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INFORMATION TECHNOLOGIES STUDY PROGRAM

Problem-Based Project

Mind Game Application

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1 Preliminary design

This section discusses the preliminary design (*figure 1*) of the application concerning the user. The design shown in *figure 1* is by no means the final version of the application and may be subject to tweaks in the future, yet the primary principles of the design described in the following sub-sections shall remain largely the same.

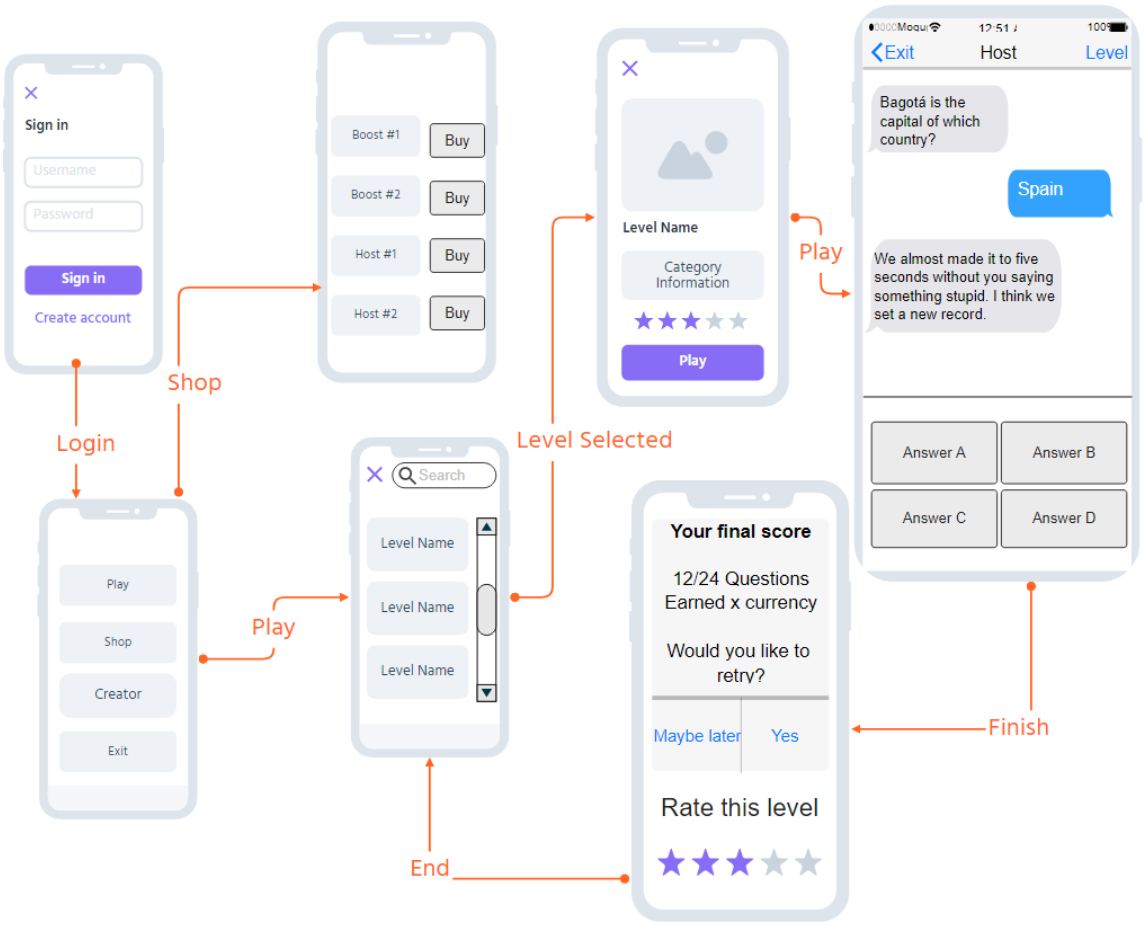

Figure 1. Preliminary design wireframe of the Mind Game application

1.1 Menu

Upon opening the application, the user shall be presented with a login screen. Following a successful login, the user shall be presented with several options including “PLAY”, “SHOP”, “CREATOR” and “EXIT” as presented in the bottom left of figure *figure 1*. The listed options will be explained in further detail in the following sections of the report with the exclusion of the self-explanatory “EXIT” option.

1.2 Topic selection

In order to play the quiz, the user must first select which topic they would like to play. Each selected topic has its own name, category, related information and rating (*figure 1*). Searching through the topics the user will be able to sort the topics by category, rating or search by specific

name (different topics may have duplicate names though). Upon selecting the desired topic, the user will be able to finally go to the game interface and play the quiz.

