

## Databases Course

### [03] Data modeling (Cont.)

Jefferson A.  
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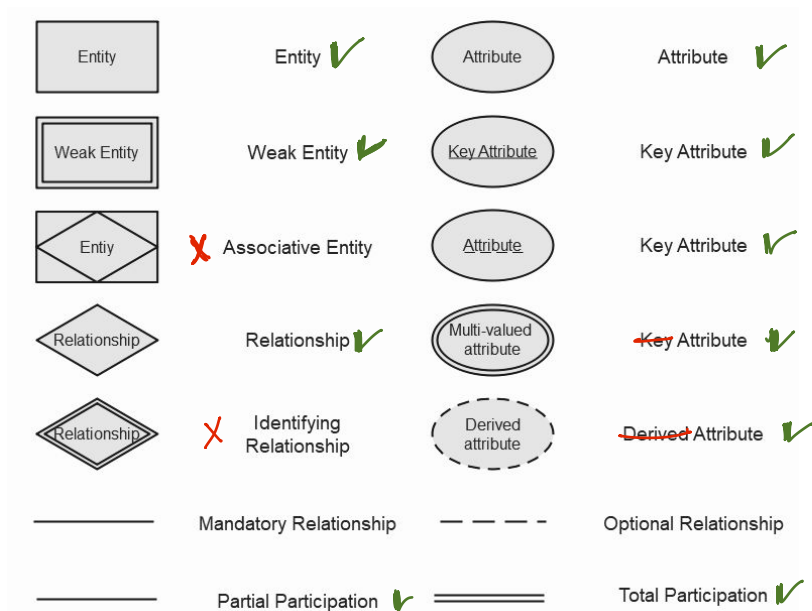
# Outline

1. Entity relationship model (MER)
  - Extended version



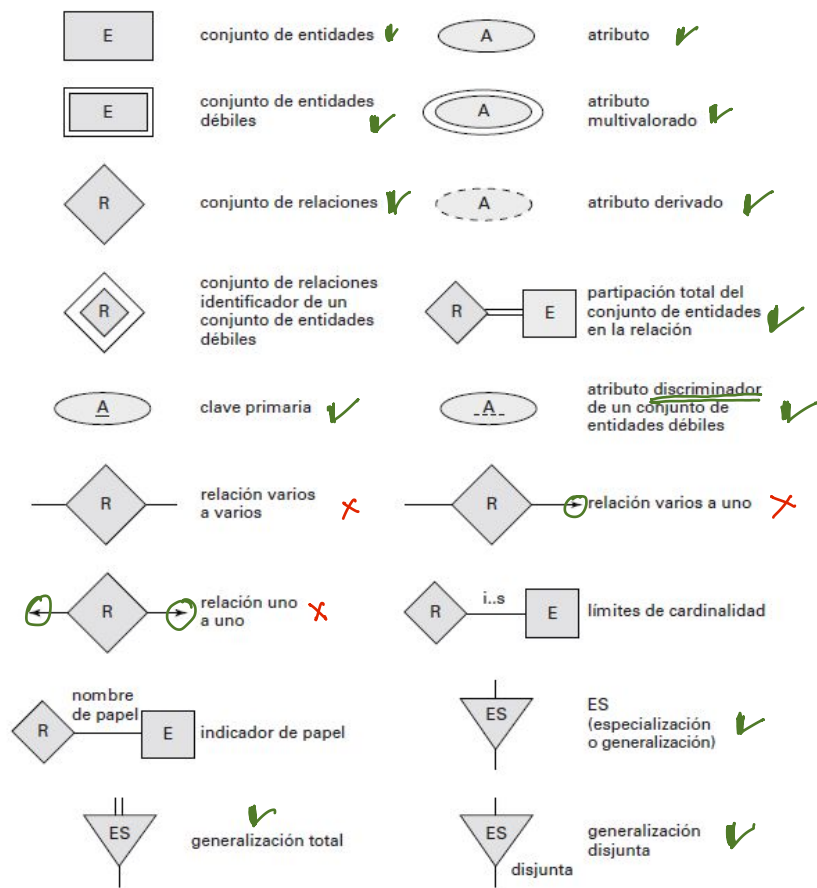
# MER

The Entity-Relationship (ER) model is a **conceptual data model**, capable of **describing the data requirements** for a **new information system** in a direct and easy to understand graphical notation.



