Contents

Components Of CASE Tools

(CASE)
COMPUTER AIDED SYSTEMS ENGINEERING

CASE is a term covering a whole range of tools and methods that SUPPORT SOFTWARE SYSTEM DEVELOPMENT.

CASE tools are programs (software) that automate or support one or more phases of a systems development life cycle.

A collection of tools used to support the software development process.

In other words,
1. Software that is used to support software process activities .

2. Provides software process support by
- **automating some process activities**
- **providing information about the software being developed**

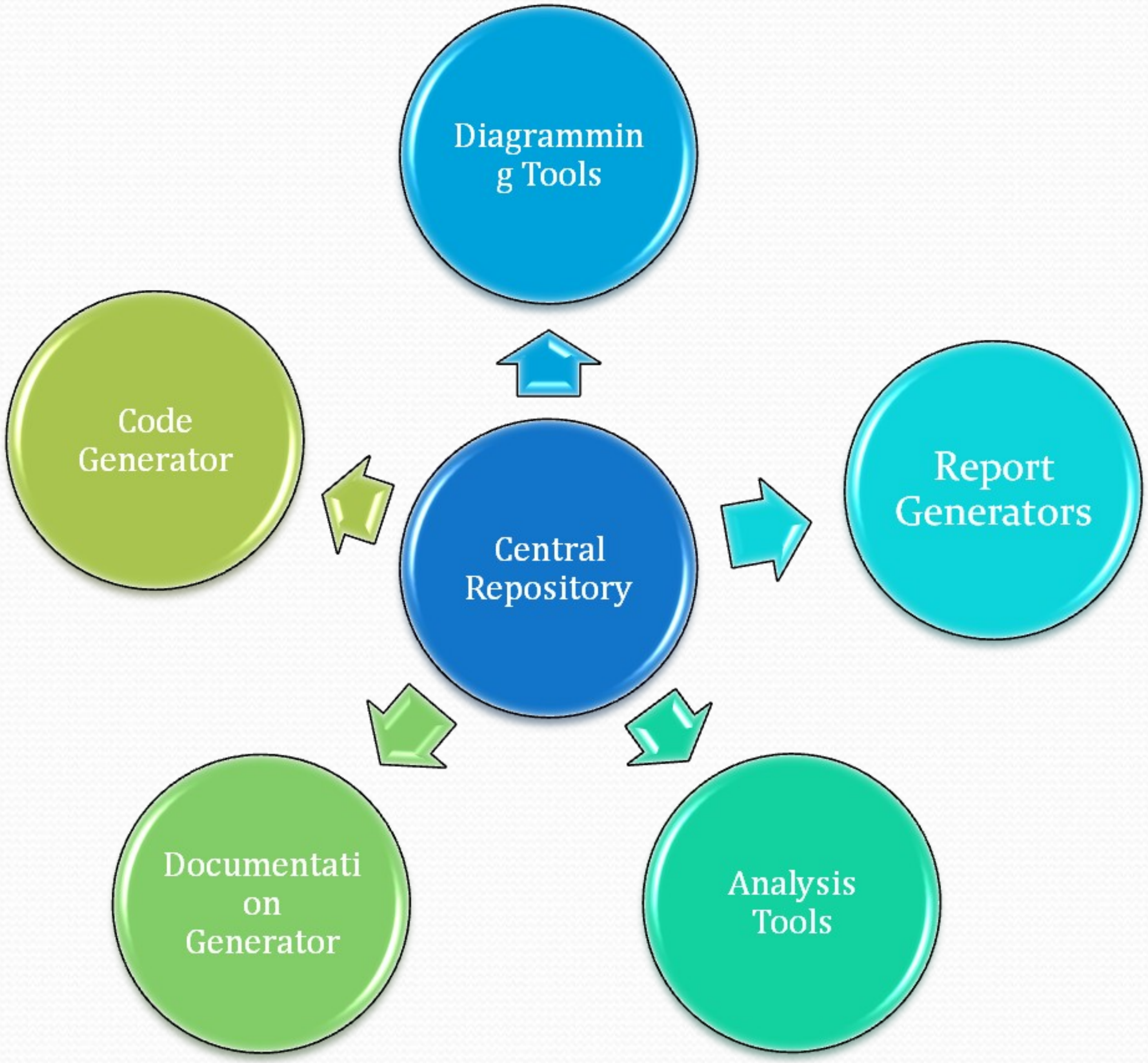
3. Currently used in every phase/workflow of life cycle

Two types of tools used by software engineers:

1. **Analytical tools**
    - **Stepwise refinement**
    - **Cost-benefit analysis**
    - **Software metrics**

2. **CASE tools**

Components Of CASE Tools



Components Of CASE Tools

1. Central Repository

- Centralized Database.
- Used to store Graphical Diagrams & Prototype Forms and Reports of analysis and diagramming workflow
- Act as
  - Information Repository
  - Data Dictionary

Components Of CASE Tools

2. Report Generator

- Used to
  - Create, modify and test prototypes of computer displays and reports.
  - Identify which data items to display or collect for each screen or report

Components Of CASE Tools

3. Diagramming Tool

- Allow you to represent a system and its components visually.
- Allows higher level processes to be easily decomposed.
- Can examine processes or data models at high or low level.

Components Of CASE Tools

4. Analysis tools

- Generate reports that help identify possible inconsistencies, redundancies and omissions.
- Generally focus on
  - diagram completeness and consistency.
  - data structures and usage.

