Database Design for Online Psychometric Design (OnPsyD) Tool

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Abstract. The objective of this poster is to discuss the extensible database design for an Online Psychometric Design (OnPsyD) Tool that will be used for research in Online Psychometrics.

1   Introduction

The Online Psychometric Design (OnPsyD) Tool is an online tool that is being developed for online psychometric research. It is essential to develop the scientific understanding of how presentation-design factors affect people's responses in psychometric measurement and design guidance. In order to facilitate this scientific understanding, the OnPsyD Tool has to be developed on a framework of an extendable software architecture with a good database design.

2   Background

Various research studies demonstrate how usability science, along with other research in HCI, can benefit from the application of psychometrics in our daily life such as assessment, information search, and diagnostics. Because psychometrics models human psychological characteristics, it is important for instruments administered on-line to be sound and standardize in terms of measurement. Very little research exists in online psychometrics that addresses psychometric measurement in human-computer interaction through web applications or mobile applications. The development of the OnPsyD Tool will help collect and facilitate the data that is required for further research in online psychometrics. For this, a strong and extensible database design is the foundation of the OnPsyD tool. The desired database design modelling will involve three aspects: first, a database design that supports the content and hierarchical structure of psychometric questionnaires; second a design that supports storage of an extensible range of design parameters and third, a design that supports the storage of the psychometric data collected from administering the questionnaires online.

3   Database Design

This section discusses details of database design including tables, packages and diagrams. The database design categorizes the database tables into three main groups or

packages Questionnaires and Question, User Interaction and Layout Options. Fig 2 shows the details diagram with all tables, relations and attributes.
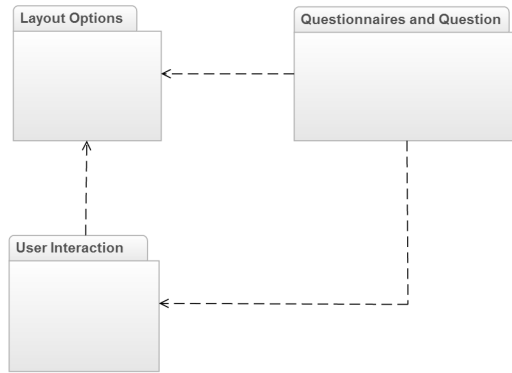
Fig. 1. Shows the packing diagram that shows the overall view of the database design

The following sub section discusses the details of the design and provides detailed explanation for the three database packages - Questionnaires and Question, User Interaction and Layout Options.

3.1   Questionnaires and Question

This group contains tables that comprise of questionnaires. It also provides information regarding questionnaire type and purpose. Furthermore, it includes tables that relate to questions the form the basic building block for all questionnaires.

Question tables contain information about question type, question group, possible answers and to the questionnaires they belong. Question type specifies if the question is close-ended (for example true and false or multiple choice) or open-ended question. Question group specifies the question category like opinion or behavior category. Further, it contains the mapping information for the questions with the possible questionnaire(s).Table 1 shows the tables in Questionnaire and Question package and their attributes.

Table 1.

Table Name	Attribute Name	Data Type	Description
Questionnaire	Questionnaire_ID	Auto Number	Serial numeric key
	Title	Text	Questionnaire Title
	Type	Text	Questionnaire Type
	Description	Text	Questionnaire details
	Creation_Date	Date	Questionnaire Creation date
Question	Question_ID	Auto Number	Serial numeric key
	Question_Group_ID	Auto Number	Question Group ID
	Description	Text	Question details
	Participant_ToolTip	Text	Tool tip participant
Question_Group	Question_Group_ID	Auto Number	Serial numeric key.
	Description	Text	Question group description and details
Questionnaire_Question	Questionnaire_ID	Auto Number	Refer to Questionnaire entry
	Question_ID	Auto Number	Refer to Question entry.
	IsRequired	Boolean	Whether the question is required or not.
Question_Options	Question_ID	Auto Number	Refer to Question entry.
	Option_ID	Auto Number	Serial numeric key.
	Question_Option	Text	Possible answer for the close-ended question.
Input_Method	Method_ID	Auto Number	Serial numeric key.
	Method_Type	Text	Type of close-ended question.
	Remarks	Text	Additional remarks.

3.2   User Interaction

User Interaction group or package holds information for the different users and their interaction with the system. It contains two types of tables - system users and user response.

System user table. This table holds information for different users with their roles in the system. It also contains the basic information required to participate in completing the questionnaire. The user acquires the role of either the system admin or participant. Admin role provides permission to create and modify system components like

questionnaires, questions, users and layout (see section 3.3 Layout Options for more information about layout component). The participant role is provided with permission only to participate in the questionnaire(s) assigned by the admin.

User response table. This table contains information about participating user's response to different questions.
Table 2 shows the tables in User Interface package and their attributes.

Table 2.

