# CSDS 341: Final Project Report Questionnaire Website

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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 Functional Dependencies

For the Users table, the functional dependencies (FDs) are user_id → first_name, last_name, email, subscription_id and email → user_id ,first_name, last_name, subscription_id. The first functional dependency exists because user_id is the primary key for Users and the second functional dependency exists because each email is associated with only one user, making it another candidate key for Users.

For the Permissions table, the only functional dependency is permission_id → user_id, questionnaire_id, role_id. This functional dependency exists because permission_id is a key for Permissions.

For the Roles table, the only functional dependency is role_id → edit_perm, resp_perm, view_resp_perm. This functional dependency exists because role_id is a key for Roles.

For the Subscription table, the only functional dependency is subscription_id → survey_limit. This functional dependency exists because subscription_id is a key for Subscription.

For the Questionnaires table, the only functional dependency is questionnaire_id → number_of_questions. This functional dependency exists because questionnaire_id is a key for Questionnaires.

# 3 BCNF

**Users**

This entity represents users of the questionnaire website. All types of users, including people who create questionnaires or answer questionnaires, are in this table. first_name, last_name, email, subscription_id are attributes of the User and there is no FD between them.

R1 = (user_id, first_name, last_name, email, subscription_id)

F1 = {user_id $\rightarrow$ first_name, last_name, email, subscription_id; email $\rightarrow$ user_id, first_name, last_name, subscription_id}

Since, both user_id and email are superkeys Users is in BCNF form.

### Permissions

This entity describes the permission level of a user for each questionnaire, this is part of a ternary relationship between users, questionnaire, and permission. user_id, questionnaire_id, role_id are attributes of Permission and there is no FD in between them.

R2 = (permission_id, user_id, questionnaire_id, role_id)

F2 = {permission_id $\rightarrow$ user_id, questionnaire_id, role_id}

Since permission_id is a superkey Permissions is in BCNF form.

### Roles

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. edit_perm, resp_perm, view_resp_perm are all attributes of a role with no FD between them.

R3 = (role_id, edit_perm, resp_perm, view_resp_perm)

F3 = {role_id $\rightarrow$ edit_perm, resp_perm, view_resp_perm}

Since role_id is a superkey Roles is in BCNF form.

### Subscription

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

R4 = (subscription_id, survey_limit)

F4 = {subscription_id $\rightarrow$ survey_limit}

Since subscription_id is a superkey Subscription is in BCNF form.

### Questionnaires

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

R5 = (questionnaire_id, number_of_questions)
F5 = {questionnaire_id, number_of_questions}
Since questionnaire_id is a superkey Questionnaires is in BCNF form.

### Questions

Determines questions as they are related to each questionnaire. questionnaire_id, question_text are attributes of Question with no FD between them.
R5 = (question_id, questionnaire_id, question_text)
F5 = {question_id $\rightarrow$ questionnaire_id, question_text}
Since question_id is a superkey Questions is in BCNF form.

### Possible_Answers

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. question_id, possible_answer are attributes of an response option with no FD between them.
R6 = (option_id, question_id, possible_answer)
F6 = {option_id $\rightarrow$ question_id, possible_answer}
Since option_id is a superkey Possible_Answers is in BCNF form.

### Responses

Defines the user response to each of the questions and ties them to the unique response option identifier and user id. user_id, option_id, date_time have no FD between them.
R7 = (response_id, user_id, option_id, date_time)
F7 = {response_id $\rightarrow$ user_id, option_id, date_time}
Since response_id is a superkey Responses is in BCNF form.