CSDS 341: Final Project Initial Report Questionnaire Website

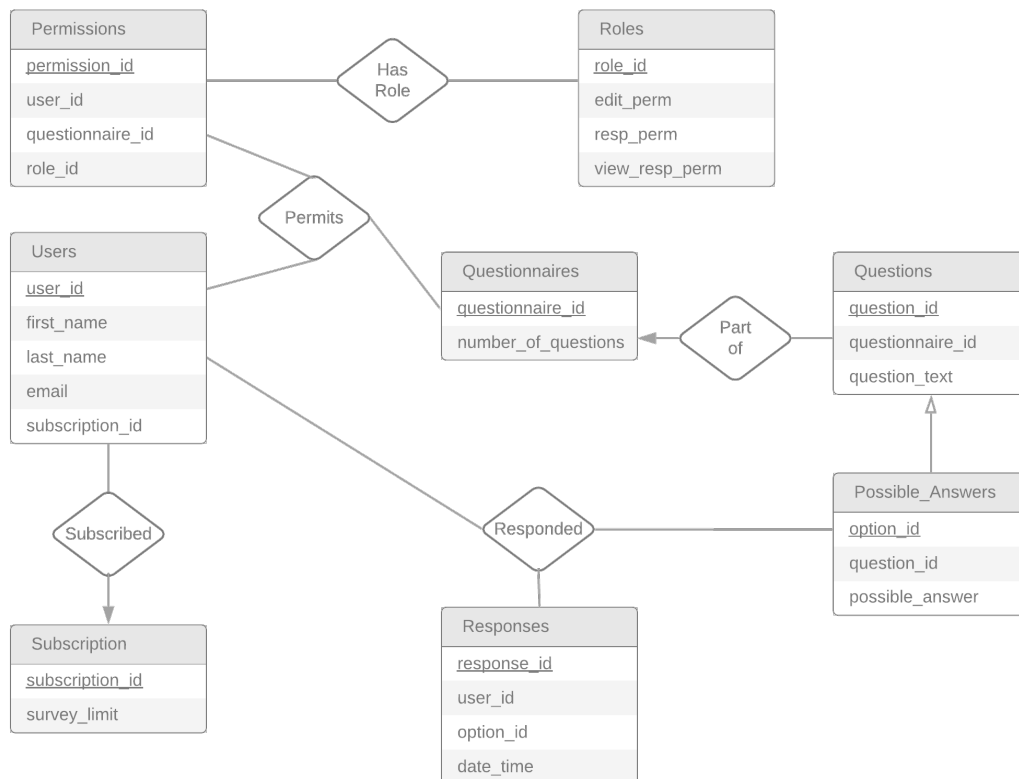Oleksii Fedorenko, David Frost, Matthew Garcia, Preeti Naik

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1 Background

Questionnaires and surveys are very important for understanding and shaping the world. Surveys are one of the main tools for collection and analysis of data for making decisions. For example, United States uses the Census and the American Community Survey to understand how country demographics is shifting and to make decisions about the allocation of resources. Researchers use questionnaires for scientific studies to understand both the social and natural worlds. Psychologists in particular make great use of Likert scales in questionnaires to help build our collective knowledge.

Therefore, streamlining the process of collecting and analysing surveys using technology is very beneficial for decision-making. Our application would allow users to create their own questionnaires, distribute and analyse them easily. Additionally, application would allow for streamlining the decision-making process based on the analysis of data to an advanced degree.

This will be accomplished through the design of the database allowing for multiple functionalities based on the user. With different roles and permissions a user will be able to participate in questionnaires or be the creator of a questionnaire. Then, questionnaires will have a certain amount of questions and these questions will have possible answers created by the maker of the questionnaire. Responses will be recorded and using the relationships in the database queries can be written to analyze the gathered data. This survey tool streamlines the process of creating and answering surveys and allows for data analysis to make decisions or understand the participants choices.