1.3 Game Interface

With an intention of providing a different experience than most quiz applications of similar notion the game interface of the application shall be rather unorthodox resembling a mixture of texting programs and a classic "A, B, C, D" type quizzes (*figure 2*). The questions shall be delivered by a bot host (*see section 1.4*) in a format similar to messages in a regular texting application. The user will be limited to 4 responses to each question each of which represent an answer to the question given by the host. Upon a choice of a specific answer the user will be informed by the host whether they answered correctly or not and move on to the next question. This shall continue until all of the topic's questions have been exhausted which in turn will prompt a result screen to pop up.

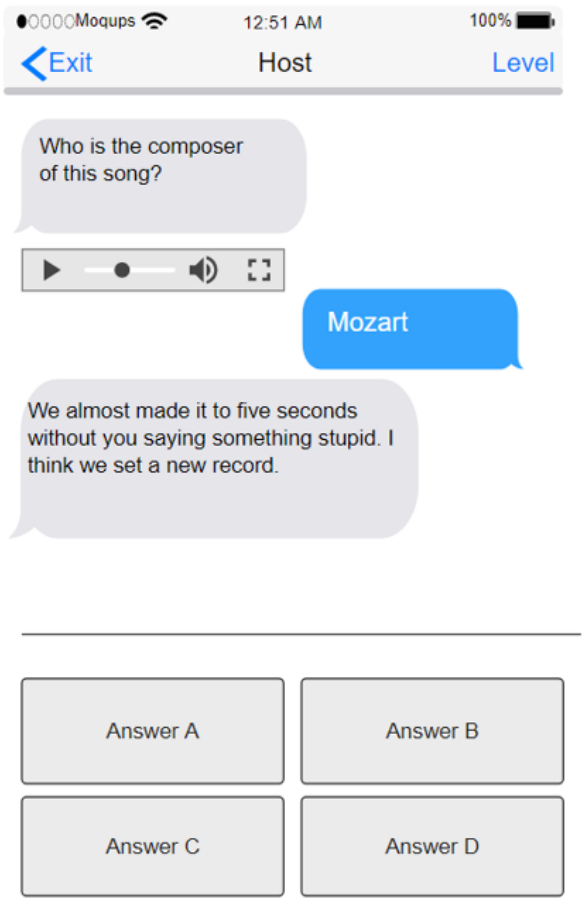

Figure 2. Game interface of the Mind Game application

1.4 Host

Considering the fact that one of the main goals of the application is to partly mimic the functionality that television game shows of similar quiz format possess, the application shall feature a host. The host's main purpose is to deliver the questions and react based on the players performance when answering the given questions. The host shall have different sets of responses by reacting

on correct answers, incorrect answers and by posting arbitrary phrases which will be randomly selected during the duration of the quiz topic playthrough. Thus, the application's host functions as an intermediary between the quiz itself and the user in an attempt to provide a more interesting and engaging experience (in a similar manner to the television game shows).

Different personalities for the host are planned, purchasable at the in-game shop (*see section 1.6*) with the starting personality for the "host" being sarcastic (interaction example provided in *figure 2*).

No complex capabilities such as learning from previous encounters are planned for the aforementioned reaction system of the host, all of the possible sets of correct answer, incorrect answer and random phrase responses are pre-written and specific choice of response in each of those three reaction categories is determined by chance.

1.5 Results

Upon the completion of the quiz the user will be presented with a congratulations screen which shall provide the number of correct answers scored in the quiz topic as well as the ability to rate the completed played topic (*figure 1*). The ability for a user to rate topics will help immensely with sorting out proper and poorly made topics, which will be especially useful after the implementation of the topic creator (*see section 1.7*).

1.6 Shop

In order to provide the feeling of progression to the user an in-game shop will be provided. The items in the shop shall be purchasable with in game currency earned by completing quiz topics. The currently planned features for the shop include:

Boosts one use abilities that the player can utilize while answering quiz questions. Boosts provide a specific advantage for the player for 1 question. For example, after usage of a 50/50 boost, two of the possible four answers are eliminated and the user is left with only two possible choices.

Host Personalities provide different sets of phrases for correct answer, incorrect answer and random reactions used by the host as discussed in *section 1.4*.

1.7 Creator

The application will also feature an option for users to create their own quiz topics and allow other users to play them. Though the full details regarding the implementation of the topic creator are yet to be clarified and will greatly depend on the progress of the development on other parts of the application, considering that the creator is of lower priority than many base functionality features.

