

Towards the Design of Distributed Synchronous Applications

1 Introduction

Today, mobile phones play a crucial part of our daily lives. With smartphones accounting for almost half of all US cell phone subscriptions in 2012, [1], access to communications applications through iPhone's App Store and Android Marketplace is ubiquitous. Distributed Synchronous Applications, is a group of communications applications that allow geographically separated people to send and receive information in a timely manner. This report focuses on mobile phones and text messaging as an example of a Distributed Synchronous Application. I start by describing the text message communication channel and its affordances, understanding users and needs, and finally, making recommendations for the design of future applications. Emphasis will be placed on teenagers as they represent the most typical users.

2 Background and Context

This report is grounded in research that was published in early to mid 2000. This was an interesting and important time for social scientists as changes in mobile phone adoption were taking place right before their eyes, allowing them to collect rich data directly from the front.

While the first wireless cell phone networks supported text messaging, or Short Message Service (SMS), it was not until the introduction of "pay-as-you-go" mobile plans that led to increased SMS use among teenagers. Usually a parent purchased the mobile at nearly full cost and teenagers purchased additional "minutes" in the form of vouchers. The SMS protocol limited text messages to 160 characters. Additionally, mobile phones at this time had limited memory capacity with storage for 150 contacts in the address book, up to 10 text messages, and very limited picture and media space.

While technology has advanced since then, understanding the way people interact through this communication medium may still inform the design of future Distributed Synchronous Applications.

3 Understanding the SMS Communication Channel

A medium is the method through which communication occurs. Medium selection plays an important role in the context and process of communication. This section describes the SMS communication channel by making comparisons with IM, another Distributed Synchronous Application.

Characteristics of text messaging as described by research [2], [3]:

- Synchronous and direct form of communication using informal language.
- Costly because teens usually have to pay for usage.

- Mobile phone allows teenagers a high level of independence and privacy. For instance, they can hide their texting activities to avoid parental scrutiny. Text messaging is more private than voice calls.
- Interruption rate is high.
- Keyboard is limited making typing slow and tedious.

Characteristics of Instant Messaging as described by research [2], [3]:

- Synchronous and direct form of communication using informal language. Because frequency of use is dependent on user login, this mode of communication is not as direct as SMS.
- Free because parents pay for Internet.
- Due to the placement of the computer within the home, IM is less private.
- Interruption rate is low.
- Full keyboard allowing for fast typing.

Because interruption rate is high, the SMS communication channel affords more urgent and important messages compared to that supported by Instant Messaging. Messages will migrate to new mediums as the degree of urgency is increased. In terms of coordination, IM may be used to establish an initial plan to get together whereas SMS may be used for further coordination on the day. The communication channels offer varying degrees of usage. For example, text messaging may be used as a quick request to a homework question whereas Instant Messaging affords a broader discussion. Teenagers will choose the free IM over SMS whenever possible.

4 Understanding Users and Their Needs

Traditionally, the mobile phone was bought with the notion that it will increase one's security. As the mobile phone becomes pervasive in everyday life, other forms of use emerge. Ling and Yttri [4] were the first to identify themes associated with cell phone usage: accessibility is important for teenagers, coordination is important for career parents, security and safety are important for elderly users. They described the cell phone usage of career parents and teenagers in terms of micro coordination and hyper coordination, respectively.

4.1 Micro Coordination

Career parents use the basic functions of the mobile phone to micro coordinate, to manage the activities of everyday life. Mobility offers 3 main coordination activities not available through regular landline communication. 1) Mobile phones help career parents to redirect trips that have already started. For instance, while driving home, one parent may receive a call for a request to pick up milk. 2) Mobile phones also create a "softening of time", such as sitting in a traffic jam and calling group members to let them know you will be late. 3) Mobile phones allow for a progressive arrangement of meetings. For instance, two people may call each other while in transit, to confirm the time and location of their meeting. Because these activities can only be done while one is in transit and away from a landline means that

mobiles are well suited for the micro coordination of career parents and active adults.

