

Research Paper

## An Early Development Process of an Augmented Reality-Based Healthy Diet Tool Prototype

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### Article History

**Received:**  
29.08.2020

**Revised:**  
16.09.2020

**Accepted:**  
25.09.2020

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**Abstract:** This paper presents an early development process of an augmented reality-based healthy diet tool prototype i.e. getting the initial requirements for the prototype. This tool is being developed using the evolutionary prototype model. Thus, the tool development will follow several complete 4-phase iterations of the prototype model. To get the initial requirements, we have analysed several existing applications that are related to diet, food and cooking. We found out that the augmented reality is not a common feature. We had also conducted an interview with one of 2018 diet challenge participants. The interviewee welcomed the idea of having augmented reality in the diet tool with a condition that the feature should be designed to accommodate the users. Therefore, several iterations will be conducted to get the best specifications for a diet tool prototype and finding the best ways to embed the augmented reality features into the tool. We will also validate with experts sets of menu, advice and instructions to be used in the tool. It is hoped that our effort will help in developing a reliable, healthy diet tool with suitable augmented reality feature.

**Keywords:** Augmented Reality, Evolutionary Prototype Model, Healthy Diet Tool.



## 1. Introduction

In 2017, Malaysia was on the first ranking of adult people that having overweight (37%) and obesity (13.3%) problems among ASEAN countries (The Economist Intelligence Unit Limited, 2017). The problems may be associated with our current lifestyle; having fast food quite frequently or having food loaded with salts, sugar, and oil, and also not moving around much with gadgets in hands [1] [2].

Most of us will find some ways to change our unhealthy lifestyle but it is highly likely that we will revert back to our old lifestyle due to many reasons. Educating Malaysian people to consume food in a healthy way or live a healthy lifestyle should be a non-stoppable journey. Most of us might need continuous motivations. Gorski and Roberto [3] had conducted a study to get different perspectives about public health policies to encourage healthy eating habits.

It is quite common for people, who wants to change their lifestyle, will simply looking for information on the internet. Massive information is available these days but not all information sources are reliable [4]. The facts that most of the diet programs available online are not reliable, can be bad, and can make people deprive and lose their intention to stay healthy are terrifying. Some of the information may be misleading or incorrect. However, there are still reliable information available online such as the Kementerian Kesihatan Malaysia [5] website. One interesting health campaign held by the official health ministry was the Healthy Plate campaign.

Having a diet tool that can suggest healthy menu accompanied with interesting state-of-art technology of augmented reality that can tell more information about the menu might be an ideal solution [6]. To educate further and also to keep people motivated, cooking instructions and professional tips can also be added. This paper presents our first few steps in developing the healthy diet tool prototype.

## 2. Literature Review

### 2.1. Definition of Healthy Diet

According to World Health Organization (WHO) [7], healthy diet is about consuming food that contains fruits, vegetables, legumes, nuts and whole grains, for example, oats, wheat, and brown rice. In a day, people must have consumed at least 400g (or 5 portions) of fruits and vegetables and other foods that contains less than 10% of total energy intake from sugar, less than 30% of total energy intake from fats and less than 5 g of salt.

### 2.2. Augmented Reality

Quite recently, augmented reality has been an interesting subject of extensive independent research across many fields such as education, entertainment, and decision making [8]. According to Juan et al. [9], augmented reality is a technology that able to present information that extends our physical world. It has a great potential to be used in many applications and yet to be fully explored. One of interesting augmented reality-based applications is helping users to learn interpreting the nutritional information on labels of real packaged foods as described in Juan et al. [9].

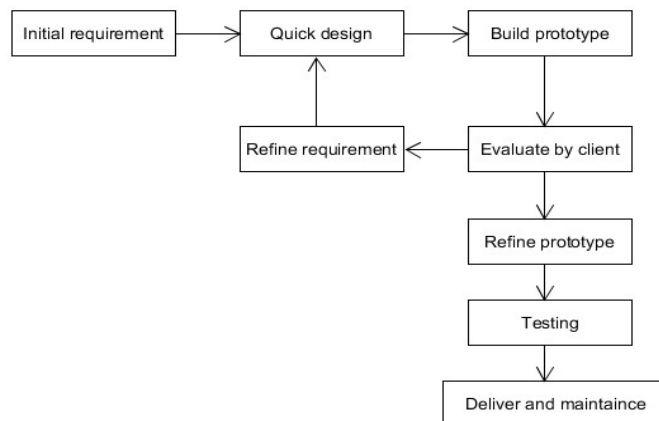


Figure 1. Evolutionary Prototype Model

### 3. Methodology

Our research in about developing a healthy diet tool with augmented reality features. We choose to use evolutionary prototype model for our product development. Prototype model has good potential to help us deliver a high-quality diet tool as it allows high user involvement throughout the development process (see Figure 1). Our tool development will follow several complete 4-phase iterations of prototype model.

