THE ENHANCED ER MODEL

As the complexity of data increased in the late 1980s, it became more and more difficult to use the traditional ER Model for database modelling. Hence some improvements or enhancements were made to the existing ER Model to make it able to handle the complex applications better.

EER is a high-level data model that incorporates the extensions to the original ER model.

It is a diagrammatic technique for displaying the following concepts

- Sub Class and Super Class

- Specialization and Generalization

- Union or Category

- Aggregation

These concepts are used when the comes in EER schema and the resulting schema diagrams called as EER Diagrams.

Features of EER Model

- EER creates a design more accurate to database schemas.

- It reflects the data properties and constraints more precisely.

- It includes all modeling concepts of the ER model.

- Diagrammatic technique helps for displaying the EER schema.

- It includes the concept of specialization and generalization.

- It is used to represent a collection of objects that is union of objects of different of

different entity types.

A. Sub Class and Super Class

- Sub class and Super class relationship leads the concept of Inheritance.

- The relationship between sub class and super class is denoted with ⓓ symbol.

1. Super Class

- Super class is an entity type that has a relationship with one or more subtypes.

- An entity cannot exist in database merely by being member of any super class.

For example: Shape super class is having sub groups as Square, Circle, Triangle.

2. Sub Class

- Sub class is a group of entities with unique attributes.

- Sub class inherits properties and attributes from its super class.

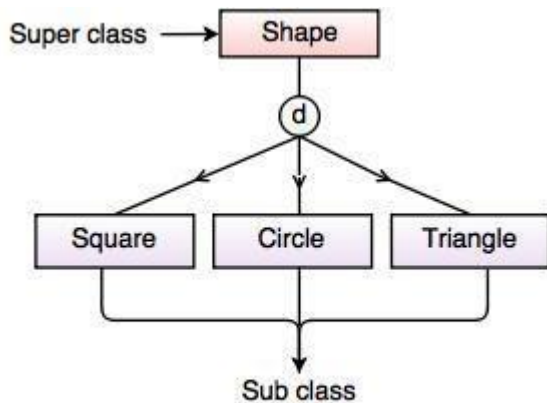**For example:** Square, Circle, Triangle are the sub class of Shape super class.

Fig. Super class/Sub class Relationship

Hence, as part of the Enhanced ER Model, along with other improvements, three new concepts were added to the existing ER Model, they were:

1. Generalization

2. Specialization

3. Aggregration

1. Generalization

Generalization is a bottom-up approach in which two lower level entities combine to form a higher level entity. In generalization, the higher level entity can also combine with other lower level entities to make further higher level entity.

It's more like Superclass and Subclass system, but the only difference is the approach, which is bottom-up. Hence, entities are combined to form a more generalised entity, in other words, sub-classes are combined to form a super-class.
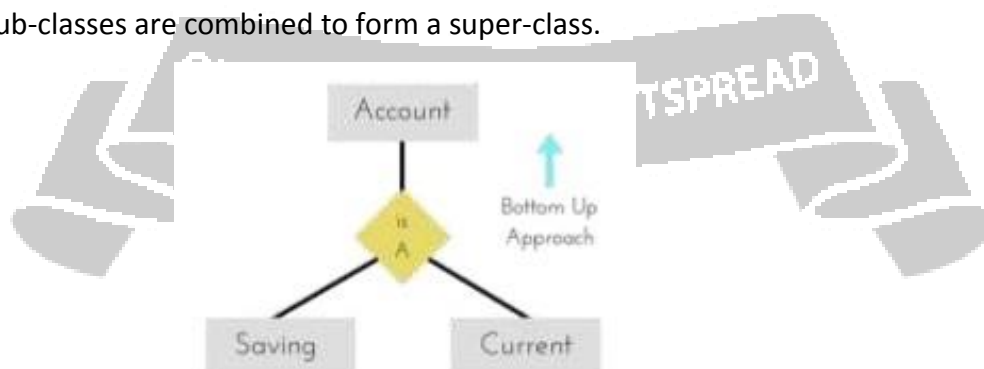
For example, Saving and Current account types entities can be generalised and an entity with name Account can be created, which covers both.

Generalization

Fig. Super class/Sub class Relationship
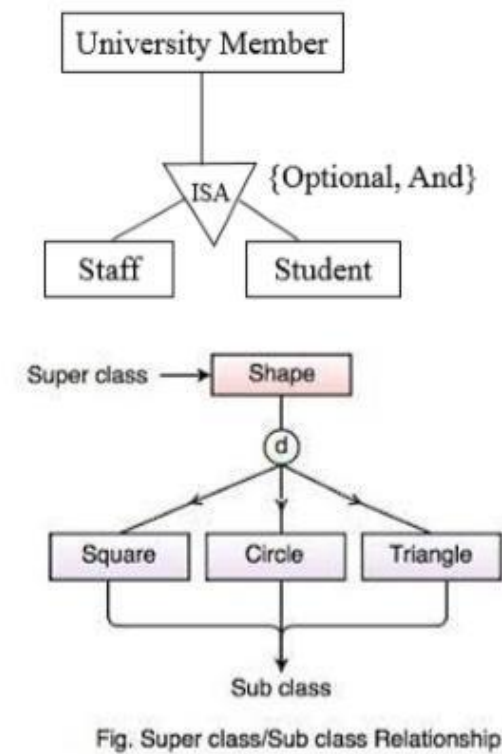
2. Specialization

