Paper-Android-Based Health Care Management System

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Abstract—Objective: The primary goal of this study is to develop an android-based healthcare application, which can assist the users to monitor their health-related conditions for improving their health. Methods: The application is developed using android operating system environment. A Visual block programming language, namely MIT App Inventor is used to develop the system. The modification is presented as: (1) integration of different modules and their offline usage, (2) history facility, (3) user friendly. The qualitative method is used to study the objective. Findings: The research paper depicts a brief study of existing systems and the new development that has made in the application and also it is better in the manner that it works as a guide to control risk factors. The descriptive analysis points out that the application is effective to deal with health related issue. Applications/Improvement: Integration of modules is performed on the android platform of different applications that are located on different websites, the storage facility is added by using Tiny DB, guidance in the form of charts and text is provided to the users. Such features are not provided in the previous work.  

Keywords—Health Care; App Inventor; Android; Diabetes; Target Heart Rate.

I. INTRODUCTION

The Expert System (ES), namely Computer Assisted diagnosis for red eye (CARDE) is proposed by [1], which assists the patients in the treatment of Red eye disease. It works like an ophthalmologist and it is not limited to only red eye diseases, but can be extended to diagnose other diseases.

A Web based expert system is proposed by [2] to diagnose red eye disease and to provide prescription with it. This system typically diagnoses disease, of the eye in which red eye is a common symptom. It has an attractive and easy to use graphical user interface.

[3] Proposed an ES to diagnose skin diseases. This system can diagnose almost 13 types of skin disease. This web based expert system can be enhanced to diagnose all types of skin diseases.

An automated alarm ringing system is developed and its center of interest is the interaction between doctor and patients. The description of medicines, date and time can be set by patients through an alarm. They received the notification through an email or messages [4].

There is a persistent disease known as diabetes mellitus, increasing globally that is caused due to the relative deficiency of insulin. Therefore, android based diabetes management health care application is developed, which helps in diagnosis and treatment of diabetes as well hypertension [5].

Chronic health patients suffer from multiple ailments, however, different patients have different such ailments. The objective of this project was to design and prototype a health monitoring system that has a capability to monitors multiple diseases [6].

An application, namely “smart carb”, is developed based on an Android OS for the management of Type2 diabetes. If the patients do not manage their diabetic level then it will lead to many complications; and if it is not treated properly, that it may even lead to death. In order to manage diabetes to avoid these complication, this application was developed [7].

Due to the refinement of wireless mobile technologies in the erstwhile years, the need for mobile data services has been aggravated dramatically. The location of the user can also be obtained to provide better facilities to the users by the service provider. However, it also has some issues like needing an approval of user privacy, standardization, and accessibility of smart services [8].

There are many systems on the health-related content analysis in the context of opinion mining and sentiment analysis [9, 10, 11,12], however, most of such studies are web-based and address the user generated contents. In addition to aforementioned studies, there are recent works [13, 14, 15, 16, 17, 18, 19, 20] performed for developing healthcare applications, which assist the users in taking care of their health. In this work, we present the development of an android-based health care application using the MIT App inventor software [21]. Nowadays, health related issues are getting common due to hectic daily routine and unbalanced diet. Therefore, it is an important task and a need to develop an android application that could assist the users to keep themselves aware of their daily activities including diet, exercise, and glucose level, B.P reading etc.

We have integrated different modules into one android application that were located on different websites such as calorie level, Target heart rate, blood volume, diabetes [22].
We also provide the data storage facility using tiny DB, which assists the user to retrieve the previous records easily, such facility is not provided in the previous work [23]. In the web based calorie application, there is no facility for the basic calorie needs so we included the Caloric chart in the calorie level module which guides the users about their caloric need, [24]. In the target heart rate module, we have given the information in the form of text so that user can easily understand the application as this feature is not present in the foregoing heart rate application, [25]. In the previous diabetes application, a diet chart facility is not provided so we address this issue in our application so that the user can maintain their diet [26].

The rest of the paper is organized as follows. Section 2 gives a detail of Material and Method. In section 3, we present Result and Discussion of proposed approach, which evaluates the effectiveness of the proposed system. The final section concludes the work with a discussion on a future extension.

