CS 432: Databases

Assignment 1: DESIGNING THE DBMS

Group - 6
GREP

Q1. What is your database for, what will be its impact, who are the stakeholders involved, and what is the functional requirement of your database? Along with these, any other information which is necessary for your database should be mentioned in the description.

The database is being created for NEEV (Nurture and Empower Entrepreneurial Ventures), a non-government organization situated in the IITGN campus. The organization works for the upliftment of the nearby villagers by providing training and educating them with various skills that will enable them to support themselves. The training programs include Computer training, stitching training, chocolate-making training, etc.
The database is being created to track and manage information related to its operations and activities. The impact of the database will be to improve the organization's efficiency and effectiveness in carrying out its mission by providing a central location for storing and accessing data about the beneficiaries, core team members, activities conducted, and various other important information. It would help streamline communication and collaboration among the core members and the IITGN administration and facilitate decision-making and reporting.

The stakeholders involved in the database will likely include staff members, volunteers, interns, donors, beneficiaries, and partners of the NEEV. The significance of the database is that it will allow NEEV to better understand and serve its target population, demonstrate the impact of its work, and secure funding and support from donors.

Other key information to include in the description of the database would be the specific types of data that will be collected and stored, the security measures in place to protect the data and any plans for data analysis and reporting.

Q2. Mention the questions that you asked from the respective stakeholders or individuals. Write the names of the individuals with whom you have interacted.

For this database, we talked with Ms Saumya Harish, the Coordinator for NEEV.

- ➔ Which all villages do you target?
- ➔ How many villages does NEEV reach?
- ➔ What age group people do you target in a village? Is it gender specific?
- ➔ What data do you collect from the beneficiaries at the time of enrolling?
- ➔ What happens to the goods made during the events? Do you sell them or just put them in the inventory?
- ➔ How many events do you organize in a year?
- ➔ What is the hierarchy of NEEV? Who manages what?
- ➔ Are there any interns as team members of NEEV?
- ➔ How does NEEV manage the data currently?
- ➔ What type of events/projects does NEEV conduct, and how many during the year?
- ➔ What is the general workflow for conducting any event/project/workshop?
- ➔ Does NEEV maintain the attendance of people enrolled in the project?
- ➔ How do you assess the beneficiaries?
- ➔ What is the registration procedure for beneficiaries?
- ➔ What type of details do you ask from the beneficiaries at the time of registration?
- ➔ Are there any sponsors of NEEV for projects?
- ➔ Are trainers members of the NEEV or hired for specific projects?
- ➔ Do volunteers participate in NEEV events? Are volunteers from IIT Gandhinagar only?
- ➔ What are the expenses spent on the projects?

We would like to express our sincerest gratitude to Ma'am Soumya Harish for cooperating and supporting us for our project of designing the databases for NEEV. We would like to extend our thanks for the open communication, flexibility, and understanding that they have provided us for this project. Their support has been invaluable and has helped us complete the first stage of a database project that will support the needs of NEEV.

Q3. Name all the entities, relationships, and attributes involved in your system.

The entity set in out design:

Entities	**Attributes**
Beneficiary	• AadhaarId • Name • DOB • Gender • MaritalStatus • Education • Photo • Employed
VillageProfile	• PinCode • Name • NoOfBeneficiaries • NoOfPrimaryHealthCenter • NoOfPrimarySchool • Transport • Infrastructure • MajorOccupation • TechnicalLiteracy • Year
Trainer	• EmailId • Fee • Name • Gender • Age
Projects	• EventName • StartDate • Types • Budget • NoOfParticipants • Duration • Collection • PhotosLinks • TotalExpense
Venue	• VenueID • Place • PINCode • District State

ProjectExpense	• EventName • StartDate • Amount • Description
Volunteers	• EmailId • Name • PhoneNo • DOB • Gender
Funding	• EmailId • Amount • FunderName • Date
Goods	• EventName • StartDate • ItemName • Quantity • Amount
Teams	• EmployID • Name • EmailID • Salary • Position • YearOfJoining • YearOfLeaving • ReasonOfLeaving
EmployPhoneEntity	• PhoneNumber • Location
TrainerPhoneEntity	• PhoneNumber • EmailId
BeneficiaryPhoneEntity	• PhoneNumber • AadhaarId