# MER

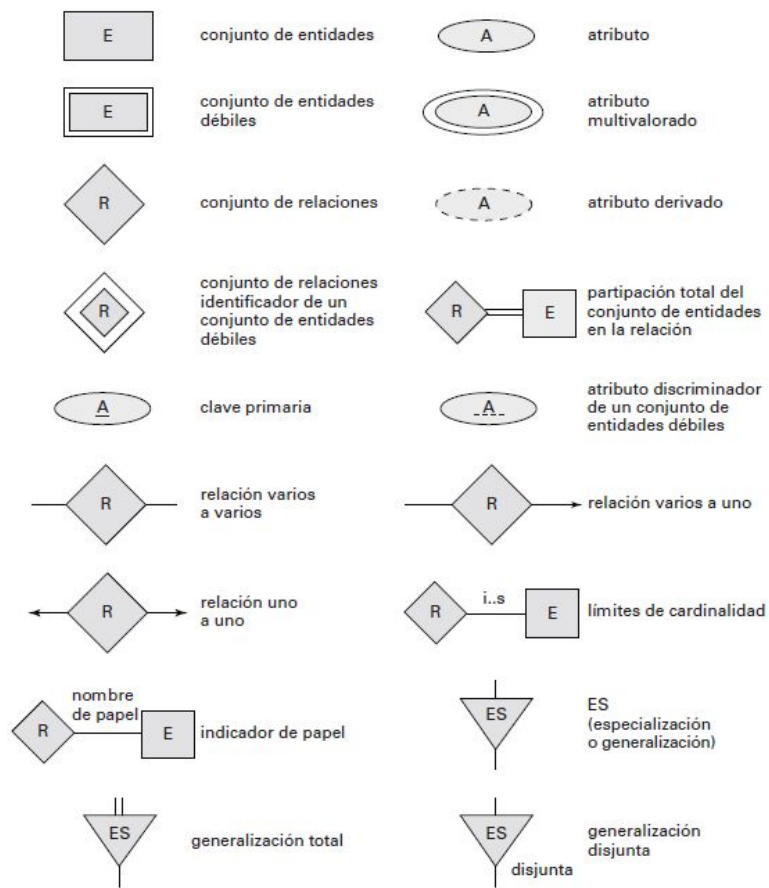
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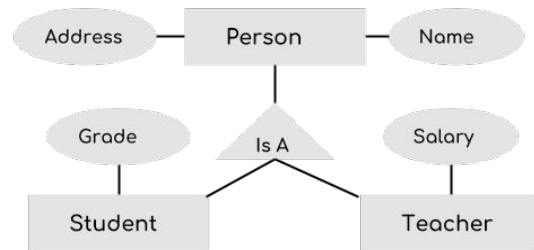
The basic ER model is too simplistic for many applications. For this reason the extended version of **Cheng Notation**. It may be regarded as somewhat object-based, but not object-oriented.



## Extended MER ⬅

The extended entity-relationship model uses object-based ideas for system design in particular:

- **Specialization**
- Generalization
- Agregation

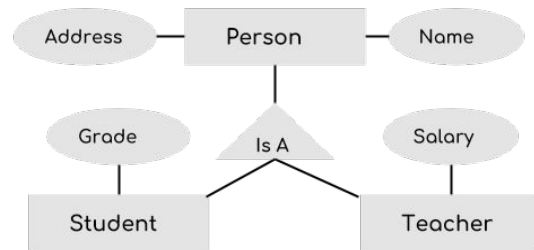


The **name and address** of all the **people** in this system are known. Additionally, if they are **teachers**, their salary is known and if they are **students**, their grade point average is known.

