

# Diabetes Dietary Scheduling Using Mobile App

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## Abstract

This paper introduces Diabetes Dietary Scheduling (DDS) mobile application which allows users who suffer from diabetes can follow the recipe provided and eat healthy. The facts show that there are many diabetics due to imbalance eating habits. DDS provides the recipes to the user so that user can eat health and get the nutrition of the foods user eat. DDS also provides recipe according to the diabetes' symptoms. Survey is the method used in DDS's formative evaluation. There are five experts involved in the survey. In the survey, DDS is tested in three dimensions which are usability, ease of use and user interface satisfaction. DDS is visually appealing but need to improve to be more users friendly.

**Keywords:** Diabetes dietary scheduling, nutrition, mobile application

## 1. Introduction

Diabetes is a 21st century challenge [1]. According to their research, the number of people with diabetes worldwide has more than doubled during the past 20 years. Diabetes is a chronic disease that has no cure. Diabetes is a disease in which the body does not produce or properly use insulin, a hormone that is needed to convert sugar, starches, and other food into energy needed for daily life [2]. Zaini [3] said that there will be a three-fold rise of the disease in Asia and much of these will be seen in China and India (total 95 million) by virtue of the massive population of these countries. Nevertheless, the other rapidly developing Asian nations like Singapore, Malaysia, Thailand, and those making up Indochina will experience the surge. Malaysian should face this problem seriously and take action before it occur on own [3]. According to American Diabetes Association, eating well can improve the patient from suffering diabetes. There are helpful to have a food scheduling for a few days or a week, writing down everything they eat [4].

In this era, everyone rely on their smartphone that such easy and convenient. Diabetic checks their daily meals recipe with their smartphone is an idea for this project. This application calls Diabetes Dietary Scheduling (DDS). Focus on the foods that taken by the diabetes' patient which are healthy and advantage for them to away from diabetes. Patients are needed to know the healthiness of the nourishment they taken every dishes.

The application DDS is a mobile application which follows the trend of the users nowadays. There are two languages provided in the application DDS which are English and Bahasa Malaysia. The content of the application DDS are three meals recipe which are breakfast, lunch, and dinner that show in Figure 1. The meals are

provided in seven days as a circle as Figure 2. While patients' family can prepare a suitable sets of foods for the diabetic so they can eat healthy with suitable nutritious. The users for DDS application focus on diabetics, patients' family members, food's counsellors, and doctors. With the help of DDS, diabetic can know the estimation of energy requirement and nutrition daily. DDS provide the correct information with the percentage of nutrition. By following the food chart that provided in DDS, diabetics can know the amount of nutrition that taken for every meal for the whole week accurately.

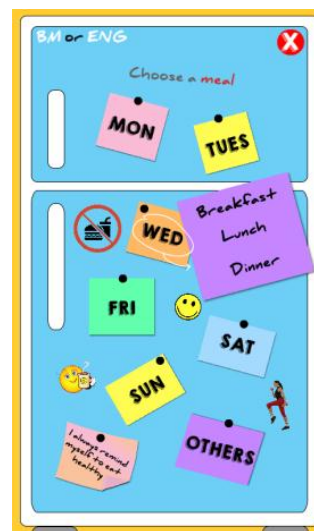


Figure 1: Meal page of DDS



Figure 2: Day page of DDS

### 1.1. Why DDS Needed In our Life

There are some reasons that make us to conduct DDS mobile application. Firstly, the existing diabetes applications were too complicated even for someone who with technology background while they were using it [5]. Then there is something left to be desired for the existing diabetes application that available for Android applications [6]. Deputy Health Minister Datuk Seri Dr Hilmi Yahaya said more young people suffering from diabetes due to the spike in the rate of obesity which is related to their imbalanced eating habits [7].

By following the ingredients and recipes (Figure 9) that provided in DDS, users can prepare the dishes by their own so the users can eat healthier. In addition, DDS provide meals based on the 13 different specific symptoms of diabetic to users (Figure 4). Every symptom will provide three different meals which are breakfast, lunch, and dinner. There are some suggestions for users to serve those three meals (breakfast, lunch and dinner) together with some side dish or drink as show in Figure 4. DDS provide some diabetes information to users so they can know more about the different between Type 1 diabetes and Type 2 diabetes. More than that, DDS also provides some ways on how to prevent or control diabetes by suggested the dose of foods that should take by diabetics daily. When users would like to exit from DDS, they can click on the exit buttons that consist in the main page of DDS and a question in Figure 5 will show. If users choose to “Stay with DDS” then the mobile application will back to the main page of DDS while users choose to eat “Alone” then the application will exit from DDS and back to the main page of the users’ smartphone.