2 System architecture

2.1 High-level Overview

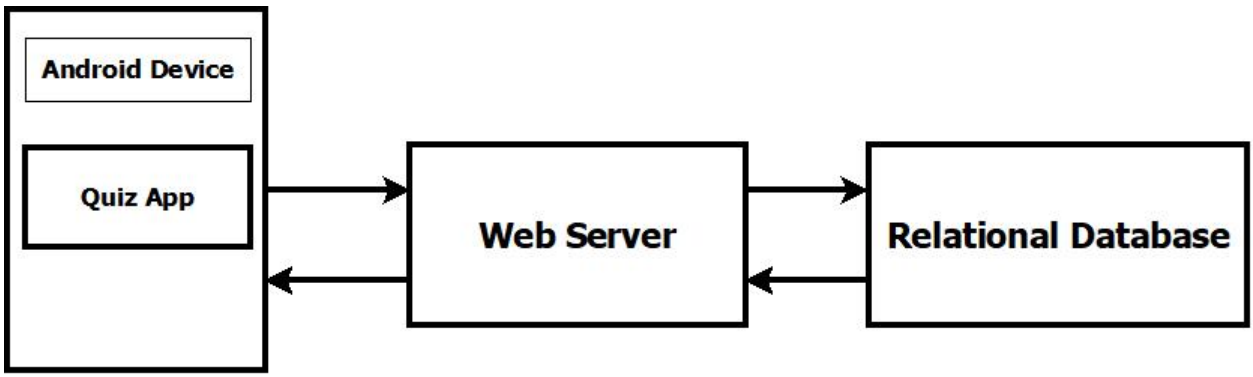

Figure 3. High-level overview of the Mind Game application

The client side Android app is being made for Android mobile devices using the Kotlin programming language.

The database is needed to store question sets, user statistics and other content. For this PostgreSQL - an open-source relational database management system is being used.

The web server is used to connect the database and the client side Android app. Currently PostgREST is used for the web server, which is running an API that serves HTTP requests by fetching data from the database and sends it back in JSON format.

2.2 Conceptual Modelling

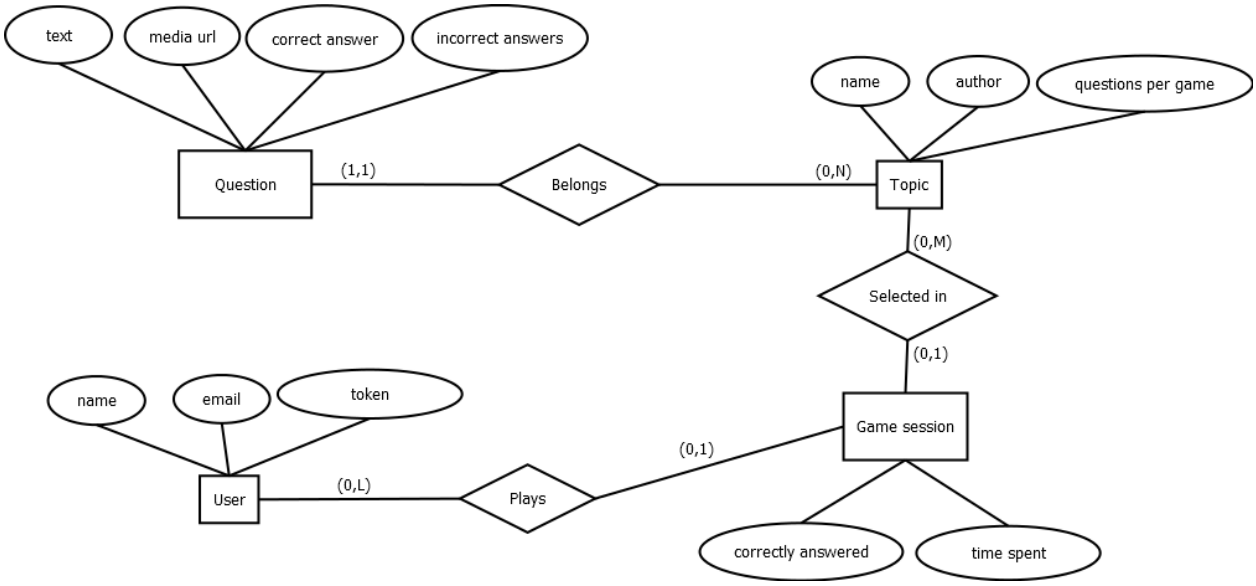

Figure 4. Entity-Relationship diagram draft

The diagram (*see figure 4*) represents our current vision of the database structure. It is not a final version merely a draft and will be heavily modified.