I. MATERIAL AND METHOD

The materials used to develop the software are as follows: (1) Window 8.1 Haier laptop, (2) MIT App Inventor 2 Software, (3) Samsung Tablet and (4) Infinix X551Android Cell Phone.

The experimental setup section presents detail about the implementation and evaluation of the proposed system. As described earlier, we developed the software using MIT App inventor and tested the apps in Bluestack emulator. To evaluate the effectiveness of proposed system, a web-based survey is conducted. The proposed system is given below.

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**Code blocks:**

**Target Heart rate:** In the following code blocks Fig. 2, we used two text boxes to enter age, and resting heart rate, where age and resting heart rate are the variables. Also, a procedure is used to display the output: upper and lower limit of target heart rate; and a button is used to call a procedure. The clock component is used to display the current date and time.

**Calorie Level:** The Spinner component provides the choice of male and female to the user. There are three variables age, height, weight that are initialized. Button 7 is used to call the procedure. The value of age, height and weight are entered in the textbox. A label is used to display the output that is used to determine the calorie level in the human body. The clock component is used to present the current date and time, below is a partial set of coding Fig. 3.

**Blood Volume:** In Fig. 4 the partial code blocks for blood volume module is presented, where a button is used to call a procedure to initialize three variables: cm, height and weight. The procedure textbox invites users to enter height and weight, spinners for selection of gender, and labels to display that how much blood is in the human body.

**Diabetes:** The diabetes module code blocks has three list pickers to display a list of items for assisting the user to make a selection from a list. A button is an event handler in which variables, list picker, and labels are used to exhibit the output in terms of blood glucose level, which is either normal, pre diabetes or diabetes. Similarly, for Random blood glucose level, three list picker are provided and a button event handler, which executes a sequence of commands; and also for HbA1c test type, a button contains spinner component that gives a list of choices to the user for making a selection. The partial code of blocks is shown in Fig. 5.

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1) Target Heart Rate

The target heart rate module allows the user to get information about the different readings related to heart-beat levels, which assists in keeping the heartbeat level at desired level. Firstly, the user has to give certain inputs like resting heart rate, age and activity level. These inputs are then calculated to get the desired output, such as it computes the extreme pulse rate and the higher and lower pulse rate limits. The pseudo code of this module is given below.

**Algorithm 1. Computation of Target Heart Rate**

**Objective:** The goal of this pseudo code is to calculate the Target Heart Rate.

**Input:** RHR, Age

**Output:** Display MaxHR, Display Low End of THR Zone, Display High End of THR Zone

**Begin:**

1. If workout intensity = Low Intensity (50-60%) then
   
   2. MaxHR ← 206.9 − (0.67 * age)
   
   3. HRR ← MaxHR − RHR
   
   4. TR1 ← HRR * 0.5
   
   5. Low End of THR Zone ← TR1 + RHR
   
   6. TR2 ← HRR * 0.6
   
   7. High End of THR Zone ← TR2 + RHR

2. If workout intensity = Moderate Intensity (60-70%) then
   
   3. MaxHR ← 206.9 − (0.67 * age)
   
   4. HRR ← MaxHR − RHR
   
   5. TR1 ← HRR * 0.6
   
   6. Low End of THR Zone ← TR1 + RHR
   
   7. TR2 ← HRR * 0.7
   
   8. High End of THR Zone ← TR2 + RHR

3. If workout intensity = Vigorous Intensity (75-85%) then
   
   4. MaxHR ← 206.9 − (0.67 * age)
   
   5. HRR ← MaxHR − RHR
   
   6. TR1 ← HRR * 0.75
   
   7. Low End of THR Zone ← TR1 + RHR
   
   8. TR2 ← HRR * 0.85
   
   9. High End of THR Zone ← TR2 + RHR

**End**

2) Calorie Level

The second module determines the caloric demands of the user based on his/her age, weight, height and activity level, and gives recommendations accordingly. Age, weight, height and activity level are the inputs, required from the user. These inputs are used in the calculation of final result, reflecting how much calorie is in the human body. The pseudo code of calorie level is given as follows,
Algorithm 2. Computation of Calorie level

Objective: The aim of this pseudo code is to calculate the Calorie level.
Input: age, weight, height
Output: Display the Calorie level

