

Where2Buy: A Location-based Shopping App with Products-wise Searching

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Abstract—It is usual for a consumer to search a product based on its category and go to related kind of shop to buy a product, e.g. food in supermarket, a pencil from a stationary shop and etc. While it is not uncommon nowadays for a shop to sell various categories of goods at the same time, like a newspaper stand do sell toys, an accessory shop has stationary. However, consumer may not easily notice and purchase these goods, especially if they are in hurry or not familiar with the shops nearby. With the emergence and popularity of many shopping search engines (shopbots), we can actually provide a better matching between the consumer and seller. In this paper, we developed a shopbot app system (Where2Buy) on smartphone that can search and filter the nearby shops which sell the desired products. To simplify the input process, our system allows users to search by text or voice and fuzzy matching is supported to widen the scope of searching. Detailed information of related product and shops are displayed in the result, together with a navigation map showing the best route to the target shops. If the desired product is not available nearby, substitutes in the same category will be recommended for the users. Our user study evidences that our system is simply and easy to use. More than half of the participants prefer Where2Buy than the other available shopbots in Hong Kong.

Index Terms—Shopbot, Location-based Searching, Product-wise Searching, Substitute Product Recommendation, Mobile Application

I. INTRODUCTION

Due to the wide variety of products in the market and price difference between shops, consumers often need to spend many time to find out the most suitable products and shops before making any purchase. On the other hand, shops right now are selling a wider range or products in order to make better profit. This situation is common in large cities where renting costs are high. For example in Hong Kong, many newspaper stands will sell toys, an accessory shop has stationary for their customers. Thus, a comparison shopping engine (also known as shopbot) which can provide useful platform for consumers and shop keepers to search, compare, and promote their products is rather important.

At the moment, there are a number of shopbot which provides consumers ways to find out the shops which sell the desired product with the cheaper price easily. Reviews of the products can be posted on the platform to share the feedback or experiences of the consumers. By using these posted reviews, consumers can carefully examine the quality and condition of the product. Recommendation systems of the shopbot can further suggest other related products which consumers may be

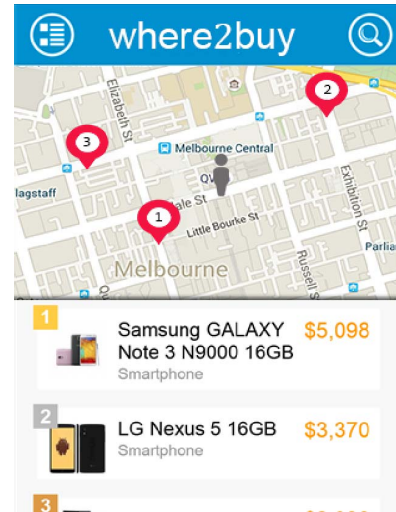


Fig. 1. Our Where2Buy shopbot app considers not only the products information, but also the distance between users and shops.

interested to. In Hong Kong, one popular example of shopbot is Price.com.hk[1].

Most of the existing shopbots focus on searching the products by lower price or better quality. However, when consumers urgently need a product, price and review may not be the most important criteria. For instance, when a consumer is thirsty on the street, this consumer may like to find the nearest shop that sell drinks. Instead of finding the shop with lower price or better quality, “easy-to-buy” may become the most important consideration in this situation. Unfortunately, “easy-to-buy” is rarely consider in the existing shopbots.

In this paper, we develop a shopbot app on smartphone, named with **Where2Buy**, that consider not only price and quality, but also this “easy-to-buy” criteria. Our Where2Buy system has three components, they are the smartphone app interface, the web-based administration tool, and the backend server module. Users (Consumers or vendors) can search products, post reviews, or update goods data by the smartphone app interface. Administrators (Server owners) can manage the system through the web-based administration tool, including approving account registration, and managing the product catalog. The server handles the backend process and the storage of the product database.

