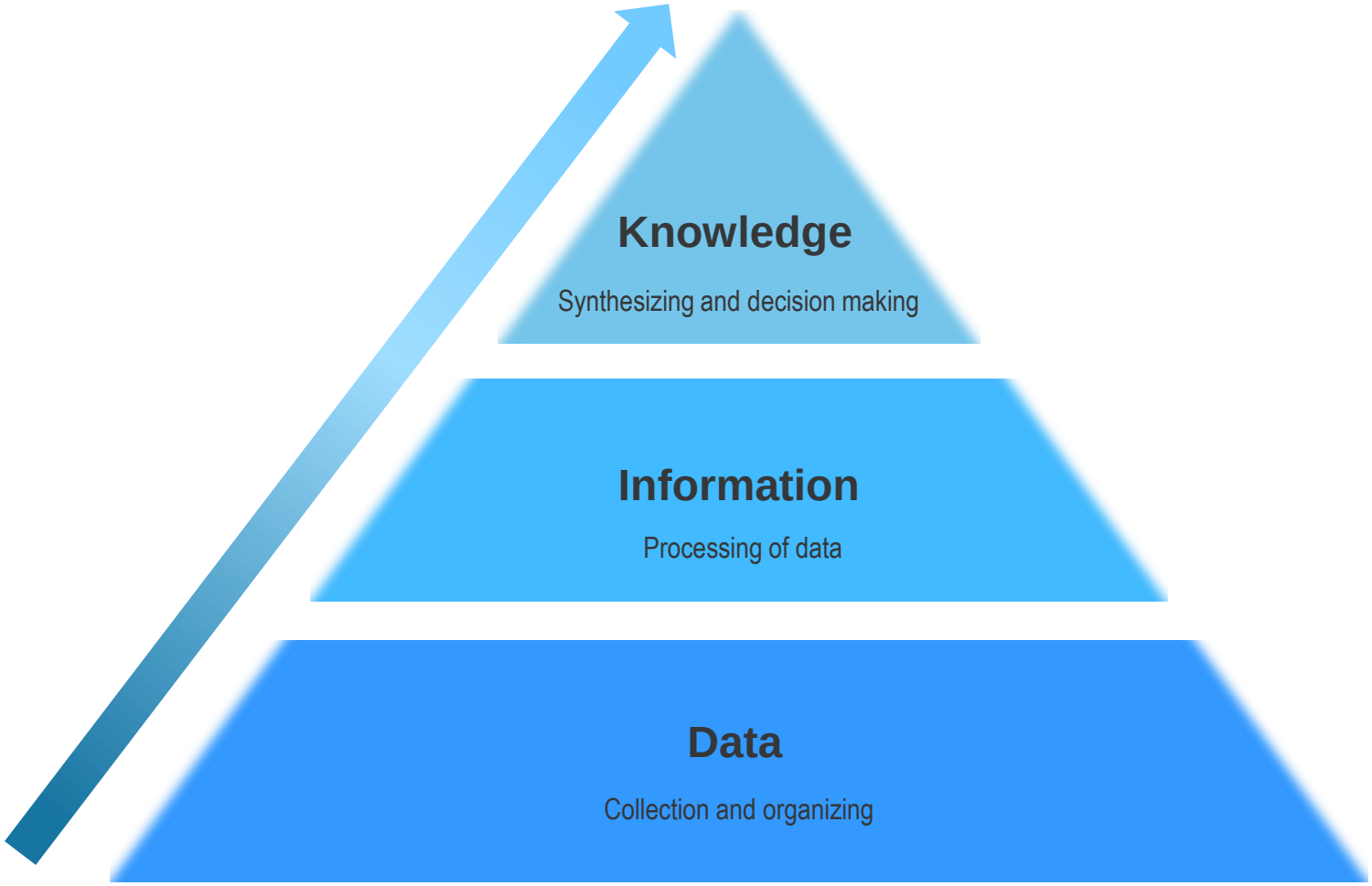
EasyShop : A snapshot

What operations can be performed on EasyShop application data ?

