

# Relational Database Management System



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# Course Information

- Course Code: CCFP4.0-RDBMS
- Course Name: Relational Database Management System
- Document Number: RDBMS-01
- Version Number: 4.0

# 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

# EasyShop : A Snapshot

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

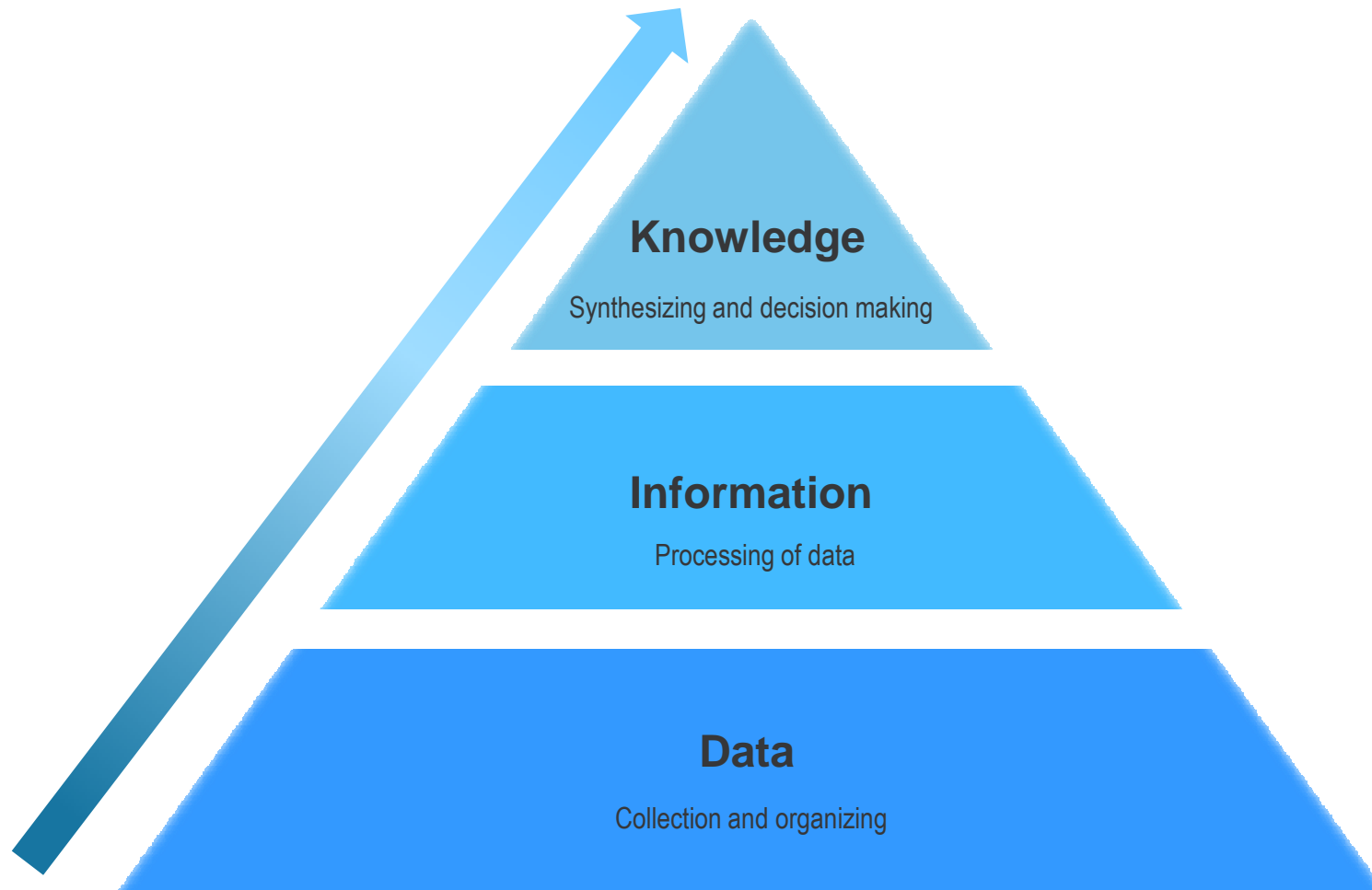
What operations can be performed on EasyShop application data ?



## 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

Administrator Home - Windows Internet Explorer

http://mysgec184014d:8080/EasyShopManager/admin/AdminHome.jsp

Administrator Home

**EasyShop Manager**

Home | Contact Us

**Welcome**

You have logged in as administrator

**Transactions**

- Customer
  - Add
- Supplier
  - Add
  - Edit
  - Delete
- Item
  - Add
- Retail Outlet
  - Add
- Report
  - Bill Amount - All Dates
  - Bill Amount - Purchase Based
  - Bill Amount - Between Dates
  - Billed Customers
  - Searched Items
  - All Items
  - Items in an Outlet