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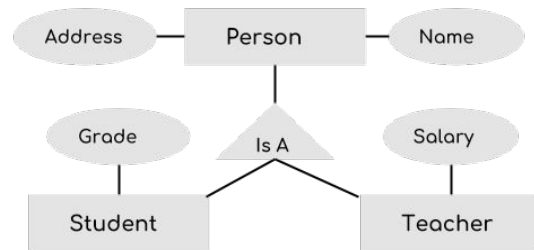


Teachers are identified by their **name, address** and salary. Students are identified by their **name, address** and salary.

## Extended MER

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- Specialization: An entity is divided into sub-entities based on their characteristics
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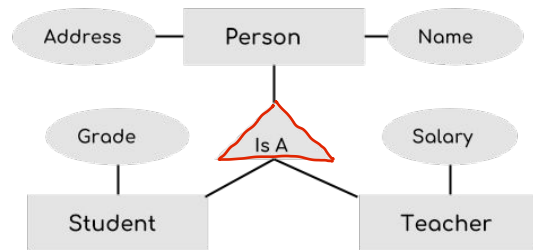
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## Extended MER

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- Specialization: An entity is **divided into sub-entities** based on their characteristics
- Generalization: **Extract common attributes** from a set of entities and create a generalized entity from it.
- Agregation