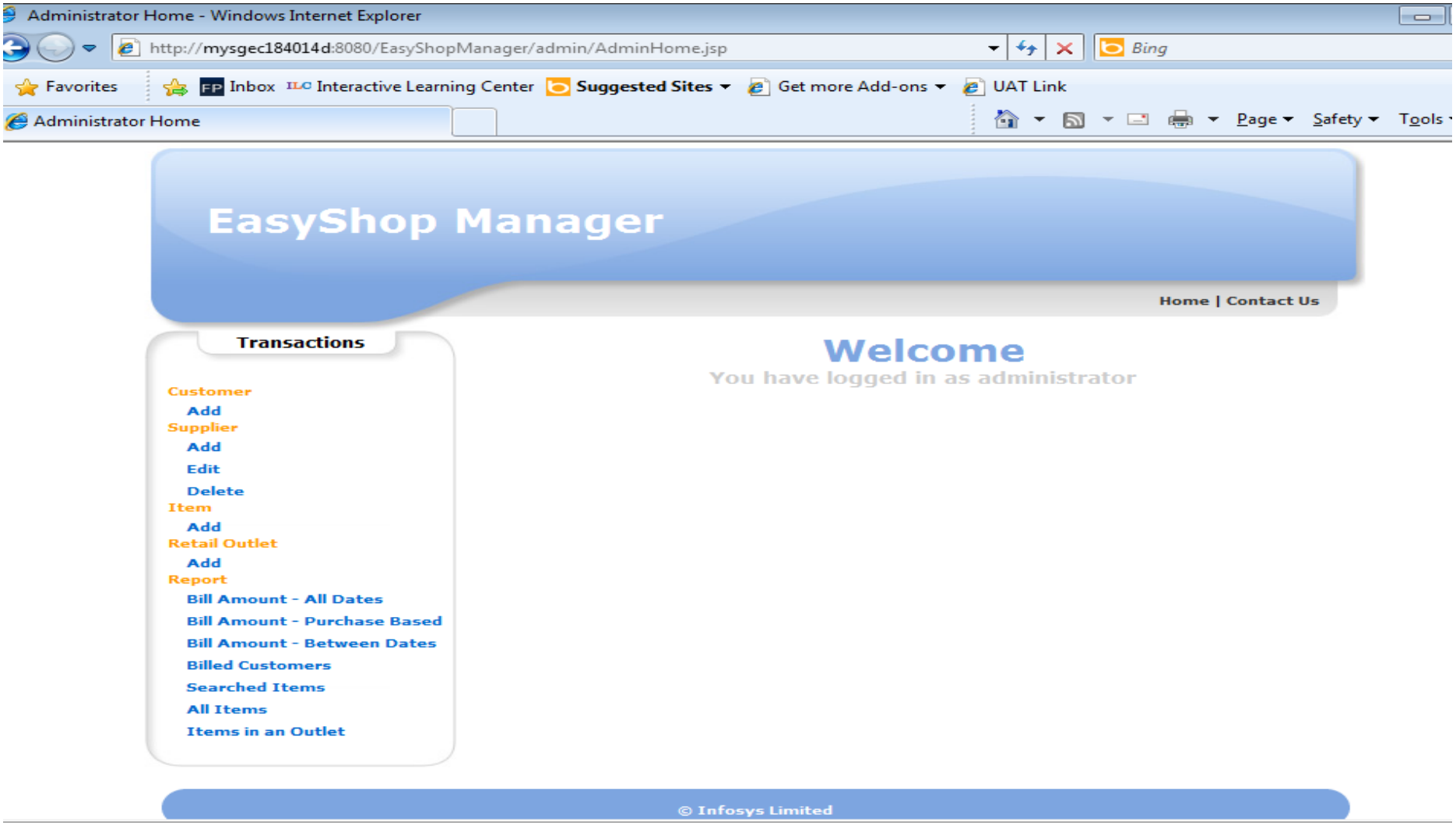
EasyShop : Data operations

- Add new items to the stock
- Modify the details of a customer / employee/items
- Retrieve customer details such as customer type for appropriate bill calculation
- Identify the pattern of items being sold

Purpose of data



Demo: EasyShop application

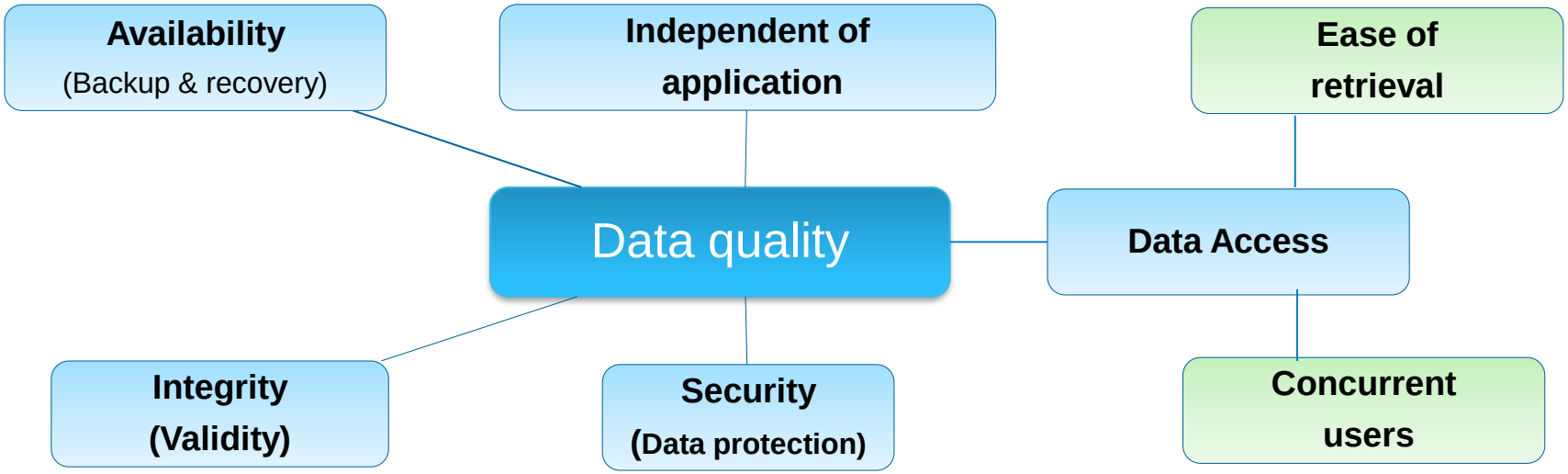


Ways of data storage

- **Non persistent**
  - Data in primary memory for processing
  - E.g.: Data in variables, arrays, linked lists etc. used as part of application

- **Persistent**
  - Data stored in secondary memory
  - E.g.: Data stored in flat files