The search engine in Where2Buy has a distance-based shop

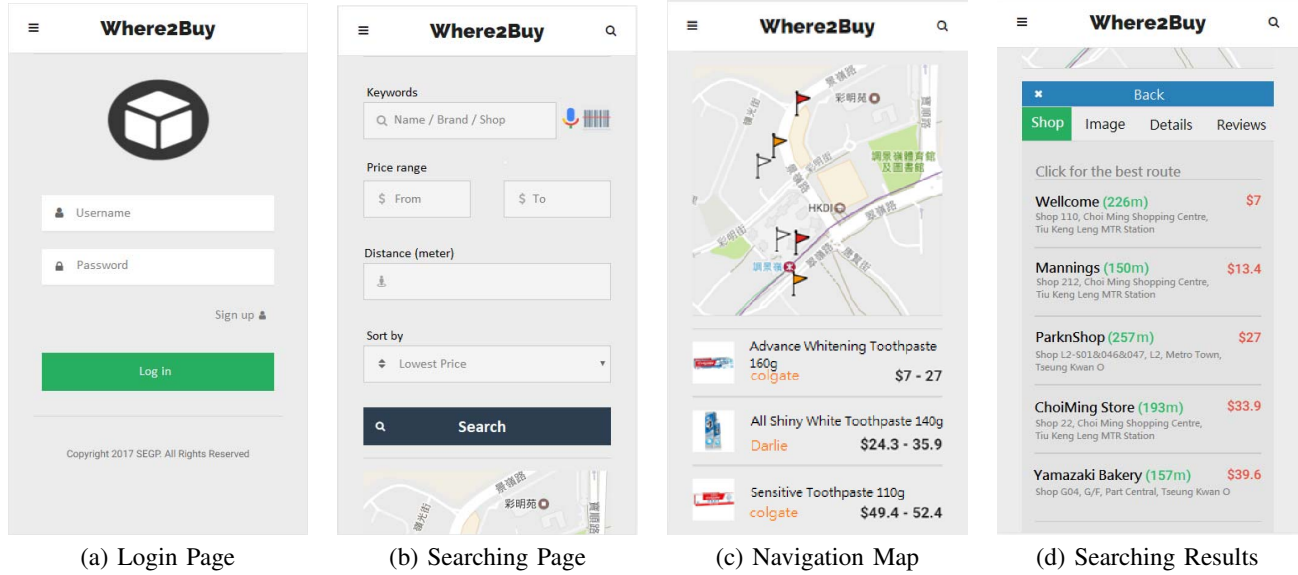


Fig. 2. The user interfaces of Where2Buy.

searching function. It allows the users to search the shops by using the distance between the shops and the location of users via global positioning system (GPS) in ordinary smartphone (Fig. 1). The searching results is displayed with a navigation map which shows the best route to the suggested shops. This navigation function allows the consumer to find and buy their desired products in an very efficient way. If a desired product is not available within a certain range, substitutes will be recommended to the user as an alternative by our intelligent recommendation system. To simplify the input process, users can input the keyword for searching using text or voice as our system involves voice recognition function.

Note that the product category of the shopbots in Hong Kong are often not comprehensive. They often mainly focus on a specific type of product, such as electronic product [1] or household product [2]. In Where2Buy, we target to contain all product category.

Our user study evidence that our system is simply and easy to use. More than half of all participants prefer our system than the other shopbots. 65.2% of the participants agree that Where2Buy can helps them to search uncommon product. We believe that our Where2Buy System will benefit most of the consumers who want to make any purchase, and the enterprises who want to promote their goods. Where2Buy may improve the efficiency of shopping for the consumers, as they can search and review the product more quickly.

Our contributions are summarized as follow:

- 1) We developed a Where2Buy system, a shopbot app, that can contain all product category. Text or voice input is allows for the users to input keywords into the search engine.
- 2) We consider the “easy-to-buy” criteria in the searching and provide distance-based shops searching in our system. A navigation map is used to lead to users to the

suggested shop.

II. LITERATURE REVIEW

Shopbot [3] is initially designed for finding lowest price music CDs [4]. Nowadays, there are many different shopbots available on the internet in different country, such as Shopping.com [5], PriceGrabber [6], and Yaoota [7]. They compare the price and reviews of the products between different shops to recommend the most suitable one to consumer.

In Hong Kong, we also have Price.com.hk [1] which is a price comparison website that focus on electronic products. Consumer Council Online Price Watch (CCOPW) [2] is another price comparison website that provides latest price and reviews of household product. Price-cream [8] compares the price of products in different supermarkets.