Several iterations will be conducted specially to focus on getting the best specifications for a diet tool and finding ways to embed the augmented reality features into the tool, as well as validating with experts sets of menu, tips and instructions to be used in the tool. We describe the early development process as follows:

### 4. Initial Requirements

The initial requirements phase for the prototype development was conducted through requirements elicitation process based on these two techniques:

- a) content analysis of five existing diet tool applications, and
- b) short interview with some former diet challenge participants.

The objectives of the first technique were to gather initial features that should be considered for the diet tool, and the latter were to get initial feedback on the idea of having a tool with augmented reality features. We also took in some views on how the tool should be like.

Table 1. Early Development Activities Based On the Evolutionary Prototype Model

Phase	Objective	Technique	Expected Outcome
Initial Requirements	To identify initial requirements for a diet tool	Content analysis on existing applications Interview with a diet challenge former participant	A list of basic functions suitable for a healthy diet tool Quality requirements and constraints (if any)
Cycle 1: <i>Menu &amp; Tips</i> <ul style="list-style-type: none"> <li>• Quick Design</li> <li>• Build Prototype</li> <li>• Evaluate</li> <li>• Refine Requirements</li> </ul>	To develop sets of validated menu and tips	Interview with Certified Dietitian Menu checklist	Validated healthy menu: N breakfast meal N lunch meal N snack meals N dinner meals
Cycle 2: <i>User Interface</i> <ul style="list-style-type: none"> <li>• Quick Design</li> <li>• Build Prototype</li> <li>• Evaluate</li> <li>• Refine Requirements</li> </ul>	To develop user interface design (on paper)	Online Survey	Validated User Interface (initial) Design
<i>Several next iteration</i>	To complete the specifications before going into system prototype development such as designing the flow in the system.		

NOTE: The process will continue to iterate until the specifications are completed, then we will continue with system prototype development.

## Cycle 1: Menu & Tips

### Quick Design

We decided to find and analyse some menus and tips available online, for example, online articles written by Seaver [10], Gunners [11] and Zakaria [12]. We looked for menus suitable for breakfast, lunch, snack and dinner.

### Build Prototype

For the first iteration, our menu suggestion was built based on menus that we can find across social medias like Instagram, Facebook, and blogs which claimed as healthy menus in the original posts. It was sorted and categorized accordingly and ready to be validated. From there, we created a checklist to be validated by experts.

### Evaluate

This activity is still in progress. We have made an appointment with a dietitian at the nearest hospital and waiting to meet up soon. We will show the dietitian our menu suggestion and will ask the dietitian to validate those menus whether they are considered as healthy and suitable for a healthy diet plan using a checklist.

Once we get the validated requirements and further suggestions from the experts and refine the idea, the first cycle of the prototype will be completed. The second cycle of the prototype will focus on the user interface. Table 1 presented the early development activities of the diet tool prototype.

## 5. Findings and Discussion

### Initial Requirements

- Content analysis of existing diet tool applications  
*See Table 2 and 3.*
- Feedback from a former diet challenge participant  
 The suggested diet regime is 14 days. Functions preferred are those that may assist with having good and healthy diet meal including food preparation and cooking instruction. Augmented reality features can be interesting and motivational to users but must have a purpose. The Healthy Plate guidelines can be useful.

Table 2. Some Details about Existing Application

Application Name	Developer/ Year	Scope	Strength	Weakness
Malaysian Food Recipes: Healthy Cuisine, Nutrition	Edutainment Ventures 2019	All type of Asian food	Provides variety of Asian recipes	Limited healthy food recipes
Healthy Recipes	Dream Apps World / 2018	Healthy and non healthy meal	Has many category of food recipes	Learner might choose non healthy food recipes
Healthy Cookbook App	Riafy Technologies / 2016	Quick healthy meal	Provide quick and easy healthy recipe	Learner hard to learn step by step to cook because no video cooking provided
Healthy Easy Recipe	Runtastic / 2017	Healthy meal	Clear healthy meal video for learner to learn	-
Kabaq Augmented Reality Food	Glimpse Group / 2017	Healthy and non healthy meal in restaurant	Very interesting. AR makes people attracted	Learner hard to keep track their food taken because of no nutrition and calories information

Table 3. Feature Comparison among Existing Applications

Application/ Year	Menu Name	Ingredient List	Cooking Video	Instruction	Nutrition Information	Calorie Reading	Image Feature	AR Feature
Malaysian Food Recipes: Healthy Cuisine, Nutrition 2019	/	/	X	/	X	X	/	X
Healthy Recipes 2018	/	/	X	/	/	/	/	X
Healthy Cookbook App 2016	/	/	X	/	/	/	/	X
Healthy Easy Recipe 2017	/	/	/	/	/	/	/	X
Kabaq Augmented Reality Food 2017	/	X	X	X	X	X	/	/

## 6. Conclusion

Having a tool that can suggest healthy menu accompanied with interesting state-of-art technology of augmented reality that can tell more information about the food is an ideal idea for people on healthy diet. We have reviewed several existing diet tools available online to make sure we have considered all major functions suitable for a diet tool.

We have also interviewed a former diet challenge participant. The challenges in our project now are to make sure that only reliable information is provided in the tool and augmented feature is included in it by design.

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