Figure 4: Symptoms in DDS



Figure 5: Exit options

### 2.1. Analysis of Diabetes’ Android Mobile Application

Based on the matrix analysis shows in Table 1, there were 15 applications that help on foods for diabetics and all of those applications are free download application and for android phone users only. The existing application for diabetic was not complete features. There were total 15 features focuses in the matrix analysis but the applications did not fulfil all of these. The 15 features listed in Table 1 are free download, for Android phone, ingredients, pictures of the foods, calories count in the apps, ads that appear in the apps, searching engines, sharing function, nutrition, drinks, diabetics’ information, video preview about the apps, fixed three meals per day, fixed meal for one week, and more than one languages that provided in the mobile application. The highest features it got which is Diabetes Recipe Apps (A1) but this application lack of few features and one of it is the bilingual provided. DDS is developed for mainly Malaysian, mother language Bahasa Malaysia is needed in DDS so that users can fully understand the instructions provide in the application. English is a worldwide language, so the user of DDS can be internationally.

Based on Table 1, the existing applications were less focusing on those feature which DDS was most mention about. In DDS application, the most important features was the nutrition information provided, fixed three meals a day and fixed meals for a week. Diabetes Diet Chart (A6) provide both fixed three meals a day and fixed meals for a week but it does not provide the nutrition information. These cause users did not know the recipe benefits and reason of the food that help to improve their diabetes.

All three helpful features are provide in DDS, so that users can eat healthy and also know the benefits of nutriment that they follow in DDS. Other then all of the features that mentioned above, DDS also provided one of the features that never exist on any diabetes’ mobile applications before which is the special 13 symptoms that provide users in three meals which are breakfast, lunch, and dinner.

Table 1: Matrix analysis of Diabetes’ Android Mobile App

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	SUM
A1	/	/	/	/	/	/	/	-	/	/	/	-	-	-	-	10
A2	/	/	/	/	/	/	/	-	/	/	-	-	-	-	-	9
A3	/	/	/	/	/	-	/	/	/	/	-	-	-	-	-	9
A4	/	/	/	/	/	-	/	-	/	-	-	/	-	-	-	8
A5	/	/	/	/	-	/	/	-	-	/	-	/	-	-	-	8
A6	/	/	/	-	/	/	-	/	-	-	-	-	/	/	-	8
A7	/	/	/	/	/	/	-	/	/	-	-	-	-	-	-	8
A8	/	/	/	/	/	/	/	/	/	-	-	-	-	-	-	8
A9	/	/	/	/	/	/	/	-	/	-	-	-	-	-	-	8
A10	/	/	/	/	/	-	-	/	-	-	-	-	/	-	-	7
A11	/	/	/	/	-	/	/	/	-	-	-	-	-	-	-	7
A12	/	/	/	/	-	-	/	-	-	-	-	-	-	-	/	6
A13	/	/	/	/	-	-	-	/	-	-	-	-	-	-	-	5
A14	/	/	-	-	/	-	-	-	-	/	/	-	-	-	-	5
A15	/	/	/	/	-	-	-	-	-	-	-	-	-	-	-	4
SUM	15	15	14	13	10	8	8	8	7	5	2	2	2	1	1	

Application Name:	Features:
A1- Diabetes Recipe Apps	F1- Free Download
A2- Diabetes Recipes: Healthy Food	F2- For Android Phone
A3- Diabetes Food Recipes: Free!	F3- Ingredients
A4- Recipes for Diabetes	F4- Pictures
A5- Diabetes Recipe Diabetes Recipe	F5- Calories Count
A6- Diabetes Diet Chart	F6- Ads in the Apps
A7- Diabetes Diet Food Recipes	F7- Searching engines
A8- Diabetes Diet Free	F8- Sharing Function
A9- Diabetes Recipes	F9- Nutrition
A10- Diabetes Weight Loss Diet	F10- Drinks
A11- Diabetes Recipes Free	F11- Diabetics' Information
A12- Diabetes Recipes Free	F12- Video Preview
A13- Diabetes Cookbook	F13- Fixed Three Meals per Day
A14- Diabetes and Fast Food	F14- Fixed Meal for One Week
A15- Delicious Diabetes Recipes	F15- More than One Languages

## 2. Method

There are five experts involved in DDS formative evaluation survey. There is a reason behind the number of experts considered. According to Jakob Nielsen, the test user after the fifth, observer will learn less and least because there is keep observing the same thing like the five test users [11]. The very first expert is giving much data to the observer and when goes to the second expert, there is almost same data the observer get. Same thing happened to third, fourth and fifth expert, there is enough data for the developer and should not waste resources to get data from other experts. There is right choice for DDS to do a formative evaluation survey with only five experts.