Most of the existing shopbots works on smartphone platform. They compare the price of all shops in a country globally. However, most of them do not consider the “easy-to-buy” criteria like us. Thus, they cannotfully utilize the advantage of mobile platform and handle urgent purchase. Instead, our Where2Buy system is a system that consider “easy-to-buy.” It searches the nearby shops of the user that sell the desired products with lower prices, so that the users can find and buy the desired product in short time. Gltekin and Bayat [9] developed a location-based shopping system with similar goal as us. While their searching can only provide user desired product but not similar ones or even provide recommendations when the desired product is not available nearby. Moreover, Where2Buy is a comprehensive solution to both shopper and seller, so a vendor version of the shopping app facilitates products input and inventory update.

There are research works related to searching method for browsing or searching product. Chen et al. [10] improve the attractiveness of a shopbot by presenting the information of

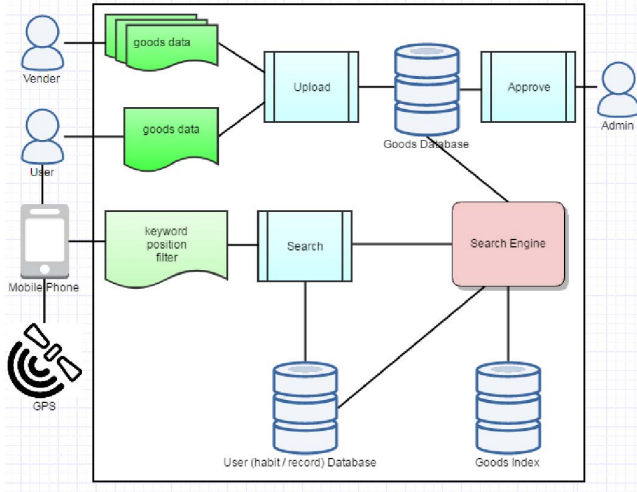


Fig. 3. The system diagram of Where2Buy.

the product based on known cognitive-biases. Fan et al. [11] use visual-based searching on E-bay to find out the product. However, most of them do not consider “easy-to-buy.” Yang et al. [12] presented an analogous idea to ours. They presented a location-aware system to tell the users the nearby shops. However, their system do not have price comparison features. In this paper, our ultimate goal is to model the “easy-to-buy” concept into the shopbots searching for urgent purchase.

III. SYSTEM OF WHERE2BUY

Fig. 2 shows the user interfaces of our Where2Buy. The user first need to login with their account before using our system (Fig. 2(a)). Then user can input searching keywords and other filter information for searching (Fig. 2(b)). Here, both text and voice input are supported. Then, the searching results will be displayed on both a navigation map and a list (Fig. 2(c & d)).

Fig. 3 shows the system diagram of our shopping app. It provides certain functions to the user, vender and admin for operating the system. According to the functionality, we divide it into three parts, which are product-wise distance-based searching, substitutes recommendation, and product management. We will describe it one by one. Finally, we will introduce our implementation in details.

A. Product-wise Distance-based Searching

One of the major strength of Where2Buy is its searching functionality which is underpinned by the document-based search engine. Fig. 4 shows the workflow of our search engine module supported by a document-based database. Our implementation employed Elasticsearch engine [13] and MongoDB which provide effective indexing, fuzzy matching in query and semi-structured data. Fuzzy matching allows single keywords to find terms with similar meanings at the same time. It also helps to tolerate certain spelling mistakes.

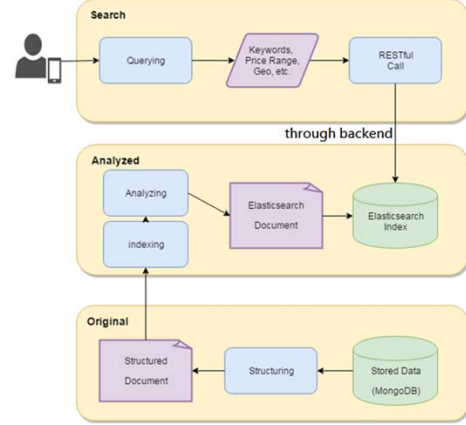


Fig. 4. The search engine module.

The core idea of our Where2Buy shopping app is to facilitate “easy-to-buy” criteria. We realize it by checking the current walking distance between the users and the shops (Fig. 2(d)). The current distance of the user is obtained by the GPS functions on ordinary smartphone. Our system allows the users to select the maximum distance in the searching results (Fig. 2(b)). Once the system obtain the searching results, the suggested shop will be listed on the user interface. Moreover, they will be displayed on a navigation map (Fig. 2(c)).