'Question' entity has attributes which represent data that will be sent to the client-side app. For text-based questions only the *'text'*, *'correct answer'* and *'incorrect answers'* attributes will be populated. In case questions require additional media (pictures, audio, video files), *'media url'* will be populated with a location of corresponding file. Thus media files can be stored independently of the database itself.

Any questions always belongs only to one topic. A **'topic'** can have many questions or possibly, none at all. It has attributes which help the player choose between them.

The **'user'** entity represents an authorized unique player. It has attributes which allow the player to securely log into their account.

The **'game session'** entity represents quizzes played by a user. It has attributes which allows collecting statistics for each time played in order to let users track their progress.

2.3 Status Quo

Currently, both the Database and the Web Server are running on the same Linux virtual machine, with the database running in a docker container. This might not be the best solution for the long run, but it enabled us to get the backend up and running very quickly.

2.4 Future Plans

In the next few weeks, parts of the system architecture might be subject to change. The possible anticipated changes are as follows:

- The web server and the PostgreSQL database moving to different VMs to increase scalability and satisfy one of the non-functional requirements regarding security.
- Using the retrofit HTTP client in the Android client side app for receiving text data in JSON format from the web server.
- Moving from postgREST to another type web server, while maintaining the same interfaces with the client side application. This will be done only if the web server itself needs to do processing that cannot easily be done in the postgreSQL database.

3 Functional Requirements

The functional requirements in this section are prioritized and will be described in the form of user stories.

3.1 High Priority

- As a “Mind Game” app player, I want to select a set of questions by choosing a topic, so I can select topics based on my knowledge.
- As a “Mind Game” app player, I want to see my statistics: number of topics completed, percentage of correct answers, time spent on question. This way I can track my progress.
- As a “Mind Game” app player, I want my progress to be saved every time I finish a set of questions, so that I do not have to answer the same questions repetitively.
- As a developer of the “Mind Game” app, I would like to easily add new sets of questions without the need of editing the client-side (mobile) application code.

3.2 Medium Priority

- As a “Mind Game” app player, I want to experience picture guessing and audio questions. This will make my experience more varied, joyful and engaging.
- As a “Mind Game” app player, I want to see how other users rated question sets, so I can better decide what question set I want to select.
- As an authorized “Mind Game” app player, I can continue playing on different devices and have my progress synced between them.
- As an authorized “Mind Game” app player, I want to be able to see other players’ statistics, so I can have fun competing with others.
- As an authorized “Mind Game” app player, I want to share sets of text questions created by me, so that other players can get a better experience.
- As an authorized “Mind Game” app player, I want to rate the question sets I complete, so I can influence the ratings that other players see.

3.3 Low Priority

- As a “Mind Game” app player, who is a non-native English speaker, I would like the application to have the ability to switch to Lithuanian or Russian languages and have ability to select separate sets of questions for my language.
- As a “Mind Game” app player, I want to create my own sets of audio and picture questions inside the app and share the sets, so other players can see them and play.
- As a “Mind Game” app player I want to get have short videos along with my questions in order to make my experience more diverse.

4 Non-functional Requirements

4.1 Compatibility

- The mobile app must be able to run on Android 6.0 or greater.
- Implement unicode compatibility in every step of the system: users must be able to type, submit and see non-Latin characters.
- The system must run in VU infrastructure.

4.2 Reliability

- The system should not have any bugs or issues that prevent the player from having an enjoyable, non-frustrating experience.

4.3 Security

- The database and the server should be in separate virtual machines due to security reasons.
- Avoid real names, cell phone number and other data that could personally identify a player.

4.4 Performance

- Topic loading should be optimized in such a way that on a 3G clients' internet connection, a topic should not take more than 20 seconds to load.

5 Competitive Analysis

The following section analyzes advantageous, disadvantageous features and the general player feeling of similar quiz applications with the goal of determining the competitive ability of the application in development. To achieve this, three other quiz applications have been selected and played through. The quiz programs analyzed were chosen randomly but contain a substantial (over 1 million downloads) user base and a generally favorable review score. An attempt to find applications of same, or extremely similar, question interface design (*see section 1.3*) was also made but was unsuccessful. Additionally, since the analysis was done entirely by our team, preference bias is a possibility.