Data quality criteria



Flat files for data storage

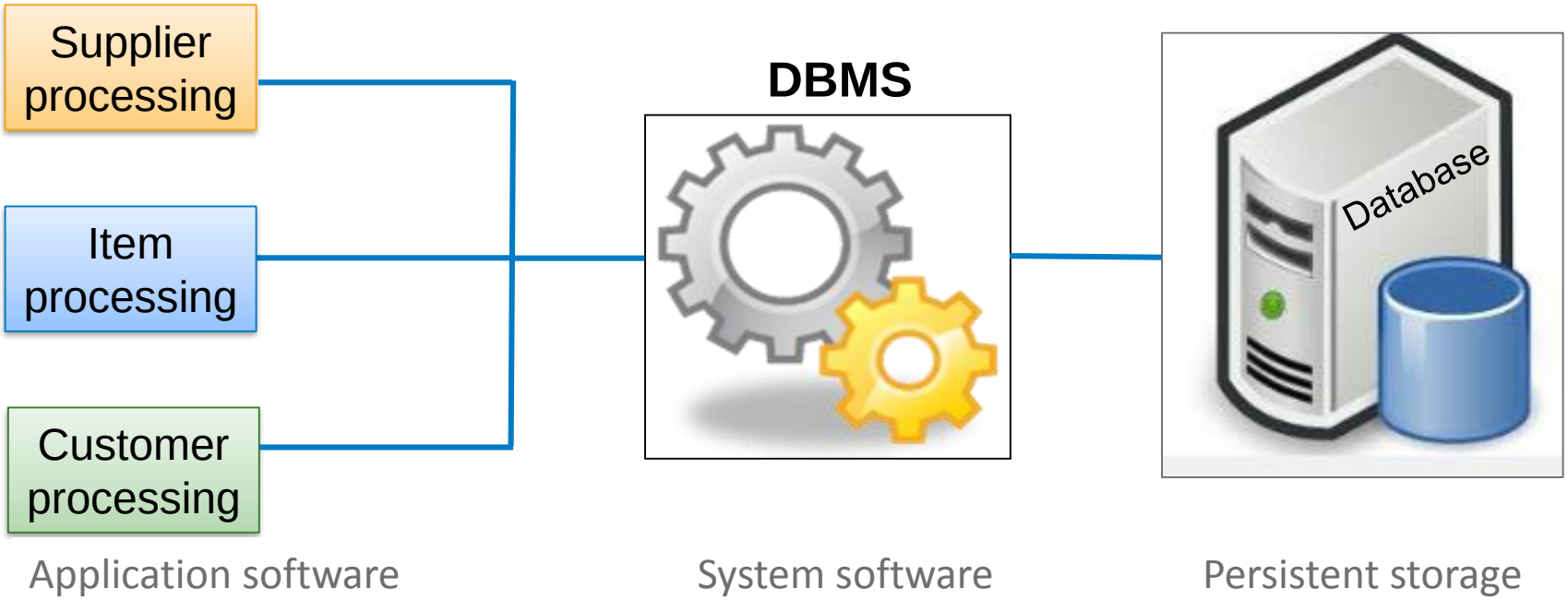
- Challenges to ensure data quality
  - Application is dependent on data
  - Complexity in data retrieval
  - Single user access only
  - Data is not secured
  - Integrity of the data requires additional logic in the application
  - Data redundancy

This necessitates a software to handle these challenges - DBMS

DBMS

- DBMS is a software that facilitates the creation, storage, retrieval and manipulation of data in the database

Modules in EasyShop

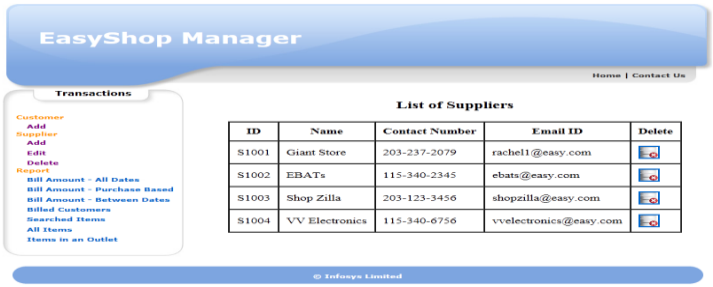


Functions of DBMS

Data management	Store, retrieve and modify data
Transaction support	Ensures that modifications to the database must be either successful or not done at all
Concurrency control	Simultaneous data access provided to users
Recovery	Recovery mechanism for data so that nothing is lost
Security	Access to authorized users only
Integrity	Maintains accuracy of data
Utilities	Data import/export, user management, backup, performance analysis, logging & audits

Data perspectives in DBMS

External level
(End-user perception of data)



Conceptual level
(Database designer perception of data)

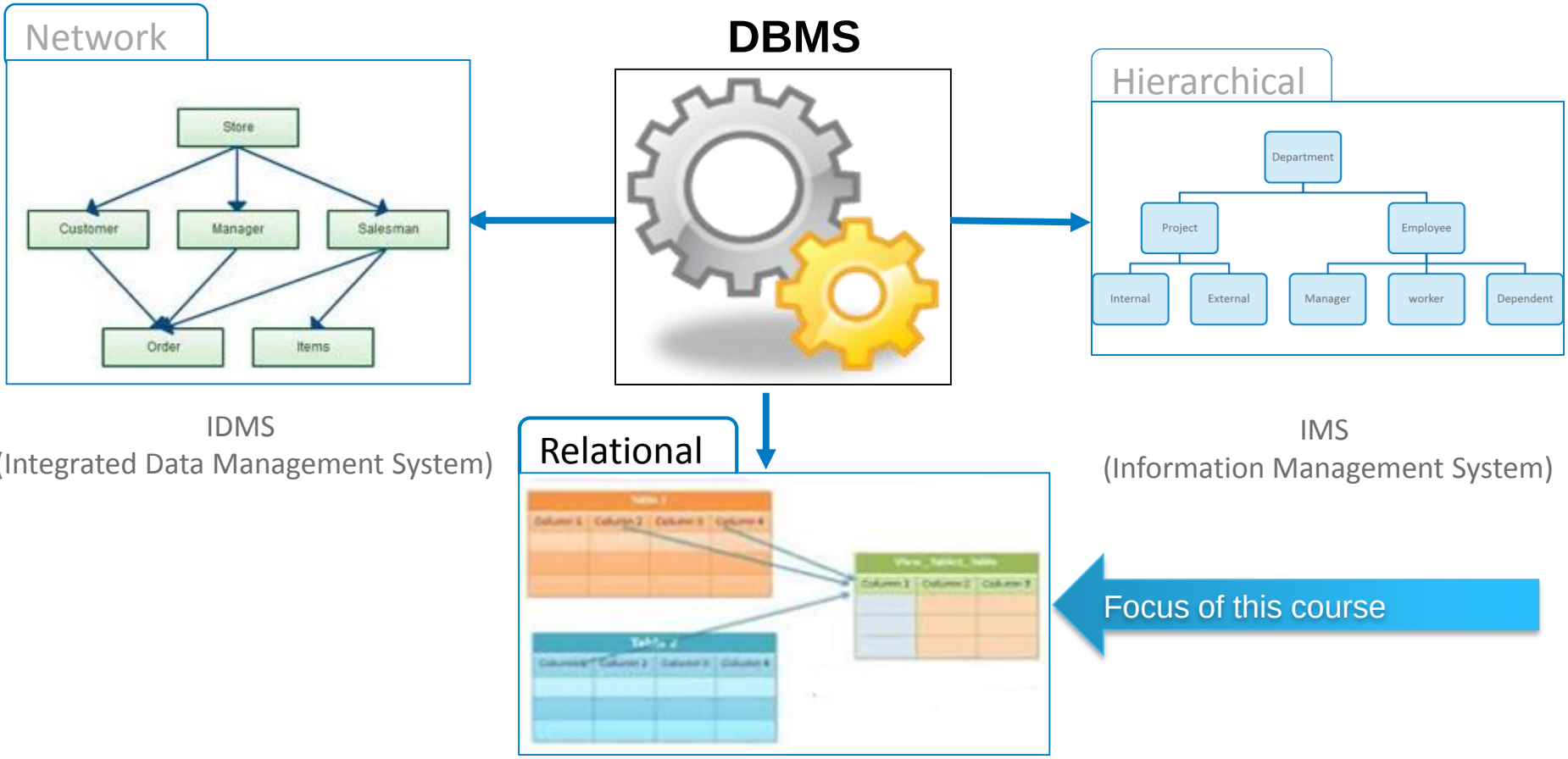
supplierid	character
suppliername	character
emailid	character