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# Ways of data storage

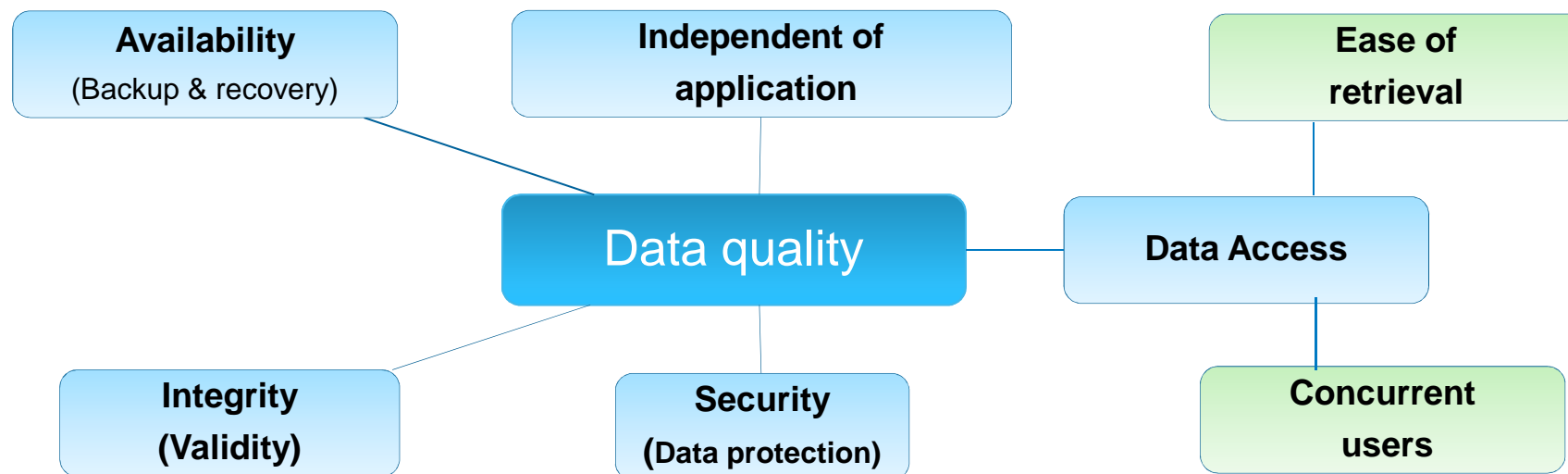
- **Non persistent**

- 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

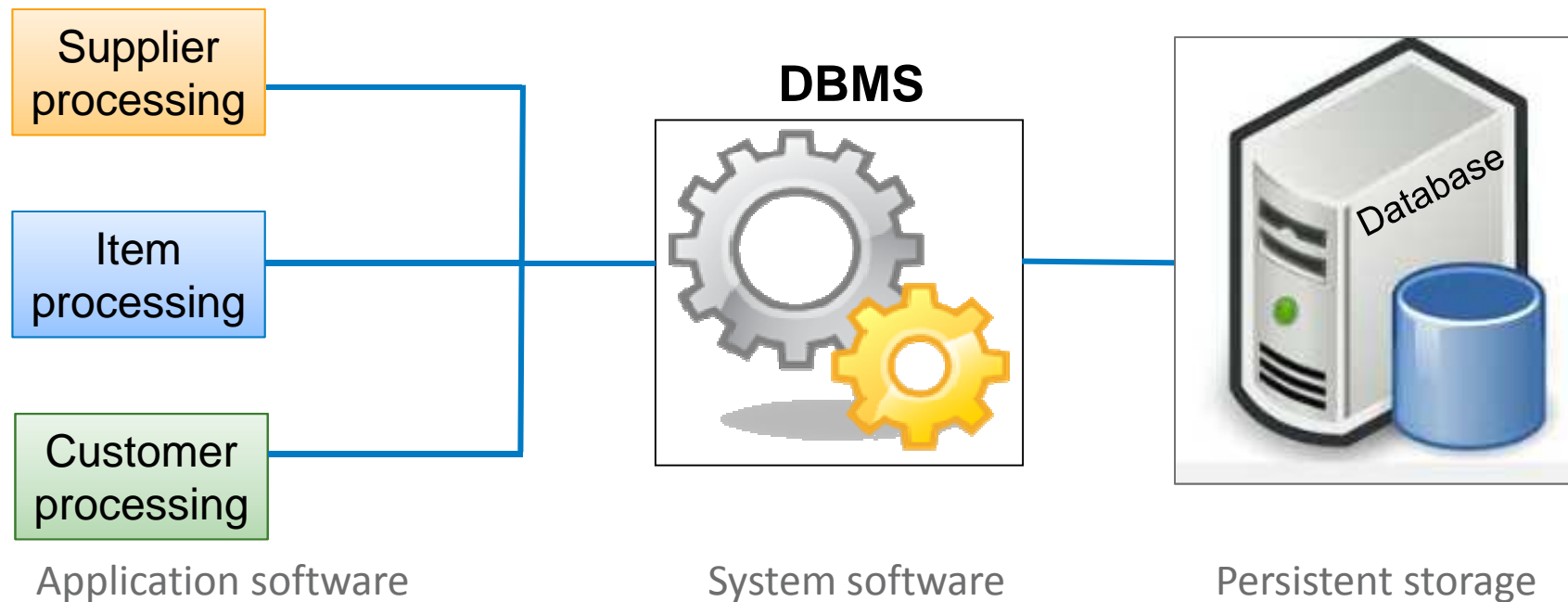
- Challenges to ensure data quality
  - Application is dependent on data
  - Complexity in data retrieval
  - Single user access only
  - Data is not secured
  - Integrity of the data requires additional logic in the application
  - Data redundancy

