CHAPTER I

INTRODUCTION

Health is the most important factor to consider while we are still living. In fact, it is the most important component of our life that we should seriously take care of. That is why we should always put health into our top priority because many people die every day because they ignore their health, because of poor health maintenance. No matter how benign the disease is, it should be taken care of immediately because benign might become severe and severity of a disease can cause death, for example, ignoring daily cholesterol intake can lead to high-blood pressure which may eventually result to stroke or other cardiovascular diseases.

Cardiovascular diseases are those diseases that involves the heart. We all know that the heart is the most important organ in the human body, it is also the most important organ for living. More and more people die every day because of heart diseases because some people do not know the health condition of their heart. They are less informed on how to take good care of their heart, the preventive measures they should undergo and the risk factors that they should consider.

Heart Beat is a web application specifically developed for those less informed people who might be at risk of a heart disease. The web application aims to inform users of the risk factors limited only to hypertension, heart attack and stroke since these three cardiovascular diseases are the most common heart diseases in the world today. The application is gamified, which means that the application has similar characteristics to game by giving the rewards and making sure the interactivity is well-designed.

1.1 Purpose

Heart Beat is a web gamified application that monitors the heart condition of the users based on the initial data they have given. The application tracks the progress of the user’s heart condition daily and weekly depending on the data needed. In daily tracking of progress, it requires the cholesterol level and cigarette consumption of the users. In weekly tracking of progress, it requires the weight and Body Mass Index (BMI) of the users. It also aims to inform the users about how several cardiovascular diseases can be acquired, and give them suggestions on how to take care of their heart.

Some people are not knowledgeable in determining the causes of cardiovascular diseases. Others are less informed of the possible risk factors they will acquire in their everyday lives. Hence, this application provides the users with in-depth understanding of the possible risk factors they will encounter in several circumstances and how these factors will lead to having cardiovascular diseases. The application will also provide an indicator of the heart status for the users. This visualization of the heart status will let them be if the heart is still healthy or at risk. Specifically, the application aims to:

1.1.1 Inform User about the Risk Factors of Heart Attack, Stroke and Hypertension

The application aims to inform the users about the risk factors that may increase the percentage of having heart attack, stroke and hypertension. Each of the three diseases has specific predictors such as: age, gender, blood pressure, body mass index, parental hypertension and smoking. It displays the information about the certain risk factor by identifying the factor with the highest score based on the results. It also displays how the total result is obtained using a graph.

1.1.2 Track the User’s Heart Health Status

The application aims to track the user’s heart health status. It aims to show the users a heart status in a way of showing users a status bar for them to know if they are at risk or possibly qualified already for heart attack, stroke and hypertension. The application calculates the heart attack, stroke and hypertension risk percentage using the available risk calculator by Framingham Heart Study Organization.

1.1.3 Provide Users with Effective and Easy-to-learn Interfaces

The application aims to provide users with intuitive and interactive design for them to engage more in the application without getting bored. Interactive design by means of letting the users answer habitual questions and filling out their profile data after which the application will generate a model based on the results and profile data provided by users. In the main screen of the application where users can monitor their progress, they can change the values of their personal data and see the changes it made to their heart condition, level of risk and their qualification for heart attack, stroke and hypertension.

1.1.4 Suggest Lifestyle Changes and Lifestyle Maintenance

The application also aims to suggest lifestyle changes and lifestyle maintenance to the users based on their current heart status. The heart status is derived from their profile data and the result of the habitual questions they answered before proceeding to the interactive main screen of the application. It also aims to suggest users with exercises than can lessen their chance of being at risk for heart attack, stroke and hypertension. The lifestyle changes and physical exercises suggestions are taken from Harvard Health Publications.

1.2 Technical Review of Related Systems

Technology has now become a necessity in today’s modern generation. Some of these technologies are helpful in coping with the difficulties that humans encounter every day in their lives. The list of existing applications discusses its different features on how the application performs according to its functionality. It consists of three criteria which are the main purpose of the application. It has heart health progress monitoring which tracks the progress and performance of the user’s heart given the data taken from the users. The application can calculate the data that are fetched from the reliable sources and it is the one that interprets the results. It uses the results to identify the proper physical exercises and lessons that will be given to the users to reduce the possibility of acquiring heart diseases. Table 1 shows the three criteria which are the basis of this project and the list of applications that the application may have similarities and differences.

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| --- | --- | --- | --- | --- | --- |
| Application    Criteria | Heart Beat | Cardiogram | Cardiio | Heart Fitness | ASCVD Risk Estimator Plus |
| Heart Health Status Tracking | Heart risk level | Daily heart rate | Heart rate and cholesterol level | Blood pressure and weight | Changes in 10-year ASCVD risk |
| Health Suggestions and Recommendations | Physical exercises and lifestyle changes | Workout recommendations for heart health | 7-Minute circuit training exercises | Interactive lessons about lifestyle changes | Heart health recommendations for clinicians and patients |
| Graph Analysis | Daily and weekly heart risk level | Heart rate metrics | Weekly and monthly average heart rate | Not available | Current and previous 10-Year ASCVD risk |

Table 1. Technical Review of Related Systems.