- Specialization is a process that defines a group entities which is divided into sub groups based on their characteristic.
- It is a top down approach, in which one higher entity can be broken down into two lower level entity.
- It maximizes the difference between the members of an entity by identifying the unique characteristic or attributes of each member.
- It defines one or more sub class for the super class and also forms the superclass/subclass relationship.
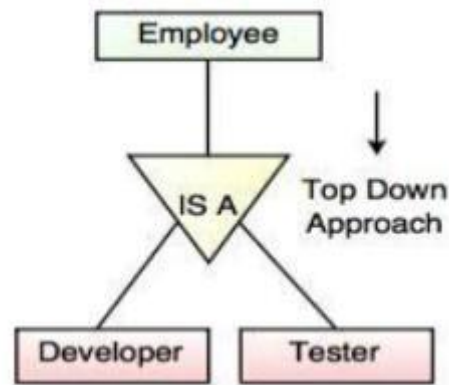
Specialization

Fig. Specialization

3. Aggregation

- Aggregation is a process that represent a relationship between a whole object and its component parts.
- It abstracts a relationship between objects and viewing the relationship as an object.
- It is a process when two entity is treated as a single entity.
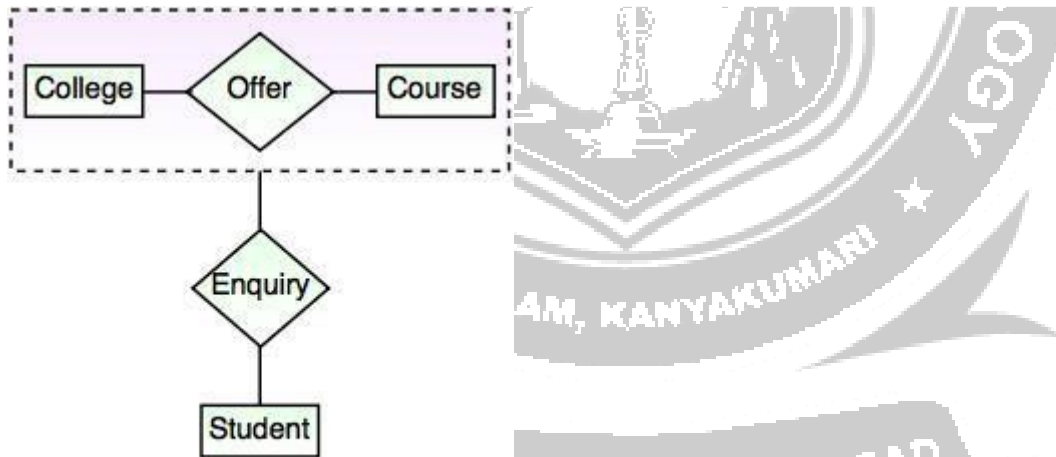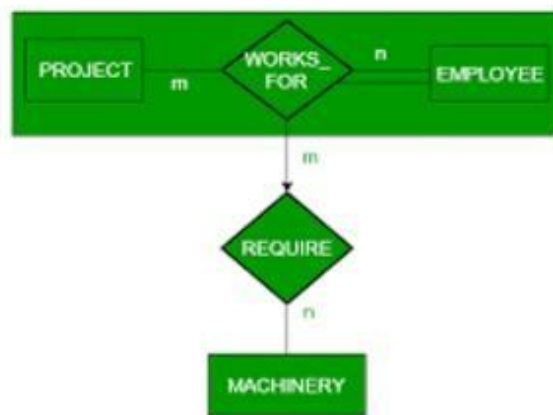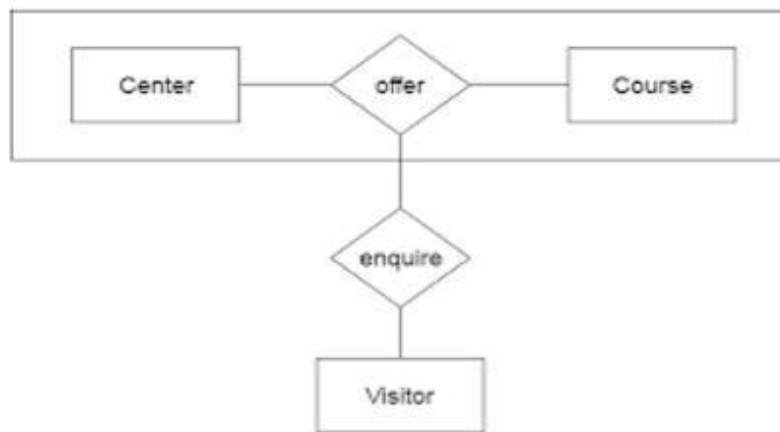

Fig. Aggregation

In the above example, the relation between College and Course is acting as an Entity in Relation with Student. In the diagram above, the relationship between Center and Course together, is acting as an Entity, which is in relationship with another entity Visitor. Now in real world, if a Visitor or a Student visits a Coaching Center, he/she will never enquire about the

center only or just about the course, rather he/she will ask enquire about both.