Components Of CASE Tools

5. Documentation Tool

- Create standard reports based on contents of repository.
- Need textual descriptions of needs, solutions, trade-offs, diagrams of data and processes, prototype forms and reports, program specifications and user documentation.
- High-quality documentation leads to 80% reduction in system maintenance effort in comparison to average quality documentation.

Components Of CASE Tools

6. Code Generation Tool

- Create code for the custom feature in object model.
- Code Generation Tool helps in:
  - Connect to the Repository.
  - Select the Object Model.
  - Select the custom features to generate code for.
  - Define properties for each custom feature.
  - Specify the output of the project.

Layers Of CASE Tools

Upper CASE Tools

Lower CASE Tools

Integrated CASE Tools

CASE Tools

The application of a set of tools and methods to a software system with the desired end result of high-quality, defect-free, and maintainable software products.

Purpose of CASE Tools

To make it simpler to enact a single design philosophy with the goal to speed up the development process.

To automate mundane tasks.

To promote a central location for referencing system development activities and documents.

To get accuracy and increase the speed of the tasks.

USES:

1. Increasing costs of software development due to the extreme intensive labor required.
2. Avoid simple human errors in software development.
3. CASE offers an important opportunity to alleviate the problems of application development and maintenance.

COMPONENTS OF CASE TOOLS

A CASE environment contains a collection of tools. Not all environments provide all tools.

Upper CASE

Lower CASE

i-CASE

TYPES OF CASE TOOLS

- Upper-CASE:-

➢ Upper CASE is focused in supporting project identification and selection, project initiation, project planning, analysis and design. Describes tools that automate or support the ‘upper’ or earliest phases of systems development.

1. Supports Software Development activities implementation

2. Focuses on Analysis Phase
   - Diagramming Tools
   - Report Generator
   - Analysis Tool

Lower-CASE:- Lower CASE provides support for the implementation and maintenance phases. Describes tools that automate or support the 'lower' or later phases of systems development.

1. Supports Programming and Integration tasks.

2. Focuses on
   - Central Repository
   - Code Generator
   - Configuration Management

I-CASE (integrative case):- support the entire SDLC.

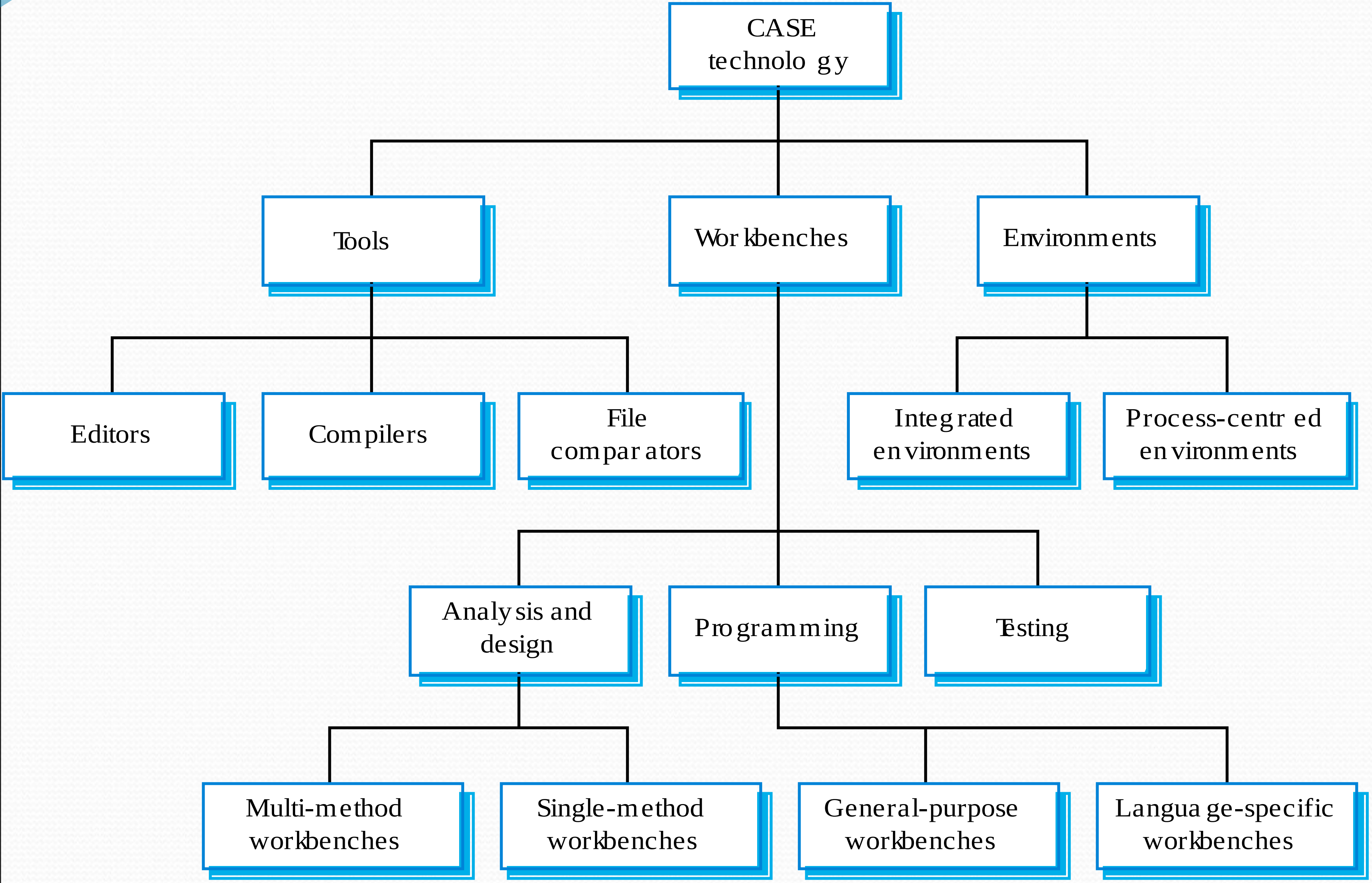
1. Supports both Upper CASE Tools and Lower CASE Tools.