B. Substitute Product Recommendation

However, it is not guaranteed that the desired product can always be found in the user specified distance. In such case, substitutes are needed to provide recommended searching results. In Where2Buy, we provide two approaches to achieve this. One simplest way is to automatically loose the requirement of the filter, such as shops located with longer maximum distance or less strict pricing requirements. Fig. 5(a) provides a sample workflow of substitute recommendation by repetitively releasing the query criteria in a loop, which include the range of pricing and maximum distance.

Another way to recommend substitutes is by searching similar product category. For instances, if a user search for coke in our system, it is very likely that the user would accept any kinds of drinks. In Fig. 5(b), we demonstrate a case that when cokes cannot be found in a nearby shop, then the our system will automatically recommend products in the same category, i.e. drinks, and finally provided orange juice and apple juice options for the user.

C. Product Management

Product management is one of an important feature for shopbots. The vender can use our smartphone interface to manage the product of their shop easily. First, the venders need to login to their vender account in the login page of our system (Fig. 2(a)). Fig. 6(a) shows the user interface after login as a vender. It displays a list of product that is currently available in your shops, a filter feature is provided for the

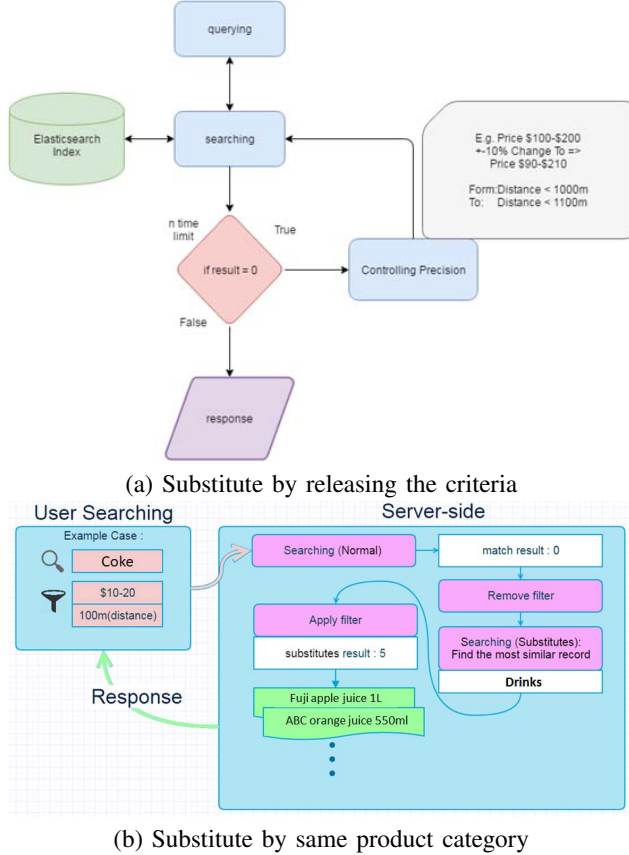


Fig. 5. Substitute product recommendation can provide other options for the user whenever the desired product is not available nearby.

vendor to quick search their items. By click any product in the list or adding a new item, vendors can add or modify the products information in the user interface (Fig. 6(b)). To simplify the input process, a barcode scanning feature is provided. The vendors can scan the barcode on the package of the products by using the camera of the smartphone. Then the information will be automatically obtains from the internet or database. This allows the vender to obtains product information in a very efficient way and avoid tedious input process for tons of the products in their shop.

Beside the smartphone interface, the vendors or administrators can manage the product lists easily via a web-based administration tool (Fig. 7). By using this web-based interface, they can add or remove any products, user, and shop information easily.