Begin

1. If gender = male then
2.  if workout intensity = inactive then
   
   3.   Calorie level = (9.99*weight + 6.25*height - 5*age + 5)*1.2
   
   4. else if workout intensity = mild active then
   
   5.   Calorie level = (9.99*weight + 6.25*height - 5*age + 5)*1.375
   
   6. else if workout intensity = moderate active then
   
   7.   Calorie level = (9.99*weight + 6.25*height - 5*age + 5)*1.55
   
   8. else if workout intensity = heavy active then
   
   9.   Calorie level = (9.99*weight + 6.25*height - 5*age - 161)*1.7

10. else workout intensity = very heavy active then

   Calorie level = (9.99*weight + 6.25*height - 5*age - 161)*1.9

11. If gender = female then
12.  if workout intensity = inactive then
   
   13.   Calorie level = (9.99*weight + 6.25*height - 5*age - 161)*1.2
   
   14. else if workout intensity = mild active then
   
   15.   Calorie level = (9.99*weight + 6.25*height - 5*age - 161)*1.375
   
   16. else if workout intensity = moderate active then
   
   17.   Calorie level = (9.99*weight + 6.25*height - 5*age - 161)*1.55

18. else if workout intensity = heavy active then

   19.   Calorie level = (10*weight + 6.25*height - 5*age - 161)*1.7

20. else workout intensity = very heavy active then

   21.   Calorie level = (10*weight + 6.25*height - 5*age - 161)*1.9

End

3) Blood Volume

The blood volume component aims at determining the quantity of blood in a human body subject to height and weight. It requires inputs including age, height and weight from the users required for calculating the blood volume. The pseudo code is given below.

Algorithm 3. Computation of Blood volume

Objective: The goal of this pseudo code is to calculate the Blood Volume.
Input: age, weight, height
Output: Display the Blood volume

Begin

1. if gender = male then
   
   2.   BD = 0.3669*height + 0.03219*weight + 0.6041

3. if gender = female then
   
   4.   BD = 0.3561*height + 0.0338*weight + 0.1833

End

4) Diabetes

This module records the reading of blood sugar to assist the users for tracking their diet. The user first has to choose from one of the three test types, namely (1) Fasting blood glucose level, (2) Random blood glucose level, and (3) hemoglobin A1C. When the user selects the test type of Fasting Blood Glucose, then he chooses the blood glucose value from required ranges given to the user. The user then gets informed about his blood glucose value that either it is in the normal range, pre-diabetes or diabetes. Similarly, when the user selects the test type of Random Blood Glucose or hemoglobin A1C, then it intimates the user about their blood glucose value, i.e. whether is in the normal range, pre-diabetes or diabetes. The pseudo code is given below.

Algorithm 4. Determination of Blood Glucose (BG)

Objective: The goal of this pseudo code is to calculate the Blood Glucose.
Input: BG value
Output: Your blood glucose level is within normal limit and you don't have diabetes at present, You have higher level of fasting blood glucose which indicates that the
possibility for you to have diabetes is more consult your doctor and start the treatment at the earliest.
Your fasting blood sugar level is extremely high,

**Begin:**
1. If test type=fasting blood glucose then
   { 
   2. if BGV=70 to 99 then
      { 
      3. Display “Your blood your blood glucose level is within normal limit and you don't have diabetes at present”
      } 
   4. else if BGV=100 to 125 then
      { 
      5. Display “You have higher level of fasting blood glucose which indicates that the possibility for you to have diabetes is more consult your doctor and start the treatment at the earliest”
      } 
   6. else BGV > 126 then
      { 
      7. Display” your fasting blood sugar level is extremely high”
      } 
   8. End if
9. Else If test type=Random blood glucose then
   { 
   10. If BGV=70 to 139 then
      { 
      11. Display “your blood your blood glucose level is within normal limit and you don't have diabetes at present”
      } 
   12. else if BGV=140 to 199 then
      { 
      13. Display” You have higher level of random blood glucosewhich indicates that the possibility for you to have diabetes is more consult your doctor and start the treatment at the earliest”
      } 
   14. else BGV >=200 then
      { 
      15. Display” your fasting blood sugar level is extremely high”
      } 
   16. End if
17. Else If test type=HemoglobinA1C then
   { 
   18. If BGV 4 to 5.6 then 
      { 
      19. Display “Your blood glucose level is within normal limits and you do not have diabetes at present”
      } 
   20. else If BGV 5.7 to 6.4 then
      { 
      21. Display “Your blood glucose level is above normal and this is seen in pre-diabetes”
      } 
   22. else BGV 5.7 to 6.4 then
      { 
      23. Display “You have higher level of fasting blood glucose which indicates that the possibility for you to have diabetes is more”
      } 
   24. End if
   25.End if
   }