Internal level
(DBMS/OS perception of data)

supplierid	TYPE = BYTE (6)	OFFSET = 0
suppliername	TYPE = BYTE (30)	OFFSET = 6
emailid	TYPE = BYTE (30)	OFFSET = 36

Demo: EasyShop application **external view**: supplier report; **conceptual view:** describe supplier table

Few categories of DBMS



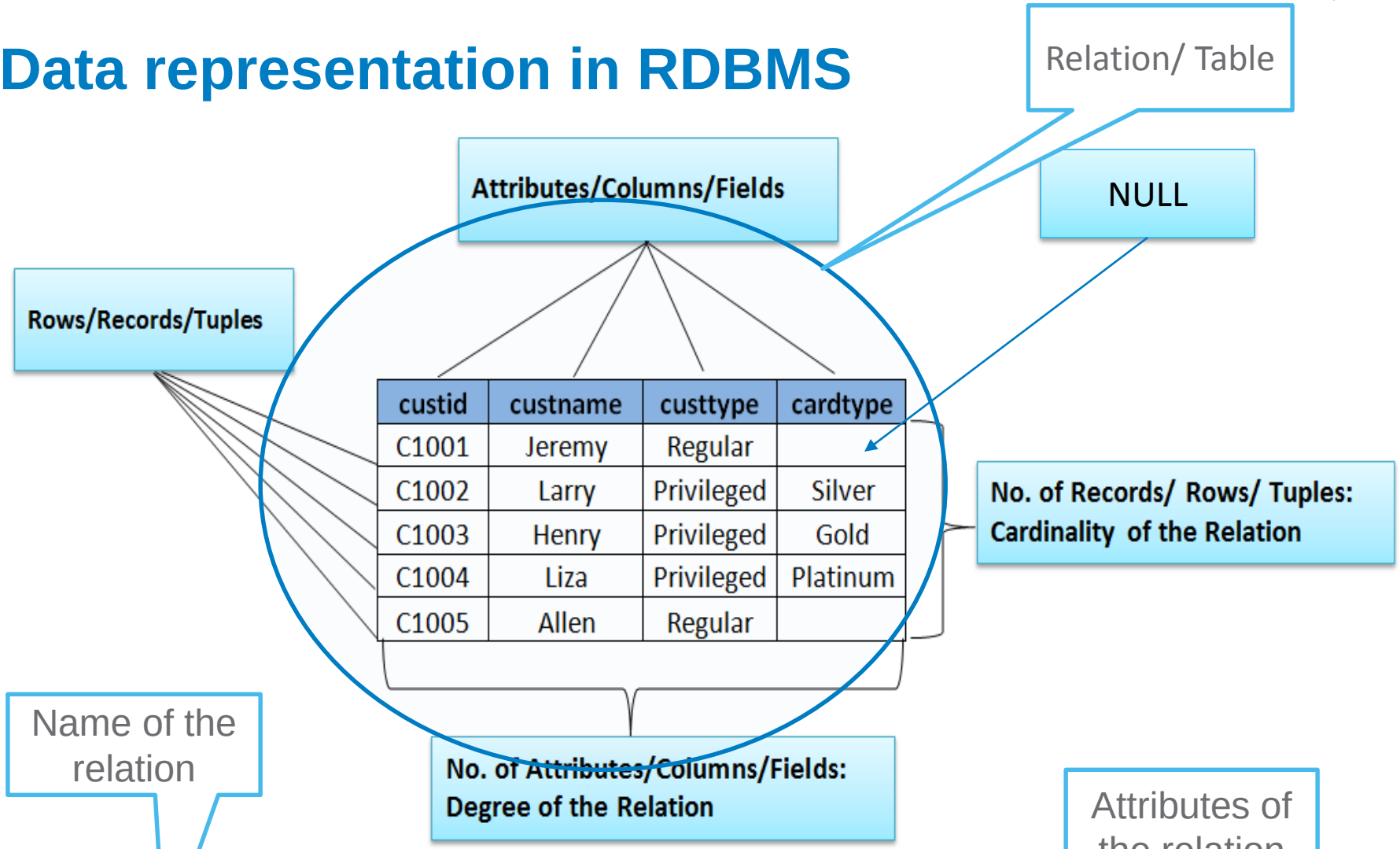
IDMS
(Integrated Data Management System)

IMS
(Information Management System)

Focus of this course

Oracle, MySQL, Microsoft SQL Server, DB2,etc.