Table Name	Attribute Name	Data Type	Description
User	User_ID	Auto Number	Serial numeric key
	Role	Text	User role. Admin or Participant.
Admin_User	Name	Text	Admin full name.
	Last_Login	Date	Last login date to the system.
Partici-pant_User	Gender	Text	Participant gender.
	Age_Group	Text	Participant age group.
	Education	Text	Participant education level.
	Professions	Text	Participant job or business.
Us-er_Response_Question	User_ID	Auto Number	Refer to User entry.
	Question_ID	Auto Number	Refer to Question entry.
	Questionnaire_ID	Auto Number	Refer to Questionnaire entry
	Remarks	Text	Additional remarks.
Clo-seEnded_Response	Answer_ID	Auto Number	Refer to Question_Option entry.
	Remarks	Text	Additional remarks.
Ope-nEnded_Response	Answer	Text	Participant answer as text.
	Remarks	Text	Additional remarks
Question-naire_Participant	Participant _ID	Auto Number	Refer to User entry.
	Questionnaire_ID	Auto Number	Refer to Questionnaire entry
	Participan-tion_Date	Date	Completing questionnaire date.
	Remarks	Text	Additional remarks.

3.3   Layout Options

Layout Option package holds information for different questionnaire layout and format options. Currently two types of layout such as position and style is included in this package for both questionnaires and questions.

One table contains information for the component style like color, font-style, font size, etc. This style is adapted by the admin user for different questionnaires and questions. Information about question order within questionnaires is contained in a separate table. The database design for the layout option provides flexibility for the admin user can create multiple questionnaires with different order of questions.

Table 3 shows the tables in Layout Options package and their attributes.

Table 3.

| Table Name	Attribute Name	Data Type	Description
Layout	Layout_ID	Auto Number	Serial numeric key
	Font_Family	Text	Text Font Family
	Font_Size	Text	Text Font Size.
	Font_Color	Text	Text Font Color.
	Remarks	Text	Additional remarks.
Question-naire_Layout	Questionnaire_ID	AutoNumber	Refer to Questionnaire entry
	Layout_ID	Auto Number	Refer to Layout entry
	Remarks	Text	Additional remarks.
Question-naire_Instance	Question-naire_Instance_ID	Auto Number	Serial numeric key
	Questionnaire_ID	Auto Number	Refer to Questionnaire entry
	Question_ID	Auto Number	Refer to Question entry
	Layout_ID	Auto Number	Refer to Layout entry
	Questions_Per_Page	Number	Number of Question per page
	Ques-tion_Display_Order	Number	Question order in the page.
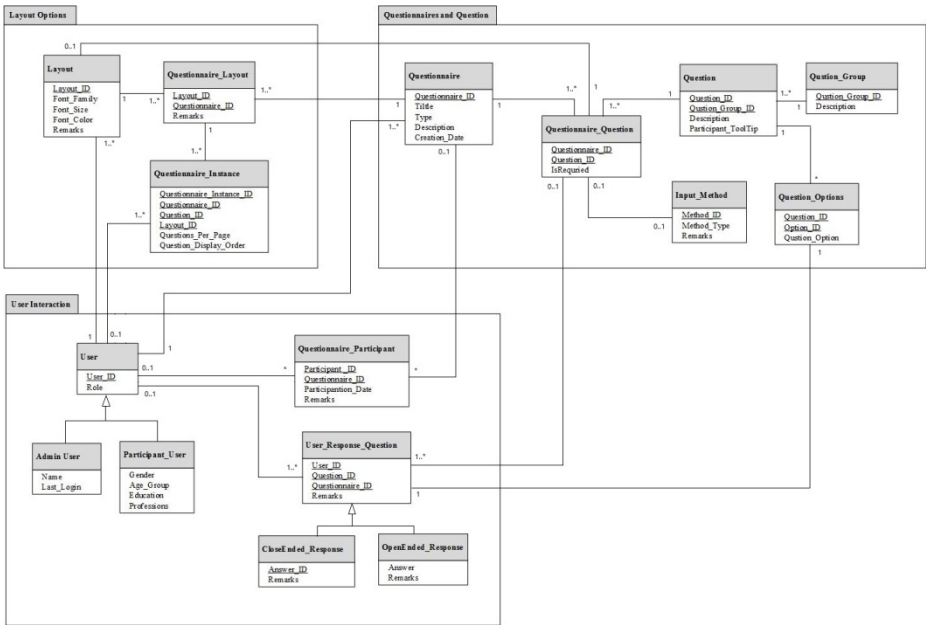
Fig. 2. Detailed Class diagram with all tables, relations and attributes

4   Conclusion

The proposed database system will also allow the definition of online experiments as a sequence in which information is presented and one questionnaire or a set of questionnaires is administered. The functionality will cover both functions of the management of psychometric items, questionnaires, response data and the setup of online administration and experiments, and the actual administration of online experiments. The database modeling further enables data collection from experiments conducted in different (social and geographical) settings. This will help to establish the generalizability of results. Although the focus of HCI has always been on user interaction, the field of HCI recently is contributing to designing new tools and techniques that improve usability. Hence, OnPsyD Tool will be a unique knowledge contribution to the field of HCI and online Psychometrics.