The relationship sets in our design are listed below:

Relations	Description
PhoneTrainer	Relating Trainer with TrainerPhoneEntity
TrainerBeneficiary	Relating Beneficiary with Trainer
Belongs	Relating Beneficiary with VillageProfile
PhoneBeneficiary	Relating BeneficiaryPhoneEntity with Beneficiary
Assessment, Participants	Relating Beneficiary with Projects
HeldAt	Relating Projects with Venue
Expense	Relating Projects with ProjectExpense
Volunteering	Relating Projects with Volunteers
Sponsors	Relating Projects with Funding
Inventory	Relating Project with Goods
Organize	Relating Teams with Projects
TeamPhone	Relating EmployPhoneEntity with Teams
Trains	Relating NEEV events with corresponding trainers
ItemsSold	Relating items manufactured and sold with the corresponding event they were manufactured in

Q4. Give examples and justification for points c to g in Design Requirements.

At least one primary key and one foreign key.

The *Belongs* relationship between the entities *Beneficiary* and *VillageProfile* can be represented as a relational schema, featuring a table of *Beneficiaries* with an *AadharId* column serving as the primary key and a *PinCode* column from the *VillageProfile* table as the foreign key.

At least one one-to-one relationship.

The *TrainerBeneficiary* relationship between the entities *Trainer* and *Beneficiary* is a one-to-one relationship, as per the NEEV context. In this scenario, a *Trainer* could also be a *Beneficiary* who has completed a specific event previously.

At least any/both of (one-to-many, many-to-one) relationships.

The *PhoneTrainer* relationship, a weak entity, between the entities *Trainer* and *TrainerPhoneEntity*, is a one-to-many relationship, with the many side on *TrainerPhoneEntity*. This relationship is characterized by a one-to-many cardinality on the *TrainerPhoneEntity* side, as there may exist multiple *PhoneNumbers* for a single Trainer.

At least one many-to-many relationship.

There are numerous *many to many* relationships present in our ER diagram. One example of such is the *Beneficiary* to *Projects* relation. *Participants* is the relationship set that exists between these two entity sets. There exists a *many to many* relationships between these entities as any one beneficiary may participate in many projects as well as any one project may have many beneficiaries participating in it.

At least one of each (total & partial) participation constraint.

We have used five total participation constraints in the ER diagram. One such example of total participation constraint is on the *ProjectExpense* weak entity set. It has a *many to one* relationship with *Projects* entity set. The relationship set between them is *Expense* and it is a weak entity set. The *ProjectExpense* weak entity set has a total participation constraint on it as all the instances present in this set must participate in a relation with the instances of *Projects* entity

set. This is because, there cannot exist any instance of an amount that is not expended on any one of the projects.

There are many partial participation constraints used in the ER diagram. The relationship between *Volunteers* and *Projects* entity set is one such example. There exist *a many to many* relation between these entity sets and these are related by the *Volunteering* relationship set. These entity sets have partial participation constraints since all the volunteers might not be associated with any one of the projects at a time. Similarly, not all the projects need to be associated with the volunteers at a time.

Converting ER Diagram entities to relational schemas

Here, the Purple colour denotes Foreign Key

Red colour denotes Attributes of Weak Entity

- TeamPhone - (Phone Number, Employ ID, Location)
- Organize - (Event_Name, Start_Date, Employee_ID, Role)
- ItemSold - (Item name, Quantity, Amount, Event_Name, Start_Date)
- Trains - (Email_id, EventName, Start_Date)
- Volunteering - (Email_id, EventName, Start_Date)
- Expense - (Amount, Event_Name, Start_Date, Description)
- Participants - (Event_Name, StartDate , Aadhar id)
- Sponsors - (Email_id, Event_Name, Start_Date)
- Belongs - (Aadhaar_id, PINCode)
- PhoneBeneficiary - (PhoneNumber, Aadhar_id)
- HeldAt - Event_Name, Start_Date, Venue_id)
- PhoneTrainer - (PhoneNumber, Email_ID)
- TrainerBeneficiary - (AadharID, EMailID)
- Assessment - (Event_Name, Start_Date, Aadhar_id, Date, PresentOrAbsent)