Category or Union

- Category represents a single super class or sub class relationship with more than one super class.
- It can be a total or partial participation.

  For example Car booking, Car owner can be a person, a bank (holds a possession on a Car) or a company. Category (sub class) → Owner is a subset of the union of the three super classes → Company, Bank, and Person. A Category member must exist in at least one of its super classes.
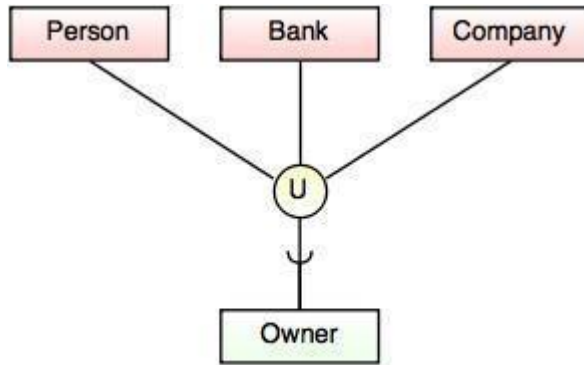
Fig. Categories (Union Type)

Generalization and Specialization –

These are very common relationships found in real entities. However, this kind of relationship was added later as an enhanced extension to the classical ER model.

Specialized classes are often called **subclass** while a **generalized class** is called a superclass, probably inspired by object-oriented programming. A sub-class is best understood by **"IS-A analysis"**. Following statements hopefully makes some sense to your mind "Technician IS-A Employee", "Laptop IS-A Computer".

An entity is a specialized type/class of another entity. For example, a Technician is a special Employee in a university system Faculty is a special class of Employee. We call this phenomenon generalization/specialization. In the example here Employee is a generalized entity class while the Technician and Faculty are specialized classes of Employee.

Example – This example instance of **"sub-class"** relationships. Here we have four sets of employees: Secretary, Technician, and Engineer. The employee is super-class of the rest three sets of individual sub-class is a subset of Employee set.
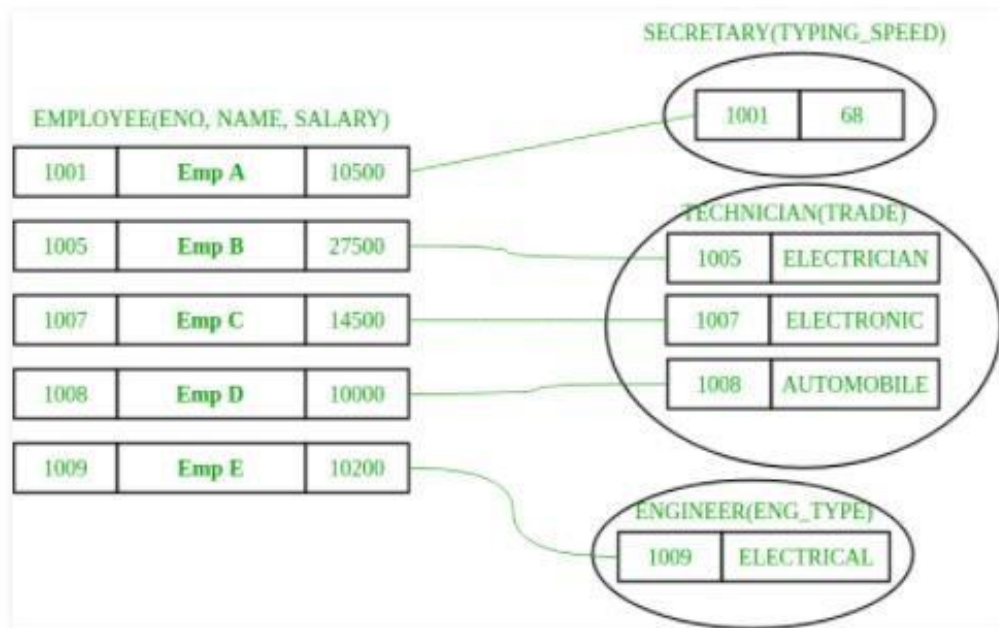
- An entity belonging to a sub-class is related to some super-class entity. For instance emp, no 1001 is a secretary, and his typing speed is 68. Emp no 1009 is an engineer (sub-class) and her trade is "Electrical", so forth.

- Sub-class entity "inherits" all attributes of super-class; for example, employee 1001 will have attributes eno, name, salary, and typing speed.