Crowdsourced Gamified Application to Streamline Grocery Shopping

Mark Hammond and Charlotte Tang
Department of Computer Science, University of Michigan-Flint
marhammo/tcharlot@umflint.edu

ABSTRACT
Grocery shopping has been mostly left out in the recent trend of applications that populate data through crowdsourcing. To better understand the way mobile applications can improve shopping, we interviewed eight participants about their current shopping practices, and their opinions on crowdsourcing and gamification. Our findings offered valuable insights to inform the design of a mobile application that can improve shopping experience with the (re)use of digital shopping list, and the gratification through physical rewards in a gamified way-finding shopping application.

Keywords: Grocery shopping, crowdsourcing, gamification.

Index Terms: [Human-Centered Computer]: Empirical Study

1 INTRODUCTION

Mobile technology has helped streamline the daily lives of millions of people in a variety of ways. However, the everyday task of grocery shopping has not received adequate support by technology [8]. Tired mothers have to cart their children through aisle after aisle searching for items they need for dinner; overworked individuals stop to pick up a few things on their way home. These people would likely benefit from a mobile application that helps them get all the items they need in an efficient manner.

The process of grocery shopping has been fairly consistent for many years, usually involving going up and down aisles and checking items off a list as you find them. Despite the prevalence of mobile devices, many shoppers continue to use paper lists to ensure they got all of the necessary items. Thus, a mobile retrieval system that mapped handwritten shopping list to actual products in a grocery store was developed to facilitate grocery shopping [7]. Yet, when an item is missed, it still requires retracing one's steps to find where the missing item is in the store [10]. Grocery shopping was also found to consist of three phases: a warm-up phase to replenish planned shopping items, a buying phase targeting at the day's needs, and a wrap-up phase to shop for new or discounted items [11].

Grocery stores are typically laid out in long aisles that contain like items. The aisles commonly have signs that describe the types of items in that aisle. While the signs cover most items, there are items that may be placed in an aisle that is not congruous with its signage. The aisle number has been found to be an adequate landmark for way finding, if the shopper is informed of needed aisles prior to searching [5]. However, the signage usually requires a shopper to get within a few aisles of the sign before it can be clearly read, but the aisle number is typically much bigger (Figure 1a). Thus, a context-aware system embedded in the shopping cart was designed to help improve grocery shopping experience [11], and an AR-enabled mobile application with color-coded tags to indicate healthy and unhealthy food items was experimented to assist shoppers to make healthier decisions during their grocery shopping [1].

Nevertheless, the placement of items in a store is not static. They may be re-located or sometimes removed for different reasons, such as to make room for new products or to meet the seasonal or festive needs of the shoppers [8]. It is thus important to get timely updates of their new locations so that shoppers will not be misled. The current research fills this gap by examining how crowdsourcing [9] may engage a large number of users to contribute to updating such dynamic information, and exploring how gamification through quests, story, levels, points, digital rewards, and digital representation can provide the user with a sense of accomplishment [2]. We also examined the use of two persuasive strategies, social comparison and reward, that can influence or reinforce behaviors, attitudes, and beliefs [3] as a means to help sustain the crowdsourced efforts.

a) b)

Figure 1: (a) Aisles in a local grocery store with clearly marked number signage, (b) A shopper with her child was checking her paper shopping list.

2 METHODOLOGY

We conducted semi-structured interviews with eight participants who were the primary shopper for their household residing in the Midwestern U.S. We aimed to identify their current shopping habits and challenges in locating items in grocery stores. We then showed them a mobile shopping application as a technology prop to stimulate discussion and to gather their opinions on a crowdsourced gamified application for improving their shopping experience. The application allowed users to create a shopping list, pick a store to shop, see aisle numbers of the items on their shopping list if such information was available in the database, and verify aisle locations of the found items to earn points. All our participants were female, aged between 27 and 62. Five worked full time, 1 retired, 1 home-caregiver, and 1 college student. Affinity diagramming was used to analyze the interview data.

3 FINDINGS

We identified current practices of our participants in their grocery shopping, from preparation to the point they have found all of their groceries. Our study also revealed a lack of knowledge in gamified systems among our participants, but found that physical rewards could be effective stimulants in engaging users in contributing to the crowdsourced shopping application.

3.1 Grocery Shopping Practices

Shopping list. All our participants developed a list of the items they needed to purchase ahead of time, with 6 using paper (e.g., Figure 1b) and 2 using a Smartphone application, namely Wonderlists and Notepad. The participants who used a paper list stated that it was easy and convenient to make a list on paper. They were also more comfortable with paper artifacts than digital formats. A participant who used a digital list said the reason was because paper was not usually readily available.

