Mobile Search with Text Messages: Designing the User Experience for Google SMS

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ABSTRACT

SMS (Short Message Service) is already a hugely popular communication technology for mobile phones, with users sending billions of text messages to each other every year. The goal of the Google SMS service is to provide this large existing base of users with access to the types of information they are most likely to need when mobile. Users simply send their query as a text message and receive their results in the reply. This enables users to search for information without having to upgrade their phone or subscribe to specialized mobile data services. In this paper we describe how we worked with the Google SMS team on the iterative design of the service's user experience. In particular, we focus on how we attempted to overcome two major constraints: the technical limitations of the SMS standard, and users' current conceptual models of both SMS and Google search.

Categories and Subject Descriptors

H.5.2 User Interfaces – *Interaction Styles, Evaluation*

General Terms

Design; human factors

Keywords

SMS; text messaging; search; mobile computing; user experience design

INTRODUCTION

Millions of people use Google every day to search for information. At present, most of these searches are done from a personal computer, but users also need to find information when they are away from a computer. Many cellular phone networks now enable users with the most up-to-date handsets to subscribe to mobile web browsing services.

Many users, however, still have older handsets which do not support these features. SMS (Short Message Service) is a technology that is far more widely supported among the

handsets currently in use. It allows users of GSM mobile phones to communicate with each other via short text messages. Worldwide, approximately 1 billion SMS messages are sent every day [2].

Google SMS is a service that builds on this popular standard to allow users of SMS-enabled phones to search for information when mobile, without requiring them to upgrade their handsets or subscribe to mobile data services.

How Google SMS Works

The user sends a query in a text message to the Google SMS short code (at the time of writing, the service works only in the US, at short code 46645). Google receives the user's message, parses the query, attempts to retrieve relevant information, and sends results back in one or several SMS messages.

The service is primarily aimed at supporting searches for specialized information such as business listings, residential listings, product prices, dictionary definitions, area codes, and zip codes. For example, if a user sends the text message "pizza 10013", Google SMS will return business listings (with names, addresses, and contact details) of pizza restaurants in the area with zip code 10013 (Figure 1a).
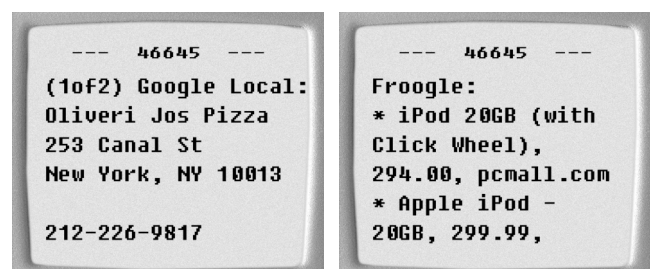
(a) query: "pizza 10013"   (b) query: "price ipod 20gb"

Figure 1: Example results for two queries sent to Google SMS (in the version that was launched in October 2004). They show only the few lines that would be visible without scrolling on many mobile phones. In example (a) the results are spread across two messages; only the first is shown here.

Note that Google SMS attempts to return the desired information directly, rather than returning hyperlinks to other resources containing the information. In the SMS

context, it would be awkward or impossible for the user to access such links.

DESIGN CONSTRAINTS

At the beginning of this project, we anticipated two major design challenges: users' existing conceptual model of SMS as a technology for communication (not search), and the technical limitations of both the SMS standard and common mobile phones.

Conceptual Model

At present, SMS is primarily used for 1-to-1 communication; Google SMS repurposes it to enable mobile search. We expected that this might be confusing to users, requiring them to adjust their conceptual model of the technology.

A related issue is that it has become common to use abbreviations in SMS messages, to save effort when entering text. Some of these are standard (e.g. "l8r" for "later") but many are ad hoc [1] – these are relatively easy for a person to understand, but potentially very difficult for an automated service to interpret.

Inherent Limitations of Mobile Devices and SMS

For text input, most mobile phones rely on numeric keypads, with multiple characters mapped to each button. Even with predictive methods such as T9 [3], text entry is slow compared to the keyboard of a personal computer, and can be frustrating when entering more than a few characters. Also, many SMS providers charge for each message sent, which may make users more reluctant to refine their queries.

In terms of output, mobile devices tend to have small, low-resolution screens that allow only a few lines of text to be displayed at a time (the disadvantages of small screens have been investigated by a number of previous researchers, e.g. [4]). In addition, a single SMS message is limited to 160 characters (including white space), and there is no guarantee that messages will arrive in the order they are sent.

In many ways, an SMS interface is comparable to a command-line interface: text-only and one-dimensional [5, p52], with no menus, forms, or buttons to help the user understand or remember its affordances, i.e. what the system is capable of, and the types of input it will accept. There are additional limitations, however: the user must send the first message in the interaction, so it is not possible for the system to offer initial instructions or a prompt. Also, to get any feedback on their input, the user must wait to receive a new message.