2. Focuses on
   - Analysis
   - Code
   - Design
   - Database

Categories Of CASE Tools

- Tools
- Workbench
- Environment

Categories Of CASE Tools


CASE technolo gy
Tools
Wor kbenches
Environm ents
Editors
Compilers
File compar ators
Integ rated en vironm ents
Process-centr ed en vironm ents
Analy sis and design
Pro gramm ing
Testing
Multi-m ethod workbenches
Single-m ethod workbenches
General-purpose workbenches
Langua ge-specific workbenches

Perspective Of CASE Tools

Three Perspective

1. Functional perspective
   – Tools are classified according to their specific function.

2. Process perspective
   – Tools are classified according to process activities that are supported.

3. Integration perspective
   – Tools are classified according to their organisation into integrated units.

Benefit Of CASE Tools

- **Improve software quality**

   1. Enforce discipline
   2. Help communication between development team members
   3. Information is illustrated through diagrams that are typically easier to understand
   4. Development information is centralized

- **Reduction of time and effort**
    1. Tasks are much faster to complete and alter
    2. Enhance reuse of models or models' components
    3. Can reduce maintenance costs

*Problems Of CASE Tools

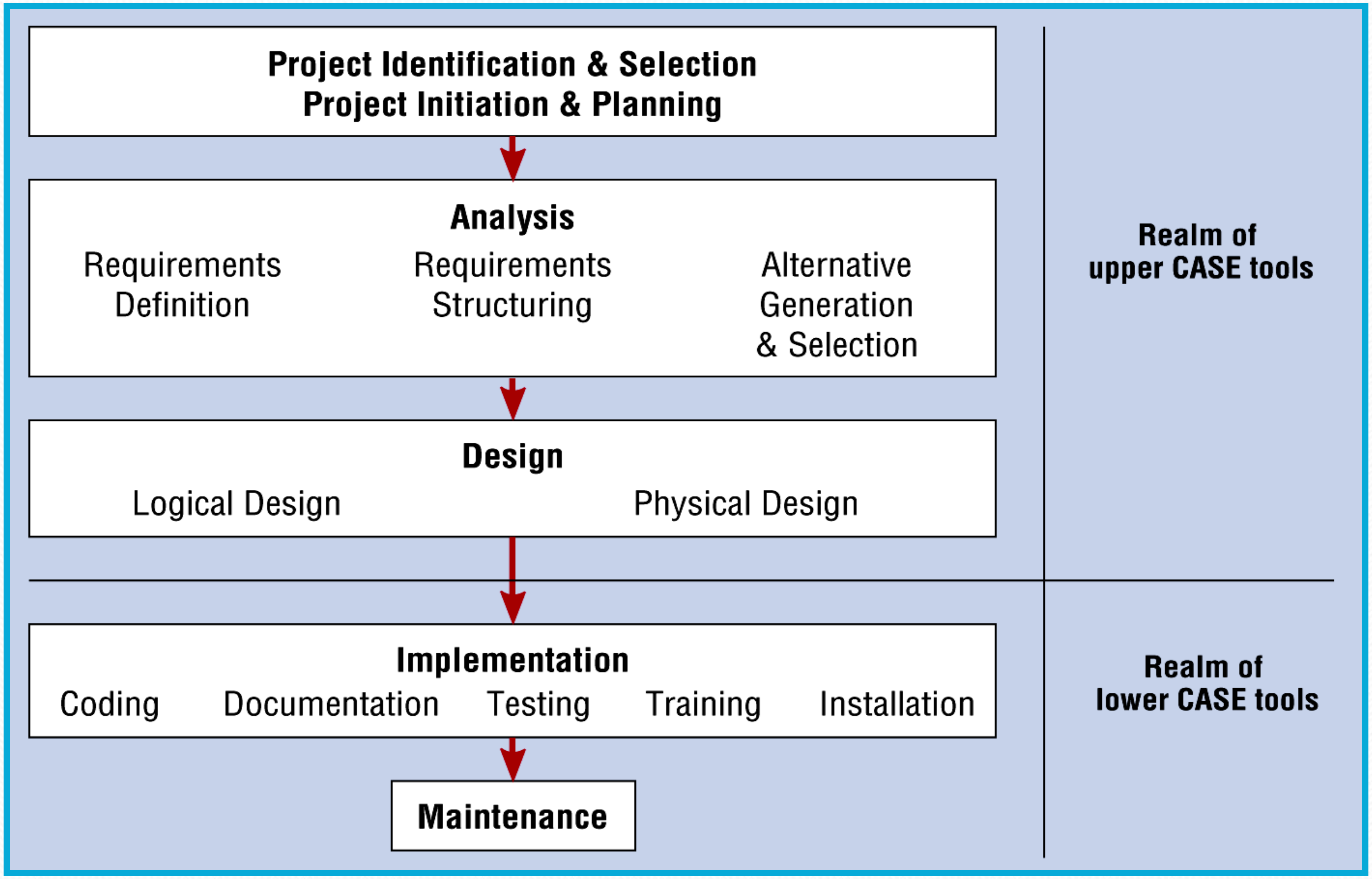
1. Limitations in flexibility of documentation
2. Major danger: completeness and syntactic correctness does NOT mean compliance with requirements
3. Costs associated with the use of the tool
    - Purchase price
    - Training