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

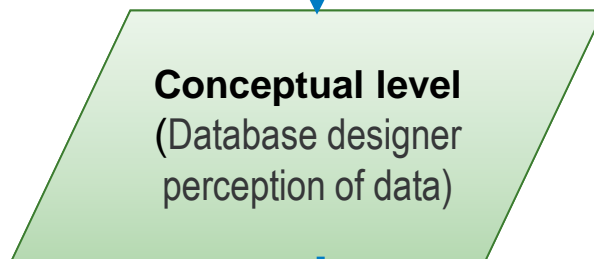
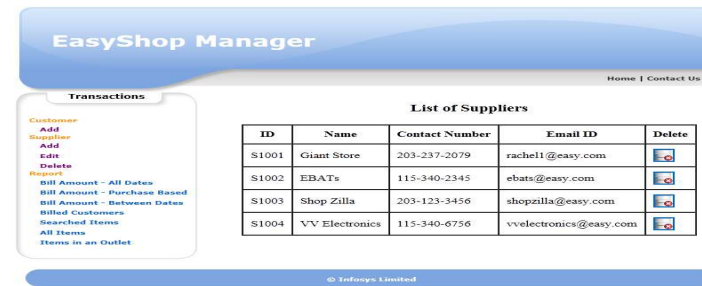
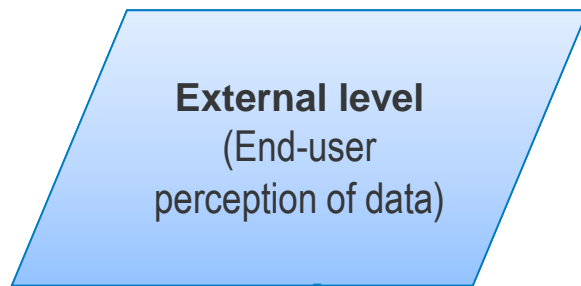


# Functions of DBMS

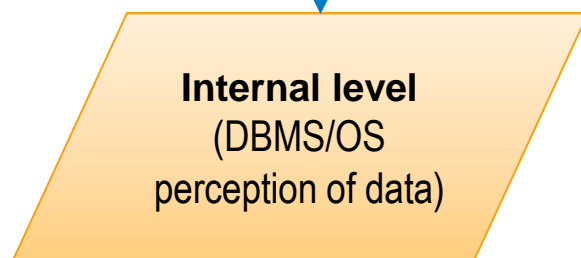
<b>Data management</b>	Store, retrieve and modify data
<b>Transaction support</b>	Ensures that modifications to the database must be either successful or not done at all
<b>Concurrency control</b>	Simultaneous data access provided to users
<b>Recovery</b>	Recovery mechanism for data so nothing is lost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



# Data perspectives in DBMS



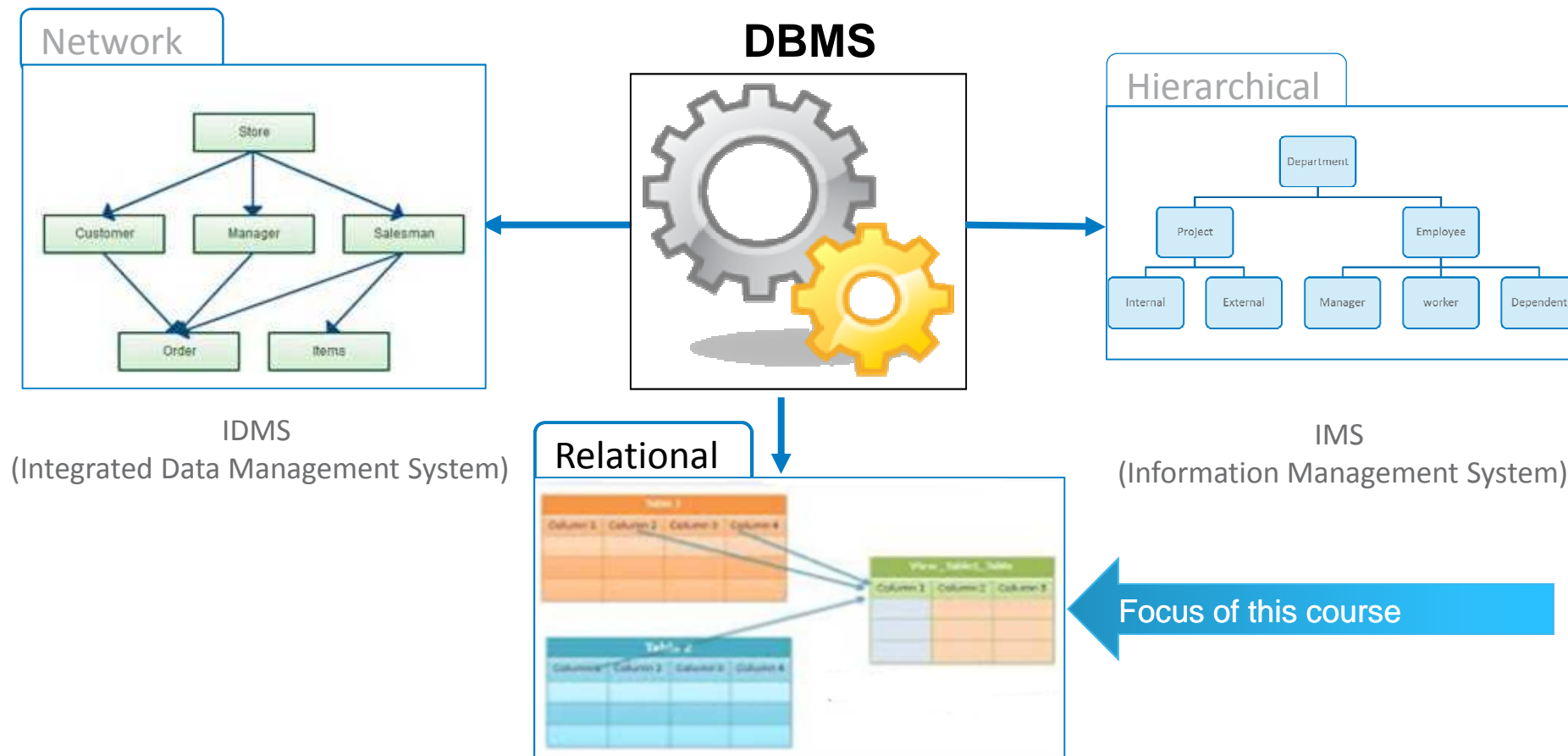
supplierid	character
suppliename	character
emailid	character