Data representation in RDBMS



Keys in RDBMS

- In EasyShop retail system, how is uniqueness maintained among customers?
- How do you establish the link/association between two relations?

Candidate key	Primary key	Foreign key
• A *minimal* set of columns/attributes that can be used to *uniquely* identify a single row/tuple in a given relation, is called candidate key • Identified during **design time**	• Database designer selects one of the candidate keys as primary key for the purpose of identification of a row of table uniquely • Implented during table creation	• A foreign key is a column or combination of columns that is used to establish and enforce a link between the data in two relations • Implented during table creation

Foreign Key

- The set of attributes whose values are required to match with the values of a column in the same or another table.
- Foreign key values need not be unique and can have NULL values
- To enter the data in child table corresponding data must be present in parent table
- If data is not present in parent table, NULL can be the default value in child table

(Parent /Master/Referenced Table)

dept

deptno 	dname
D1	IVS
D2	ETA

(Child /Referencing Table)

emp

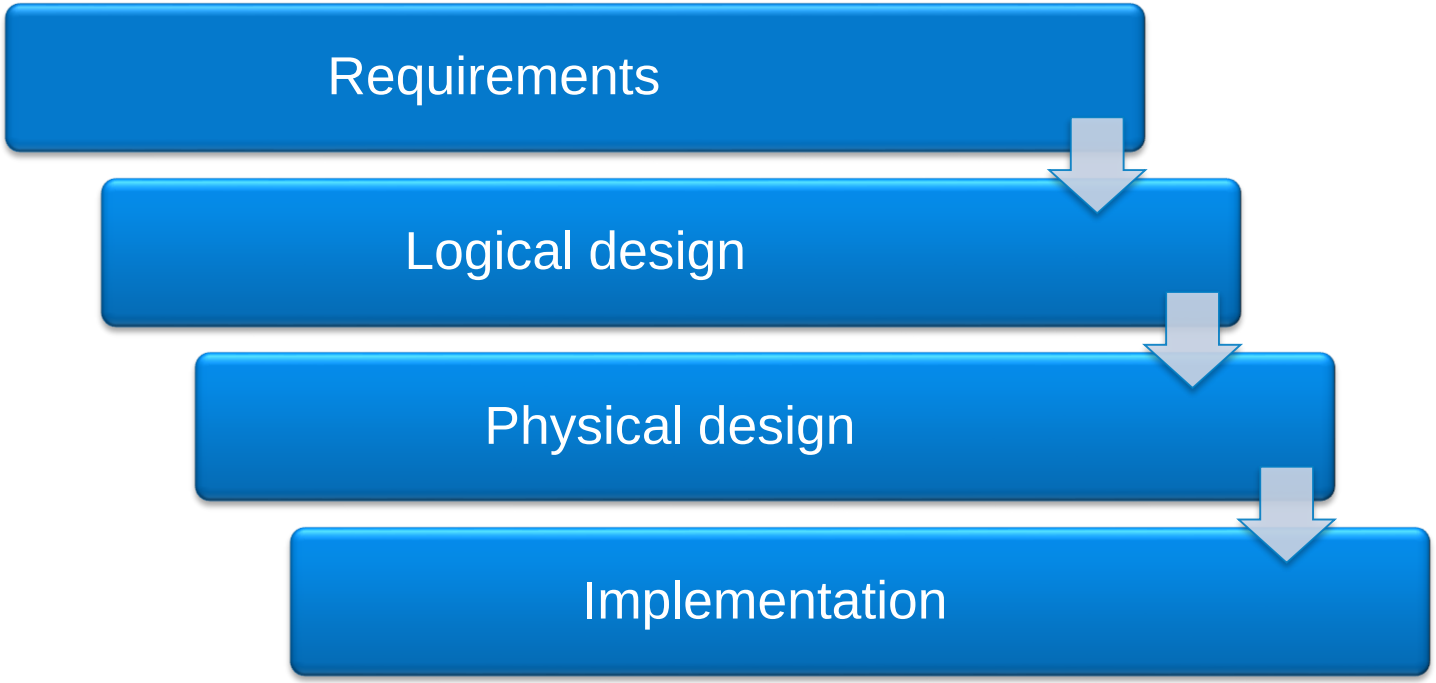
empno	ename	edeptno
1001	Elsa	D1
1002	John	D2
1003	Maria	NULL
1004	Maida	D1

Guided Activity: CCFP4.1-RDBMSAssignments, Database Basics Assignment 1

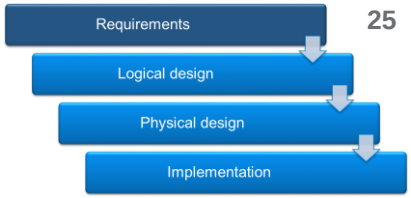
To Summarize…..

- Database fundamentals
- Data, information and knowledge
- Data quality criteria
- Challenges of storing data in flat files
- Need for DBMS
  - functions of DBMS

Database life cycle

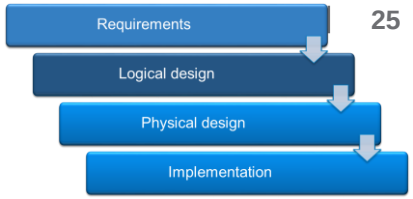


Database life cycle – Data requirements



This stage involves assessing the informational needs of an organization so that a database can be designed to meet those needs

Guided Activity: CCFP4.1-RDBMSAssignments, Database Basics, Assignment 2 (Estimated Time: 20 mins.)