5.1 Analysis

5.1.1 "Super Quiz - General Knowledge Russian" by WalkMe Mobile Solutions

Advantages:

- **Concise category selection** - each different topic is divided into categories of Geography, Entertainment, History, Art and Literature, Nature and Science, Sport, making it easy to select which topic a user would prefer to play, which provides more enjoyment to the user.
- **Daily login bonuses** - the application contains in game currency and daily currency bonus just for turning on the application in an attempt to keep player retention over a longer period of time.
- **Achievement system** - gaining achievements is not hard at all - player receives revards for completing achievements while playing the game. For instance, after player answers correctly 10 times in a row, after the end of a game (winnig or losing by answering incorrectly), pop-up appears on the screen and informs about successfully completing one or more achievements. Information about name, actions needed to complete and revard of the acievement is represented on that pop-up.

Disadvantages:

- **Cliché question structure** - structure common among most quiz applications. The quiz game interface provides nothing special of interest apart from the questions themselves and the possible answers making the application similar to hundreds of quizzes of such kind.
- **Too many advertisements** - advertisements are everywhere, from continuing a quiz if a user answered incorrectly, to earning in-game currency by watching them, to simply being forced to watch them in a middle of the quiz.

General thoughts:

Though common, achievement and daily in-game currency bonus systems are an options that allow to keep steady user retention, could potentially be something worth implementing.

5.1.2 "Quiz Planet" by LOTUM one GmbH

Advantages:

- **Nice Visuals** - the application has a consistent theme among all the screens, pleasant color scheme and correctly uses basic rules of composition.
- **Opponent system** - there are two people that get the same quiz questions and after finishing they see results of each other and scores they both got. This creates more engagement for the application as the players try to answer as correctly as possible in order to defeat their opponent, the sense of competition drives the user to continue playing.

Disadvantages:

- **Cliché question structure** - structure common among most quiz applications. The quiz game interface provides nothing special of interest apart from the questions themselves and the possible answers making the application similar to hundreds of quizzes of such kind.
- **Lacks user friendliness** - the interface is rather confusing at times, especially where to tap after quiz ends.
- **Too many advertisements** - the player has to watch an ad every 2-3 games which have only at maximum 3 questions. Eventually, it happens really often and becomes annoying to the player. There is no benefit from watching the ad for the players, they are forced to do that.

General thoughts:

This application has really good idea of adding competitive aspect and creating attractive design for it. However, it is a regular quiz with textual questions and 4 possible answers which is similar to most of other quiz application. In addition, its fifty-fifty UX design helps players to start a game by showing one big “Start” button but is confusing and not user-friendly in other places like ending the game or quitting. And one of the most important disadvantages is a willingness of the developers to overly monetize their game by adding a lot of advertisements.

5.1.3 "Quiz - offline games" by The Angry Kraken

Advantages:

- **User statistics are integrated with the quiz itself** - After answering each question the user is able to see how many people have answered that question correctly. This provides a competitive element to the application.
- **Charming visuals** - the interface, while rather simple, has a fairly aesthetically pleasing design.

Disadvantages:

- **Unadjusted difficulty** - the questions are often far too simple, and would fit best for a children, yet the application does not state its target demographic, which leads to a conclusion it aims to provide quizzes for every demographic.
- **Limitations for playthroughs** - Users are limited on how many quizzes they can do by an energy meter which can be replenished by either purchasing more or waiting, this hinders player enjoyment.
- **Cliché question structure** - structure common among most quiz applications. The quiz game interface provides nothing special of interest apart from the questions themselves and the possible answers making the application similar to hundreds of quizzes of such kind.
- **Too many advertisements** - the application contains many, long advertisements that can not be skipped and are shown randomly.

General thoughts:

The application implements user statistics tracking in an interesting way, which the Mind Game application described in the report is aimed to achieve as well. Though in the reviewed application the accuracy of the tracked statistics is rather dubious considering the fact that a user can play the quiz offline and the statistics are still shown without internet connection.

5.2 Results of Competitive Analysis

All of the applications tested have a lot of similar features, with the most important one to mention being the question structure, which only includes a question and possible answers with little to nothing else of interest, relying solely on the entertainment value of the questions, this has become a staple in the quiz application genre. Considering that our application aims to stand out in an already overpopulated field of mobile phone quiz programs the game interface that offers a different take on the mind game genre (*see section 1.3*) is extremely beneficial from the user engagement perspective. Additionally, since the application is being made with academic rather than business purposes in mind the advertisements that plague many quiz applications of similar nature are not going to be added (at the very least for the early versions of the system) with the aim of providing a better experience for the player. It is also important to mention that the analysis yielded some results regarding features that could be potentially implemented into our application, which include but are not limit to: achievements and daily rewards.