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

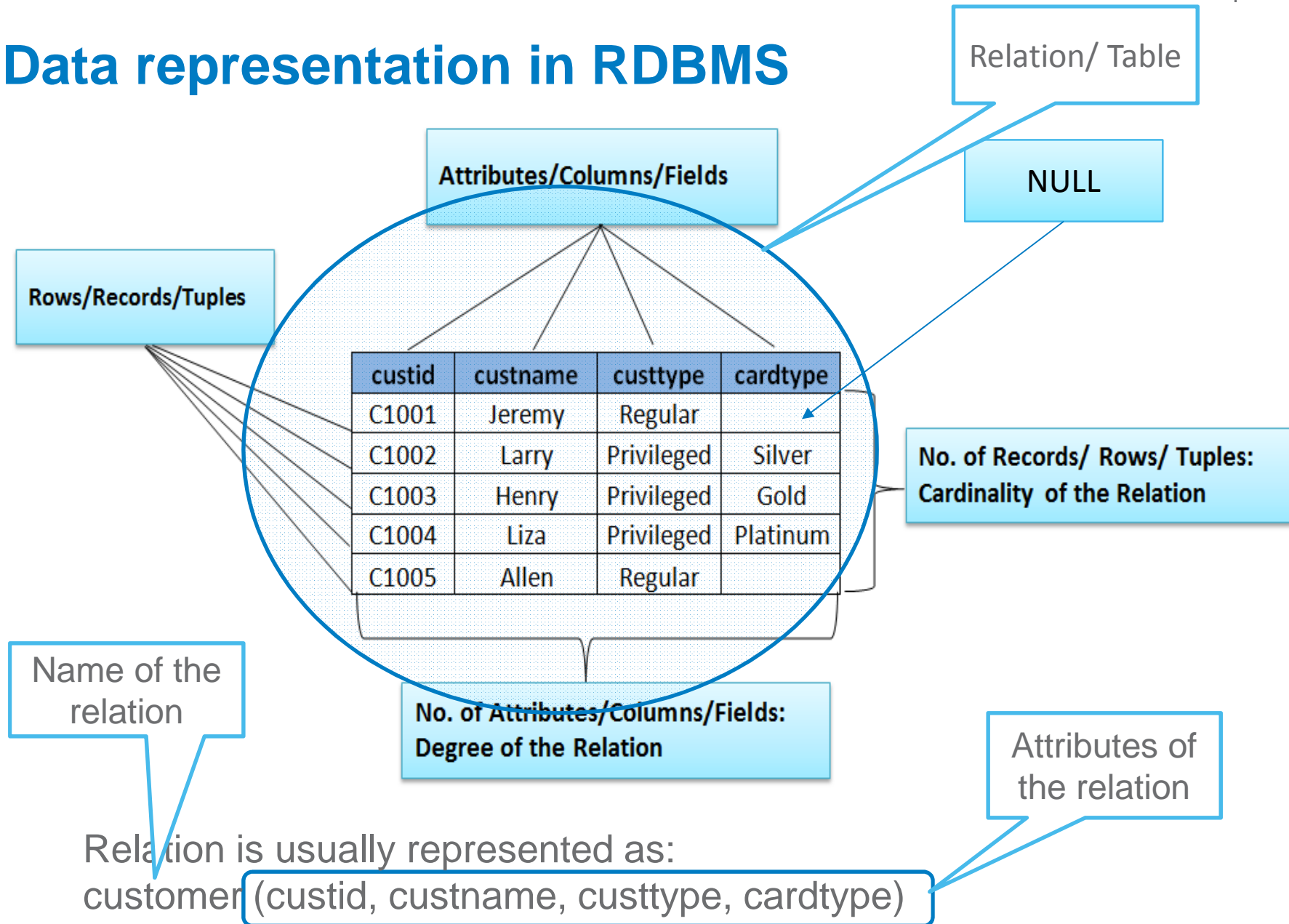
Demo: EasyShop application **external view**: supplier report; **conceptual view**: describe supplier table