Shopping trip. Only 2 shoppers went grocery shopping multiple times a week. All of the shoppers typically went back to the same store or stores, whereas 4 participants visited multiple stores during each shopping trip.

Shopping route. Only 1 participant went down every aisle in all her shopping trips. She would also check out items that were on sale but not already in her shopping list to see if they might be needed in her household. All other shoppers would only look for and go down the aisles where the items on their shopping lists might be located, as they did not want to spend extra time in the store. All the participants spent about 45-60 minutes in a store and half of them followed the same general path every time.

Store map. All our participants had a basic map of the grocery stores that they frequented on their Smartphone. However 4 had never used the map while the other 4 only used it in special circumstances, such as when they had trouble locating items or when they wanted to locate sales merchandise. When we asked if they would use a map that showed them the path to the items on their shopping list, 2 of the participants said they still would not use it. On the other hand, 6 participants used a map if they were going to an unfamiliar store.

Locating items. Five participants stated that they rarely had trouble finding items inside of a store because they were very familiar with the store. The other 3 shoppers sometimes had trouble finding an item - on average 1 out of 4 trips. When the participants failed to locate an item they needed, 5 would ask store employees for help, 2 would just leave without the item, and 1 would search the aisles exhaustively for the needed item.

In summary, the current reliance on paper may require a solution to integrate paper lists into an application, similar to the mobile application to convert natural language to a digital list [7]. The tendency for shoppers to only go down needed aisles reveals a need for a targeted path through the store, which can be achieved through a map that can be customized based on the user's shopping list.

3.2 Perceptions of Crowdsourcing and Gamification

Using our shopping application prototype as a technology prop, we explored the participants' perceptions toward a mobile gamified application that update the location of grocery items through crowdsourcing, and rewards for their contributions.

Reluctance to crowdsource. We asked participants about the mobile applications that they used. Six participants used a variety of social applications on their Smartphone regularly, and they used Wikipedia the most often to seek information. Yet to our surprise, 2 of them were unaware that users populated the information on Wikipedia. Meanwhile, the participants did not show much interest when asked if they would contribute to building and updating a mobile map with item locations for their local grocery store. They were reluctant mainly because they were not willing to spend time inputting the information. Only 3 participants expressed their willingness if the application required only very lightweight interaction that would take at most a few minutes, similar to the interaction needed for the mobile navigation application, Waze [12].

Physical rewards preferred. We then showed the participants our shopping application and asked about their perceptions of the gamified system. In particular, we explored how persuasive strategies - social comparison and rewards [4][6] - might impact their willingness to contribute to the mobile application. With the prevalence of mobile applications particularly social media and mobile games nowadays, we were quite surprised to find that most participants were unfamiliar with the idea of gamification. Among our participants, fitness applications were the only type of gamified systems that they were aware of. Participants have tried such system and they were familiar with the in-application competitive leaderboards. Two participants however found current leaderboards badly designed and even discouraging. They preferred age-based leaderboards. The others either did not like these competitive features or did not understand how these features work.

Since the shopping application required input from grocery shoppers, our participants indicated that physical rewards in the form of coupons, rebates, or monetary rewards rather than virtual ones like reputation in leaderboards would be more effective in motivating them to interact with such an application. However, we were flabbergasted to find that the participants expected a monetary hourly return from $5 to $30 as compensation for their time spent inputting updates to the mobile application.

In short, we discovered that gamification is a relatively new concept to our participants who were the primary shopper for their household, and the lack of knowledge about crowdsourcing may contribute to their apathy to getting involved with populating data. Our study also revealed the importance of physical rewards, in lieu of virtual rewards, in keeping users engaged with and contribute to the shopping application.

4 Conclusion and Future Work

Our semi-structured interviews revealed that most of our participants still used paper lists, and a map with paths through the store based on their lists were found useful. Most of the participants were not interested in participating in crowdsourcing, unless physical rewards were offered for their contributions. We thus recommend grocery stores to collaborate with manufacturers to offer financial reward to the mobile shopping application participants. Our study also showed that crowdsourcing must be integrated into the natural flow of shopping. These findings revealed key insights into digital shopping list adoption, item proximity alerts, easy in-flow crowdsourcing, physical rewards, and gamification introduction techniques. Our next step is to revise our prototype for field experiments. On the other hand, although our research focused on the quotidian grocery shopping, our findings can benefit other everyday information spaces.

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