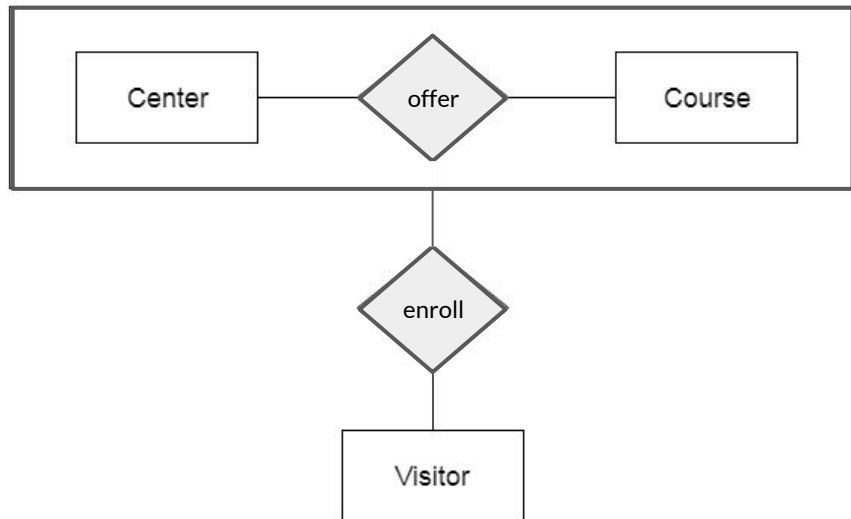


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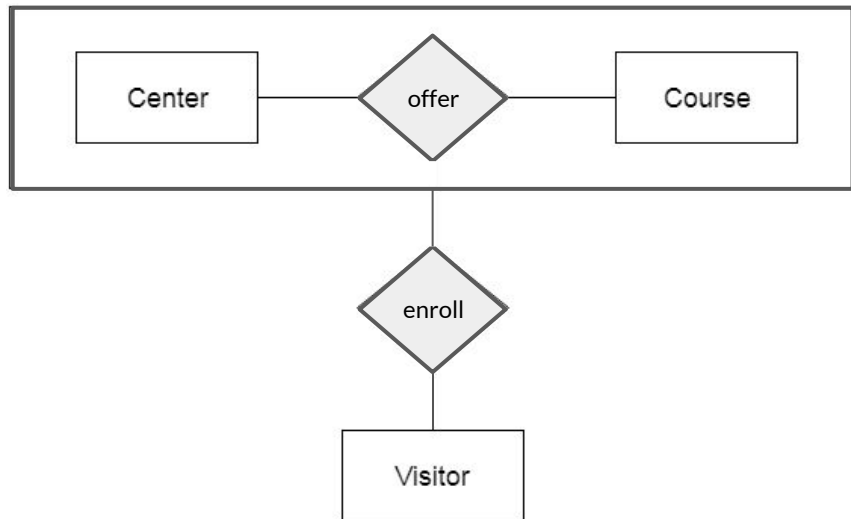
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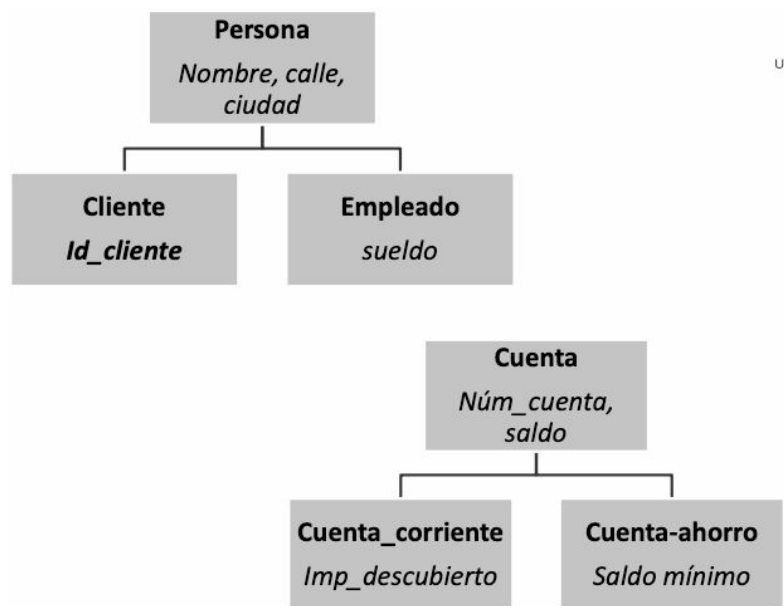
- Specialization: An entity is divided into sub-entities based on their characteristics
- Generalization: Extract common attributes from a set of entities and create a generalized entity from it.
- Agregation: Is an abstraction through which we can represent relationships as a entity