# Few categories of DBMS



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

- 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**

## Primary key

- 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


## Foreign key

- 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

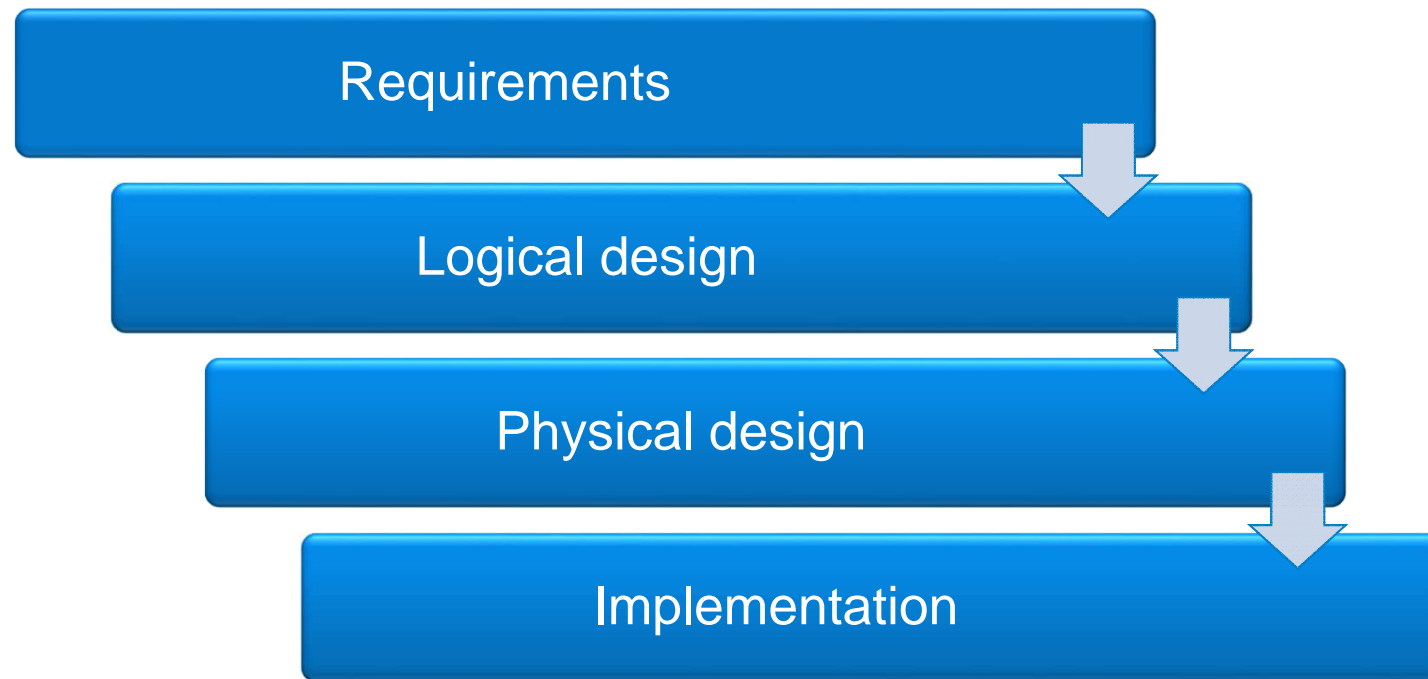
Guided Activity: CCFP4.0-RDBMSAssignments, Database Basics Assignment 1

## To Summarize.....

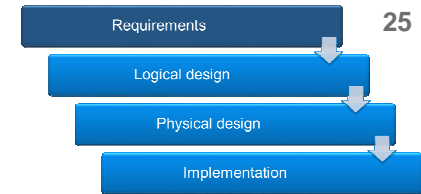
- Database fundamentals
- Data, information and knowledge
- Data quality criteria
- Challenges of storing data in flat files
- Need for DBMS
  - functions of DBMS

Database life cycle

# Database life cycle



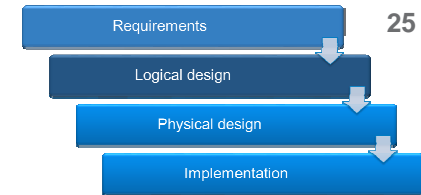
## Database life cycle – Data requirements



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

Guided Activity: CCFP4.0-RDBMSAssignments, Database Basics, Assignment 2  
(Estimated Time: 20 mins.)