**II. RESULTS AND DISCUSSION**
We executed our healthcare application using android based platform, which encourages users to nourish their health and improves their healthy habits. Visual block programming language is used for the development of the application. Fig. 8 shows menu screen of our application, Fig. 9 to Fig. 13 show input and output of our application and Fig. 14 shows the data storage screen of our application.

Figure 8. Main menu screen
(a) (b) (c)

Figure 9. Target heart rate module screen (a) input1 (b) input2 (c) output
Figure 10. Calorie level module (a) input (b) output (c) Calorie chart

Figure 11. Blood volume (a) input (b) output

Figure 12. (a) Fasting blood glucose (input & output) (b) Random blood glucose (input & output)

Figure 13. (c) HbA1C test (input & output) (d) Unit converter (e) Diet chart

Figure 14. Storage of data

A. Quantitative Evaluation

The qualitative evaluation consists of basic statistical analysis of the survey.

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<td>1.00</td>
<td>4.00</td>
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<td>1.83</td>
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</table>

The minimum and maximum mean the smallest and largest number answer choice that collects not less than one response. It is useful to find the range of answer by subtracting the minimum and maximum. In Table I, minimum (1) and maximum (2) presents that there were 5 responses in the uppermost answer (i.e. Male) and 25 responses in the lowermost answer (i.e. female). The answer choice that is in the center of all responses shows a median, means there is 50% response before median are smaller and 50% response after median are larger. The median of 2.00 (higher than the 1.83 mean) shows that there were more respondents who were Female than respondents who were Male. The mean gives the average of entire responses by adding all number answer choices and then divide them by total amount of number. In this case, a mean of 1.83 represents the overall respondents came in somewhere between Male, and the Female. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.37.

Figure 15. Pie Chart of gender
The Fig. 15 shows that there were total 5 (16.67%) male respondents and 25 (83.33%) female respondents in the survey and the total respondents were 30.

TABLE II. SHOWING THE AGE-WISE BASIC STATISTICS

<table>
<thead>
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</table>

In Table II, minimum (1) and maximum (3) present that there were 12 responses in the uppermost answer (i.e. age 18 to 24) and 3 responses in the lowermost answer (i.e. age 45 to 54). The median of 2.00 (higher than the 1.67 mean) shows that there were more respondents who were in age (25 to 34) than respondents who were in age (18 to 24). A mean of 1.67 shows that overall respondents came in somewhere between age (18 to 24), and the age (25 to 34). Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.60.

Figure 16. Pie Chart of age

Fig. 16 shows that there were total 12 (40.00%) respondents whose age is between 18 to 24, and 16 (53.33%) respondents whose age is between 25 to 34 while the respondents whose age is between 45 to 54 were 2 (6.67%).

TABLE III. SHOWING THE IMPORTANCE OF EXERCISE-WISE BASIC STATISTICS

<table>
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<tr>
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</table>

In Table III, minimum (1) and maximum (4) presents that there were 5 responses in the uppermost answer (i.e. extremely important) and 6 responses in the lowermost answer (i.e. slightly important). The median of 2.00 (lower than the 2.43 mean) shows that there were more respondents who mostly do walk for exercise. In this case, a mean of 2.43 shows that overall respondents came in somewhere between exercise (walk), and the exercise (run). Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 1.05.

Figure 17. Pie Chart about importance of exercise

The Fig. 17 shows that there were total 5 (16.67%) respondents who consider that exercise is extremely important for them, and the exercise that is very important for the respondents were 11 (36.67%) while the respondents who said that exercise is moderately important for them were 8 (26.67%), the exercise that is slightly important for the respondents were 6 (20.00%).