ITERATIVE DESIGN PROCESS

All of these constraints had to be addressed on a tight schedule, and this influenced our choice of methods. In this section, we describe our process, which included an informal heuristic evaluation, several cognitive walkthroughs, and two usability studies in the lab. At each stage, changes were made to the product based on our findings; we cover the main findings and resulting improvements in a later section.

Inspection Methods

To gather feedback for the product team early in the design process, our first step was an informal heuristic evaluation of an early prototype of the system, running on an emulator.

We conducted cognitive walkthroughs as needed during the design process, to enable fast iteration by providing usability feedback to the team while new parts of the system were being implemented. We created scenarios and tasks (e.g. a user who is in an unfamiliar city and wants to find a bookstore), and considered different user types (e.g. does the user already have web access on their phone?).

User Studies

Ideally, we would have conducted a field study early in the process, to identify users' needs in the mobile context, and followed up by observing usage of the prototype Google SMS service in realistic settings. Given our schedule, however, we decided to learn what we could from existing field studies of mobile users, and evaluate prototypes with lab-based usability studies. This had the additional advantage of enabling the Google SMS development team to directly observe users interacting with their product. We tried to make the scenarios and tasks as realistic as possible.

We conducted two main usability studies, using a similar method for both. Several design iterations occurred between the studies. We used 12 participants in total, half of whom were experienced SMS users; the other half had limited or no experience. We ended the first study after 6 users, having discovered all of the major issues after the first few.

In the first study, all participants used the phone we provided, a Nokia 6200. In the second study, participants were asked to use their own phones where possible, to facilitate a more realistic interaction. We reimbursed them for any charges incurred during the study.

In both studies, the phone was fixed to a desk, to allow us to create a high-quality digital recording of the screen, using a standard document camera. The camera output was also projected in the observation room, allowing the Google SMS team to see exactly how the user was interacting with the service. The one disadvantage of this setup was that participants could not hold the phone, making it harder for them to use their thumbs to type.

The scenarios and questions were based in part on our previous user research from relevant products, such as Froogle and Google Local. Initial questions covered proficiency with SMS and mobile information needs. Then, half of the users were shown the Google SMS web home page (with a description of the service and instructions on how to use it). The other half of the users in the first study

were asked to imagine that a friend had told them about a new Google SMS service at a particular short code; in the second study we provided a mock press release instead, simulating the situation where the user finds out about the service from a news story.

This was followed by a series of tasks, where we used a think-aloud protocol. In the first task, we asked the users to think of a situation where they had needed information while away from their computer, and we encouraged them to use the service to look for this information. This was intended to reveal how users would approach the system, as well as their initial reactions to it. After several minutes of allowing the user to freely interact with the service (and discover some of its functionality), we followed up with several more structured tasks. These were designed to test all major features of the Google SMS service while simulating a realistic and coherent mobile experience. For example, in one task users had to imagine that they were in a store and had found a DVD they wanted to buy, but were not sure whether the store's price was reasonable.

Finally, users completed a questionnaire, rating the potential usefulness of the service's existing features, and indicating any requests for additional features. Each session lasted about one hour.

SELECTED FINDINGS AND IMPROVEMENTS

By closely cooperating with the Google SMS team, we were able to quickly iterate on the design of the service's user experience. In this section we compile our main findings and describe the resulting design improvements.

Addressing Users' Existing Conceptual Models

As we expected, users' existing conceptual model of SMS (as a technology for communication) meant that most of them had some initial problems understanding how it could be used for search. For example, one experienced SMS user wondered at first whether a Google employee would receive their query and reply with an answer. However, we saw no queries containing the sort of ad hoc abbreviations that would normally be used in human-human SMS communication. Also, there seemed to be no relationship between users' initial understanding of the service and the way in which they were first introduced to it (help page, press release, or word of mouth). After their initial interactions with the service, the users seemed to understand how it worked.

We did not anticipate, however, that users' existing conceptual model of *Google searching* would also cause them some initial problems. With a web browser on a personal computer, users typically initiate a Google search by going to the Google.com web site (e.g. by typing its URL or following a link), and initiate a specialized search by going to the corresponding Google site, e.g. Froogle for product search. Consequently, some users expected at first that they would have to do something similar with Google SMS, to "log in" to the service, or trigger a mode for specialized searches. For example, several users started a product search task by sending a message like "shopping", expecting to enter a mode that would cause their subsequent messages to be interpreted as product searches. They were confused to receive an error message in return, telling them that their query had no results.

Changes to Message Interpretation

We recommended that for messages containing certain keywords (feature names or types such as "froogle", "shopping", "yellow pages", "white pages", "dictionary", and combinations of these names with keywords such as "help", "tips" or "instructions"), Google SMS should return a help message explaining how to execute the corresponding type of specialized search. For example, sending the query "shopping" now returns a message telling the user how to conduct a search for product prices.

In addition, we recommended changes to the service's query interpretation, to make it easier for users to remember how to trigger specialized searches. For example, we noted that many users included the word "price" or "prices" in their query when doing a task that required them to find out how much a given product costs online. We therefore recommended that this keyword should explicitly trigger a product search for the other terms in the query, e.g. "price ipod 20gb" (as in Figure 1b).