# Database life cycle – Logical design

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

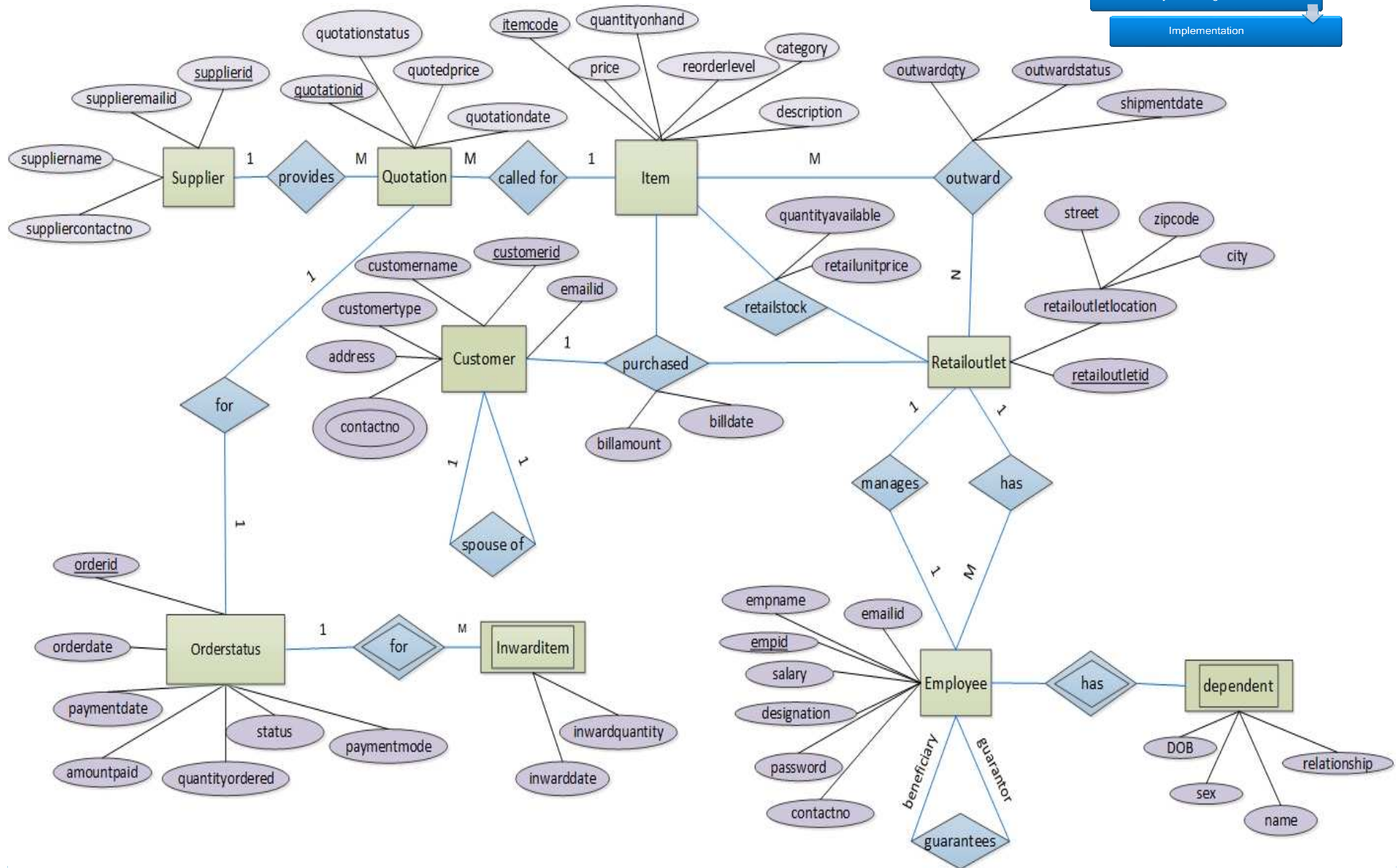
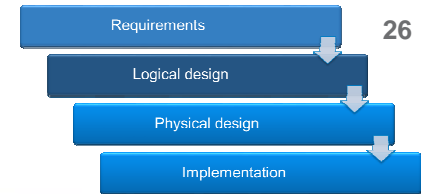
- This approach is used when application **requirements are clear**
- Represents the application requirements in a pictorial form
- The real world objects and their corresponding attributes are identified from the requirements – hence it is top down
- This model helps in
  - analysis and design
  - re-validating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

## Bottom up approach (Normalization)

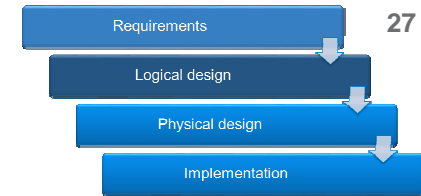
- This approach is used when application requirements are not very clear
- First define the required data items and then group the related data items
- Further refinement may be carried out depending on the application need