D. Overall Implementation

Our Where2Buy frontend system are implemented on Android platform by using Adobe Phonegap [14]. The voice recognition are achieved by Google Voice Search [15]. We adopt Elasticsearch [13] as our system search engine, which is a free and open source search engine running on Java environment. The navigation map on the user interface is built by applying the Google map API [16] directly. The location

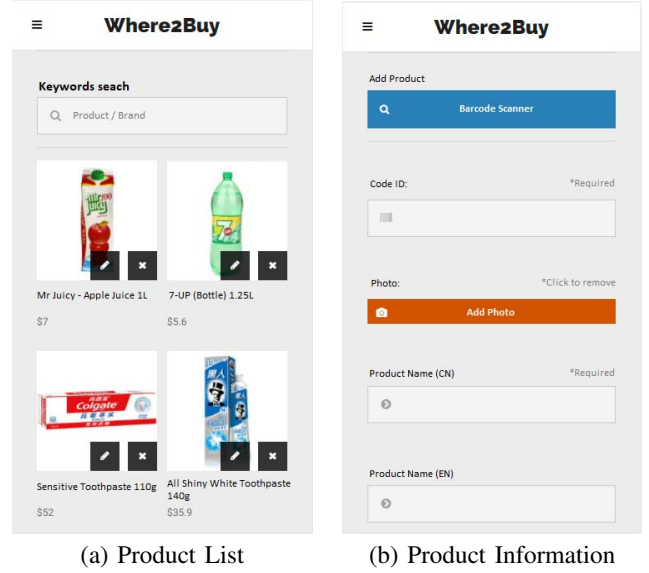


Fig. 6. The user interface for the vendors to add or modify the products information in their shops.

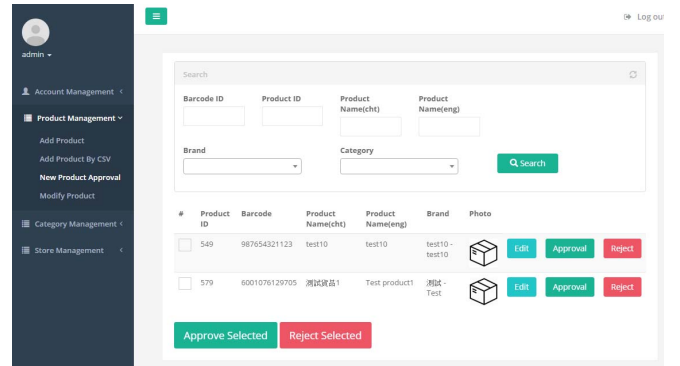


Fig. 7. The web-based administration tool.

marking and the navigation functions are all provided. The backend part of Where2Buy are implemented by PHP on a web server.

IV. USER STUDY AND DISCUSSIONS

To evaluate our system, we performed a user study. We invited 23 subjects with different age, gender, and education level to exam our Where2Buy system and return the feedback by answering several questions. All of the participants have the experience of using shotbot for recommending products. Table I shows the questions in the user study and Fig. 8 shows the statistic of the responses in the user study.

According to Fig. 8, most of the participants want to use shopbots as they are convenient and useful for price analysis before making purchase. 66.6% of the participants will consider to use Where2buy in the future after testing our prototype system. More than half of the participants prefer our system more than the others in Hong Kong. Most of the

- 1) Why do you want to use shopbots applications?
- 2) Will you consider to use Where2Buy?
- 3) Do you prefer Where2Buy more than other similar applications?
- 4) Is Where2Buy helpful for finding uncommon product?
- 5) Which are the advantage of Where2Buy?
- 6) Which features are important in Where2Buy?
- 7) Which are the disadvantage of Where2Buy?

TABLE I
THE QUESTIONS ASKED IN OUR USER STUDY.

participants agree that Where2buy is useful to find uncommon products and easy to use.

The distance-based searching and navigation map display, our core idea, are the most important features of where2Buy. Last but not last, the UI needs to be further improved according to the feedback of the subjects.

Based on the user study, our Where2buy outperforms the other existing shopbots in Hong Kong. The “easy-to-buy” criteria is attractive to the subjects. This evidence that our idea is solid and sound. We highly believe that our Where2buy has certain market value to both consumers and vendors.

V. CONCLUSION

In this paper, we developed Where2buy, a shopbot app on smartphone, to help consumers search and review products. Where2buy consider not only the price and the quality of the product, but also the “easy-to-buy” criteria. Our distance-based shop searching idea allows users to search the desired product from the nearby shops. A navigation map result helps the users to reach the suggested shops quickly and easily.

One limitation of our system is that our distance-based shop searching method considers the walking distance between users and shops. Even if the shops can be reached in a short time by bus, the shops are not consider in searching result. Another limitation is that we do not consider if the product is out of stock. If the user wants to buy a product urgently, the stock can be an important criteria for consumers.