Formative evaluation encompasses a variety of assessment types that are employed during the learning or development process [8]. The purpose to conduct a formative evaluation for DDS is to get the comments from different experts about the interface and the functions that need to be improve in DDS. The project frames of DDS had listed that a formative evaluation will be conducted in phase two during the design and develop of the application of DDS. A survey was conducted during this formative evaluation. Conduction of a survey is to uncover answers to specific, important question. Those questions are varied, cover a diverse range of topic, and can be asked in multiple formats [9]. A survey is a collection of questions asked repetitively to a sample of a population to mathematically derive characteristics of the total population [10]. The objective of this survey was conducted is to improve the usability components; ease of use and user interface satisfaction of DDS by five experts who are the lecturer in UUM who taught Human Computer Interaction (HCI) or User Centred Design (UCD).

### 2.1. Sample Selection

Based on Teller [12], the sample size, or number of people you need to complete your survey, depends on two factors which is how big is the population and how confident to you want to be in the result. Our survey included five experts who are the lecturer in University Utara Malaysia (UUM) who taught HCI and UCD more than five years. Besides that, we are very confident about the results that answer by all the experts that we found due to the questions of the survey are related to their working field which is HCI or UCD.

### 2.2. Expert Survey

The experts were given a prototype video that shows the function and how DDS work before they start to answer the questionnaire that involved 15 questions. We adapted the 15 questions which are usability, ease of use and user interface satisfaction in the questionnaire to measure the performance of DDS. The experts

select their answers on the paper based questionnaire that printed out from Google Form. Feedbacks from the questionnaire will be analyzed to improve DDS in the future.

## 3. Results

Based on the survey conducted earlier, the following results were found. All the data collected in the survey is analysis into the graph and figure. In some situation, tables, graphs, and figures can present certain types of information (including complicated relationship and sequences of events) more clearly and in less space than the same information would require in sentences form [13].

### 3.1. DDS usability

Based on the Figure 6, the analysis line graph shows that the questions had been asked in the survey section B which is the usability evaluation of DDS. Figure 6; clearly show that the overall reaction of DDS is moderate because three out of five experts answered wonderful about the overall reaction of DDS. Besides, four of the experts answered that the performing task of DDS is very straightforward after they watched the prototype video [14]. Figure 6 show the expert answered that DDS not really design for all levels of users. One of the experts couldn't answer the question and comment that we should consider the different perspective of users.

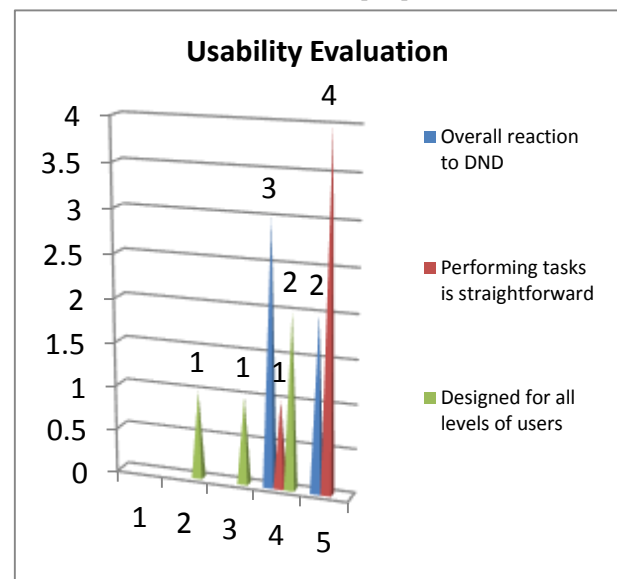


Figure 6: Usability evaluation of DDS

### 3.3. DDS is ease of use mobile application

Figure 7 shows the ease of use of DDS. Three out of five experts answered easy when the question ask about the easiness of instruction of DDS. Other than that, four of the experts answered the overall look of DDS is very simple. It shows that DDS is actually easy to use and the simple interface of it easy to navigate user to use the mobile application.