# Sample ER diagram

26



# ER diagram



Guided Activity: CCFP4.0-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

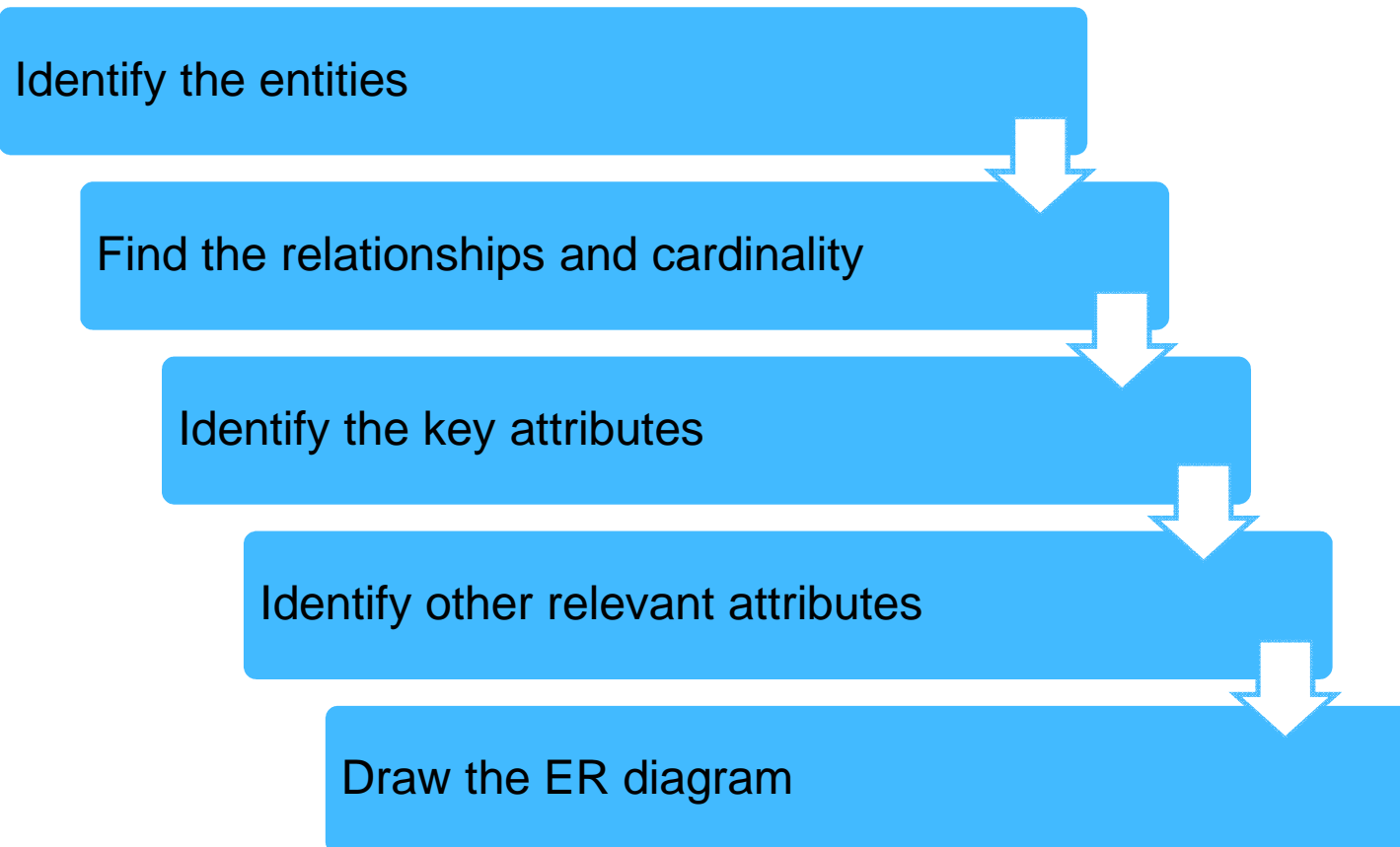
## Case study – Guided activity

Guided Activity: **CCFP4.0-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

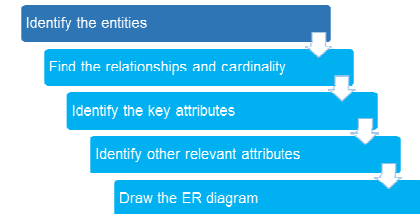
## Developing ER model – Guided activity



# 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

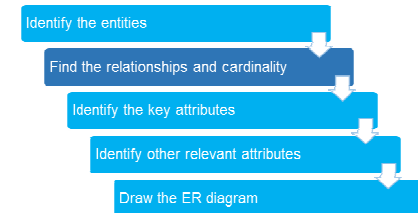
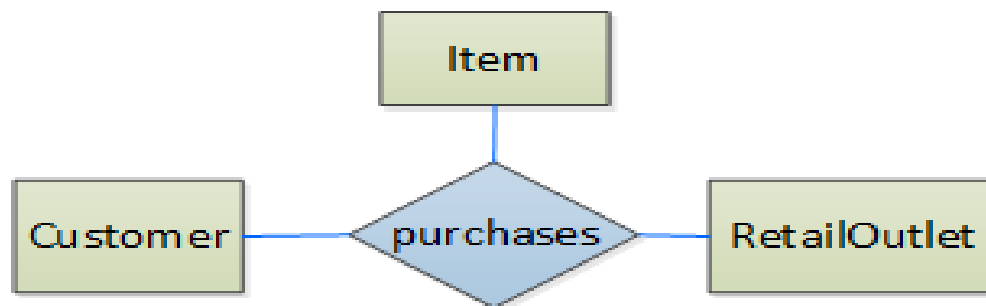
- One supplier can provide many quotations



