Instant Messaging in Teen Life

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ABSTRACT

Instant Messaging (IM) is being widely adopted by teenagers. In a study of 16 teenage IM users, we explore IM as an emerging feature of teen life, focusing our questions on its support of interpersonal communication and its role and salience in everyday life. We qualitatively describe the teens' IM use interpersonally, as well as its place in the domestic ecology. We also identify technology adoption conditions and discuss behaviors around privacy management. In this initial investigation, we found differences in the nature of use between high school and college teens, differences we propose are accounted for by teens' degree of autonomy as a function of domestic and scholastic obligations, the development of independent work practices, Internet connectivity access, and even transportation access. Moreover, while teen IM use is in part characterized as an optimizing choice between multiple communications media, practice is also tied to concerns around peer pressure, peer group membership and creating additional opportunities to socialize.

Keywords

Instant Messaging, Teenagers, Chat, Communications, Domestic information technology, CSCW, HCI, qualitative user study

INTRODUCTION

Teenagers' use of Instant Messaging (IM) is on rapid rise, and has been a recent object of media attention. Indeed, the popularity of IM indicates that synchronous (or near-synchronous) text messaging and presence awareness has a place in teenage communications, despite an array of competing media available to them [21]. However, little is empirically known about how and why teens use IM. To that end, this paper reports findings from a qualitative study of IM use within this population.

The objective of our investigation was to explore the space of issues pertaining to IM's place and salience in teen life and, by so doing, inform the growing area of CSCW

research in domestic environments. We sought to identify the major features of IM use, and describe our findings in terms of teen IM adoption paths, the nature and purpose of IM social congregation, and the place of IM in the domestic ecology. We then turn to an analysis of privacy regulation concerns and practices for IM communications, as well as privacy regulatory mechanisms that support IM use within the home. Finally, we propose that the role and salience of IM in teen life shift as teens age and acquire greater autonomy.

INSTANT MESSAGING

Operational Overview

IM systems support Internet-based synchronous text chat, with point-to-point communication between users on the same system. A window is dedicated to the conversation, with messages scrolling upward and eventually out of view as the conversation ensues. IM also supports group chat, with users inviting others to join them in a specified "room." Some systems, such as AIM and ICQ, make some chat rooms public. In some IM systems, pictures and URLs can be included in the messaging. Colors and fonts are personalizable.

"Buddy" lists display information about IM cohorts. Buddies' on-line handles (usernames) are displayed, along with indicators of activity (usually as a function of input device use) and availability (as inferred by activity and as stated explicitly by user-specified settings). Buddies can be sorted into user-defined categories such as "friends," "family," "co-workers" and so forth.

From IRC to IM: Text Chat Past and Present

Instant Messaging is the newest and most popular incarnation of near-synchronous text chat technologies. UNIX "talk" and "write" have supported one-on-one conversation for over twenty and fifteen years, respectively. Multi User Dungeons (MUDs) and Internet Relay Chat have supported multi-way real-time text chat for over a decade. Zephyr is another multi-way real-time text chat facility first developed at MIT in the late 1980s and subsequently adopted at a number of academic institutions [1].

MUD and IRC systems tend to be used for supporting communications between strangers or, more accurately, people who do not know each other in real space. These technologies enable people to congregate around topics or

activities of common interest, from gaming to discussions of research [22], although off-topic conversation might ensue once initial contacts are made. Like IRC and MUDs, Zephyr communications are often topic-centered (organized around "instances") with a large but constrained population of users (university students). Research on these systems has focused on the opportunities and difficulties that these virtual user communities experience in the context of public chat (see for example [1, 4, 20, 22]). Today IM offers analogous public chat rooms organized around such topics as "Britney Spears" and the television show, "Sex and the City."