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# Extended MER

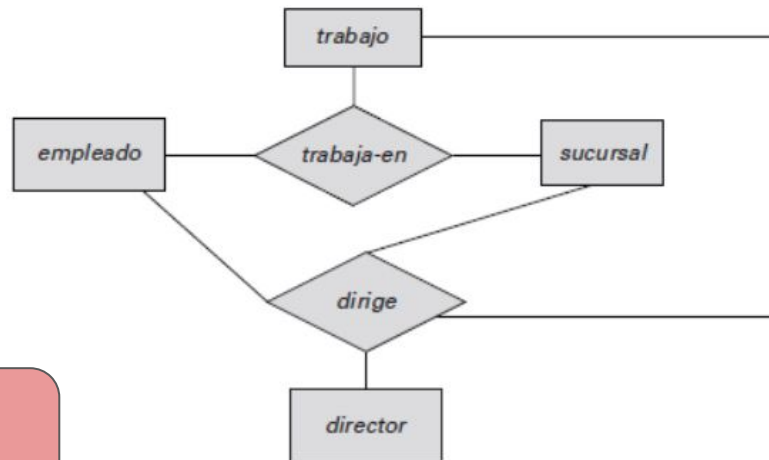
## Extended MER



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# Extended MER

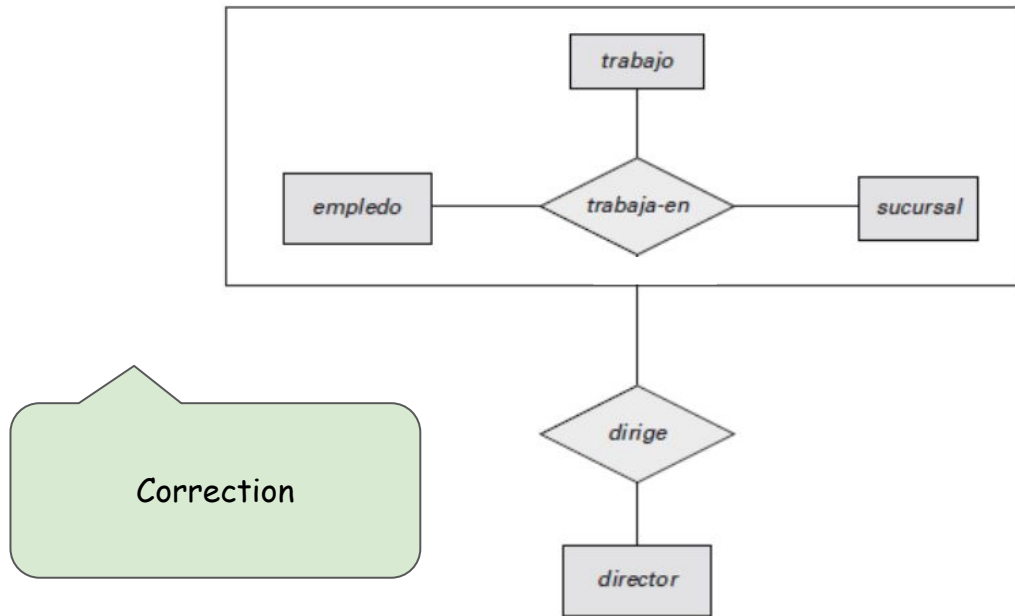
## Extended MER



Bad design, has  
redundant relationships



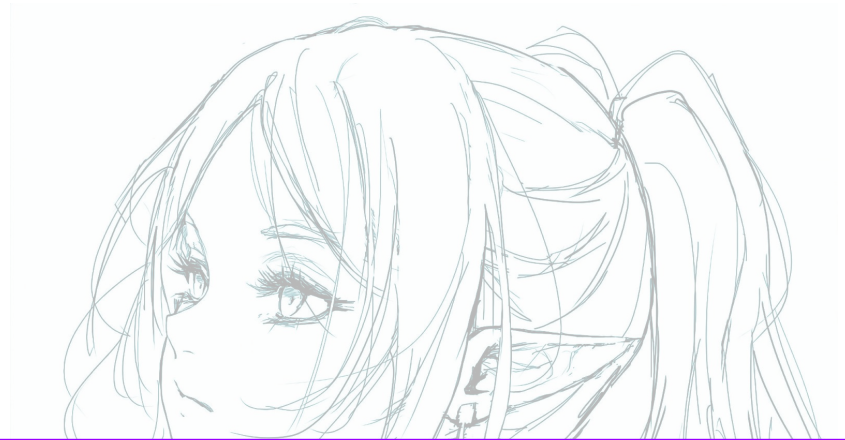
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# Extended MER



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## Databases Course

### [03] Design Considerations

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# Outline

1. Quality assessment
2. Quality factors
  - 2.1. Completeness
  - 2.2. Correctness
  - 2.3. Minimal
  - 2.4. Expressiveness
  - 2.5. Explicitness
3. Exercises



# Quality assessment

Entity Relationship (E-R) models are at the core of logical database design.

For this reason, there are metrics and methodologies for assessing the quality of a design.



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To assess the quality of conceptual diagrams, any diagram must meet several properties, which must be validated before, during or after the design.



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A comprehensive set of metrics for evaluating the quality of Entity Relationship models/design.

