DESIGN AND DEVELOPMENT OF A MOBILE APPLICATION ANDROID FOR THE MEASUREMENT OF STRESS LEVEL

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Abstract. *The case study presented in this article consists in a mobile aplication created on the basis of the Cohen questionnaire meant to detect stress level. The study is a novelty because the mobile app can be used on an undefined number of Android terminals. The test can be performed several times by the same person, and the data can be used later for various reports due to the authentication and in-app account creation feature.To design the application were used the follow instruments: PhoneGap, HTML, CSS, JavaScript, PHP, server web, MYSQL and Adobe photoshop.The application can be used in any medium that requires rapid detection of stress on the Cohen test of a large number of respondents. Data obtained through the application can be used to carry out research studies in universities, psychology offices, recruitment companies, and so on.*

Keywords:stress, Android, mobile application, Cohen, HTML

Introduction

The purpose of this paper is to detect the stress level using Cohen Williamson Questionnaire [1] by mobile device. The application impuls users to a questionnaire of 10 questions, and depending on responses, the respondent's level of stress and some recommendations are released to reduce stress.This app provides to the participants a quick and easy way to answer of questions without the need for physical presence in a room (if we are talking about universities) or at the headquarters of the survey. For psychology clinics, the application could be used by psychologists to obtain preliminary data about new patients or to obtain new data regarding the condition of existing patients.

The instruments that are used to design the mobile application are presented below:

PhoneGap - the low operating costs of this framework, the ease of use and the extensive capabilities of the framework have led to the choice of this platform for implementing the application in this research work.

PhoneGap[2] it is a hybrid application which are using technologies such as Cascading Style Sheets (CSS) [3], JavaScript [4] and Hyper Text Markup Language (HTML) [5] for building cross-platform. The application supports the following mobile device operating system platforms: Google Android[6], Apple Ios [7], Microsoft Windows Phone 7 [8] and so one.

HTML – in this project we used HTML to create the general structure of all the pages (screens) that shows the questions, the results of the questionnaire, but also the part of the account creation and login in the application.

HTML is a format used to display a web page. The documents are plain text files with special "tags" or codes that a web browser uses to interpret and display on your computer screen.

The most important tags in HTML are tags that define headings, paragraphs and line breaks, such us:

<html> Defines an HTML document

<body> Defines the document's body
<h1> to <h6> Defines header 1 to header 6
<p> Defines a paragraph

 Inserts a single line break
<hr> Defines a horizontal rule
<!--> Defines a comment

CSS – in this study, we used CSS for general page styling that displays the questions and results of the questionnaire.

CSS is used to control the style of a web document in a simple and easy way and allows to format an entire webpage (or an entire website) in one document.Using CSS, we can control the colour of the text, the style of fonts, the spacing between paragraphs and other effects.

JavaScript - for this application we used Javascript and a Javascript library called Jquery for client interface programming, screen flow, slide animations (left /right), validation of forms and transmission of saved information in the browser to the server.

JavaScript it is designed for creating network-centric applications and it is integrated with HTML.JavaScript can be implemented using the follow JavaScript statements:

<script ...>
JavaScript code
</script>

PHP[9] – this application uses PHP for conection to the database and save the data in it.

PHP is a programming language for building dynamic, interactive Web sites and it is running on a Web server. The advantage of this toolit is that we can embed PHP code within HTML Web pages.

MYSQL[10] – to develop the Cohen application, we used InnoDB for the speed and stability of the database engine.

MySQL it is the most popular Open Source SQL database management system. The SQL part of "MySQL" means "Structured Query Language" and is the most common standardized language used to access databases.

To design the application we used one folder for platforms and another one for CSS tool, as per Fig.1 from below:

