Clever Shopper: Supporting In-Store Decision-Making

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Abstract. Grocery shopping can be a difficult task where the users are overwhelmed by the number of products available. It can be daunting to efficiently locate products and make decisions among dozens of brands to meet personal priorities (e.g., budget or nutritional value). To date, existing interactive systems supporting the grocery shopping experience do not help shoppers make informed decisions based on their priorities or preferences. To address this problem, and based on requirements gathered through contextual observations of shoppers, we have developed Clever Shopper, an on-cart, tablet application prototype that enables shoppers to quickly and visually compare key product features across brands based on their price, volume, and nutritional values. Clever Shopper also supports checking for product availability and directly guides the shopper to efficiently reach the product at its physical location in the store. Evaluation sessions with shoppers revealed important benefits of Clever Shopper and point to further improvements of the concept and prototype.

Keywords: decision-making, interactive visualization, grocery shopping

1 Introduction

Grocery shopping is a pervasive dimension of modern society. Shoppers are facing more challenges in making informed decisions in the immense variety of options available not only among stores, but also within a store, due to the growing amount of brands, variants, types of products and their quality. According to the Time Use Institute, the average time an individual spends grocery shopping is around 41 minutes per trip [1]. The amount of time and effort spent deciding which product to buy can be greatly reduced if an intelligent and appropriate support could enable shoppers to compare different products based on their preferences and provide suggestions and guide in the maze of options. Henneman [2] suggests having shopping lists where items are ordered by product category to save time in locating products. However, additional, important factors of a product, such as the price, brand, nutrition information also come into play in making a buying decision. To address this difficult problem, we propose an in-store, on-cart interactive design that will help an individual efficiently visualize and compare large sets of products across price, brand, nutritional information or type. This design will also include a dynamic store map that will help shoppers easily navigate through the store to locate products of interest. At this stage, the final design is a high-fidelity prototype system that demonstrates the key features supporting the desired shopper’s experience and can be feasibly deployed with existing technology.
2 Requirements Analysis and Related Work

To empathize directly with the experience of the shoppers and their hurdles, we conducted a Contextual Inquiry with five users by shadowing them while shopping in the supermarket. Based on the inquiry notes, we drew an affinity diagram and categorized them into two topics: decision making and product location. A sequential model summarizes the process of grocery shopping: generating needs for a product, locating products, decision making, adding them to the cart, and checking out. In this flow, during the contextual inquiry, we found that shoppers had difficulties focusing and reading the condensed information on the product packages. Another issue was their difficulty in locating the product in large stores without wasting precious time.

Systems based using RFID technology such as IRL SmartCart [10], MyGrocer [3] and Personal Shopping Assistants (PSA) [4] have already been developed. These systems use shopping carts equipped with an RFID reader to deliver specific product information when shoppers scan the products [3][4][5]. Dynamic route maps can help shoppers find specific products to make the shopping experience easier and less time consuming [3][4][5][6]. These systems provide decision aids by means of recipe recommendations, product recommendations, or promotional information [3][4][7]. To date, there is no in-store system that helps shoppers decide which products to buy based on their preferences. Our design will provide more precise decision aids with products comparison, customized by consumers’ preference, and based on price, nutrition, and related information. Moreover, the existing systems mostly display information in a text format and organize them into a dense list [4]. Our design will present the vast amount of product information in a highly-visual manner, especially when comparing products, so that consumers can capture salient information at a glance.

3 Conceptual Design and Prototyping

Based on the requirements analysis, we devised “Clever Shopper,” a concept design synthetically illustrated in Fig. 1. Our low fidelity prototype explored a number of unique ways in which data can be visualized and a number of design alternatives. Some of these designs like design 1 and 2 were inspired by the data visualization principles proposed by Tufte [8]. While the concept of using small multiples is useful when there are multiple dimensions [8], it is difficult for the user to analyze and understand such a huge amount of data spread across the entire console. Design 3 associates a “bubble” and its color with a particular product type or brand with the size of the bubble representing the product’s price. Design 3 was refined to form design 4, because the disc layout can be confusing or overwhelming to users. Design 4 is more intuitive with the customers performing sorting or filtering of the available options according to their preferences. This layout includes two charts, one displaying all brands varying across price and the other reserved for user workspace. A user may choose to perform first order sorting based on type of food product (this may vary based on cooking instructions or actual type of product) to filter out the undesired types. A second level of visualization may involve dragging and dropping the desired brands to the workspace to compare not only price but also nutritional information such as protein, calcium and so on.

In addition to providing all the data pertaining to a particular product (for instance price, brand name, nutritional information or type) and comparisons across products, our goal is to help customers make an informed buying decision using a feedback system that performs backend comparison based on user preferences. A barcode scanner is also attached to the console on the cart to scan many different products of the same kind and compare all of them visually by relevant parameters.
Our design will also suggest sample recipes for products along with their ingredients linked for reference that can be emailed or texted to the user. Our design makes the process of finding a product very simple for the user by providing a map and indicators through lights flashing on the console indicating the direction in which the user has to move. The current position of the user in the store is determined by means of a RFID service attached to the shopping cart [5], [10]. Another feature is the ability to manage an account for storing purchased items as a virtual shopping list. Every user’s account can be linked to a card that can be swiped to retrieve this information at the store.

![Fig. 1. Conceptualizing Clever Shopper: Products Visualization and Physical Location Guide.](image)

![Fig. 2. Alternative Visualization Designs for product comparison.](image)

## 4 User Evaluation and Future Work

User experience evaluations with five users involved assigning tasks searching for and comparing different brands of a particular product. Users successfully searched for the product, located it physically, and performed visual comparisons by using finger tap and drag gestures.
Some users insisted on attaching a physical barcode scanner to scan products to compare rather than tapping on a button named “Scan product to compare.” All the five users tested rated the interface as very good in terms of its appearance while three out of five users tested rated the interface as easy to learn. Some users found it difficult to navigate repeatedly between the visualization page and the product information page and required some help.

![Fig. 3. On-cart visual product comparison with Clever Shopper.](image)

With respect to existing systems, such as Smart Shopping Carts [9] or MediaCart [5], our design is different in that it provides a means for comparing different products in a visual manner and also helps guide a customer through the grocery store, thus saving time and energy. Further, our design helps the customers make informed decision while buying a product by providing suggestions based on their preferences. Given the modern technological platform, our design could be easily deployed. This design may also be implemented and further extended to provide suggestions to individuals as to what nutrition they need based on their body mass index (BMI), age, gender or even their doctor’s prescribed diet. Besides the on-cart experience, a mobile phone application with the added feature of using the built-in camera to take pictures of products for visualization and similar interactive comparisons is also envisioned. It can also be extended to form a system that will allow collaborative shopping with multiple users from the same home splitting the task of grocery shopping, and hence saving more time.

References

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