TABLE IV. SHOWING THE LEVEL OF BASIC STATISTICS

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In the Table IV, minimum (1) and maximum (4) presents that there were 6 responses in the uppermost answer (i.e. lift weights) and 7 responses in the lowermost answer (i.e. Aerobics). The median of 2.00 (lower than the 2.43 mean) shows that there were more respondents who mostly do walk for exercise. In this case, a mean of 2.43 shows that overall respondents came in somewhere between exercise (walk), and the exercise (run). Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 1.05.

Figure 18. Pie Chart for level of exercise

The Fig. 18 shows that there were total 20.00% respondents and for them the level of exercise is just lifting weights, 12 (40.00%) respondents do walk for exercise, 5 (16.67%) do running, and 7 (23.3%) perform Aerobics exercise.
In the Table V minimum (1) and maximum (4) presents that there were 5 responses in the uppermost answer (i.e. strongly agreed) and 1 response in the lowermost answer (i.e. Disagree). The median of 2.00 (lower than the 2.13 mean) show that there were more respondents who were agreed. In this case, a mean of 2.13 shows that overall respondents came in somewhere between agreed, and the satisfactory. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.72.

![Figure 19. Pie Chart for Significance of BG app](image)

**Table V.** SHOWNING THE SIGNIFICANCE OF BG APP BASIC STATISTICS

<table>
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<tr>
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<td>4.00</td>
<td>2.00</td>
<td>2.13</td>
<td>0.72</td>
</tr>
</tbody>
</table>

The Fig. 19 shows that there were total 20.00% respondents who were strongly agreed with the statement, 17(56.67%) respondents were agreed while 7(23.33%) have satisfactory views about BG app and only 1(3.33%) respondent disagree.

In Table VI, minimum (1) and maximum (3) presents that there were 10 responses in the uppermost answer (i.e. strongly agreed) and 4 responses in the lowermost answer (i.e. Satisfactory).The median of 2.00 (higher than the 1.80 mean) shows that there were more respondents who were agreed than respondents who were strongly agreed. In this case, a mean of 1.60 shows that overall respondents came in somewhere between strongly agreed, and the agreed. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.61.

![Figure 20. Pie Chart of Maintain diet](image)

**Table VI.** SHOWNING THE MAINTAIN DIET BASIC STATISTICS

<table>
<thead>
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<td>1.00</td>
<td>3.00</td>
<td>2.00</td>
<td>1.60</td>
<td>0.61</td>
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</table>

The Fig. 20 shows that there were total 10(33.33%) respondents who were strongly agreed with the statement, 16(53.33%) respondents said that application is helpful to maintain their diet and 4(13.33%) found application satisfactory to maintain their diet.

In Table VII, minimum (1) and maximum (3) presents that there were 14 responses in the uppermost answer (i.e. strongly agreed) and 2 responses in the lowermost answer (i.e. Satisfactory).The median of 2.00 (higher than the 1.60 mean) shows that there were more respondents who were agreed than respondents who were strongly agreed. In this case, a mean of 1.60 shows that overall respondents came in somewhere between strongly agreed, and the agreed. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.61.

**Table VII.** SHOWNING THE GUIDANCE ABOUT BASIC CALORIC NEEDS

<table>
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<td>3.00</td>
<td>2.00</td>
<td>1.60</td>
<td>0.61</td>
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The Fig. 21 shows that there were total 14(46.67%) respondents who were strongly agreed with the statement, 14(46.67%) respondents said that application is helpful to provide basic information about caloric needs and 2(6.67%) respondents found application satisfactory.
In the Table VIII, minimum (1) and maximum (3) presents that there were 19 responses in the uppermost answer (i.e. strongly agreed) and 2 responses in the lowermost answer (i.e. Satisfactory). The median of 1.00 (less than the 1.53 mean) show that there were more respondents who strongly agreed with the statement. In this case, a mean of 1.53 shows that overall respondents came in somewhere between strongly agreed, and the agreed. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.76.

**Figure 22. Pie Chart for Integration of module**

The Fig. 22 shows that there were total 19(63.33%) respondents who were strongly agreed with the statement, 6(20.00%) respondents agreed that the modules well integrated and 5(16.67%) respondents found the integration of modules in an application is satisfactory.

