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Abstract

Research on email, voicemail, and instant messaging highlights the extent to which conversations often consist of multiple messages exchanged over a fairly extended period of time, using more than one communication medium. This research in progress explores the impact of increasing availability and integration of communication tools on media switching practices, which is the act of changing media in the course of a conversation. Specifically, the research outlined examines media switching, and the impact of media integration on it, through a multi-phase study of Instant Messaging and IP-Telephony practices. The study focuses on the effects of integrating Instant Messaging and IP-Telephony on media switching. In particular, the nature of media switching observed in the study is from Instant Messaging to other forms of media including telephone, face-to-face conversations, and email.

Keywords: Human computer interaction, computer supported cooperative work, instant messaging, IP-telephony, media switching, media integration, outeraction

Introduction

Conversations are often perceived as occurring at a single point in time or in a single medium. However, research on email (Mackay 1988), voicemail (Whittaker et. al. 2000), and instant messaging (Nardi et al. 2000) challenges this perspective by highlighting the extent to which conversations typically consist of multiple messages exchanged over a fairly extended period of time: days, weeks, or even months. Further, such conversations are often maintained not just by face-to-face interactions, or a single communication tool such as email, but can also be carried out with the help of a range of communication media (Whittaker et. al. 2002). In our study we view conversations to be topic based exchange of multiple messages that occurs over multiple communication media and extended periods of time. People often switch from one medium to another during a single conversation using either synchronous or asynchronous communication tools. This results in media switching, which we define as the act of changing media in the course of a conversation.

We hypothesize that media switching is occurring more often today than in the past because we are using a greater variety of communication tools each of which has a specific set of advantages in specific situations. Further, we hypothesize that media integration which we define as the combination of various communication, conversation, and contact management tools (e.g. PDA-mobile-phones can now be used to manage phone conversations, email, and voicemail through software such as Microsoft

Outlook) that enable seamless communication across various contexts and tasks, also encourages media switching behavior. The research in progress outlined in this paper is the first to systematically address these two issues.

Background

A variety of theories and reasons have been put forward to explain why individuals select one medium over another, these include: media richness (Daft & Lengel 1986); task objectives (Trevino et al. 1987); technology acceptance (Davis 1989); the need for group action (Guthrie 2002; Dennis & Valacich 1998); social or political culture (Romm & Pliskin 1997); and social richness (Connell et al. 2001). The emphasis of media choice research has been on the significance of differences between face-to-face and individual types of mediated communication, addressing issues such as why individuals use the phone or email, rather than engage in a face-to-face conversation. While these theories and associated studies are of considerable value, their research focus has ignored issues such as media switching, integration, and conversation management (Whittaker et al. 2002). In contrast, research on Instant Messaging (IM) user practices has paid attention to conversation management, awareness and media switching because of the widespread use of the technology for these purposes.

IM is a form of near synchronous, mediated communication that displays availability of other potential communication partners online through a "buddy list" for the exchange of messages (Nardi et al. 2002). There are numerous freely downloadable IM's such as AIM, Yahoo Messenger, ICQ, Trillian, etc. IM has gained popularity in the last few years for use in both social and work related interactions. It is estimated that nearly 40% of the population in US use IM for communication, with the number of messages having grown by 50% in the last year alone (Forrester Research 2002 as in Harmon 2003).

Media switching has been examined widely in studies conducted with IM in the workplace. Nardi et al. (2000) found that media switching from IM to other media (such as phone or face-to-face meetings) in the workplace occurred primarily for two reasons: 1) complexity of conversation and, 2) outeraction, defined as "communication processes outside of the direct information exchange that enables people to reach out and enhance the information exchange" (p.79). Outeraction includes such tasks as the use of information communication to negotiate individual's availability (e.g., "Can we talk now?") and media preference (e.g., "Can I come to your office in a couple of hours to talk to you?"). Isaacs et al. (2002) analyzed thousands of workplace IM logs and found that 31% of IM conversations in the workplace were for the purpose of scheduling or coordinating conversations of which 17.8% resulted in media switching from IM to either face to face (8.8%), telephone (6.8%) or other asynchronous forms of communication (2.2%). These findings suggest that IM is an ideal medium to examine media switching.

One of the issues raised in IM studies where media switching was examined, was the potential value of integrating IM with telephony (Nardi, et al. 2000; Isaacs et al., 2002). These studies hypothesized that such integration may result in ease and convenience of media switching. One way to integrate IM use with telephony on personal computers is through the integration of IM with Internet Protocol Telephony (IP-Telephony). IP-Telephony, also known as Internet Telephony, enables telephone calls to be routed through the Internet (Gralla 2001). Advances in technology and network connections have elevated IP telephony from being a mere cost saving technology to one that delivers quality sound over the Internet. IP-Telephony is becoming increasingly popular as it offers a cheap alternative to Public Switched Telephone Network (PSTN) long distance calls. Going beyond carrying voice, its applications include integration with multimedia services such as text chat, video, games, and shared application (Polyzois et al. 1999; Jansenn et al. 2002). While industry-based trials have highlighted the advantages and potential of the IP-Telephony technology, its rate of adoption is slow. Bradner (2002) attributes this to a "significant mindset problem to be overcome" concerning traditional telephony.