Representing Relationship set and Entity as Relational Schemas

Here, Purple colour denotes Foreign Key

Red colour denotes Attributes of Weak Entity

- In the relationship set **Trains**: It is a many to many relationship. There will be 3 schemas possible: Trains, Trainer, Projects
    - Trains - (Email_id, EventName, Start_Date)
    - Trainer - (Email_id, Fee, Name, Gender, Age)
    - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
- In the relationship set **Volunteering**: It is a many to many relationship. There will be 3 schemas possible:
    - Volunteering - (EmailID, EventName, Start_Date)
    - Volunteers - (Email_id, Name, PhoneNo, DOB, Gender)
    - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
- In the relationship set **PhoneTrainer**: It is a many(**TrainerPhoneEntity**) to one (Trainer) relationship. There will be 2 schemas possible:
    - PhoneTrainer - (PhoneNumber, Email_ID)
    - Trainer - (Email_id, Fee, Name, Gender, Age)

- In the relationship set **Organize**: It is a many(Projects) to many (Teams) relationship. There will be 3 schemas possible:
    - Organize - (EventName, StartDate, EmployID, Role)
    - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
    - Teams - (Employ_ID, Name, EmailID, Salary, Position, YearOfJoining, YearOfLeaving, ReasonOfLeaving)

- In the relationship set **PhoneBeneficiary**: It is a many(**BeneficiaryPhoneEntity)** to one(**Beneficiary**) relationship. There will be 2 schemas possible:
    - PhoneBeneficiary - (PhoneNumber, Aadhar_id)

    - Beneficiary- (Aadhar_id, Name, DOB, Gender, MaritalStatus, Education, Photo, Employed)
- In the relationship set **TeamPhone**: It is a many(**EmployPhoneEntity**) to one (Teams) relationship. There will be 2 schemas possible:
    - TeamPhone - (Phone No, EmployID, Location)
    - Teams - (EmployID, Name, EmailID, Salary, Position, YearOfJoining, YearOfLeaving, ReasonOfLeaving.)

- In the relationship set **ItemSold**: It is a many(Goods) to one (Projects) relationship. There will be 2 schemas possible:
    - ItemSold - (Item name, Quantity, Amount, Event_Name, Start_Date)
    - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)

- In the relationship set **Expense**: It is a many(ProjectExpense) to one (Projects) relationship. There will be 2 schemas possible:
    - Expense - (Amount, Description, Event_Name, Start_Date)
    - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink(blob), TotalExpense)

- In the relationship set **Participants**: It is a many(Projects) to many (Beneficiary List) relationships. There will be 3 schemas possible:
    - Participants - (EventName, StartDate, AadharID)
    - Projects - (EventName, StartDate, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
    - Beneficiary List - (AadharID, Name, DOB, Gender, MaritalStatus, Education, Photo, Employed)
- In the relationship set **Sponsors**: It is a many(Projects) to many (Funding) relationship. There will be 3 schemas possible:
    - Sponsors - (EmailID, Name, StartDate)

- Projects - (EventName, StartDate, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
- Funding - (EmailID, Amount, FunderName, Date)

- In the relationship set **Belongs**: It is a many(Beneficiary) to one (VillageProfile) relationship. There will be 3 schemas possible:
  - Belongs - (Aadhaar_id, PINCode)
  - VillageProfile - (PINCode, Name, NoOfBeneficiaries, NoOfPrimaryHealthCenter, NoOfPrimarySchool, Transport, Infrastructure, MajorOccupation, TechnicalLiteracy, Year)
  - Beneficiary - (Aadhar_id, Name, DOB, Gender, MaritalStatus, Education, Photo, Employed)