Database life cycle – Logical design

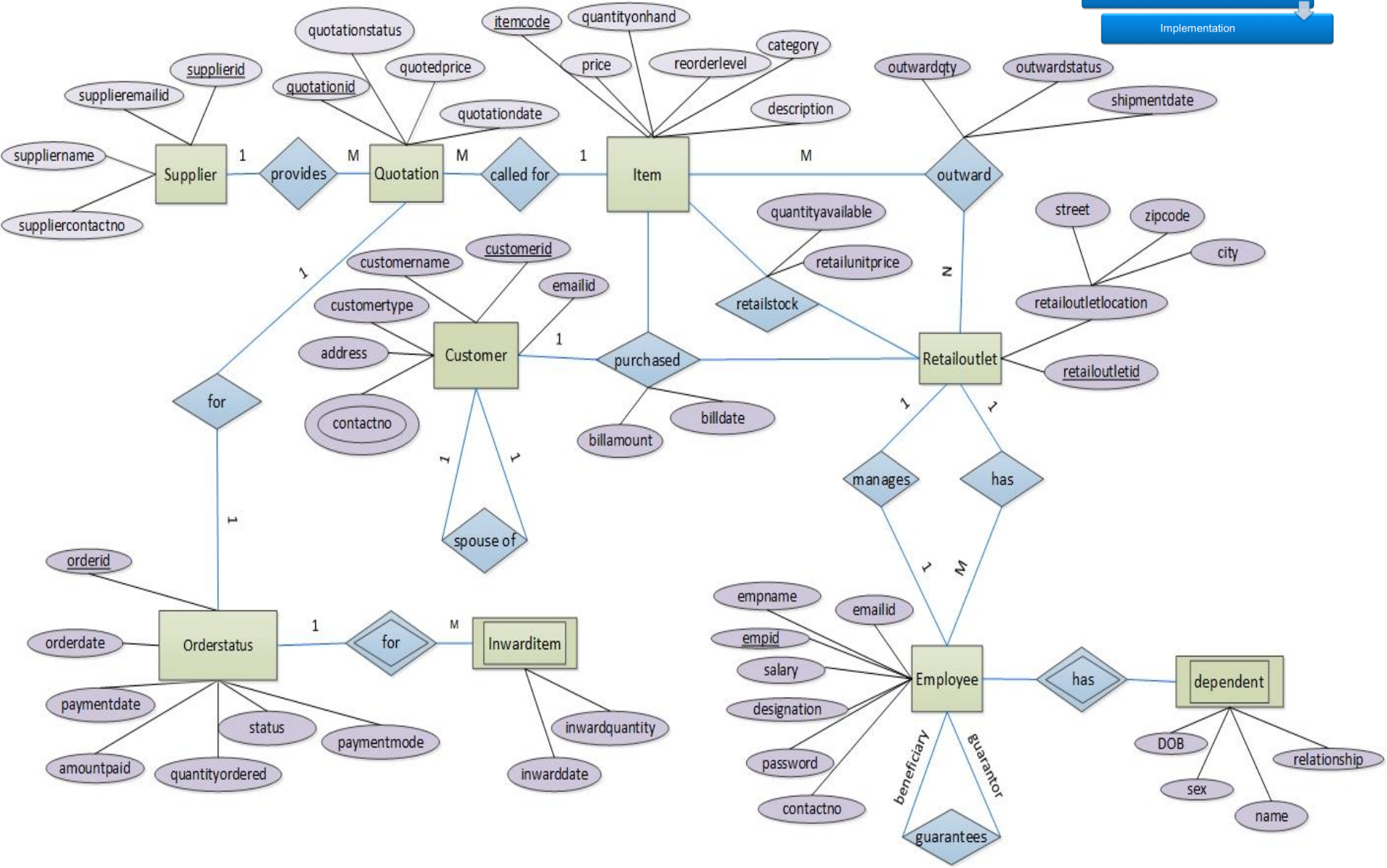
Top down approach (Entity – Relationship (ER) model)

- This approach is used when application **requirements are clear**
- Represents the application requirements in a pictorial form
- The real world objects and their corresponding attributes are identified from the requirements – hence it is top down
- This model helps in
  - analysis and design
  - re-validating the requirements

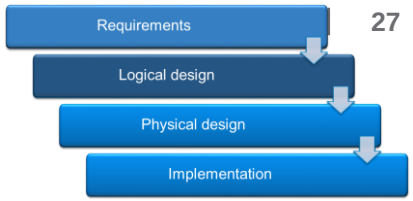
Bottom up approach (Normalization)

- This approach is used when application requirements are not very clear
- First define the required data items and then group the related data items
- Further refinement may be carried out depending on the application need

Sample ER diagram



ER diagram



Guided Activity: CCFP4.1-RDBMSAssignments, Database Basics, Assignment 5, 6 (Estimated Time: 30 mins.)

To summarize:

- Logical design in database life cycle
- ER diagram terminologies and notations
  - Degree and cardinality of relationship