- Many items can be outward to several retail outlets



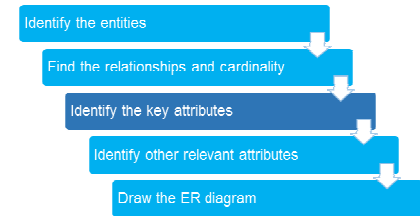
- Many customers can purchase items from several retail outlets



# 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

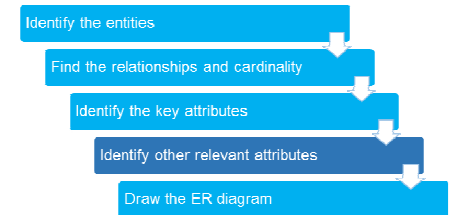




# Steps in ER modeling (4 of 5) – Guided activity

## 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

## Step 5: Draw the ER diagram

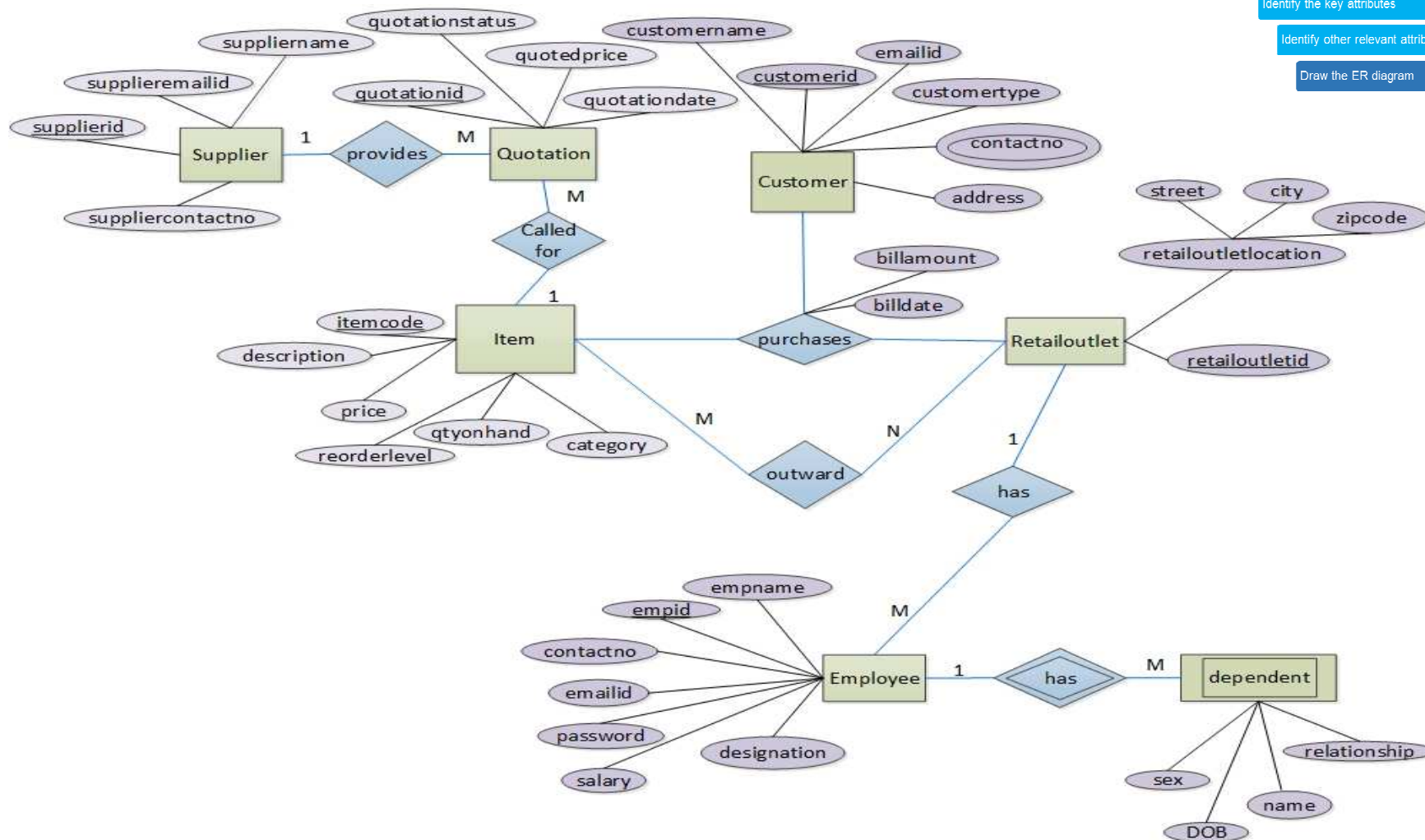
Identify the entities

Find the relationships and cardinality

Identify the key attributes

Identify other relevant attributes

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>

# References

- <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/lecture-notes/>
- <http://www.learnerstv.com/Free-Computers-Video-lectures-ltv048-Page1.htm>
- <http://www.learnerstv.com/video/Free-video-Lecture-23856-Computer-Science.htm>
- <http://www.htmlgoodies.com/primers/database/article.php/3478051>
- <http://online.stanford.edu/course/intro-to-databases-winter-2014>
- <http://www.techopedia.com/6/28832/enterprise/databases/introduction-to-databases>

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