- In the relationship set **HeldAt**: It is a many(Projects) to many (Venue) relationship. There will be 3 schemas possible:
  - HeldAt - (Event_Name, Start_Date, VenueID)
  - Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense, VenueID)
  - Venue - (VenueID, Place, PINCode, District, State, Event_name, Start_Date)

- In the relationship set **TrainerBeneficiary**: It is one to one relationship. There are three schemas possible:
  - TrainerBeneficiary - (Aadhar ID, EmailID)
  - Trainer - (Aadhar ID, Fee, Name, Gender, Age)
  - Beneficiary - (Aadhar_id, Name, DOB, Gender, MaritalStatus, Education, Photo, Employed)

- In the relationship set **Assessment**: It is a many(PhoneNumber) to one (Trainer) relationship
  - Assessment - (Event_Name, Start_Date, Aadhar_id, Date, PresentOrAbsent)

- Projects - (Event_name, Start_Date, Types, Budget, NoOfParticipants, Duration, Collection, PhotosLink, TotalExpense)
- Beneficiary - (Aadhar_id, Name, DOB, Gender, MaritalStatus, Education, Photo, Employed)

Q3.

Red color denotes Attributes of Weak Entity

For displaying the key constraints of all the attributes involved in our schema, we have displayed only attributes of entity sets (since the attributes of relationship sets are already present in entity sets as primary keys) and the descriptive attributes of relationship sets separately.

Projects

Event_name	PRIMARY KEY	Event name, along with date, uniquely identifies the event along with all details
Start_date	PRIMARY KEY	Event name, along with date uniquely identifies the event along with all details
Types	CHECK (workshop, courses, …), NOT_NULL	Event cannot fall into any other type Event falls into some type or other
Budget	NOT NULL	keeping data of budget important for financial decisions
Number of participants	NOT NULL	There must be some number
Duration	NOT NULL	NEEV must be collecting data on duration
Collection (entry fee, sales)	DEFAULT = NULL	Some events may not be done

		with the objective of collection
Photos Links	DEFAULT = NULL	Maybe They might not have photos of some events
Total expense	NOT NULL	NEEV must have collected data of expenses for a program

Beneficiary

	Key constraints	Reasons
Aadhaar ID	PRIMARY KEY	Aadhaar id can be used to identify a beneficiary along with its other details uniquely.
Name	NOT NULL	NEEV needs to keep track of the beneficiary name, so the field can not be NULL
Date of Birth	NOT NULL	If aadhaar card is there, DOB is mentioned there
Gender	NOT NULL	NEEV must keep data of gender of participants
Marital Status	NOT NULL	NEEV must keep data of the marital status of participants
Education	NOT NULL	NEEV must have data on the

	Key constraints	Reasons
Aadhaar ID	PRIMARY KEY	Aadhaar id can be used to identify a beneficiary along with its other details uniquely.
		educational status of participants
Photo	DEFAULT = NULL	In villages, there can be cases in which people could not produce their photo, so that field is replaced by NULL.
Employed	DEFAULT = NULL	Here a dichotomy of “employed vs unemployed” does not apply

Teams

Employ Id	PRIMARY KEY	Uniquely identifies an employee
Name	NOT NULL	Name can’t be a null value
EmailId	UNIQUE	All employees has unique email address
Salary	NOT NULL	There should be some salary associated with an employ)(can be zero
Position	NOT NULL	Every employee has a particular position to work upon
YearOfJoining	NOT NULL	Year of joining needs to be specified

YearOfLeaving	DEFAULT: NULL	In case the employee is currently Working
ReasonOfLeaving	DEFAULT: NULL	Entry will be empty in case employee is working or leaves without explanation

Volunteers

Email Id	PRIMARY KEY	For volunteers, it would not change frequently and is useful in unique identification.
Name	NOT NULL	Each volunteer must have a name
PhoneNo	NOT NULL	Phone no. must be present for contact when necessary.
DOB	DEFAULT = NULL	It is not necessary but would be helpful to know
Gender	DEFAULT = NULL	It is not necessary but would be helpful to know.