CASE Usage Within the SDLC

SDLC Phase	Key Activities	CASE Tool Usage
Project identification and selection	Display and structure high-level organizational information	Diagramming and matrix tools to create and structure information
Project initiation and planning	Develop project scope and feasibility	Repository and documentation generators to develop project plans
Analysis	Determine and structure system requirements	Diagramming to create process, logic and data models

SDLC Phase	Key Activities	CASE Tool Usage
Design	Create new system designs	Form and report generators to prototype designs; analysis and documentation generators to define specifications
Implementatio n	Translate designs into an information system	Code generators and analyzers, form and report generators; documentation generators to develop system and user documentation
Maintenance	Evolve information systems	All tools are used .

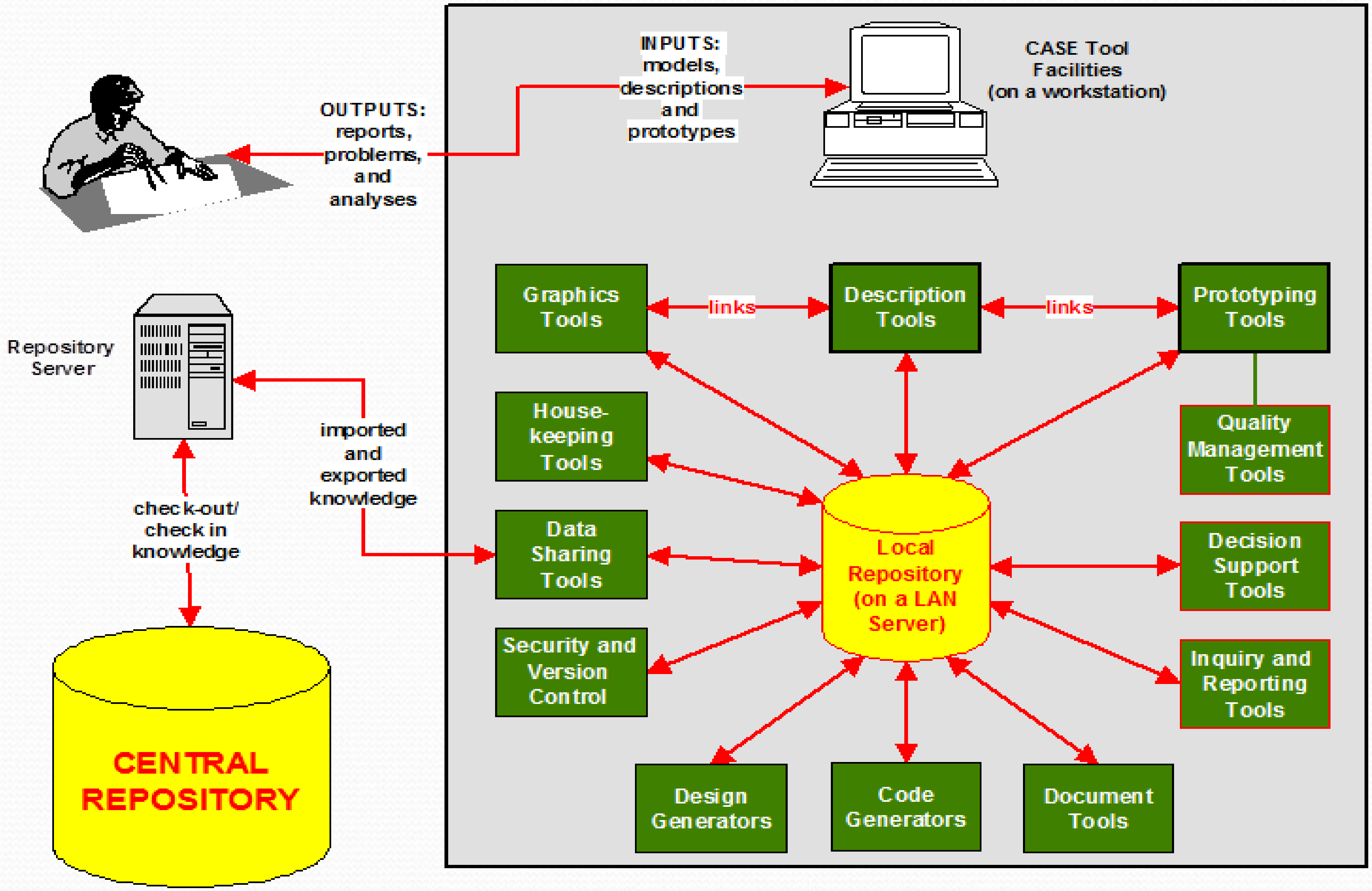
CASE and the SDLC



Types of CASE Tools

1. Programming tools.
2. Documentation tools.
3. Static analysis tools.
4. Metrics management tools.
5. Quality assurance tools.
6. Diagramming tools.
7. Requirement tracing tools.
8. Programming tools.
9. Process modelling and management tools.
10. Prototyping tools.
11. Software configuration management tools.