4.2 Hyper Coordination

In addition to coordination, teenagers often use their mobiles in expressive ways to promote emotional and social interactions, in a manner known as hyper coordination. In their study of text messaging among teenagers, Grinter and Eldridge quantitatively support Ling's and Yttri's theory by showing that micro coordination accounted for roughly 70% of all messages exchanged while hyper coordination constituted the rest [5], Figure A.1. This pattern of adoption is specific to the teenager's particular life period.

It is important to place the phenomena of adolescence in its proper context. The teenage years are seen as a rite of passage from childhood to adulthood. According to Rubin [6], "this is perhaps the only time in [their] lives when friends come fully to center stage, transcending all other relationships in immediate importance...". For instance, a teen's address book is a quantification of her popularity and it must be kept full. While this is the case, research shows that teens actually communicate with a small percentage of these contacts [5], [7]. A teenager's relationship with family is often a struggle for independence. The mobile phone helps teenagers to be more accessible to their peers while maintaining outside the purview of parents. Grinter and Eldridge show that teens exchange 90% of text messages with peers and the rest with family members [8].

The expressive use of mobile phone for teenagers goes beyond simply sending and receiving chain text messages, jokes, and pictures. Teens sent creative messages such as haikus where the message body is exactly 160 characters. I find it particularly interesting that text messages have replaced handwritten notes to friends in class, an activity I remember partaking in as a teenager. These expressive messages are a confirmation of a relationship that is refreshed with each new message transaction.

The quality of the relationship resembles closely to that of traditional gift giving practices. Teenagers treat certain text messages, call credit and mobile phones as gifts [8], [9]. As Taylor and Harper write, "it is through the offering of the gift - the ritual exchange - that the gift takes on its meaning". For instance, the nightly "goodnight" text message exchanged between friends is made special through the observation of ceremony. The text message comes to mean more than just the words; it becomes an offering of commitment to the relationship. Half of all goodnight messages are sent between a teenager and the most frequent regular contact [5]. Text messages also have emotional significance as they can be used to recall memories through later readings. Text messages and memories are intimately entwined. Each message resembles a gift as it carries with it a symbolic meaning for the recipient.

Different age groups have their own distinct uses and needs for a cell phone. The next section discusses how usage pattern can be translated into design.

5 Implications for Design

Clearly, different age groups have different needs for a mobile phone. Incorporating these needs into the design of future Distributed Synchronous Applications may lead to more efficient devices for career parents and more expressive devices for teenagers.

As Ling and Yttri noted, career parents and active adults use the mobile phone to micro coordinate their daily activities. They suggested giving mobile phones access to third party databases, such as bus schedules, to encourage micro coordination. Today, Vancouver's Transit app exemplifies their vision.

Conversely, teenagers use the mobile phone in a more expressive manner. Ling and Yttri suggested incorporating chat technologies, such as IM, into mobile phones to allow teenagers to express themselves with people outside of their immediate geographical peer group. They also envisioned incorporating games to mobile phones to extend expression beyond individuals and into groups. Today, examples of their vision include mobile Skype (for chatting) and Angry Birds (for gaming).

Taylor and Harper noted that the teenager's quality of expression through mobile phones is consistent with gift giving practices. They suggested a memory solution that would further enhance association between an object (such as a text message) and its symbolic meaning. The object can be shared and swapped to further support gift giving practices. For instance, memory cards can embody all sentimental memories of one person. Multiple memory cards can represent a whole group of friends. Today, the increased memory capacity in mobile phones means messages need never to be deleted so that their meanings can remain in tact. Instagram is a photo sharing application between friends.

6 Conclusion

This report examines mobile phones and text messaging as an example of Distributed Synchronous Applications. Text messaging offers a quick and direct communication channel that affords urgent and important messages. Career parents and active adults use mobile phones to micro coordinate their everyday activities. Mobile phone applications that benefit this group include ones that support coordination, such as accessing bus schedules on the phone. In addition to micro coordination, teenagers use mobiles in expressive ways, or hyper coordination. Expressive mobile phone applications for this group include chat, games, and those that support the sharing of memories between friends.