Trainers

EmailId	PRIMARY KEY	For trainers, we can uniquely identify using it.
Name	NOT NULL	Everyone has a name
Age	NOT NULL	For checking their experience
Gender	NOT NULL	For some gender specific teachings
Fee	DEFAULT = NULL	Some trainers may work for free.

EmployPhoneEntity

PhoneNumber	NOT NULL	An employee must have some contact number
Location	NOT NULL	The employee must have some location whose record is kept by NEEV

Goods

ItemName	DEFAULT = Not applicable	Maybe nothing was manufactured
Quantity	DEFAULT = Not Applicable	In case nothing was manufactured
Amount	DEFAULT = Not Applicable	In case nothing was manufactured

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Funding

Email Id	PRIMARY KEY	Email id uniquely identifies the donor
Amount	NOT NULL	NEEV must have data of amount donated
FunderName	NOT NULL	Someone must be funding NEEV
Date	NOT NULL	There must be some date of donation

ProjectExpense

Amount	NOT NULL	NEEV must have data of amount spent
Description	NOT NULL	It is important to have a description of money spent

Venue

Venue ID	PRIMARY KEY	Uniquely identifies a place
Place	NOT NULL	Venue must have an address
PINCode	NOT NULL	There must be PINCode related to venue
District	NOT NULL	Every village comes under some district
State	NOT NULL	A venue must be in some Indian state

TrainerPhoneEntity

PhoneNumber	NOT NULL	An Trainer must have some contact number to contact

BeneficiaryPhoneEntity

PhoneNumber	DEFAULT: NULL	An Trainer must have some contact number to contact

Following includes key constraints for the descriptive Attributes

Assessment

Date	NOT NULL	Attendance must be associated with a date
PresentOrAbsent	NOT NULL	Either you will be present or absent

Organize

Role	NOT NULL	He/she would have some post/role with NEEV

Q4. Mapping Cardinalities

The mapping cardinalities are shown in the ER Diagram. Below, we have mentioned the cardinalities:

Note: In many-to-many relationships, we have not mentioned which one it represents as it is simply Many to many.

- TeamPhone: Many(EmployPhoneEntity) to One(Teams)
- Organize: Many(Teams) to Many(Projects)
- ItemSold: Many(Goods) to One(Projects)
- Trains: Many(Trainer) to Many(Projects)
- Volunteering: Many(Volunteers) to Many(Projects)
- Expense: Many(ProjectExpense) to One(Projects)
- Participants: Many(Beneficiary) to Many(Projects)
- Sponsors: Many(Funding) to Many(Projects)
- Belongs: Many(Beneficiary) to One(VillageProfile)
- PhoneBeneficiary: Many(BeneficiaryPhoneEntity) to One(Beneficiary)
- HeldAt: Many(Venue) to Many(Projects)
- PhoneTrainer: Many (TrainerPhoneEntity) to one (Trainer)
- Assessment: Many(Beneficiary) to One(Projects)
- TrainerBeneficiary: One(Trainer) to One(Beneficiary)

Q5. Redundant sets

In the relationship set **ItemSold**, the relational schema for weak entity set **Goods** will be redundant as it is serving as a weak entity and it does not have a primary key of its own. If we make a relational schema for this weak entity, we cannot extract any information about the event, to which the goods belong to.

In the relationship set **PhoneTrainer**, the relational schema for the entity set **TrainerPhoneEntity** is redundant because it is a connected entity between the relationship set PhoneTrainer and entity Trainer. PhoneTrainer will contain its primary key {PhoneNumber} and Foreign Key Email_id. From the relationship set schema, we could extract the phoneNumber as

we have {PhoneNumber} as a Primary Key. Therefore a separate relational table for Entity TrainerPhoneEntity is redundant.

In the **Expense** relationship set, connecting Projects and ProjectExpense, here Expense is a weak entity set. Therefore, it does not have a primary key of its own. To represent the Expense relationship set, we are using the primary key {EventName, StartDate} and {Amount, Description}. Here we will not be having a separate relational schema for ProjectExpense as it is a weak entity. We could not retrieve any information about the Project Expense without knowing the EventName. Therefore a separate relational table for Entity Project Expense is redundant.