CASE Tool Components


INPUTS: models, descriptions and prototypes
CASE Tool Facilities (on a workstation)
OUTPUTS: reports, problems, and analyses
Graphics Tools
links
Description Tools
links
Prototyping Tools
Quality Management Tools
Repository Server
House-keeping Tools
imported and exported knowledge
check-out/ check in knowledge
Data Sharing Tools
Local Repository (on a LAN Server)
Decision Support Tools
Security and Version Control
Inquiry and Reporting Tools
CENTRAL REPOSITORY
Design Generators
Code Generators
Document Tools

Advantages of CASE Tools

- Increased speed
- Increased accuracy
- Reduced lifetime maintenance
- Better documentation
- Programming in the hand of programmers
- Intangible benefits

Disadvantages of CASE Tools

- May be difficult to customize
- Requires training of maintenance staff
- May be difficult to use with existing systems
- Requires more extensive and accurate definition of use requirement.
- It is costly if it is proprietary tool.

The Good and Bad about CASE

- Development process productivity and quality increases are realizable
- Portability of new systems to other platforms is greatly enhanced
- Analyst skill set will improve due to greater understanding of the process
- Time to delivery of new applications will decrease
- Conformity to development standards will increase

- CASE acquisition costs are extremely high
- Training of analysts and administrators is costly and time-consuming
- Most organizations do not have clear standards for application development
- CASE tools can be viewed as a threat to job security
- CASE tools do not have a great reputation due to early benefits not being realized

DATA MODELING

Introduction

- Process of creating a data model for an information system by applying formal data modeling techniques.
- Process used to define and analyze data requirements needed to support the business processes.
- Therefore, the process of data modeling involves professional data modelers working closely with business stakeholders, as well as potential users of the information system.

What is Data Model

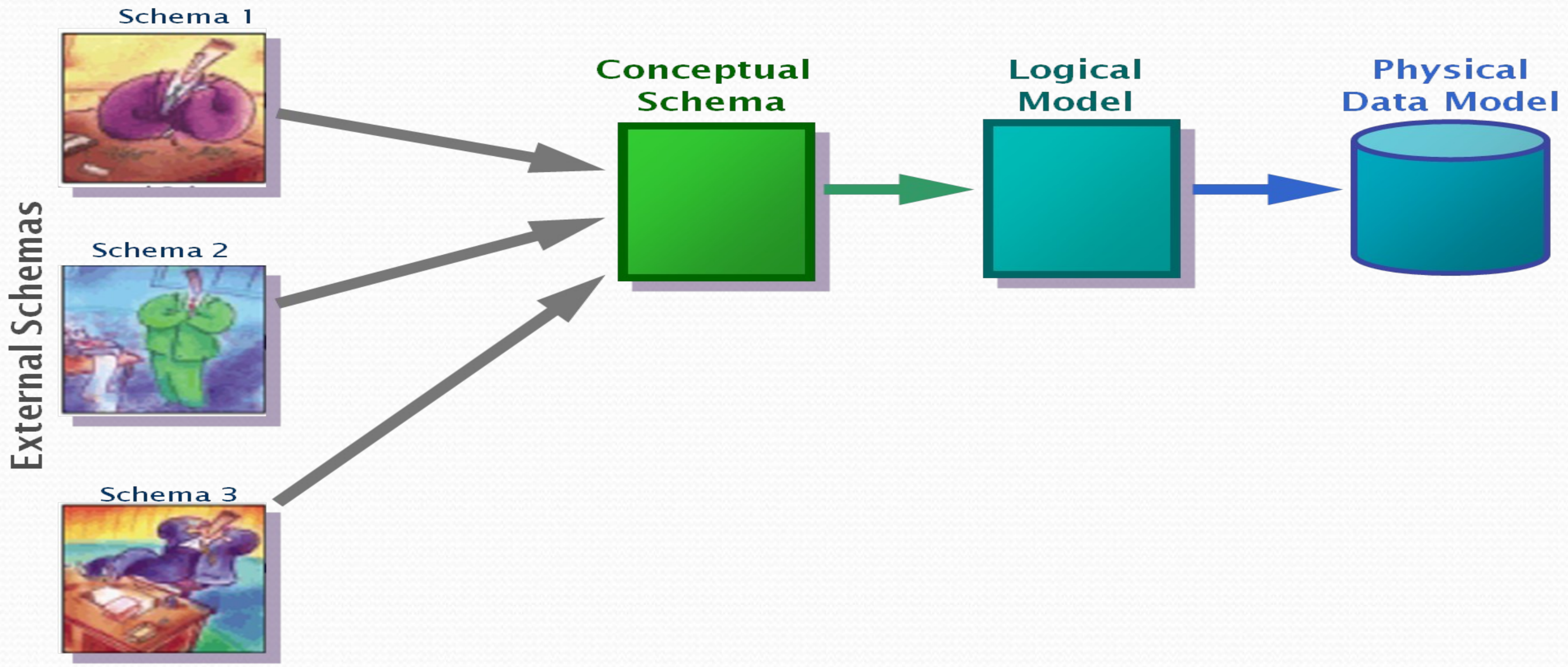
- Data Model is a collection of conceptual tools for describing data, data relationships, data semantics and consistency constraint.
- A data model is a conceptual representation of data structures required for data base and is very powerful in expressing and communicating the business requirements
- A data model visually represents the nature of data, business rules governing the data, and how it will be organized in the database

- A data model provides a way to describe the design of a database at the physical, logical and view levels.