To date consumer IP-Telephony use has typically occurred using standard PC hardware. Kulathumani (1999) has suggested possible usability problems in absence of transparency to user, such as an interface that retains the capabilities of original phones. This suggests that a handset similar to a regular phone may improve usability of this technology. Considering the research into IM practices, and the current state of IP-Telephony technology and consumer adoption, it makes sense to examine media integration and its impact on IM media switching, through a study of IM practices with and without integration with IP-Telephony.

Motivation and Value

Research suggests that communication needs to be understood beyond the act of information exchange based on task or purpose (Whittaker et al. 2002). Management and progress of interaction and communication is influenced by negotiation of availability, establishing shared communication zones that include switching between media (Nardi et al. 2000). In this study, we examine

media switching and media integration. In particular, we want to understand if increased media options and/or media integration leads to increased media switching. While research seems to suggest IM-Telephone integration to be useful, little direct observation on user experience in switching between these two media has been conducted (Nardi et al. 2000; Isaacs et al. 2002). This study also examines IM media switching practices in the home computing environment. This approach is of value because IM at present appears to be primarily used outside of the work environment (Grinter & Palen 2002; Harmon 2003). Furthermore, while previous research has focused on ethnographic studies and IM log content analysis, this study will explicitly collect data to examine various reasons for media switching from IM. In addition, unlike previous research, our study will differentiate between immediate media switching, and outeraction processes such as scheduling and coordination that may or may not lead to media switching at a later point in time. Finally, our initial pilot study suggests that ease of media switching is a valuable measure of communication tool usability, an approach that has not been adequately addressed by HCI theory. In addition, content analysis of the IM conversation logs will be carried out to in order to understand reasons for media switching.

Hypotheses

Testing of the following hypotheses on media switching and media integration between IM and IP-Telephony, are the primary focus of the experimental study.

> *H1: Frequency of IM use is positively correlated with switches from IM to other media.*
> *H2: User IM experience is positively correlated with number of switches from IM to other media.*
> *H3: Addition of IM-Integrated-IP-Telephony will result in increased use of IM*
> *H4: Addition of IM-Integrated-IP-Telephony will result in an increase in total number of switches from IM to other media.*
> *H5: Addition of IM-Integrated-IP-Telephony will result in decrease in switches from IM to media other than IP-Telephony.*

Pilot Study

We recently completed a semester long pilot study to:

(1) Ensure the adequacy of our techniques for collecting IM switching and coordination habits, IM discourse logs, Call Detail Records for IM-Integrated-IP-Telephony product;
(2) Assess the validity and reliability of our survey methods;
(3) Ensure that we could effectively provide IM-Integrated-IP-Telephony services to subjects as required; and
(4) Explore the overall value of our approach through semi-structured interviews and analysis of pilot data.

The pilot study consisted of a student survey (96 students), a field trial with two experimental groups 1) IM only (55 subjects) and 2) IM and IM-integrated-IP-Telephony software and hardware (10 subjects), and semi-structured interviews (14 subjects). The subjects for the pilot study were all undergraduate students in the College of Computing Sciences, at NJIT, taking an introductory IS course. Preliminary findings from this pilot study are discussed in sections after the methodology of our field study.

Method

Subjects

Approximately 300 students in various undergraduate courses of College of Computing Sciences, *NJIT,* will be surveyed over the summer and fall 2003. From this group 50 students with a broadband connection at home will be selected as the subjects for the field and qualitative study outlined in this paper. The study phases of the field study are described below.

Study Phases

Phase I: Student Survey

Students in undergraduate courses of College of Computing Sciences, NJIT, will be surveyed to collect information about their IM use (such as years of experience, number IM types used etc), history of technology adoption (such as computers, laptops, PDA, mobile phones, etc.), Internet access, etc.

Phase II: IM-Integrated-IP-Telephony Field Study

Details of study are given below.

Phase III: Semi-Structured Interviews

To gain a clearer understanding of what motivates media switching practices, we will conduct twenty five semi-structured interviews. During these interviews, subjects will also be asked to demonstrate and discuss how they used the study technologies. We hope that the semi-structured interviews will help elucidate experimental findings. We also hope to gain general understanding of user experience with IM-Integrated IP-Telephony software and hardware. Further, we hope to discover future research topics in this area.

