CS631-Data Management systems design
Woody's automotive online application project

Deliverable-2

Team-09

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Goals of this project:

The goal of this phase is to create a detailed logical design for the Woody's Automotive database system, which results from the mapping of an EER schema to a Relational schema. Relational Schema Is a blueprint used in database design to represent the data to be entered into the database and describe how that data is structured in tables.

Revisions made in Deliverable-1:

Extended ER diagram for the Woody's Automotive database system:
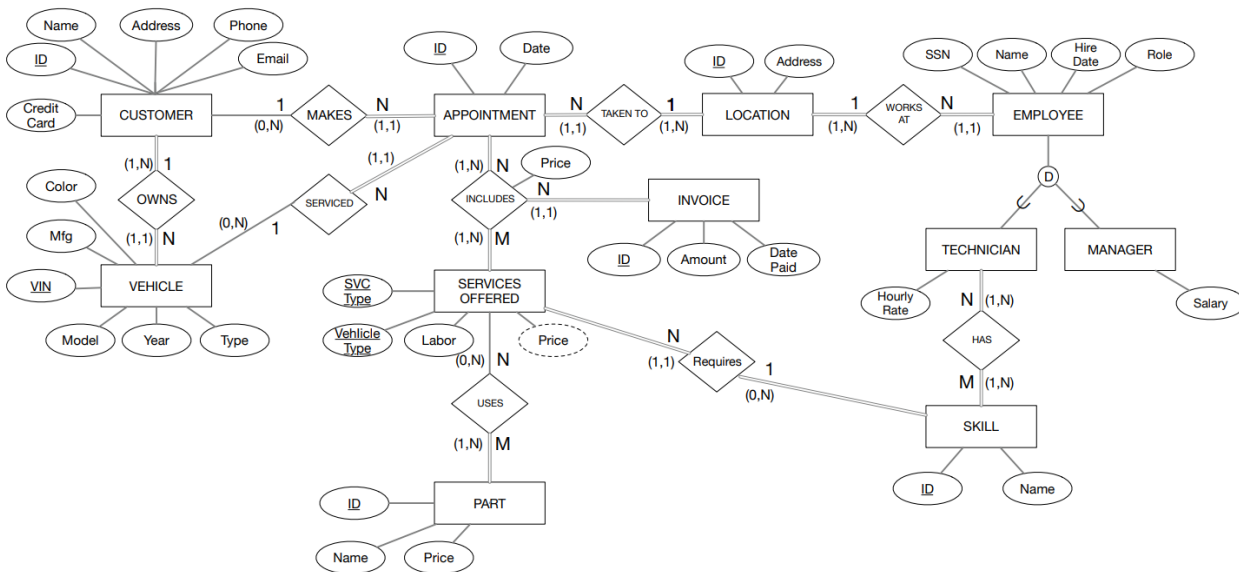
EER to Relational mapping:

There are few steps to be taken to be followed when converting a EER diagram into a relational schema.

- Mapping strong entities.
- Mapping weak entities.
- Map binary one-to-one relations.
- Map binary one-to-many relations.
- Map binary many-to-many relations.
- Map multivalued attributes.
- Map N-ary relations
- Map specialization or generalization

Mapping strong entities:

- In this step of the mapping, we have identified all the strong entity types in our ER diagram and based upon that we have created the new relations.
- The new relation will include all the simple attributes along with a unique attribute which makes the primary key of that relation.
- If there are any composite attributes in the entity, we can add their simple attributes as a part of the new relation.
- In our above EER diagram all the entities are strong entities, following is the list.

CUSTOMER(<u>ID</u>, Name, Address, Phone, Email, Credit Card)
APPOINTMENT(<u>ID</u>, Date)
VEHICLE(<u>VIN</u>, Type, Mfg, Model, Color, Year)
SERVICES OFFERED(<u>SVC Type</u>, <u>Vehicle Type</u>, Labor, Price)
PART(<u>ID</u>, Name, Price)
INVOICE(<u>ID</u>, Amount, Date Paid)
LOCATION(<u>ID</u>, Address)
SKILL(<u>ID</u>, Name)
 EMPLOYEE(<u>SSN</u>, Name, Hire Date, Role)
TECHNICIAN(Hourly Rate)
MANAGER(Salary)

Mapping weak entities:

- There are no weak entities in our EER diagram for the Woody's Automotive database system.

Map binary one-to-one relations:

- There are no one-to-one relations in our EER diagram for the Woody's Automotive database system.

Map binary one-to-many relations:
- During this mapping phase, we have identified the entities that are involved in a 1:N relationship type.
- In these cases, we need to modify the relation which has the N constraint on this side.

APPOINTMENT(Apt_id, ID,Cust_id,Loc_id,VIN,Date)

TECHNICIAN(Tech_ssn,Name,HireDate,Role,HourlyRate,Loc_id)

MANAGER(mgr_ssn, Name, HireDate, Role, Salary, Loc_id)

VEHICLE(VIN, Cust_id, Type, Mfg, Model, Color, Year)

SERVICES OFFERED(SVC Type, Vehicle Type, Labor, Price, skill_id)

Map binary many-to-many relations:
- In this mapping phase, we have recognized the entities involved in N:M relationship type.
- In such cases, we need to create a new relation which includes the primary keys of both the participating entities as foreign keys and the combination of these two keys will be the primary key for this new relation.
- We also include any simple attributes of the N:M relationship type to this new relation.