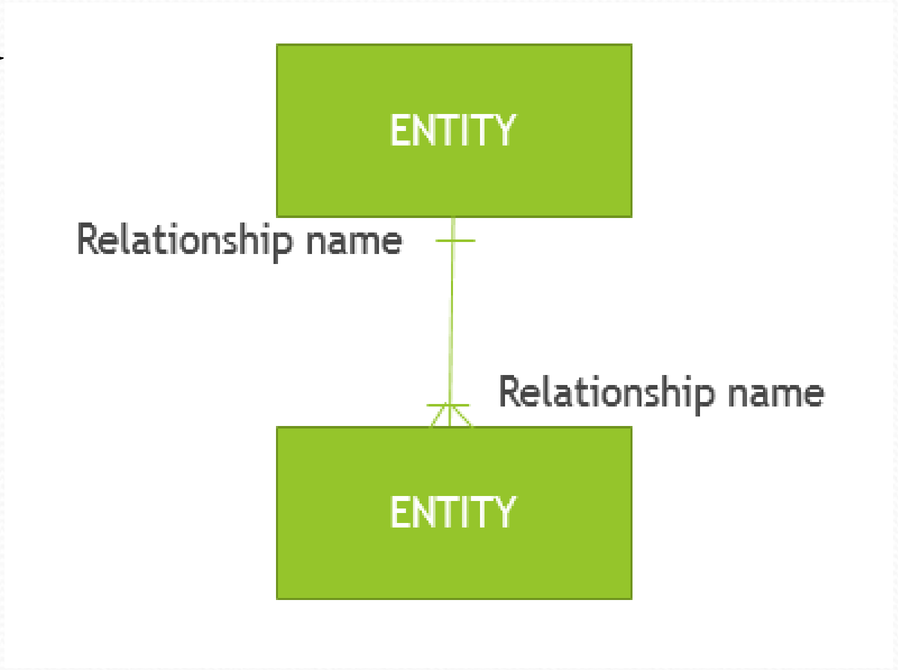
- There are three different types of data models produced while progressing from requirements to the actual database to be used for the information system

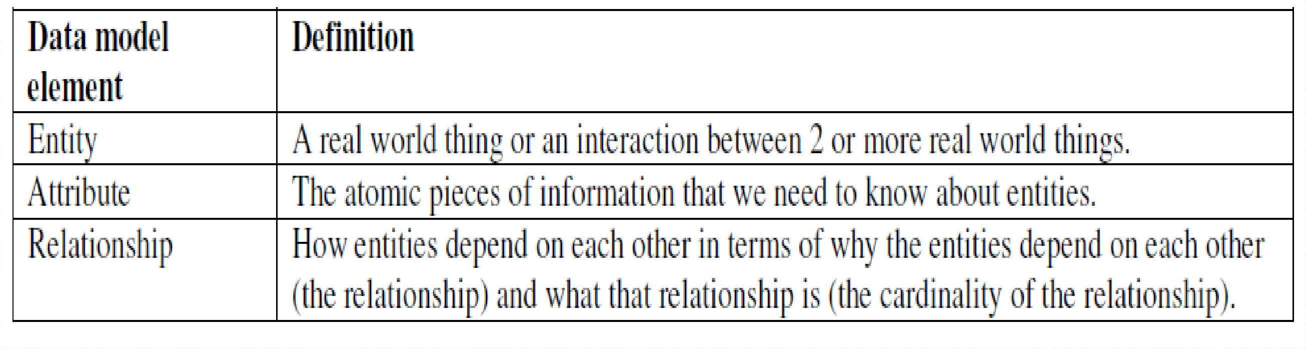
Different Data Models

- Conceptual: describes WHAT the system contains
- Logical: describes HOW the system will be implemented, regardless of the DBMS
- Physical: describes HOW the system will be implemented using a specific DBMS



A data model consists of entities related





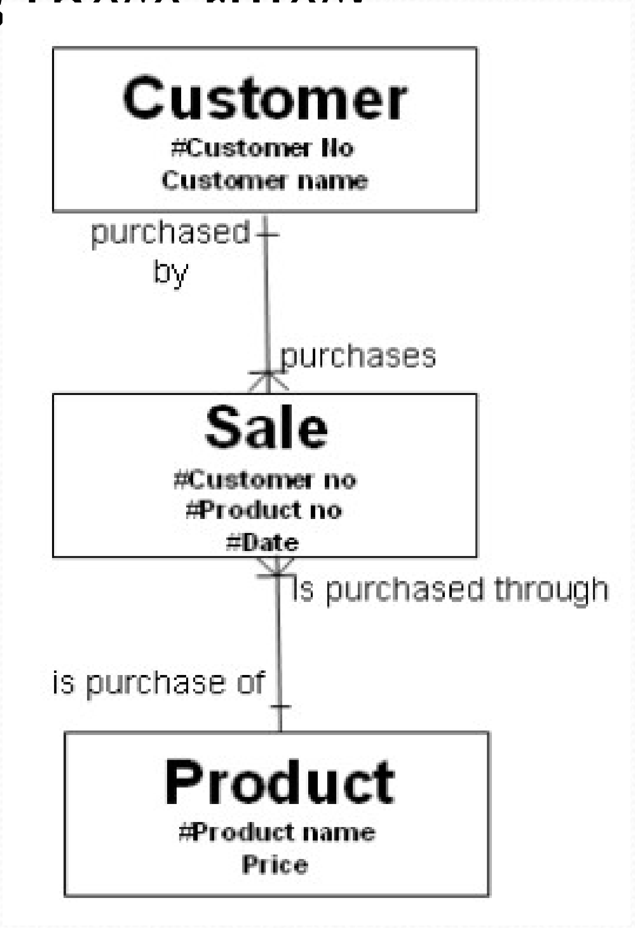
Data model element	Definition
Entity	A real world thing or an interaction between 2 or more real world things.
Attribute	The atomic pieces of information that we need to know about entities.
Relationship	How entities depend on each other in terms of why the entities depend on each other (the relationship) and what that relationship is (the cardinality of the relationship).