2   ER Diagram

Permissions
- permission_id
- user_id
- questionnaire_id
- role_id

Has Role

Roles
- role_id
- edit_perm
- resp_perm
- view_resp_perm

Permits

Users
- user_id
- first_name
- last_name
- email
- subscription_id

Questionnaires
- questionnaire_id
- number_of_questions

Part of

Questions
- question_id
- questionnaire_id
- question_text

Subscribed

Responded

Possible_Answers
- option_id
- question_id
- possible_answer

Subscription
- subscription_id
- survey_limit

Responses
- response_id
- user_id
- option_id
- date_time

3   Data Description and Schemas

```
CREATE TABLE Users (
    user_id  INT,
    first_name VARCHAR(40),
    last_name VARCHAR(40),
    email VARCHAR(100),
    subscription_id  INT,
    PRIMARY KEY(user_id),
    FOREIGN KEY(subscription_id REFERENCES Subscription(subscription_id))
)
```

This entity represents users of the questionnaire website. All types of users,
including people who create questionnaires or answer questionnaires, are in
this table.

```
CREATE TABLE Permissions (
    permission_id  INT,
    user_id  INT,
    questionnaire_id  INT,
    role_id  INT,
    PRIMARY KEY (permission_id),
    FOREIGN KEY(user_id REFERENCES Users(user_id)),
    FOREIGN KEY(questionnaire_id REFERENCES Questionnaires(questionnaire_id
    FOREIGN KEY(role_id REFERENCES Roles(role_id))
)
```

This entity describes the permission level of a user for each questionnaire, this
is part of a ternary relationship between users, questionnaire, and permis-
sion. User and Questionnaire entities are not fully participating in this table.

```
CREATE TABLE Roles (
    role_id  INT,
    edit_perm BIT,
    resp_perm BIT,
    view_resp_perm BIT,
    PRIMARY KEY(role_id)
)
```

This entity describes the roles that are allowed for each permission evel. For
each role there are different permissions that are dependent on a true or false
value (BIT) in SQL. For each tuple of user and survey the permission level

determines what roles they have.

```
CREATE TABLE Subscription (
    subscription_id  INT,
    survey_limit  INT,
    PRIMARY KEY(subscription_id)
)
```

Describes the subscription level and how many surveys users are allowed to create at each subscription level.

```
CREATE TABLE Questionnaires (
    questionnaire_id  INT,
    number_of_questions  INT,
    PRIMARY KEY(questionnaire_id)
)
```

Defines a questionnaire with the unique id that will be bound to a user using the permissions table.

```
CREATE TABLE Questions (
    question_id  BIGINT,
    questionnaire_id  INT,
    question_text  VARCHAR(400),
    PRIMARY KEY(question_id),
    FOREIGN KEY(questionnaire_id REFERENCES Questionnaires(questionnaire_id
)
```

Determines questions as they are related to each questionnaire.

```
CREATE TABLE Possible_Answers (
    option_id  BIGINT,
    question_id  BIGINT,
    possible_answer  VARCHAR(400),
    PRIMARY KEY(option_id),
    FOREIGN KEY(question_id REFERENCES Questions(question_id))
)
```

Defines possible answers to each question. e.g. for multiple choice questions, this will have entries for each possible answer, while for questions like rating questions, this place will have the range of rankings available.

```
CREATE TABLE Responses (
    response_id INT,
    user_id INT,
    option_id BIGINT,
    date_time DATETIME,
    PRIMARY KEY(response_id),
    FOREIGN KEY(user_id REFERENCES Users(user_id)),
    FOREIGN KEY(option_id REFERENCES Possible_Answers(option_id))
)
```

Defines the user response to each of the questions and ties them to the unique response option identifier and user id.

Possible queries:

- Check if user answered the survey

- Check if user has permission to edit

- Check if user has permission to see analysis

- Retrieve user answers

- Retrive answer counts per question per questionnaire

- Retrieve quetions related to questionnaire

- Retrieve possible answers related to question

- Distributions of responses to a question based on filters like date

- Number of responses to a specific question

- Query the number of times the question has been asked vs the response rate

- Did person hit the limit of the number of questionnaires to create

Improving performance:

- Create various table indexes

- Create materialized views to improve performance on some of the queries