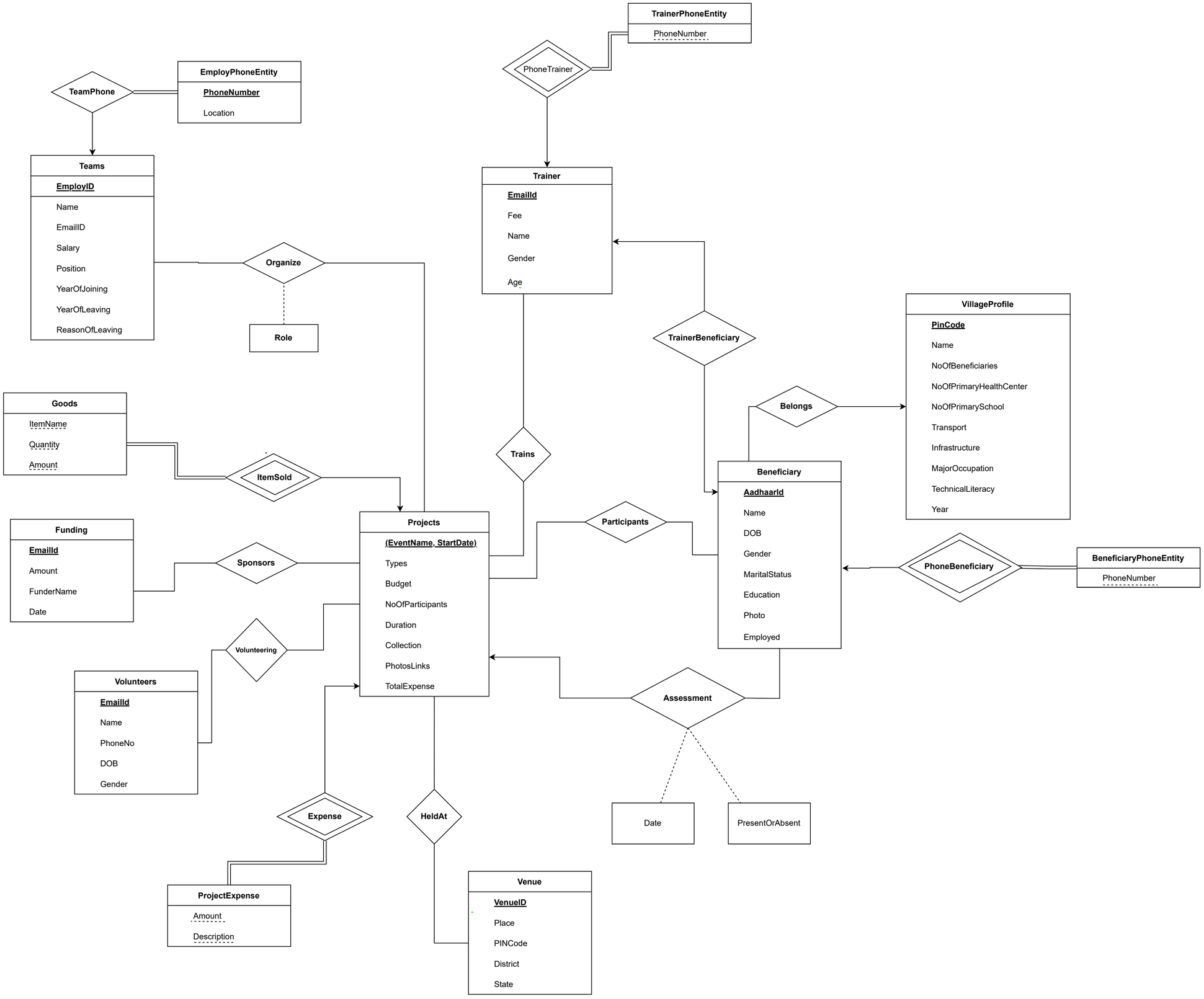
In the relationship set **TeamPhone, the** relational schema fothe r entity set **EmployPhoneEntity** is considered redundant because it is connected withthe relationship set TeamPhone and entity set Teams. Its primary key {PhoneNumber} will be present in the relationship set along with {EmployID} as Foreign Key. Therefore a separate schema for **EmployPhoneEntity** is redundant.