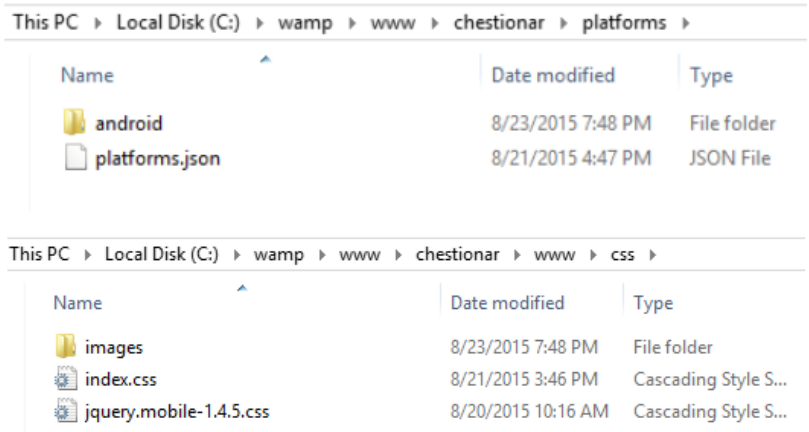

Figure.1. Folders for platforms and CSS

Measurement results

This present case study is the result of a two-monthswork to design the aplication for ANDROID terminals based on the tool:

- The Cohen Williamson Questionnaire, to identify the level of stress (Fig.2).

Cohen Scoring: each item is rated on a 5-point scale ranging from never (0) to almost always (4). Scores ranging from 0-14 would be considered low/ without stress; from 14-20 would be considered moderate stress and over 20 would be considered high perceived stress.The questions ask about your feelings and thoughts during the last month [1].

Name _____ Date _____

Age _____ Gender (*Circle*): **M F** Other _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Figure.2. Cohen questionnaire

In the current study, the collected data about users are: name, age, answers to questions, final test score, email address and password.

To build the application architecture, the following components were required:

Client (Mobile Terminal) - any terminal equipped with the Android operating systemconnected to the Internet can be used.

Phonegap - used to compile the source code needed to install and run the application

Web server - used to transmit the data and host the application to be downloadable on mobile phones

Database - used to store data at the end of the test.

Several scripting languages and software applications have been used to implement the application:

a) Phonegap (Cordova) for compilers

b) HTML (HyperText Markup Language) used to create web pages that can be displayed in a browser
c) Cascading Style Sheets (CSS) is a standard for formatting elements of an HTML document
d) Javascript (JS)
e) PHP (Hypertext Preprocessor) - originally used to produce dynamic web pages, it is widely used in the development of web pages and applications
f) Apache WEB server
g) MYSQL database server
h) Adobe Photoshop for graphics
The data flow represented in the diagram in Fig. 3 is: the application asks the user for the identification data and, at the end of the test, is sent to the web server where they are stored in the MYSQL database for further analysis.

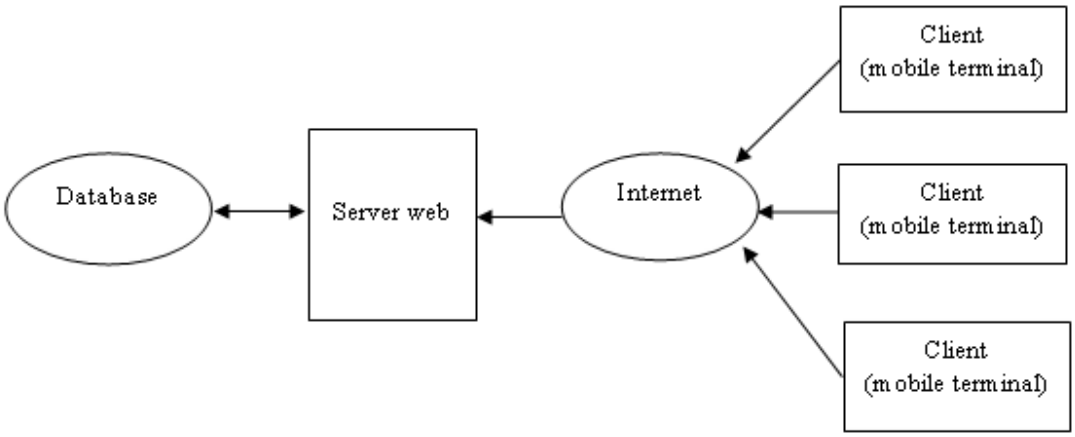

Figure.3. General arhitecture for application

To concept the project was used a MYSQL database to store data input by the respondents.The database it is generically called "Cohen" and consists in two tables as per Fig.4.