Communicating Affordances

Because of the limitations of the medium, the Google SMS UI cannot display its affordances to the user, or give them any instructions about what to enter. We realized that we would need to communicate with users through alternative channels, to set their initial expectations of the service and help them understand how to use it.

To promote a clearer conceptual understanding of Google SMS before the user's first interaction with the service, its web home page (currently http://sms.google.com/) and online help were rewritten and restructured. The page now features a minimal and prominent sequence of instructions at the top, and the features that study participants considered most useful are highlighted above the fold. The web page clearly details what types of searches Google SMS can execute and presents suggested use cases relevant to the mobile context. Screenshots of example queries and results are displayed to teach query formation and assist conceptual understanding.

Of course, most users will not have access to the information on the web site while away from their personal computers. Given that the UI of the service itself has no affordances or prompts, users may forget about its features and control mechanisms. In addition, some users may start sending messages to the short code without ever seeing the web home page – for example if they have read about the service in a news article, or heard about it from a friend. We addressed these issues in several different ways:

- We recommended after the initial heuristic evaluation that sending the message "help" to the service should return a concise set of instructions on how to use it.

- We collaborated closely with our PR team to ensure that their external communications about Google SMS mentioned the "help" command, as well as highlighting the most important features of the service.

- We worked with our Marketing team to develop a wallet-sized instruction card that could be distributed to potential users, or downloaded and printed.

Addressing the Limitations of Mobile Devices and SMS

We encountered several usability problems that were directly related to the inherent limitations of the SMS standard or of current mobile phones. While there was nothing we could do to eliminate these limitations, we aimed to reduce their impact on the user experience.

Order of Messages

A set of Google SMS results often consists of more than one message, and these may arrive out of order. The messages were numbered (e.g. "(1/2)") and users seemed to notice these labels, but continued to be confused about the message ordering of search results. When we inquired directly about their interpretation of the labels, it was clear that several users did not understand them, seeing only mysterious-looking fractions. However, spelling out the message number (e.g. "Message 1 of 2") was not a viable option given the restrictions on message size. We settled on the format "1of2" (as in Figure 1a), which all subsequent users understood.

Limited Input Technology

As previously discussed, the total cost of sending a query to Google SMS is significantly higher than that of using Google Web Search on a personal computer. Refinement of an existing query is also more difficult. One common type of refinement is fixing a misspelled query, such as "cofee". In a web browser, Google suggests a spelling correction which links to the corresponding results (i.e. "Did you mean *coffee*?"). In the context of SMS, this model would require the user to send an additional message and wait to receive the corrected results. We suggested that Google SMS should attempt to eliminate this extra step by immediately returning search results for the closest match.

Limited Output Technology

Similarly, the limited output technology available on mobile devices led to numerous usability issues that we had to address in Google SMS. It was especially challenging to design for a small screen that could only display a few lines of text at a time. For example, if the user entered a query that had no results, the initial version of the system returned a message containing a hint to use the help feature. However, this information was "below the fold" on most phones, and our study participants did not tend to scroll down far enough to see it. We moved this hint into the first few lines of the message, and capitalized the word "help" to draw the user's attention to it.

It was also difficult to provide comprehensive and useful help information to users, given the limit of 160 characters per message. Since many users can only store a small number of SMS messages on their phones, we decided to send no more than 3 messages in response to each help request, which further constrained the amount of information we could provide.

After re-writing the primary help message over several iterations of the product, we finally settled on a short message in two parts, focusing on how to use the key features rather than simply highlighting them. Since we knew that some of our users would receive these two messages out of order, we made sure that the content still made sense even if the second message arrived first.

CONCLUSION

In iterating on the user experience design for the Google SMS prototype, we found that users' conceptual model both of SMS and Google Search made it difficult for them at first to understand how to use the service. We also needed to address problems caused by the limitations of mobile phones and the SMS standard. We adapted the minimal UI as necessary, and worked closely with other teams (including Marketing and PR) to find alternative ways to set user expectations of the service and communicate its affordances.

Google SMS was launched in October 2004. At the time of writing, we are gathering initial feedback from users and continuing to iterate on the design of the user experience.

REFERENCES

1. Grinter, R.E. and Eldridge, M. Wan2tlk?: Everyday text messaging. In *Proc. CHI 2003*, ACM, 441–448.

2. GSM Association. *SMS (Short Message Service)*. http://www.gsmworld.com/technology/sms/

3. James, C.L. and Reischel, K.M. Text input for mobile devices: Comparing model prediction to actual performance. In *Proc. CHI 2001*, ACM, 365–371.

4. Jones, M., Buchanan, G., and Thimbleby, H. Sorting out searching on small screen devices. In *Proc. Mobile HCI 2002*, LNCS 2411, Springer, 81–94.

5. Nielsen, J. *Usability Engineering*. Academic Press, 1993.