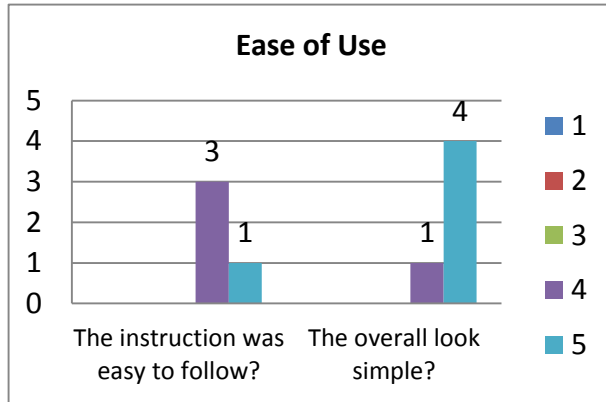


Figure 7: Ease of use of DDS

### 3.4. DDS user interface satisfaction

Figure 8 shows the user interface satisfaction of DDS. There are two experts answered agree, one answered neutral and two disagree about the readability of the font type in DDS. Meanwhile, three out of five experts do agree with the attractively of the colour in DDS. As the conclusion of Figure 12, the experts feel that the font type in DDS is not really readable but the colour of DDS is very attractive [15].

### 3.5. Understanding of DDS

In Figure 9, the experts need to answer the understanding about the instruction of the exit button. Two out of five experts understood the instruction about eat alone or stay with DDS. Another three experts answered neutral about the instruction given after users click the exit button. After DDS users click on the exit button, the instruction about “You want to eat alone? Or with DDS?” will show on the screen. If users choose “Alone”, they will go back to their smartphone menu page. Hence if users choose “Stay with you”, they will back to the day page of DDS. Based on Figure 9 (right), 100% (five lectures) of the experts understand about Figure 9 (right) is the Back button on the mobile application [16] of DDS.

In addition, Figure 10 shows the video about the information of diabetes that available in DDS. The feedback from the experts about the size of video display in DDS is acceptable. One expert answered very suitable, two experts answered suitable and two experts answered neutral [17].

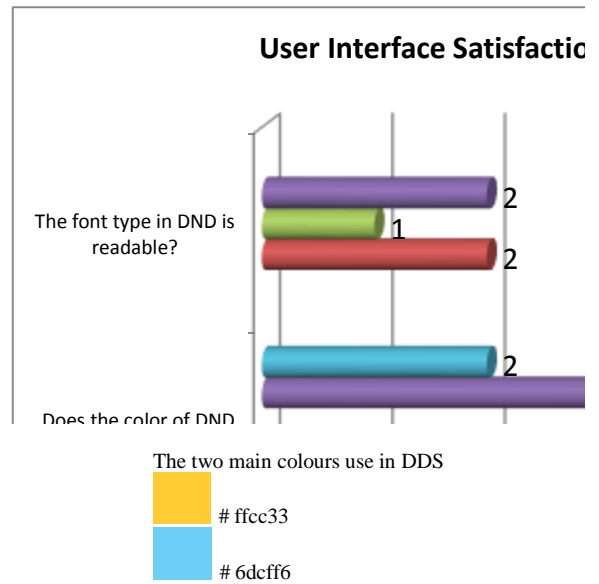


Figure 8: User interface satisfaction of DDS

### 3.6. Expert Feedback

Analysed all five experts’ comment become DDS feedback and also part of helpful to improve DDS. Based on the comments, there are two categories which are positive and negative comments.