However, IM distinguishes itself from previous text messaging technologies by users' predominant messaging with known others. One-on-one and small group chat characterizes use in the workplace, where IM is considered a valuable component of coordination in some places. Existing empirical studies of IM examine mostly workplace use [2, 9, 10, 15, 24, 27], with findings sharing common features. In particular, the informal communicative nature of IM supports much workplace activity. The ability to ask and respond to questions without overt interruption, possess general awareness of co-workers' availability, participate in social banter and so forth, support the conduct of work and reinforce the social "glue" that ties people together. Although IM is gaining popularity in the workplace, the institutional imperatives of research lab and high-tech environments where much of this research has taken place [2, 15, 24, 27] tend to support the activities associated with informal chat. The work of Herbsleb et al. cautions that challenges for the adoption of IM systems can still be found in some workplaces where "informal chatting" of any kind needs explanation and justification to be understood and valued [9].

Teenage IM Adoption Wave
Empirical study of IM in the workplace has illuminated adoption factors and use characteristics among adults. We draw on these observations and findings to explore the concurrent adoption wave among teenagers, an area rife with interesting and open research questions (see for example [12, 21]).

Within the context of CSCW research, we believe that teenage IM adoption offers three potential insights. Firstly, teenage IM adoption marks a significant entry of collaborative information technologies into the home. Studying teenagers' use of collaborative technology in the home offers new insight about its role in the domestic ecology. Secondly, since most teenagers have little previous experience with technologies that convey presence between remote peers, they must learn what it means to be simultaneously private and public people. Finally, teenagers are the workforce of the future, and communication habits they develop now may indicate what we can expect from them as adults.

THE STUDY
Method
The objective of the study was to understand and identify the most salient attributes of teenage IM use. The intention was to take a grounded, bottom-up approach to the investigation, allowing the most common and significant issues to emerge from the inquiry, with few initial expectations. To that end, we restricted the study to IM users only, studying non-use only from their perspective, albeit acknowledging that the study of non-users should figure into future investigation. We note that one participant was 20 years old, and therefore slightly outside the teenage demographic. However, he shared much in common with the 19 year olds in college, and we chose to include his data in this paper after finding that IM usage characteristics among young people appears to be correlated to increasing autonomy in part as function of student status.

With a set of 16 teenage IM users (whose descriptions follow) the first author conducted in-depth interviews [14] lasting from 1/2 to 3 hours each. Interviews with P1-4 took place in the United Kingdom and P5-16 in the United States. Following the interviews and with participant permission, the first author added participants' usernames to her buddy list to make general observations about participants' on-line activity and to verify participant estimates of time spent on-line.

Participants
All 16 participants were IM users employing at least one of the four most popular IM systems: AOL's Instant Messenger (AIM), ICQ, MSN Messenger (MSN) and Yahoo! Messenger. Four teens resided in the UK with the remaining in United States[1]. Three participants lived in dorms at their universities, while the others lived at home with their families.

All participants lived in regions where the local economies centered on computing and telecommunications. Our assumption was that this population of people leads others in technology adoption, and that examination of such a group forecasts future practice of wider and more diverse populations.

Table 1 summarizes select demographics and IM characteristics.

INSTANT MESSAGING IN TEEN LIFE
In this section, we describe our findings about teenage use of Instant Messaging in detail. We organize the discussion in terms of IM use frequency patterns, IM adoption factors and trajectories, IM cohorts, the nature of IM-based social congregation, and the relationship between IM technology and domestic environments in which it resides.

Use Frequency & Connectivity Profiles
IM use is generally characterized by two different patterns: discrete or continuous connectivity. Discrete connectivity generally describes a user with a dial-up Internet access using a modem and/or a shared computer. These

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[1] We found that after analysis of this data, as well as the first author's experience from empirical study of UK teen use of short text messaging, differences between US and UK teens were minimal along the dimensions we discuss in this paper.