USES(SVC Type, part_id)

INCLUDES(SVC_Type, Price, Apt_id)

HAS(Tech_ssn, skill_id)

Map multivalued attributes:
- There are no multivalued attributes in our ERR diagram for the Woody's Automotive database system.

Map N-ary relations:
- In this mapping phase, we have recognized the entities involved in N-ary relationship type.
- In such cases, we need to create a new relation which includes the primary keys of all the participating entities as foreign keys and the combination of these all the keys will be the primary key for this new relation.
- We also include any simple attributes of the relationship type to this new relation.

INCLUDES(SVC_Type, Price, Apt_id, invoice_id)

## Map specialization or generalization:
- In this mapping phase, we have recognized the entities involved in specialization.

- For Specialization, we need to create a new relation for every subclass and add the primary key of the superclass as a foreign key in each of the newly created subclasses.
- EMPLOYEE superclass

MANAGER (Mgr_SSN, Name, Hire Date, Role,Salary)
TECHNICIAN(Tec_SSN, Name, Hire Date, Role,hourly_rate)

THE RESULTANT RELATIONAL SCHEMA
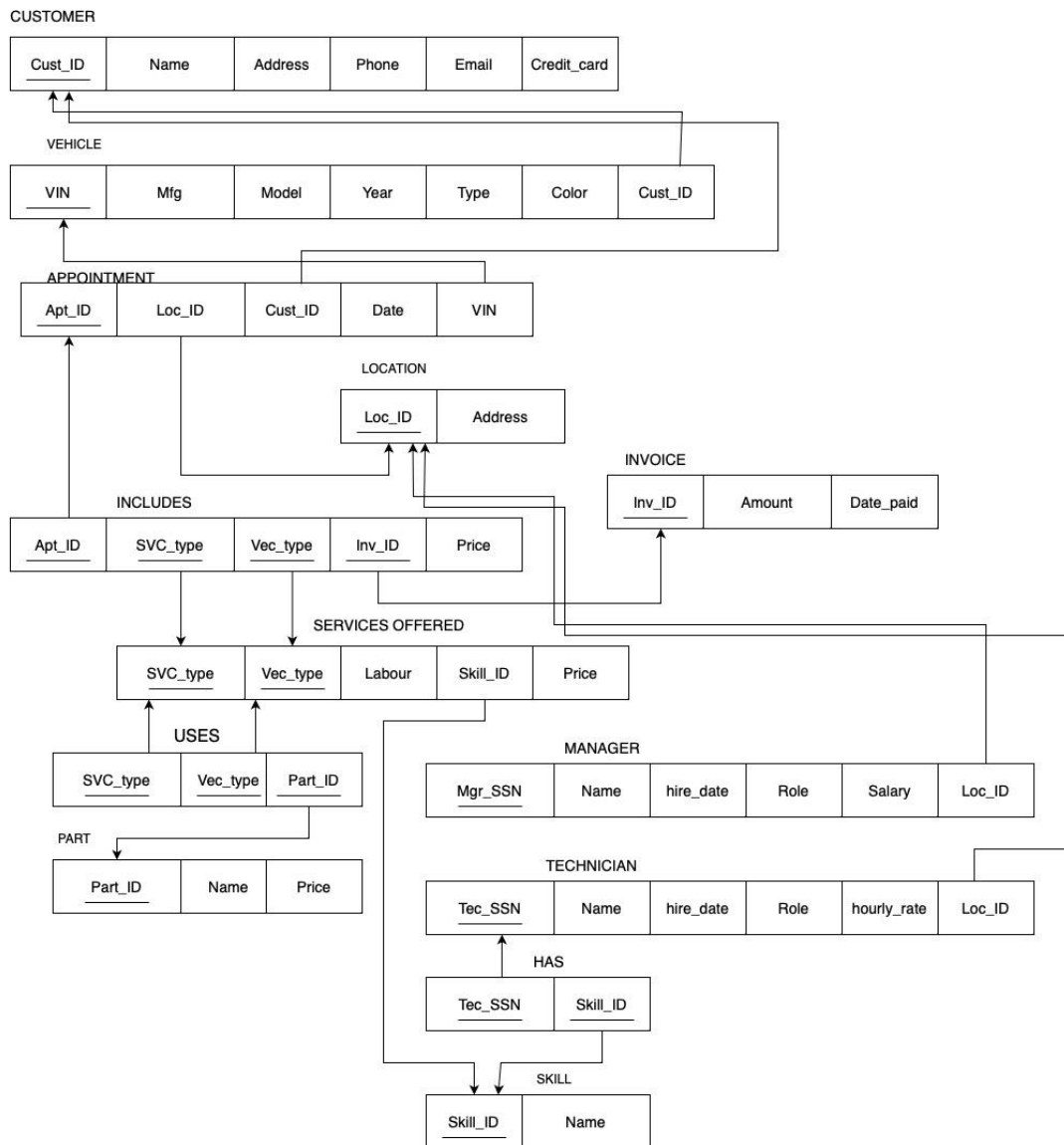
Constraints:
- Price attribute of INVOICE is derived from the relationship between SERVICES OFFERED and APPOINTMENT , occasionally manager can change the price of the service offered.

Difficulties encountered with this phase of project:
- Converting EER to Relational Schema became more difficult as the number of relations are more.
- It became challenging to determine referential constraints.
- Mapping Ternary Relationships to the schema became complicated.