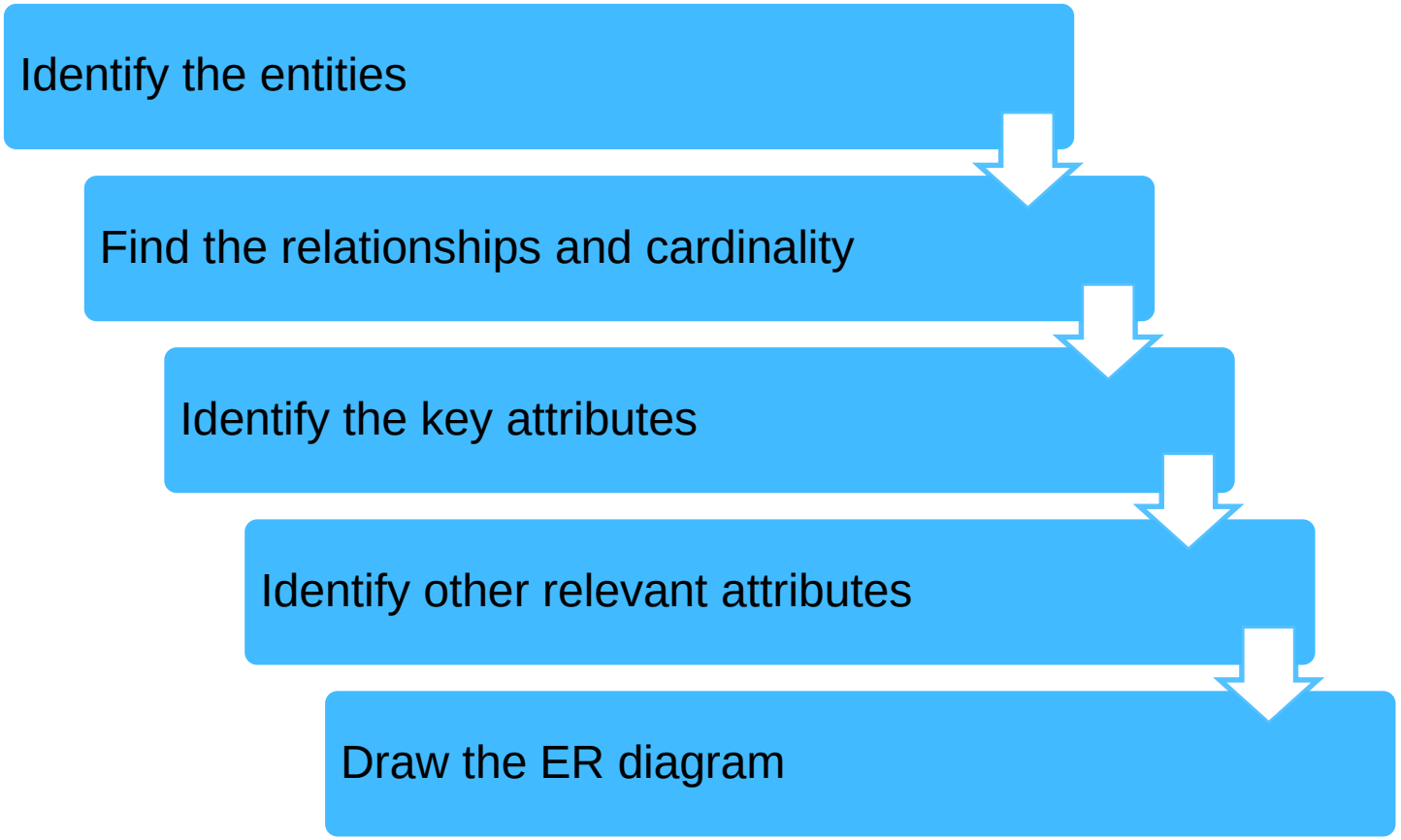
Next step: given a case study, draw the ER diagram

Case study – Guided activity

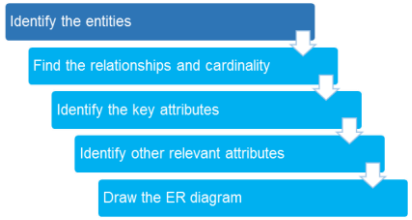
Guided Activity: **CCFP4.1-RDBMS-EasyShop Retail Application Case Study**
(Estimated Time: 20 mins.)

1. One supplier can provide many quotations
2. For every item, there will be a separate quotation
3. Many suppliers can quote for the same item
4. Many items can be outward to the several retail outlets
5. One employee works for only one retail outlet
6. One retail outlet can have many employees
7. Many customers can purchase items from several retail outlets
8. One employee can nominate many dependents

Developing ER model – Guided activity



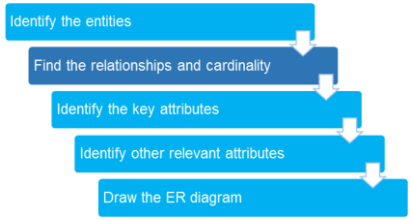
Steps in ER modeling (1 of 5) – Guided activity



Step 1: Identify the entities

- Supplier
- Quotation
- Item
- RetailOutlet
- Employee
- Customer
- Dependent

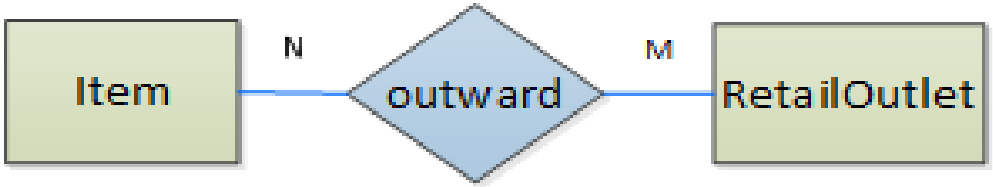
Steps in ER modeling (2 of 5) – Guided activity



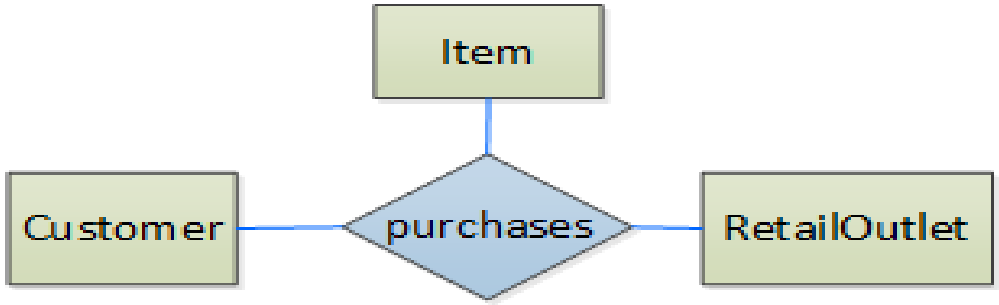
Step 2: Find relationship and cardinality

- One supplier can provide many quotations

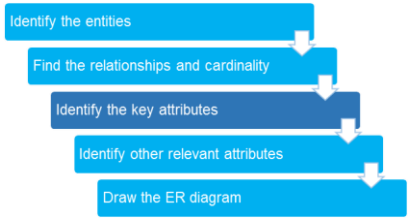
- Many items can be outward to several retail outlets