Participant	Sex	Age	Years of IM Use	Residence	Internet Access Technology	Share or Own Personal Computer	Reported IM use /day (Hours)[α]	Reported # IM Buddies /Session[β]
P1	F	15	3	Family	Modem	Share	2-4	6-8
P2	M	16	3	Family	Modem	Own	<=2	6-8
P3	M	16	3	Family	Modem	Share	2-4	8+
P4	M	19	6	Dorm	Ethernet	Own	24	6-8
P5	F	14	3	Family	Modem	Share	2-4	5-8
P6	F	14	2	Family	Modem	Share	<=2	4-6
P7	F	15	2	Family	Modem	Own	<=2	6-8
P8	M	17	3	Family	Modem	Share	2-4	1-2
P9	M	17	5	Family	DSL	Own	<=2	1-2
P10	M	17	2	Family	DSL	Own	<=2	1-2
P11	M	17	6	Family	DSL	Own	<=2	3-5
P12	M	17	5	Family	DSL	Own	<=2	3-5
P13	M	17	5	Family	DSL	Own	24	3-5
P14	F	17	7	Family	Modem	Own	<=2	3-5
P15	F	19	7	Dorm	Ethernet	Own	24	3-5
P16	M	20	3	Dorm	Ethernet	Own	24	6-8

Table 1: Teenagers' IM Demographics

[α]Reported IM use per day refers to total length of IM sessions, and does not reflect whether the teenagers engaged in IM exclusively or switched between IM and other activities. Those who left IM on continuously are noted as reporting 24 hours per day.

[β]Reported number of IM buddies is a self-report estimate of how many buddies are IM-ed during any one on-line session.

conditions make it impossible for teenagers to stay on continuously. Their IM use can be characterized as intensive and focused, with other concurrent Internet activity. Participants who shared this profile reported IM sessions lasting no more than 3 hours.

Continuous IM connectivity is possible when users have a dedicated DSL or Ethernet connection and a personal machine. All college students had such conditions, as well as high school teens P9-13. This usage is typified by sporadic IM use intermingled with other computer and non-computer activities. IM windows might remain open over a period of days with bits of conversation added across the day. Sessions might only be terminated when a reboot is required. However, we note that even when conditions make "always-on" use possible, some participants (P9-12) reported their use to be much more like discrete users.

Technology Choice & Adoption

Instant messaging is finding its way into teen communications despite a lack of system interoperability, which would intuitively seem to be a major obstacle to adoption. After all, other text communications technologies like e-mail and SMS benefit from being interoperable. For teenagers, peer pressure is a major catalyst in IM adoption, and helps overcome the problems that a lack of interoperability initially presents.

Among our participants, IM communications are mostly restricted to one's "real space friends"—people who first met face-to-face in physical space settings such as school or summer camp. Technology adoption is best described as group-wise, similar to the discretionary, bottom-up pattern found with shared calendaring systems [9, 19]. A group of friends settles on a particular IM system while others in the social group are encouraged to join in, using the same system. P4, for instance, used one IM system with his college friends and a different IM system with his high school friends. He and his high school friends had collectively decided on one IM system, but when he arrived at college, another system was already dominant. Only P16 had found a technical solution to the problem of having friends that used different IM systems. He used Jabber, an interoperable IM client for MSN, Yahoo! and ICQ.

Our participants experienced high and sustained IM use because of a desire to conform to and increase socializing opportunities with their peers. For example as P6 explained, it was a matter of "be on or be out." Another, P5, offered that she started using it "because all my friends were talking, and I didn't want to miss out." Peer pressure helped to achieve a critical mass of users within a social group, which in turn sustained long-term use [13]. Over time, claiming membership in a particular social group rested in part on the ability to participate in IM communications. IM use was also sustained by the desire to socialize and keep abreast of social event planning, as was similarly found in the case of SMS [8].

Participants reported being annoyed by IM non-users and complained of the inconvenience and additional work required to contact them. Moreover, non-users' lack of IM presence rendered them even somewhat invisible, or at least missing-in-action: one participant (P6) complained about not feeling like she knew where her friends were. Indeed, some participants felt that maintaining relationships with IM non-users was more difficult than with IM users.