In the future, we prepare to consider more aspects for “easy-to-buy” criteria in our Where2buy system. It may include the availability of products or the status of the shops (e.g., opened, closed, busy) for urgent purchase.

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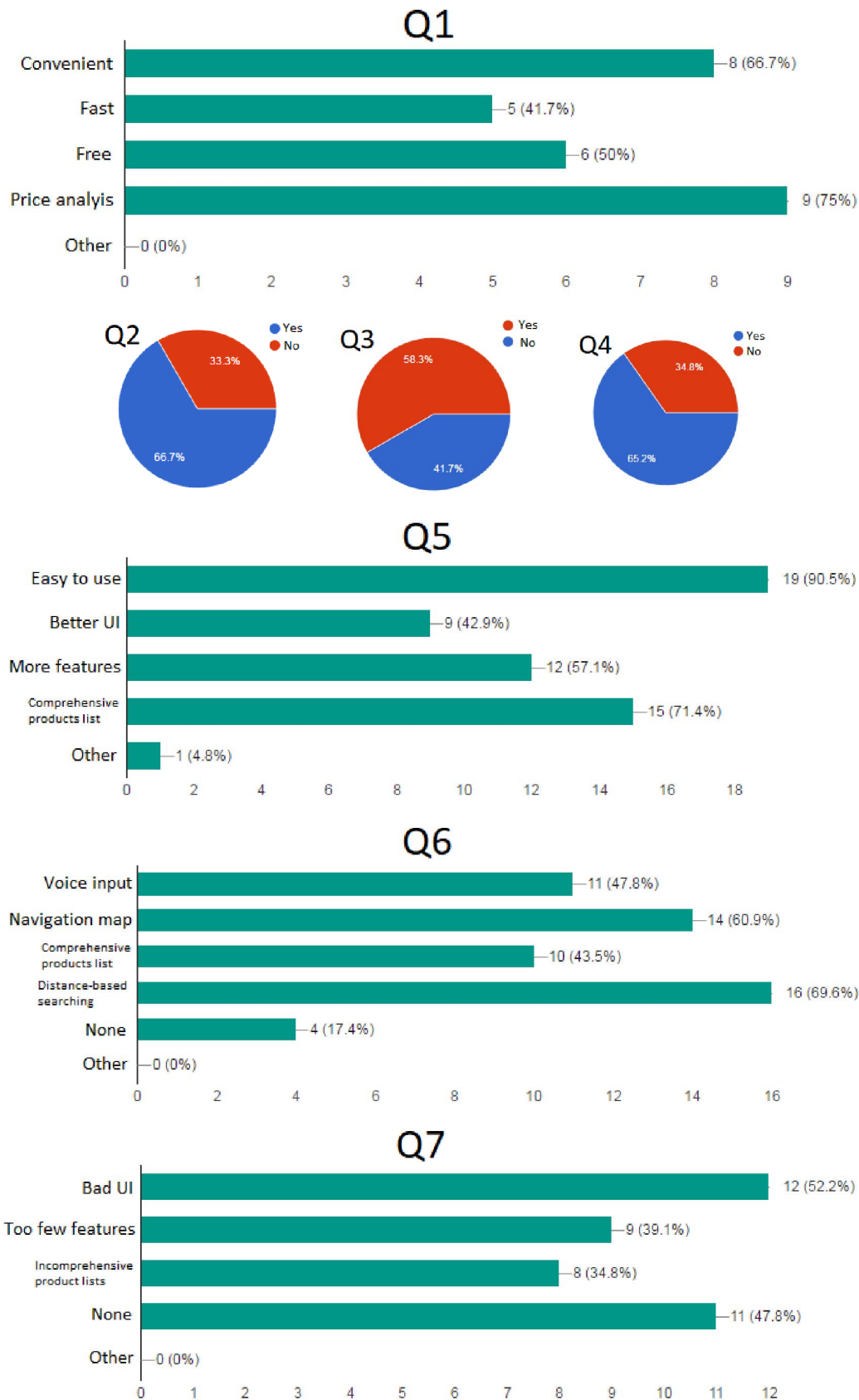


Fig. 8. The statistic of the responses in the user study.



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