In the relationship set **PhoneBeneficiary**, a separate relational schema for **BeneficiaryPhoneEntity** is redundant because the relationship set **PhoneBeneficiary** contains primary key {PhoneNumber} and foreign key **AadharId.** Therefore, a separate schema for **BeneficiaryPhoneEntity** is not required as we can extract the beneficiary phone number from its relationship set.

Contribution

Group G1		
Roll No.	**Name**	**Participation**
20110002	Mahesh Abhale	Participated effectively and coordinated with the NEEV team to collect the required data. I helped in making the ER diagram. Collaborated and answered the questions allotted to G1 and reviewed the work of G2.
20110034	Badal Chowdhary	Participated effectively and coordinated with the NEEV team to collect the required data. I helped in making the ER diagram. Collaborated and answered the questions allotted to G1 and reviewed the work of G2.
20110047	Chirag Sarda	Participated effectively and coordinated with the NEEV team to collect the required data. I helped in making the ER diagram. Collaborated and answered the questions allotted to G1 and reviewed the work of G2.
20110052	Sandeep Desai	Participated effectively and coordinated with the NEEV team to collect the required data. I helped in making the ER diagram. Collaborated and answered the questions allotted to G1 and reviewed the work of G2.
20110056	Dheeraj Yadav	Participated effectively and coordinated with the NEEV team to collect the required data. I helped in making the ER diagram. Collaborated and answered the questions allotted to G1 and reviewed the work of G2.

Group G2		
Roll No.	**Name**	**Participation**
20110129	Utkarsh Mittal	Contributed to making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed in setting mapping cardinalities and reviewed the work of G1 and collecting data.
20110156	Rahul Rai	Contributed in making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed in setting mapping cardinalities and reviewed the work of G1. Also helped G1 make an ER Diagram
20110117	Narla Karthikeya	I Contributed to making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed to setting mapping cardinalities and reviewed the work of G1
20110242	Zeeshan Snehil Bhagat	Contributed to making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed in setting mapping cardinalities and reviewed the work of G1 and collecting data.
20110154	Rahul Lalani	Contributed to making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed in setting mapping cardinalities and reviewed the work of G1
20110024	Ary Pratap Singh	Contributed to making Relational Schemas from ER diagrams and setting key constraints of schemas. Also contributed in setting mapping cardinalities and reviewed the work of G1


TrainerPhoneEntity
PhoneNumber
PhoneTrainer
EmployPhoneEntity
PhoneNumber
Location
TeamPhone
Teams
EmployID
Name
EmailID
Salary
Position
YearOfJoining
YearOfLeaving
ReasonOfLeaving
Organize
Role
Trainer
EmailId
Fee
Name
Gender
Age
TrainerBeneficiary
VillageProfile
PinCode
Name
NoOfBeneficiaries
NoOfPrimaryHealthCenter
NoOfPrimarySchool
Transport
Infrastructure
MajorOccupation
TechnicalLiteracy
Year
Belongs
Goods
ItemName
Quantity
Amount
ItemSold
Trains
Beneficiary
AadhaarId
Name
DOB
Gender
MaritalStatus
Education
Photo
Employed
Participants
Projects
(EventName, StartDate)
Types
Budget
NoOfParticipants
Duration
Collection
PhotosLinks
TotalExpense
Funding
EmailId
Amount
FunderName
Date
Sponsors
PhoneBeneficiary
BeneficiaryPhoneEntity
PhoneNumber
Volunteering
Volunteers
EmailId
Name
PhoneNo
DOB
Gender
Assessment
Date
PresentOrAbsent
Expense
HeldAt
ProjectExpense
Amount
Description
Venue
VenueID
Place
PINCode
District
State