- Completeness
- Correctness
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To assess the quality of conceptual diagrams, any diagram must meet several properties, which must be validated before, during or after the design.

A comprehensive set of metrics for evaluating the quality of Entity Relationship models/design.

- Completeness
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The quality factors are not enough to ensure quality in practice, because different people will have different interpretations of the same concept.





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## Quality: Completeness factor

A schema is complete when it represents all the relevant features of the problem.

Design a database for a system that allows users to post messages in the groups they are affiliated with.

How assess completeness factor?

1. All the concepts of the problem are represented in some part of the diagram/design/model.
2. Check that all requirements are achievable with the schema
3. Read the result and compare it with the original description.

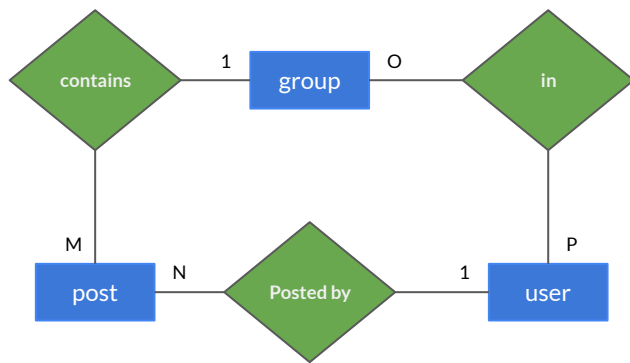
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## Quality: Completeness factor

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**Design a database for an educational system that allows students to rate courses.**

How assess completeness factor?

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## Quality: Completeness factor

Design a library management system that stores and manages data for books, authors, users, and loans. The system should allow users to search for and reserve books, while administrators can manage the inventory, register new users, and track loans and returns.

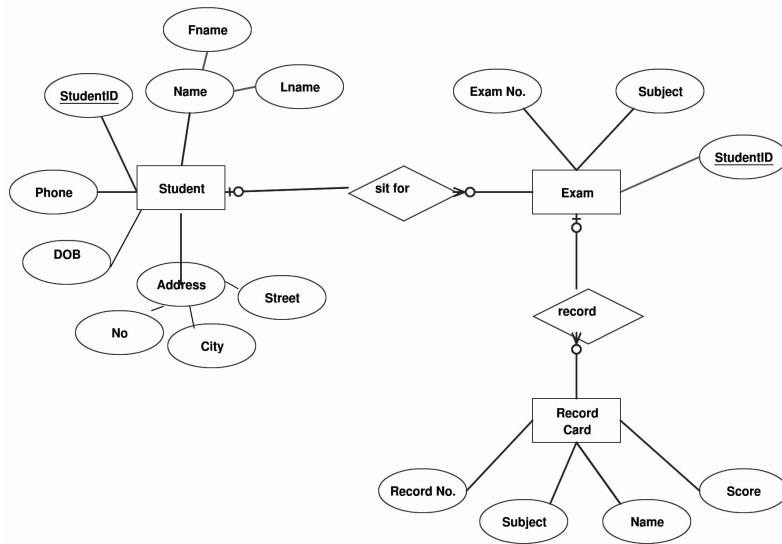
## Quality: Correctness factor

A schema is correct syntactically when the way the schema is specified is consistent with the language.

A schema has correct semantics when the way the schema is specified is consistent with the problem and its characteristics.

How assess correctness factor?