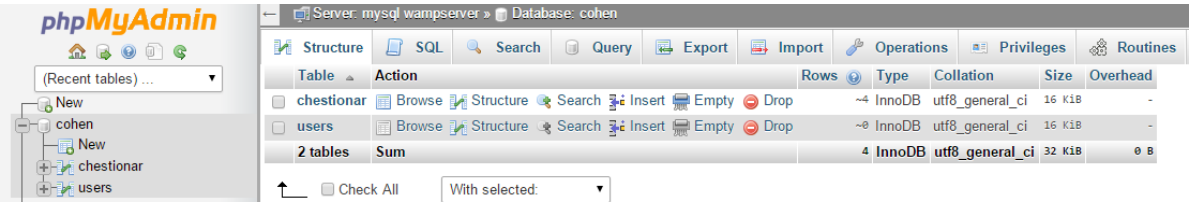

Figure.4. Database and list of tables

The UML (Unified Modeling Language) diagram describes the structure of the database by including tables, columns in tables, and also shows relationships between tables. There is a one-to-many relationship between the Users table and the Questionnaire table as per Fig.5 represented below.

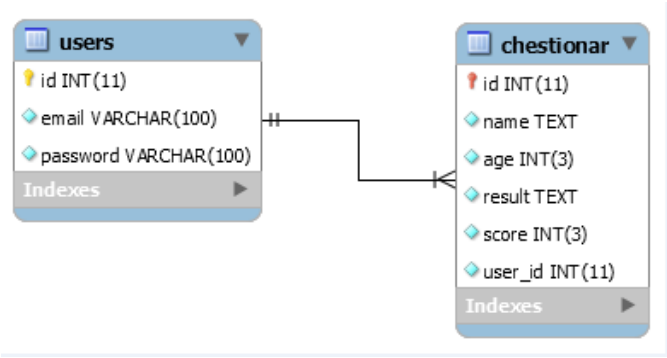

Figure.5. UML Diagram

The table called "questionnaire" presented in Fig.6 has the role of storing all the values of the answers to each question, the ID of the user, the test score and the date of thest at the end.

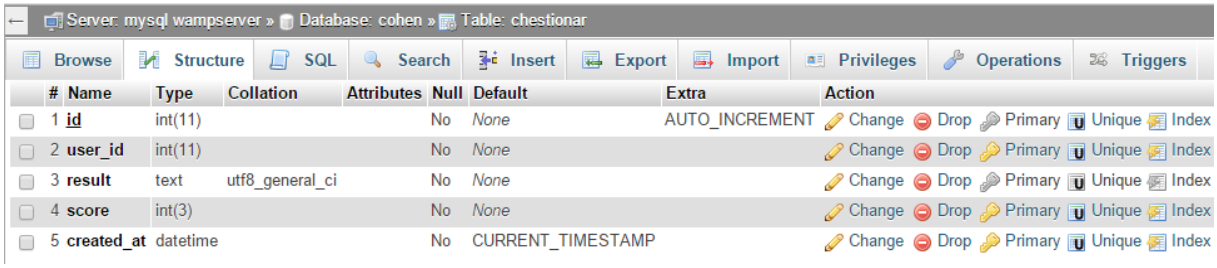

Figure.6. Table „questionnaire”

The table „Users” from Fig.7 contains the data for each user who creates the account and complet the Cohen test.

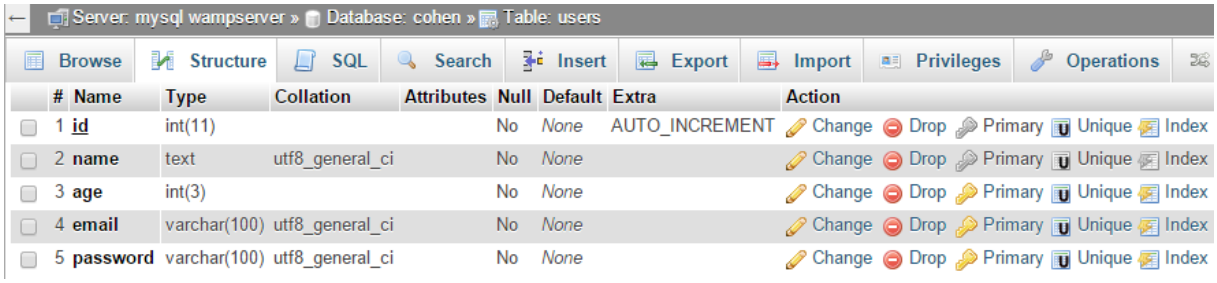

Figure.7. Table „Users”

Development of mobile application contain the following steps: the structure of database, the UML diagram and the tables from questionnaire and users.

