Evaluation of Interactive System For Diet App – Effect of Personalization

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Developed Interaction System
Using HCI theories and methods
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ABSTRACT
Health is one of the most important aspects of our happiness. The vital role of determining our health is played by the food we consume - our meals. Due to busy daily routines, people these days often look for quick and simple recipes to spend less time preparing their meals. In recent times, people have become more self-conscious of their appearances and looks; turning towards various diet apps to achieve their ideal appearance goals. But most of these apps work in a generalized manner for all users, and this turns out to be a problem for some users. We therefore developed an interactive system, named *Dietora*, that will recommend various quick, simple, and healthy recipes to the users based on their needs, which is also the main highlight of our design. This paper discusses the evaluation of the system, along with an experiment to test the personalization feature of this system.

Keywords
Diet; Quick, simple and healthy recipes; Interactive system; Personalization; Appearance; Meals; Busy people; AI; HCI (Human Computer Interaction).

INTRODUCTION
The more the world is modernizing, the busier the people are getting; this makes time spent on meal preparation a problem for many, as not everyone can afford ordering food on a daily basis. So, we designed a system that comes up with suggestions of quick meals, along with their details, for users. Alongside the time, the simplicity of the recipe is also ensured as our target audience is mostly working students who might not be experienced in cooking; but also, office workers who might want a recipe that can be prepared easily after a very tiring day.

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We have also included the diet approach is our app, but rather less strictly than most other apps. The system provides users with a range of meals that correspond to their diet plan instead of demotivating users with strict diet plans like the '***Diet Plan***' app by *Fit Apps Studio* [1] or the '***Diet'*** app by *AA Mobile Soft* [2]. Moreover, the users could be allergic to the dishes suggested or not be fond of the dishes at all. Additionally, our app provides the options of 'Staying fit' or 'Gaining weight', unlike most apps, such as '***Diet Point***' by *DietPoint Ltd.* [3] or *'**Diety**'* by *HealthyDietDev* [4], which only focuses on losing weight. These are two of the features that differs our app from the others by providing the advantages of freedom in people's choice of diet meals and an option to help underweight users. We added these features, along with the personalization (explained in the next section) considering the user diversity of our target audience, so that they can adjust the app to their needs [8].

The feature that makes our app stand out from the rest is the personalization of data along with its cost-effectiveness, as many good apps like '***Easy Meal Planner***' by *Riafy Technologies* [5] does not fulfill the need to give personalized recommendations to the users; and the apps that do offer personalization are expensive, as we can see with the apps '***BetterME*** ' by *BetterMe Limited* [6] and '***Lifesum***' [7]. The system asks new users to enter their personal details like gender, height etc.; their basic medical info, for instance, if they have high BP (Blood Pressure) or any allergies; and their type of diet, along with goals. Based on these data, the system will provide personalized recommendations based on the intelligent algorithm (AI) it is connected to, which has been trained on large amount of data using machine learning (ML). As personal information like weight or medical conditions might be changing, we have an **Edit bar** on the **Home page** for users to update their data. We also have *'Back'* button on all the pages to go back and change the data if needed, while signing up. Both the features allow easy reversal of action by changing data if wrong data is entered by mistake [9].

The use of the AI algorithm reduces the number of professionals needed to be involved in the process (nutritionists or dietitians), and thus, makes the app very

cost-efficient. This cost is one of the needs that users often do not mention, but do looks for when choosing an app, and we found it by asking specific questions in the focus group we conducted. The option to contact health specialists when needed was a design alternative we chose not to use due to the expense it comes with. This of course brings us to one of the weaknesses of our app, which is the algorithm might not be accurate at times and may frustrate the user, but the probability is small. Another factor that our app proves weak at is motivating the users explicitly for which, solutions like connecting with other users with some social platform or quotes have been suggested. This again increases the design complexity and brings in the *'affordance'* issue user-oriented design as argued by Norman [10]; so, we chose not to include it. The app also asks for a lot of information from the users which many users might not be comfortable to share with, decreasing the quality of the personalization and suggestions; but the system does provide options to choose not to share the information.

As most apps, our app starts with the *Log-in/Sign-up* page. After logging in or signing up by inputting the personal information, the *Home* page appears, consisting of the Quick recipes and the Diet recipes bars. These bars lead the users to a list of recommended recipes; choosing one of the recipes takes the user to a page with further details of the recipe. We have also kept a *Rating and feedback* page to review user's feedback and future improvement of the app. We have mostly kept simple sliders and buttons, with text entry only where needed, to reduce chances of error. [11]. The *learnability* [12] is high as we have labelled all the features explicitly and kept all the features remarkably simple, and consistent with the design of common apps [13]. Our design space is only computers mobile devices; so, the outputs are mostly screens while inputs are touchscreen, keyboard, and mouse [14].

RESEACRCH QUESTION

The research question being investigated in this paper is regarding the personalization feature of the app as this signifies one of the biggest advantages and differentiation of our interactive system. Users often have to spend a long time looking for recipes in most diet apps or websites to suit their needs or even if they find one, some ingredients of the recipes might be such that the users are restricted from consuming those by doctors; this is very inconvenient. This paper, therefore, hypothesizes that the personalized list of recipes would require less time for users to find an appropriate recipe for themselves, and be more convenient, compared to the general list of recipes suggested my usual diet/quick recipe sources.