1. Check if a diagram is syntactically correct or not
2. Check if a diagram is semantics correct or not



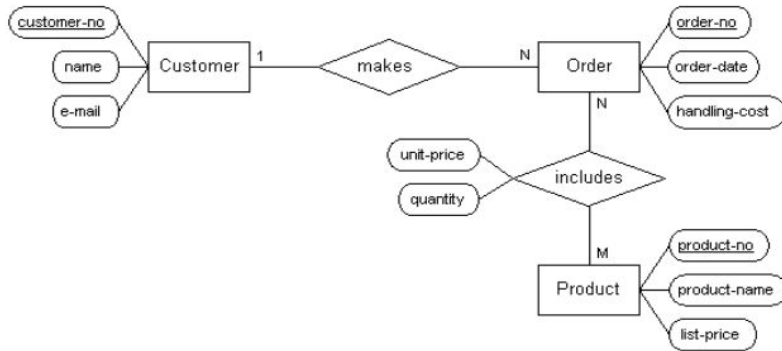
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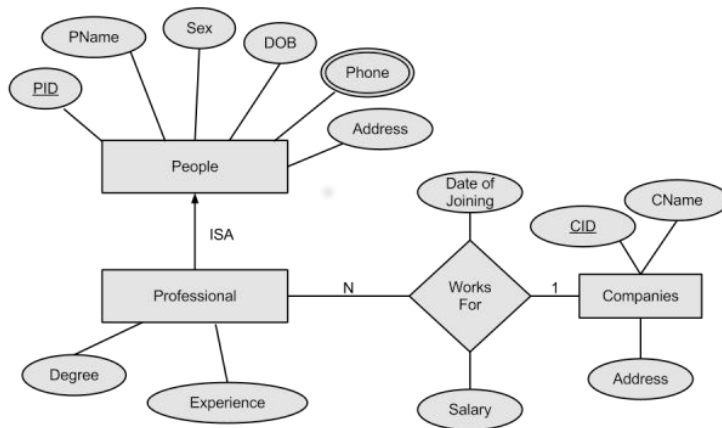
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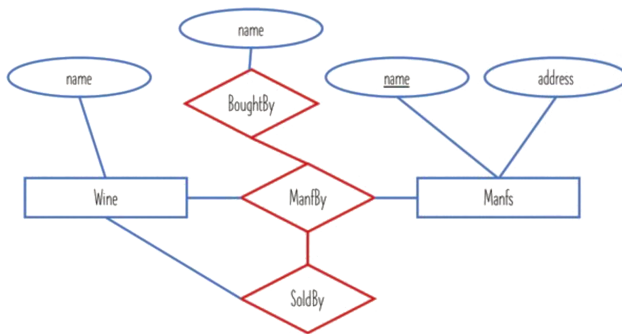
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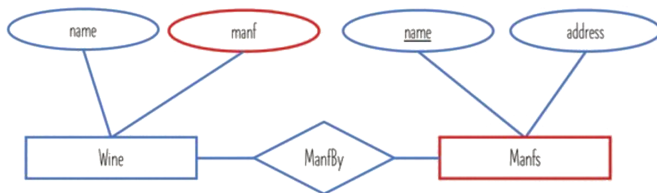
Design a parking management system that tracks the availability, occupancy, and reservations of parking spaces. The system should allow users to view available spots in real-time, reserve parking spaces in advance, and make payments. Administrators should be able to monitor occupancy rates, manage parking space assignments, and generate reports on usage patterns.

## Quality: Minimal factor

A schema is correct minimal if any element of reality appears only once in the schema.

How assess correctness factor?

1. Check if each element of reality is represented
2. Check to which element of reality does it correspond
3. Check attributes

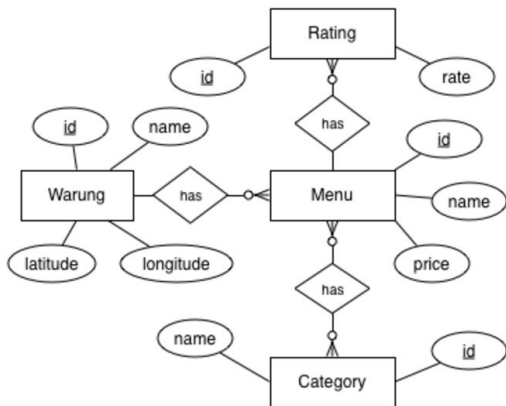


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