**TABLE IX. SHOWING THE USER-INTERFACE BASIC STATISTICS**

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In the Table IX, minimum (1) and maximum (3) presents that there were 13 responses in the uppermost answer (i.e. strongly agreed) and 9 responses in the lowermost answer (i.e. Useful). The median of 2.00 (higher than the 1.87 mean) show that there were more respondents who said that the application is of high quality. In this case, a mean of 1.87 shows that overall respondents came in somewhere between reliable, and the high quality. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.85.

**Figure 23. Pie Chart of system user interface**

Fig. 23 shows that there were total 13(43.33%) respondents who were strongly agreed with the statement, 15(50.00%) respondents agreed that the system is user friendly and 2(6.67%) respondents have satisfactory views about the user interface of an application.

**TABLE X. SHOWING THE RATE APPLICATION BASIC STATISTICS**

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</tbody>
</table>

In Table X, minimum (1) and maximum (3) presents that there were 13 responses in the uppermost answer (i.e. reliable) and 9 responses in the lowermost answer (i.e. Useable). The median of 2.00 (higher than the 1.87 mean) show that there were more respondents who said that the application is of high quality. In this case, a mean of 1.87 shows that overall respondents came in somewhere between reliable, and the high quality. Finally, the standard deviation shows the growth or alteration of your responses, so here the standard deviation is 0.85.

**Figure 24. Pie Chart of rate application**

The Fig. 24 shows that there were total 13(43.33%) respondents found the application reliable and 8(26.67%) respondents said that application is of high quality while 8(26.67%) respondents said that the application is useful.
Table XI calculations are obtained from the Excel data analysis by using the mean values of all the questions.

**B. Questionnaire**

Fig. 25 shows the questionnaire of an individual respondent in order to obtain the feedback and also to analyze the result. The respondent chooses one option from multiple choice.

Some of the major findings during analysis are listed below:

- A question was asked from the respondent to gather information about the performance of application that whether application helps them to keep track of their diet. So, 33.3% respondents were strongly agreed that the application is helpful to maintain their diet, while 53.3% respondent were agreed with the statement, 33.3% respondents were satisfied and there are no respondents that disagree with the statement.

- The objective of the Second question was to get respondents views about the integration of module. The separated modules are combined or coordinated into main application so respondents look at the integration that it is well organized or not. 62.23% respondents strongly agreed with the statement, 20.00% respondent were agreed with the statement that module were well integrated while at the same time 16.67% respondents were satisfied with the statement moreover no respondent were found who disagree with the statement.

- The Third question aims to know whether respondents find the application helpful to control blood glucose level or not.

16.67% respondents strongly agreed that application is helpful to control blood glucose level. There are 56.67% respondents who consider that application is helpful to control blood glucose level, 23.33% respondents found application satisfactory to control blood glucose level, 3.33% respondents disagree with the statement.

From the above questions we conclude that the users find that the application is beneficial to maintain their health.

**III. CONCLUSION AND FUTURE WORK**

The main purpose and focus of developing the healthcare application is to help people to maintain their health. This healthcare application includes the four modules, namely (1) Target heart rate, (2) calorie level, (3) blood volume, and (4) diabetes app.

The first module describes the pulse rate (in beats per minute) that allows the user to exercise safely while getting the maximum benefits from your workout. It includes THR zones which range from low to vigorous i.e (50 to 85) % of MaxHR.

The second module is the calorie level, all essential process of our body, uses this measurement unit of energy. In order to encounter the energy needs of our body the speed at which the calorie is used alters continually. Throughout different phases of life, it changes from individual to individual. It is used to determine the caloric needs based on the age, weight, and height and activity level.

The third module is the blood volume, which reflects the amount of the blood in human body. This app assists in answering about how much blood is in the human body, more precisely in your own body depending on the height and weight.

The fourth module is the diabetes app tells about that when the body does not properly use or store glucose. Its records, the
blood sugar readings, and assists users to track their diet properly.

**Future Work:** In the future, we will integrate more apps to our main application to make it a more sophisticated auto-help tool and to provide a wide range of facilities to the end user. These apps will include: (1) Measuring blood pressure and Measuring Weight of the body, (2) Provide reminders to users about their medications which help them to take medicine on time. Therefore, through these reminders, the user can take care of their health, and (3) Graphs of the output obtained will help the user to keep track of the changes in diabetes-related readings and to manage their diet and health in a more effective way.

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**REFERENCES**