- Many customers can purchase items from several retail outlets



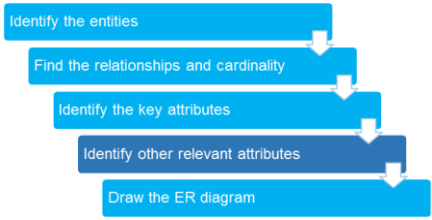
Steps in ER modeling (3 of 5) – Guided activity



Step 3: Identify key attributes

- **Supplier**: supplierid
- **Quotation**: quotationid
- **Item**: itemcode
- **RetailOutlet**: retailoutletid
- **Employee**: empid
- **Customer**: customerid

Steps in ER modeling (4 of 5) – Guided activity



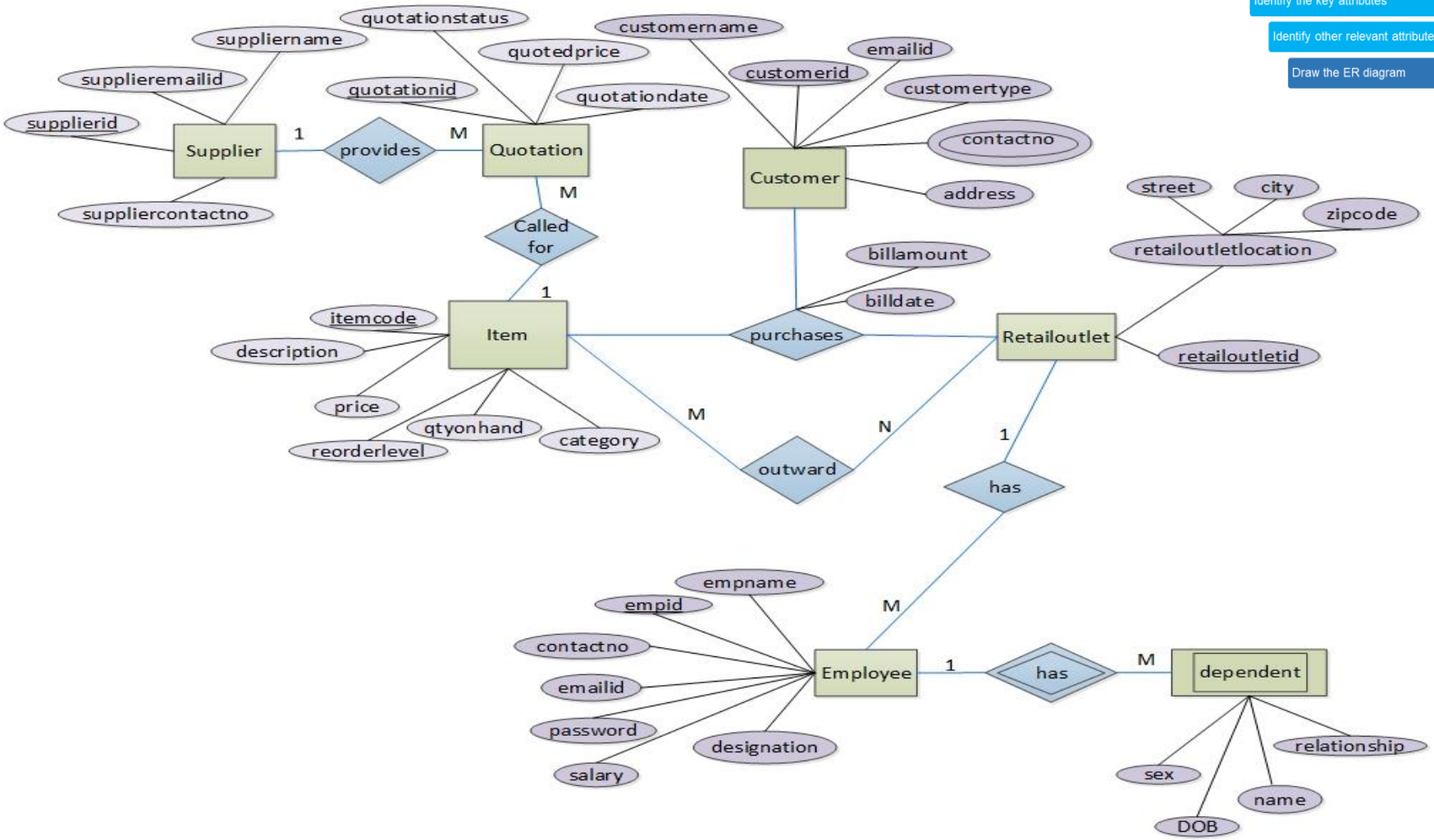
Step 4: Identify other relevant attributes

- **Supplier**: suppliername
- **Quotation**: quotedprice, quotationdate, quotationstatus
- **Item**: Itemcode, description, price, category, qtyonhand, reorderlevel
- **RetailOutlet**: retailoutletlocation
- **Employee**: empname, designation, emailid, contactno, salary, password
- **Customer**: customertype, customername, emailid, contactno, address

Steps in ER modeling (5 of 5) – Guided activity

Identify the entities
Find the relationships and cardinality
Identify the key attributes
Identify other relevant attributes
Draw the ER diagram

Step 5: Draw the ER diagram



Summary

- Database basics
- Relational data model basics
- Keys in RDBMS
- Database design
  - Top down and bottom up approach (ERD)

Self-Study

Refer to NPTEL course: http://nptel.ac.in/courses.php

Course : Course : NPTEL >> Computer Science and Engineering >> **Database Design**

Videos:

Introduction to Database Management System
Conceptual Designs
Relational Model

Refer to:

https://class.stanford.edu/courses/Home/Databases/Engineering/about

Study Material – RDBMS

References

- http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/
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