EXPERIMENT AND METHODS

Measurements and Variables

To evaluate the system and test the hypothesis, it will be required to measure the time taken by the users to complete the destined task, which is finding a suitable recipe, and the conveniency of using the system. The experiment will use calculations related to two of the standard usability metrics in HCI to determine these measurements; although, this will not be testing the usability of the entire system, only display the benefits of the personalization feature and the related part of the interactive system. The usability metric of efficiency will be a measure the time taken by the user to complete the task, which will be found by subtracting the *start time* from the *end time* [15]. The usability metric of satisfaction, using the *Standardize Satisfaction Questionnaire*, will be a measure of the convenience of using the system to carry out the task [15].

The independent variable will be type of recommended recipes, where one will be personalized and the other being general. The dependent variables are the ones that are being measure, namely – the time taken and the satisfaction of the user. The diverse needs of two groups of users would be a confounding variable if a between-subject design is used [16]; therefore, a within-subject design would be used. As the experiment will follow a within-subject design, users might get proficient with the use of the interface for the later trials [17]. This factor will be minimized by a sample trial at the beginning of the experiment, to get the user comfortable with the system. Both the experiments would be conducted in the same environment, day, and time of the day (like morning or evening) to eliminate the possibilities of any other confounding errors.

Participants

Participants will mostly be selected based on our target audience, to represent the whole target group of users as explicitly as possible. This would include young adults, preferably teenagers, who are more concerned about diets, but also very picky while choosing dishes. Additionally, we would like to keep a few elderly people as they often have restrictions to certain foods and ingredients. We will recruit participants through ads on social media, along with a small reward upon completion of the experiment. This will be most effective as both young and elderly people use social media and is one of the simplest ways to reach out to people; and people are less likely to be enthusiastic about the participation unless rewards are assigned. We will be recruiting 2 groups of 20 participants each, as typically done in HCI studies [18].

Apparatus

The system we would be comparing our approach would be any of the usual diet meal or recipe suggestion apps that has a good rating but does not provide the personalization

feature. To make sure the app interface, which would be a confounding variable, does not manipulate the results, we will use the two different apps (ours and the one compared against) to get the list of recipes and represent in a much simpler display and interface, which would partly be like the wizard of Oz technique [19] as the participants will not be directly interacting with the app but a representation of the results of the apps, in the same format for both apps. There will be a need for timers to record the time taken to complete the tasks.

Experiment Procedure

The participants will be asked to give their personal information at the start of the experiment for the personalization, but they will not be informed which set of recommendations is from which app to reduce any external factors manipulating the results. This data would be input into the app by a human and the result will be displayed on the presentation. All the participants will be tested separately in a room as there are few of them and will be given a trial run to get used to the representation of recipes. The experiment will start with representing the recommendation list of the one of the apps, our app for instance, in a touch screen display. The time will be recorded from the instance the participant is presented the representation until the participant declares (speaks out) that they have found the recipe. After they are done, a break will be given so the participants do not tire out as that will make the time flawed. Then the same is repeated with the results of the other app. 20 participants are presented results of our app first and the other 20 with our result at the end to minimize the results of leaning effect, if any exists [20]. After both the trials end, the participants are given a questionnaire about the satisfaction of each of the apps, so they can compare both experiences and rate them accordingly.

Result Analysis

The results will involve a set of time periods, which will be analyzed using statistical methods, and the questionnaires, which would be treated rather generally as an overview. The 'time taken' recorded will be all converted to seconds and spreadsheets would be used (MS Excel, for instance) to assemble the data of both groups and all the 40 participants. The data will be checked, and any anomaly spotted (data different by and exceptional margin from the rest) will be removed to make sure our statistical tests are not affected by a greater margin of flaw. As our experiment is not very specialized and the data is completely numerical, we will use *mean* and either *standard deviation* or *variance* for the statistical evaluation.

As there are a lot of possible values and values of all the attempts are equally significant for the test, *mode* and *median* were not chosen [21]. The *mean* will give us the average time taken for each of the systems, and the *standard deviance* will be used to measure the accuracy of the *mean*. The hypotheses are expected to be supported by the mean time for our app being significantly less than the mean time for the other app. The mode results from the questionaries would be selected for both the apps, as the questionaries have small number of specific options to choose and the most frequently chosen option would be the most likely result, but frequency (how frequently and option is chosen) of all the available options might also be considered.

CONCLUSION AND DISCUSSION

To sum up, this experiment will evaluate the interactive system we designed to help users with recommendations of quick recipes and diet meals. The experiment tests the personalization feature of the app by comparing with an alternative design in terms of efficiency and conveniency of users to look for suitable recipes, both of which are tested using standard usability metrics. The use of the HCI usability metrics along with other HCI techniques discussed makes the experiment justified and concrete. The use of the statistical analyses and all the measures to ensure the elimination of confounding variables proves the significancy, accuracy and validity of the results. The use of fixed similar environment and apparatus makes the experiment fair for all participants from both the groups. Equal division of participants of both the groups removes any chances of manipulation of data in terms of selection of participants.

But the experiment is focusing on specific target groups of our product, and this limits our conclusions and results to the specific groups which we selected our participants from and not the overall population in general. Also, the personalization feature is just one of the many features of our interactive system and so does not represent the complete system, excluding some of its advantages and disadvantages. Moreover, as the experiment uses a separate representation of the results of the app, the participants have no direct interaction with the system and its interface. Therefore, conclusions cannot be generalized to the overall performance of the system and the design. However, the tested feature does convey the main goal and advantage of the system. Further experiments can be conducted in the future to test the other features of the system, and the interactive interface especially. Participants samples could be extended to other age groups to allow generalization of results and advanced apparatus to achieve more accurate results, which my commit to the development of the system in the future.

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