HOW TO PROVIDE HEALTH-RELATED INFORMATION BY MOBILE COMPUTING?

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ABSTRACT

The paper describes an approach taken by a mobile application eDietetik for the presentation of health-related information that is not allowed to be provided as a health claim. In this case, a mobile device running the application interacts with consumers, translating health-related information in an understandable and unambiguous way. Moreover, it may present an interface between different human stakeholders (i.e. consumers and manufacturers, consumers and health-care providers, manufacturers and policy-makers).

This paper presents a mobile application eDietetik aimed to support Slovenian consumers with special dietary needs in the selection of foods and drinks [1]. The application provides services tailored for people with coeliac disease, phenylketonuria, diabetes, arterial hypertension, and people with acute or travelers' diarrhea.

eDietetik instantly identifies selected nutrients and non-nutrients in food items using the camera on smartphones. A user simply points the smartphone's camera at the barcode on the product packaging, and the application identifies the product by the barcode, and displays whether the product matches the user's dietary needs (Figure 1).

The application is compatible with iPhone and Android, Symbian and Windows8 smartphones.

1 INTRODUCTION

In some diseases, dietary recommendations and guidelines are defined in a clear way. For instance, coeliac patients are educated to consume gluten-free food to control the disease. Gluten-free food cannot contain any wheat, rye, barley or mixtures of these grains. And any incidental gluten in a food must be less than 20 parts per million (ppm) in order to carry the gluten-free label. In Slovenia, the threshold of 20 ppm is defined by regulation [2].

However, there are other diseases, where dietary recommendations are unclear and undefined by regulation. Examples include infective diarrhea and inflammatory bowel diseases, where probiotics may help treat or prevent the disease. As the evidence from controlled studies is not convincing yet, the Slovenia has not allowed any statement (health claim) to be used on food labels, advertising that health benefits can result from consuming a given food or from its probiotic bacteria [3].

The rest of the paper is organized as follows. In Section 2, we discuss the current literature on human-computer interaction (HCI) issues for mobile computing in the context of mHealth systems as well as health claims. In Section 3, we present the approach taken by eDietetik to interact with a consumer on probiotic claims in a legal way. In Section 4, we summarize our findings, draw conclusions and provide directions for future research.
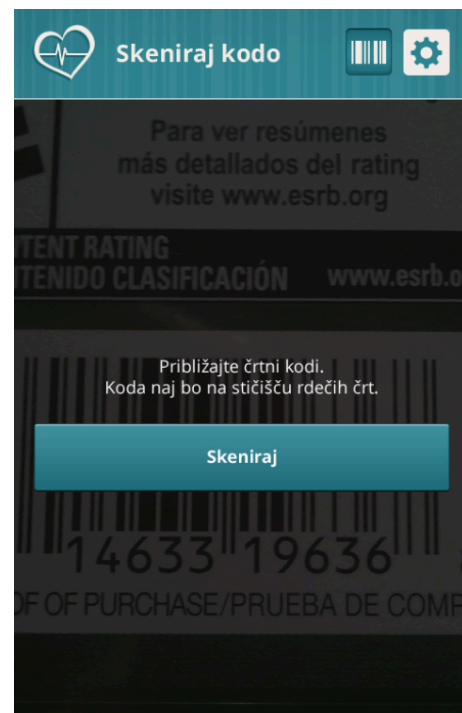

Figure 1: *eDietetik.*

2 HUMAN INTERACTING WITH MHEALTH

With the availability of mobile information resources, different interpretations of mHealth are evolving as people proactively seek out information from diverse contextual perceptions. mHealth applications are required to provide not only

- an efficient healthcare delivery via standardized electronic data interchange and standards-based enforcement of the confidentiality and security of health data, but also
- a delivery of any information in an understandable, unambiguous and legal way.

Studies have found that concepts in desktop computing are unsuitable for the mobile computing environment [4]. The main reason is that both a human and a mobile device involve a high degree of mobility. Special considerations include high-speed interaction, limited attention capacity, and context (time and space) dependency.

3 EDIETETIK INTERACTING WITH CONSUMER

The application informs users about the content of a given scanned food so that it displays its nutritional profile and a symbol interpreting the profile as "positive" or "negative" (Figure 2). The "positive" interpretation means that a given scanned food has the content of critical nutrient or non-nutrient below a given threshold. This threshold is provided by a default value that can be redefined by the user in his personal settings.

In this way, complex information about

- food composition data that are collected in a scientific way following EU standards [5] and
- national dietary recommendations and guidelines [6]

are interpreted by a computer (smartphone) for a human (consumer with special dietary needs). The user is supported with an information that may ease his decision on food purchase in order of seconds.

eDietetik also displays an information about the food product's name, producer, country of production, image and prices in different markets, provided by our users.

For eco-conscious users, carbon footprint is calculated and interpreted with a symbol in four different colours, i.e. green, yellow, orange and red.

In this way, information about foods and drinks is displayed for consumers with special dietary needs because of coeliac disease, phenylketonuria, diabetes and arterial hypertension. For these diseases, dietary recommendations and guidelines are specified in a clear way:

- Coeliac disease: gluten in a gluten-free food must be less than 20 ppm;
- Phenylketonuria: a safe amount of phenylalanine to be daily consumed by a patient is defined by his physician;
- Diabetes: the carbohydrate intake per day and each meal is defined by the patient's physician;

- Arterial hypertension: daily sodium intake must be less than 2400 mg or defined individually by the patient's physician.