- [1] Nielsen, "Smartphones Account for Half of all Mobile Phones, Dominate New Phone Purchases in the US," *Nielsen Wire*, 29-Mar-2012. [Online]. Available: http://blog.nielsen.com/nielsenwire/online_mobile/smartphones-account-for-half-of-all-mobile-phones-dominate-new-phone-purchases-in-the-us/.
- [2] C. Heyer and M. Brereton, "Socialising across channels: group multichannel communication," in *Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments*, New York, NY, USA, 2006, pp. 421–424.
- [3] R. E. Grinter, L. Palen, and M. Eldridge, "Chatting with teenagers: Considering the place of chat technologies in teen life," *ACM Trans. Comput.-Hum. Interact.*, vol. 13, no. 4, pp. 423–447, Dec. 2006.
- [4] R. Ling and B. Yttri, "Nobody sits at home and waits for the telephone to ring: Micro and hyper-coordination through the use of the mobile telephone," *Telenor Forskning og Utvikling, FoU Rapport*, vol. 30, p. 99, 1999.
- [5] R. Grinter and M. Eldridge, "Wan2tlk?: everyday text messaging," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, New York, NY, USA, 2003, pp. 441–448.
- [6] L. B. Rubin, *Just friends : the role of friendship in our lives*. New York : Harper & Row, 1985.
- [7] M. Ito, "Mobile Phones, Japanese Youth, and the Re-placement of Social Contact," in *Mobile Communications*, Springer London, 2005, pp. 131–148.
- [8] R. E. Grinter and M. A. Eldridge, "y do tngrs luv 2 txt msg?," in *Proceedings of the seventh conference on European Conference on Computer Supported Cooperative Work*, Norwell, MA, USA, 2001, pp. 219–238.
- [9] A. S. Taylor and R. Harper, "Age-old practices in the 'new world': a study of gift-giving between teenage mobile phone users," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, New York, NY, USA, 2002, pp. 439–446.

Appendix A

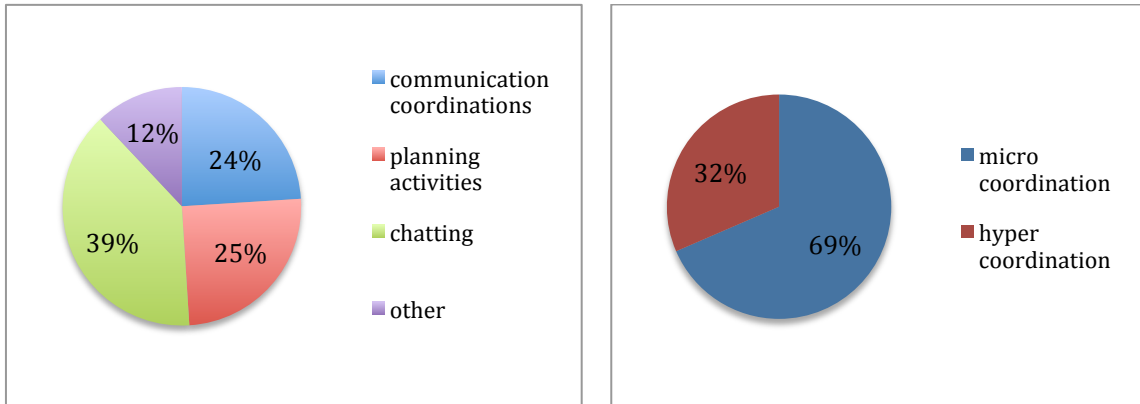


Figure A.1 - Grinter and Eldridge [5] present quantitative evidence of teenager text messaging activities [left]. Their findings are consistent with that of Ling and Yttri where 70% of all messages relate to micro coordination and 30% account for hyper coordination [right].