Example:

Given that …

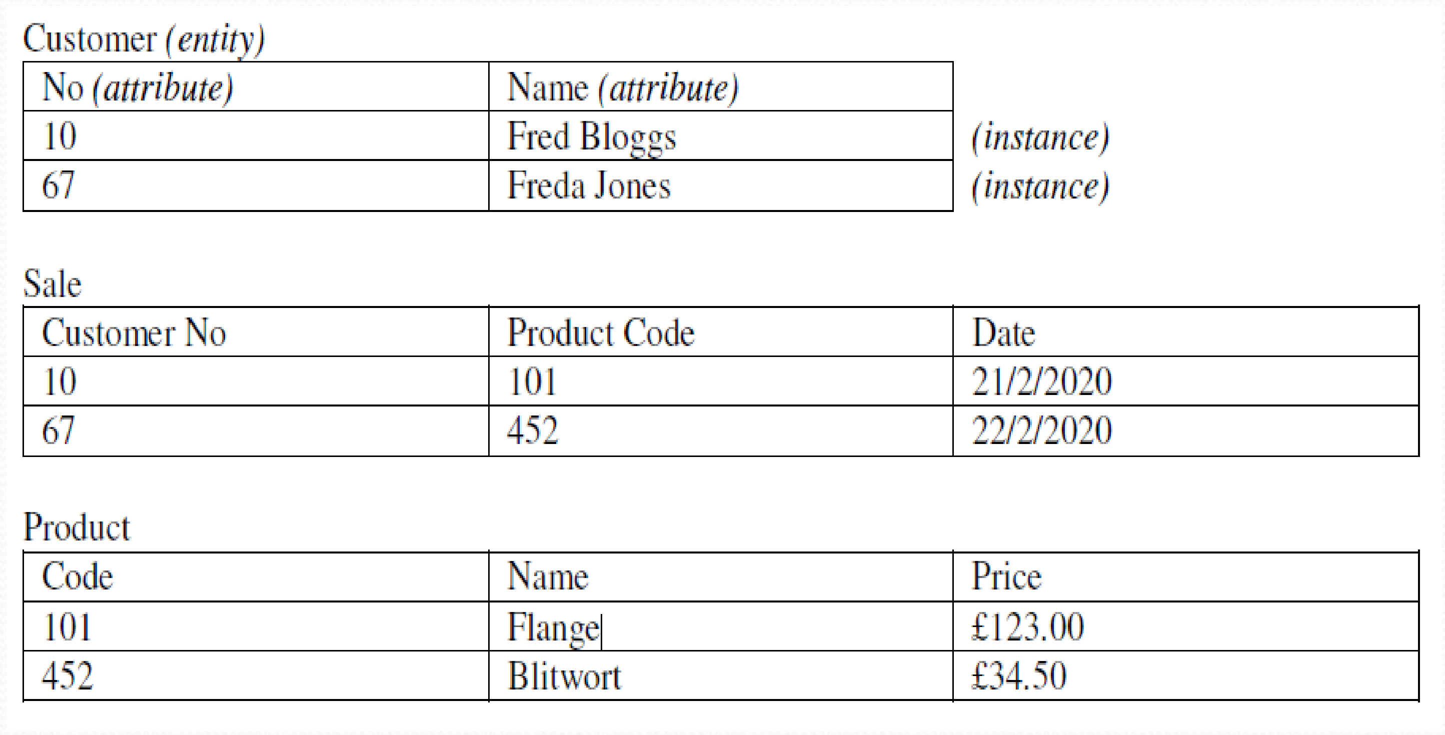
- "Customer" is an entity.
- "Product" is an entity.
- For a "Customer" we need to know their "customer number" attribute and "name" attribute.
- For a "Product" we need to know the "product name" attribute and "price" attribute.
- "Sale" is an entity that is used to record the interaction of "Customer" and "Product".

Here is the diagram that encapsulates these rules:



Notes

- By convention, entities are named in the singular.
- The attributes of “Customer” are “Customer No” (which is the unique identifier or primary key of the “Customer” entity and is shown by the # symbol) and “Customer Name”.
- “Sale” has a composite primary key made up of the primary key of “Customer”, the primary key of “Product” and the date of the sale.
- Think of entities as tables, think of attributes as columns on the table and think of instances as rows on that table:



Customer *(entity)*

No *(attribute)*	Name *(attribute)*	
10	Fred Bloggs	*(instance)*
67	Freda Jones	*(instance)*

Sale

Customer No	Product Code	Date
10	101	21/2/2020
67	452	22/2/2020

Product

Code	Name	Price
101	Flange	£123.00
452	Blitwort	£34.50

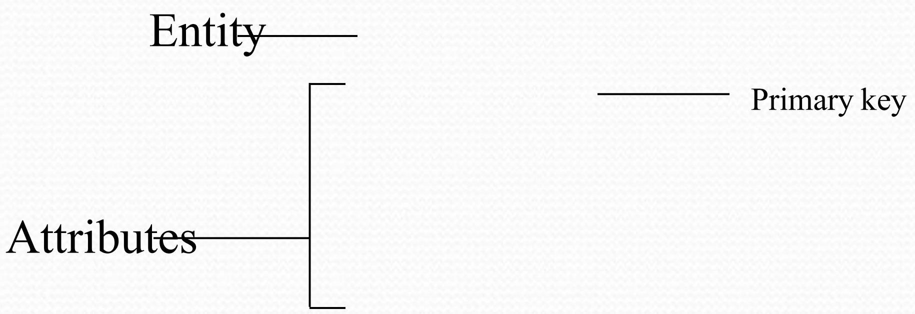
- If we want to know the price of a Sale, we can ‘find’ it by using the “Product Code” on the instance of “Sale” we are interested in and look up the corresponding “Price” on the “Product” entity with the matching “Product Code”.