Figure 2: *Information about the food content.*

3.1 Probiotic information instead of claim

Although some studies of both children and adults have shown that probiotics may help treat and prevent infective diarrhea and inflammatory bowel diseases, we are not allowed to claim any statement about probiotic beneficial nutritional or physiological effects in eDietetik. We follow the Slovenian directives as well as the Directive 2000/13/EC on the approximation of the laws of the Member States relating to the labelling, presentation and advertising of foodstuffs, to be replaced by Regulation 1169/2011 as of 13 December 2014.

For users with special dietary needs because of diarrhea, the application eDietetik displays

1. scientific and lay names of probiotic cultures (strains) contained in probiotic-filled foods as well as
2. the concentration of probiotic bacteria

without any symbolic interpretation.

The information about probiotics is obtained from the manufacturer producing a given scanned food product. If cultures are unspecified or the concentration of bacteria is unknown, the information is interpreted as incomplete. Similarly, if any probiotic culture does not fit with the cultures from the list of scientifically proven probiotic cultures or the number of bacteria is less than a threshold, the application warns the user about that (Figure 3). The default threshold (one billion) can be redefined by the user in the user's personal settings.

Figure 3: *Information about a new or unrecognized food.*

In this way, we provide eDietetik users with an information about probiotics and then it is up to them and their physicians to decide whether a given food product satisfies their dietary needs.

Collecting the information about probiotic-filled foods available in Slovenia, we realized that most products advertised as "probiotic" foods provide no information about the concentration of probiotic bacteria on food labels. Last year, the European Food Safety Authority (EFSA) rejected all probiotic health claims dossiers it had been sent for reasons such as inadequate strain characterization.

The application eDietetik also enables users to send us description and photo of new food products and those food products that are still unknown to our system (Figure 6). In this way, we are able to provide an interaction not only between consumers and eDietetik but also between consumers and manufacturers (human to human over a mobile device).

Figure 4: *Information about a new or unrecognized food.*

3.2 eDietetik Website

The mobile application may be uploaded to a smartphone from a website [7], where more information about diseases, dietary recommendations and guidelines, medical societies, and food manufacturers is provided.

There is an interesting tool *Food calculator* that can be used for the dietary assessment of a selection of foods or a meal (Figure 5). The application interacts with the user providing more detailed information about nutrients relevant for his disease. An unexperienced user may select food portions from pictures presenting three different portions as typically consumed in Slovenia. Foods can be searched by using a search facility or by exploring the list of already categorized foods.

The history of the usage of the eDietetik mobile application can be viewed in the *User's settings* section.
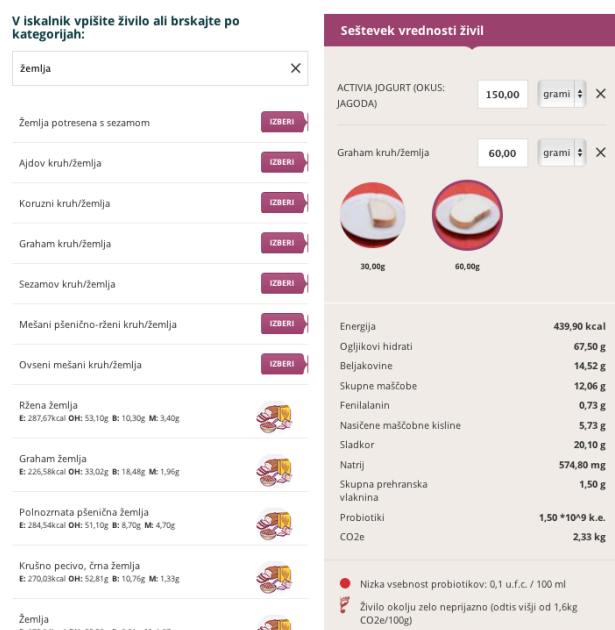
Figure 5: *Food calculator.*

4 CONCLUSION

We developed a mobile application eDietetik that informs Slovenian consumers about health and nutritional claims on foods and drinks. The paper describes an attempt of eDietetik to present probiotic information instead of health claims in a legal way.

In the near future, we are going to evaluate the mobile application in a clinical setting, where a degree of perception of probiotic information will be studied. The application will also undergo a different type of assessment and authorisation. The assessment of the application functionality in terms of technology (image capturing and barcode recognition) have been performed in our laboratory, and will be finalized by a group of experts (dietitians, physicians and food analyists) who will assess the application functionalty in terms of health-related information and food composition data. In addition, the application will be assessed by a group of patients and environmentally conscious consumers for the user friendliness of the application. We will do our best to receive a certificate like HONcode [8] that guarantees that the online health information is useful and reliable.

Currently, there are more than 10,000 users of OPEN that all have rights to access eDietetik as well. In average, every day, approximately ten new users register, and few ten users actively use some of the OPEN functionalities. In addition to the OPEN users, eDietetik will be actively used by most members of the Slovene Celiac Society (few hundreds) and the Slovene PKU Society (few tens). Patients will be informed about the application by dietitians at different hospitals. We have also introduced the application to the Slovene Nutritionist and Dietetic Association, and to school and kindergarten teachers (few hundreds) who daily

plan meals for children. As these potential users of eDietetik have different computer (and mobile device) literacy, most probably we will need to adapt the underlying concept of the human-computer interaction to the specific needs of the users.

References

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