1.2.1 Heart Health Status Tracking

Heart Beat track the heart health of the user starting from the time when they create an account and use the application. The application requires data from the users by providing a series of questions to be used in determining the status of their heart. Considering the quantifiable risk factors, the application will determine whether the heart is at risk or not. The application contains a dashboard for the history of the user's progress daily and weekly. Cardiio and Cardiogram applications track the progress and monitor the heart rate of the users by reading the pulse of their fingers covered on the back camera. Meanwhile, Heart Fitness tracks the progress of blood pressure and weight of the users and it also logs the physical activity of the users. ASCVD Risk Estimator Plus estimates and monitors the patients’ initial 10-year ASCVD risk.

1.2.2 Health Suggestions and Recommendations

The application provides a series of physical exercises that will minimize the possibility of acquiring cardiovascular diseases for the users. It calculates the heart risk of the users given of the different risk factors acquired. The level of heart risk will be used in determining what exercises and suggestions the application will provide to the users. Cardiio has a built-in high intensity circuit training exercises that only takes 7 minutes for the users to complete. Cardiogram provides workouts for taking care of heart health. Heart Fitness provides interactive lessons on how to change the lifestyle of the users if their hearts are at risk. ASCVD Risk Estimator Plus gives health recommendations for clinicians and patients about the cardiovascular health.

1.2.3 Graph Analysis

The application shows a graph containing the results from the analysis of the user’s heart risk level. It determines the level of heart risk based on the profile input of the users and the corresponding risk factors. Every time the user’s model acquires a risk factor, the graph will change its values depending on the values of the identified risk factors. Cardiogram shows the user’s heart trend while he/she is sleeping, moving, exercising or simply resting. Cardiio only shows the average heart rate for days, weeks or months. ASCVD Risk Estimator only calculates the 10-year risk rate of the users and displays the result by percentage.

1.3 Project Scope

Cardiovascular disease awareness is one of the reasons why people die of certain heart disease without even trying to prevent it with lifestyle change. Poor people are affected by this lack of awareness and prevention of possible heart disease that they have. People with low income are also affected as they think they do not have the capability to prevent cardiovascular diseases. The developers have realized this problem and many people suffer these diseases without even warning and so Heart Beat is conceptualized.

Heart Beat is a web application for people who are conscious about their cardiovascular health. The application can be accessed through web and mobile. The application evaluates user’s risk of cardiovascular diseases that includes: stroke, hypertension and heart attack. It will then suggest users of actions or lifestyle change to somehow decrease their risks. Some cardiovascular disease risk factors differ from every disease and most are related such as: age, gender, race, family history, smoking habit, diabetes history, cholesterol, physical inactivity, obesity and alcohol.

Heart Beat is a gamified web application with less text input and more user interaction through graphics and styles. Interactivity of the application helps users stay and enjoy the application for long.

1.3.1 Cardiovascular Disease

Heart Beat is designed to evaluate the user’s risk of cardiovascular disease. The application will evaluate the users’ risk of three different cardiovascular diseases, they are: stroke, hypertension and heart attack. Each disease has different characteristics.

1.3.2 Risk Factors

Each cardiovascular disease mentioned has almost similar risk factors, there are a few that are unique for every disease. The risk factor calculation will be based on historical data from Behavioural Risk Factors Surveillance System, a survey data of the behavioral risk factors in the United States. [WWW04]. The group also based the model to the existing Framingham Risk Score model, which currently the widely used risk score calculator. [WWW05].

1.3.3 Users

Users are the most important factor in developing this application. The target users of this application are people with the age of 20 years and above that are capable of using smart phones or with the assistance of person capable of using a smartphone. The target users are those who have no prior knowledge of cardiovascular diseases and their risk. The users must at least know important details of their daily lifestyle such as their physical activity and their basic information on weight and height.

1.3.4 User Interface

The mobile interface of this application is dynamic and interactive in a way of making the user answer personal questions where the data needed for the suggestions are derived. The interface will not be boring because of the visual representations and heart simulation. Developing this interface plays a very important role in convincing the users to provide the application the data needed for its analysis.

1.3.5 Questionnaire

Heart Beat will gather basic information that will be used to determine the risk of the user. The application will adopt the questionnaire of the Framingham risk calculator. [WWW05]

Generally, this chapter aims to inform users why the developers created this application, the compared related applications and the scope this application can only cover. This chapter aims to let the users know the purpose of Heart Beat and its uniqueness.