Types of Data Models

- Entity-Relationship (E-R) Models
- UML (unified modeling language)

Entity-Relationship Model

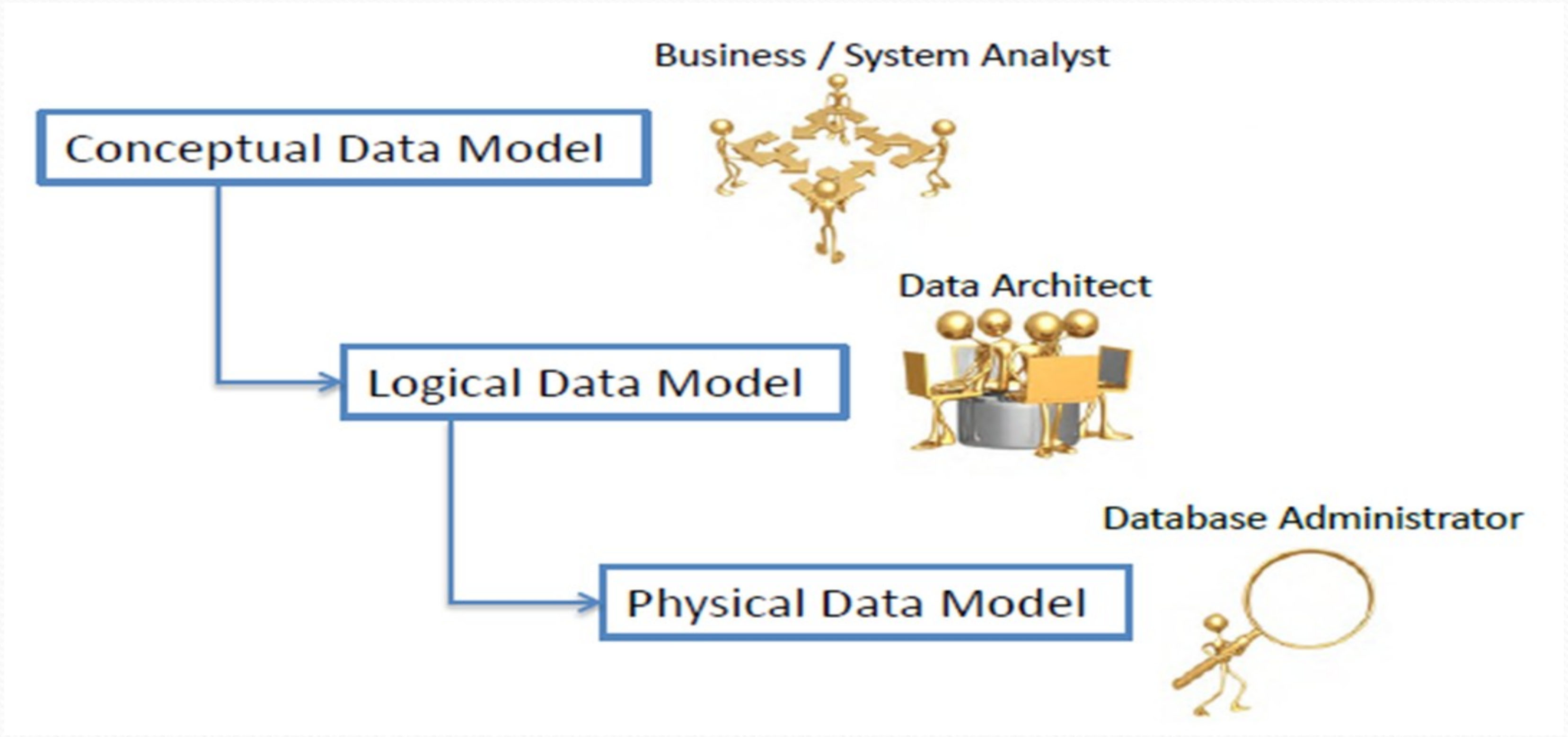
- Entity Relationship Diagrams (ERD) as this is the most widely used
- ERDs have an advantage in that they are capable of being normalized



- Represent entities as rectangles
- List attributes within the rectangle

Why and When

- The purpose of a data model is to describe the concepts relevant to a domain, the relationships between those concepts, and information associated with them



- Used to model data in a standard, consistent, predictable manner in order to manage it as a resource.
- To have a clear picture of the base data that your business needs
- To identify missing and redundant base data

- To Establish a baseline for communication across functional boundaries within your organization
- Provides a basis for defining business rules
- Makes it cheaper, easier, and faster to upgrade your IT solutions

CASE Summary

- Overall use of CASE tools on a software system improves software quality dramatically by –
- Reducing errors
- Improving designs throughout the development
- Standardizing many tasks and development aspects
- Providing many many well-tested automated functions
- Centralizing resources
- CASE is so good for software development its extremely rare to find a program that doesn't include some form of it within the last 2 decades