Interpretation of measurement results

As a result of the research, it has been implemented the config.xml file which contains a selection of settings (metadata) designed to control how the app behaves. At the same time, this file is the most important part of the application and is required to approve the app on the Android Market (Google Play).

The code software programming for config file it is presented below [11]:

```
<?xml version='1.0' encoding='utf-8'?>
<widget xmlns="http://www.w3.org/ns/widgets"
xmlns:cdv="http://cordova.apache.org/ns/1.0">
id="es.esy.dascaluloredanacristina"
version="1.0.0"
<name>Test Cohen</name>
<description>Test Cohen formeasurementthe stress level | Dascalu Loredana Cristina
</description>
<author email="d_l_cristina@gmail.com" href="http://loredanadascalu.ro">
Dascalu Loredana Cristina </author>
<content src="index.html" />
<plugin name="cordova-plugin-whitelist" version="1" />
<access origin="*" />
<allow-intent href="http://*/*" />
<allow-intent href="https://*/*" />
<platform name="android">
<allow-intent href="market:*" />
</platform>
</widget>
```

The "www" folder presented in Fig.8 is a very important folder in the application. This folder contains all the source code written for the application to can work and record data.

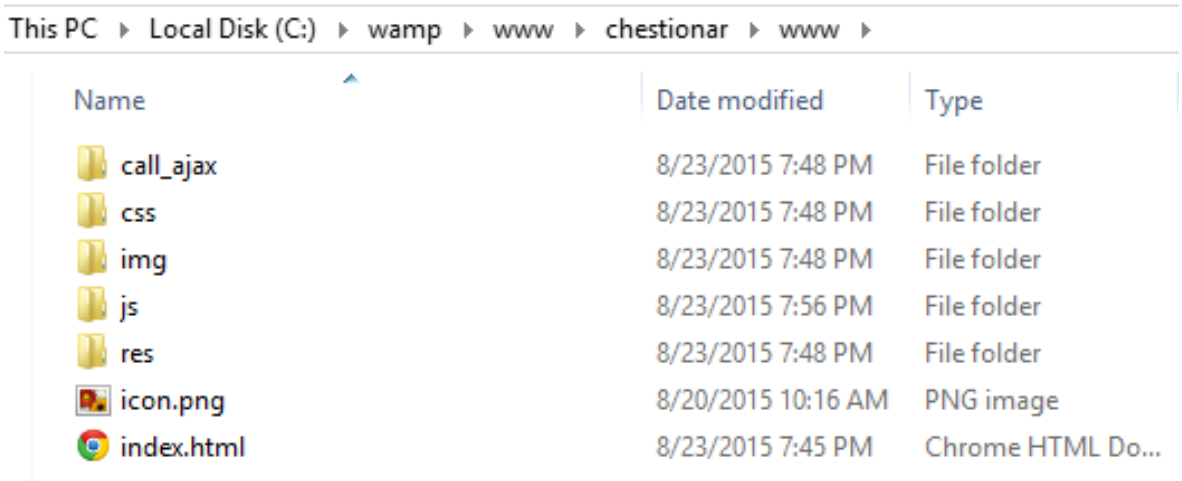

Figure.8. Folder WWW

For the implementation of the user interface was used especially HTML and JavaScript. Form validations are written in JavaScript. The source code (HTML) for home/start screen it is below:

```
<body>
<div class="app">
<!-- start afisareecranului principal -->
<p class="user"></p>
<div id="screen-start">
```

<h1>Questionnairer Cohen </h1>
<h3>Measurement of stress level</h3>
<button id="registration-start" class="registration-start" >Inregistrare</button>
<button id="log-start" class="log-start" >Autentificare</button>
* *
<!—endmainscreen display -->

The home screen (Fig.8) of the application for Cohen questionnaire looks like this:

Figure.8. "Cohen" mobile app home screen

The Cohen test can easily be replacedbyanother test after aninitialupdateoftheapplicationforallrespondents.

Conclusions

The conclusions of the case study are that the mobile aplication it is necesary for research in domains such us: engineering, management, psihology, occupational health, stress management and so one.

Implementing this mobile application for Android terminals we have the advantage to

reach many respondents if it is necessary for various reports, scientific research or, even the possibility to be used by psychology and trainers' specialists to determine the stress level by completing the Cohen test.

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