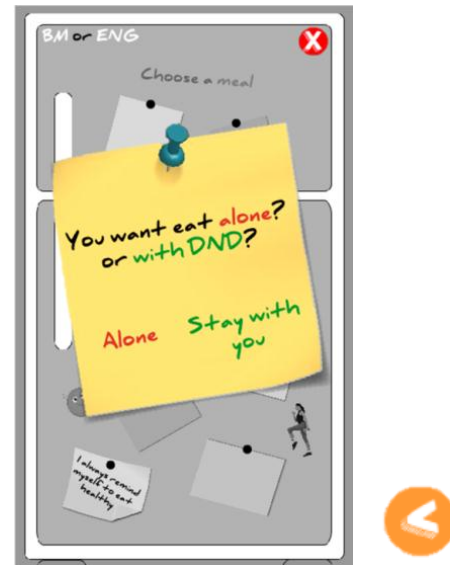


Figure 9: Understanding of the instruction

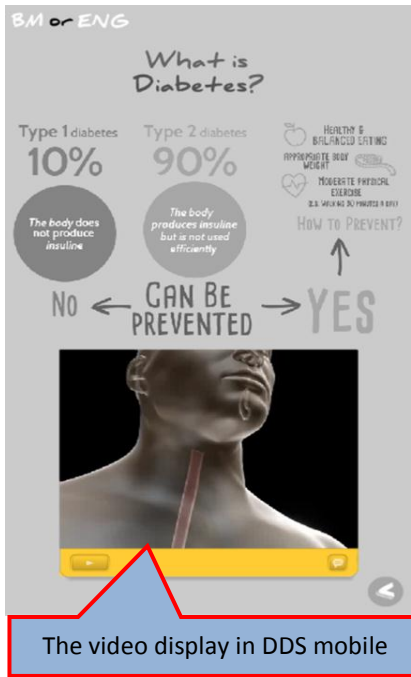


Figure 10: Video that available in DDS



Figure 11: Interface of DDS

### 3.7. Positive Feedback

DDS overall look very simple, nice and have an interesting interface that shown in Figure 11. DDS believes that persuasion for user to use the mobile application, first should catch the attention from the user and energized the user. From expert’s feedback, DDS clearly reached to the target and raise the attention from the experts. Besides, experts also gave very good feedback that DDS is visually appealing and have very nice video presented. No matter from the colours choices or the graphic, there are related to the application and suitable to use.

### Negative Feedback

DDS is appreciated that experts view the leakage of the DDS and lead DDS to a better mobile application. Based on Figure 12 (left), there are two mistakes in the same page of DDS. First, the expert comment that there are too many information squeezes in one page and this will confusing the user [18]. Second, the font size is too small and it is not really readable. DDS should consider more to the patient who have vision loss and if DDS target to more level of users, it should also consider to the senior citizen user and those who have vision problem.

DDS also get the feedback that the clickable button is not obvious. Figure 12 (right) shows the graphic of the DDS is appealing but it should be more user-friendly. The clickable button is important for the user to discover more to DDS and also for user easy to direct them in the application. If the clickable button is not obvious enough, user would probably lost direction in the application and it would annoyed user in navigation.

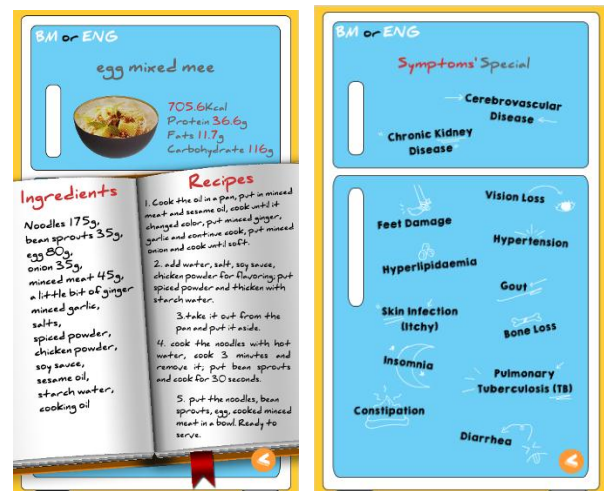
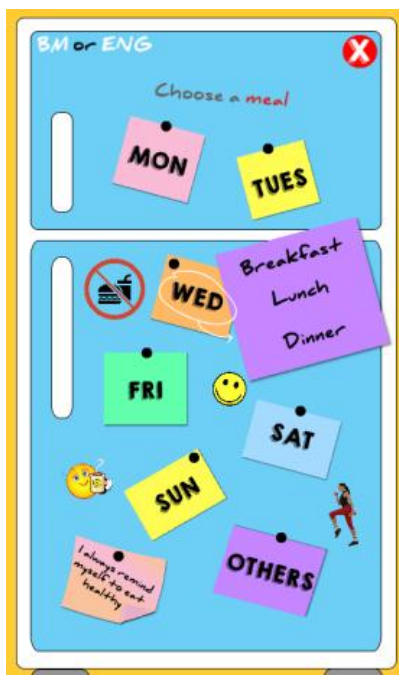


Figure 12: Negative comments on DDS interface

## 4. Conclusion

DDS is almost fulfilling three dimensions which are usability, ease of use and user interface satisfaction. DDS is a good kick on the diabetics' recipe mobile application. DDS mobile application is look nice, easy and simple. Apart from the mistake of font size that is not good enough due to it is not fully readable, information too crowd and clickable button in apparent, other part in DDS is rated over moderate. The best part in DDS is visually appealing which can attract user to use it. DDS use suitable colours which experts agree on it but some of the experts are recommend considering user who have vision problem. The negative comments of the experts will used to improve the DDS mobile application. Each of the comment collected from the experts lead DDS to a better way and become a perfect mobile application for diabetic.

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