Field Study Design

Subjects will be assigned to one of the following two experimental groups using a random stratified sampling technique: 1) IM only and 2) IM and IM-integrated-IP-Telephony software and hardware. The IM use of both groups will be logged for 6 weeks. Half way through the study, the group with IM-Integrated-IP-Telephony software will be provided with IP-Telephone handsets and a calling plan. This will provide data on media switching, coordination, and other outeraction processes before and after the introduction of IM-Integrated-IP-Telephony. The subjects will be keeping logs, filling online surveys, and participating in semi-structured interviews for data collection as described in a later section below.

Field Study Technology

The following technology is used for the field study:

1) *Instant Messaging:* Freely available MSN IM software will be used by subjects

2) *IM-Integrated-IP-Telephony Hardware:* The IP-Telephony hardware used in this study will be an off hook handset connected to the USB port of a PC as shown in Figure 1 below.

Figure 1. Anonymous IP-Telephony Handset

3) *IM-Integrated-IP-Telephony Software:* MSN software is integrated with IP-Telephony enabling the regular telephone numbers of all the users in the "Buddy List" to be stored in the system. It creates an automatic telephone link between people already in an IM conversation, thus facilitating a seamless transition from IM to phone. An end user can make a call to the person mid-IM-conversation by simply picking up the handset off the hook and without having to dial the number.

4) *IP-Telephony Service Plan:* The service will enable the users to 1) make outgoing calls to other subscribers of the same IP-Telephone service, 2) make outgoing calls to regular PSTN phones, 3) receive calls from subscribers of the same IP-Telephone service, 4) receive calls from regular PSTN phones. In other words, during the study, the subjects' regular phone service except emergency 911 service can be replaced by the IP-Telephony service plan.

The IP-Telephony handsets and IM-integrated-IP-Telephony software are provided free of cost by Eutectics and the IP-Telephony service is provided free of cost by Everest Broadband Networks. The subjects will use their own Internet services such as DSL and cable.

Data Collection

IM usage will be logged and archived using freely available software for MSN Messenger. Subjects will be encouraged to provide us complete uncensored log files of their IM conversations. However, they will have the option of 1) sending us a log where all exchanges are noted but personal text content is removed; or 2) running a script over the archive to remove the content of messages exchanged while keeping other important data. Subjects will also be required to manually log their IM media switching practices and IM generated co-ordination /scheduling practices which may or may not lead to a media switch. This includes details such as the date/time of media switch, reasons for switch, medium switched to etc as listed below. Call Detail Records (CDR) logged by the service provider, Everest Broadband Networks will be used to monitor the IP-Telephony use during the study.

The data collected from each subject regarding IM use includes:

1) IM session logs to obtain:
   a. Number of IM sessions;
   b. Length of IM sessions;
   c. Number of switches from IM to other media; and
   d. Time of switches from IM to other media.

2) Online logs manually maintained by each subject on the following:
   a. Time of switching from IM to other media;
   b. Time when a meeting is coordinated or scheduled using IM;
   c. Type of switching from IM to other media (e.g. to IP-Telephone, Regular Telephone, Mobile Telephone, Face-to-Face, Email, etc); and
   d. Primary reasons for switching from IM to other media such as simplifying conversation, increasing conversation efficiency, clearing misunderstandings, persuasion, urgency, etc.

Preliminary Findings

While we are still in the process of analyzing the data from the pilot study some interesting preliminary findings from the pilot study were noted. It was found that 15.96% of IM conversations resulted in a media switch and 16.94% of IM conversations were used for coordination. The most common reasons cited for media switching was 1) to "simplify conversation" (40.22%) 2) increase communication efficiency by talking (34.09%) and 3) coordination (29.5%). These findings are consistent with the research findings of Nardi et al. (2000), which focused on use of IM in the work setting.

The most common type of media switch was from IM to phone (39.48% which includes IM to Regular phone (17.24%), IM to Mobile phone (16.48%) and IM to IP-Telephone (6.13%)) followed by IM to Face to face (31.03%). This is extremely interesting because only a very small number of students had the ability to switch to IM-Integrated-IP-Telephony in the pilot study which suggests that integration where available is associated with a high level of media switching. It was also interesting to note that significantly large number of media switching was attributed to "enhance friendly relations" (24.52%) and "to hear the person's voice" (20.68%).

Expected Significance

From this study, we hope to expand our knowledge of the impact of media integration on media switching. Apart from testing our hypotheses stated above, we also hope to gain understanding of broader questions such as 1) How does media integration

influence the frequency and nature of media selection and media switching? 2) How does technology experience relate to media switching? And, 3) What are the implications of media integration for CMC-Tool design?

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