Price performance also figured into adoption success for this population. Their IM clients were free. Moreover, the hardware and connection set up costs were absorbed by the "domestic infrastructure"—either the parents who bought the machines and paid for the Internet connection and/or a university that provides Internet connectivity in dorm rooms.

Limited financial resources coupled with a great desire to socialize meant that participants were sensitive to the relative costs of all technologies they used or could use. They also actively sought solutions that maximized their communication opportunities while conserving money. This was made especially clear by those participants who used a dial-up connection to IM. Participants knew that for the cost of a local call to an Internet service provider, they could communicate with several of their long-distance as well as local friends via IM. Choosing IM over the telephone, then, is not just determined by its conversational affordances, as media richness theory [6] would predict [11]. Rather, constraints faced by its users, including price performance concerns, limited social congregation opportunities and a desire to create private conversational

spaces, (which we discuss later in the paper), figured in to the decision to use IM.

Email was reported as serving different purposes than IM, consistent with other experiences around IM media choice [15, 21]. All participants had email accounts they checked regularly. In fact, email was often used to coordinate IM sessions with others, but did not replace IM. Participants described email as having more "formal" purposes, such as college application submissions and communications with teachers. Among this population, email was used for communications that require careful thought and time to compose and spell-check, even over the course of multiple days.

In addition to IM and email, the British participants used Short Message System (SMS), a nearly instant text messaging service for mobile phones. (Only half of the US teens owned a mobile phone and none of them used SMS). These teenagers felt obligated to monitor their incoming SMS messages all the time [8, 25], even while using IM on a desktop machine. This again illustrates how media choice is determined by several factors, including obligations to others to participate within a particular medium, a function of critical mass [11] that is in turn is a function of group membership assertion.

IM Cohorts

For most participants, their IM peer group reflected their real space relationships. For high schoolers, the most active IM social groups mirrored those at school. Some of the high school students also reported having contact with distant friends they had either met during vacations or at former schools. The use of IM to maintain real space relationships with distant friends was even more pronounced with college teenagers.

College students living away from home also used IM as a way to maintain ties with their families, as Nardi et al. also found among office workers [15], and, in some cases, were the evangelists that encouraged their families to adopt IM. P15 reported making a special point of regularly IMing her parents and siblings to reinforce their use.

Participants reported that they did not use the public IM chat rooms. A number of participants observed that the chat in these rooms was a "waste of time" because the quality of the content in public chat rooms was extremely poor. However, some participants did have one-on-one chats with strangers. P8 observed that he usually did this when his friends were not on-line. P4, P8, and P16 each reported talking with strangers but used other chat technologies to do so, gravitating towards systems with public chat organized around defined topics. Specifically, P4 and P16 used IRC, and P8 used Aimster, a combined music-sharing and IM client, to share and discuss music with like-minded strangers, a practice consistent with Brown et al's [3] findings that people who share music on-line also like to talk about it with potential recipients.

These observations suggest that IM might be conceptualized differently by users than preceding chat technologies. We hypothesize that IRC, MUDs and MOOs are conceptualized as "destinations," with users knowing where to congregate with like-minded people. IM, on the other hand, appears to be conceptualized more neutrally as a general communications tool for reaching known others but without the constraints of keeping to particular topics, much like the telephone or email.

Social Congregation: Means and Purpose

Participants explained that IM allows them to converse with friends outside the places and times that socializing is traditionally permitted. IM also made congregating with multiple people in such places and times easier than telephones permitted, simplifying their coordination and planning processes.

Study participants, particularly those in high school, explained that they "needed" to use IM to talk with peers after school, with some claiming that they had too limited social time during school hours. As P5 explained, the trend in her school district was to start and finish school early, with very short breaks in between. Many of the participants had structured activities scheduled in the afternoon, leaving, they felt, too little time to converse face-to-face.

How did peers congregate using IM? One way was to send out IM system-generated invitations to join in a chat session. Some also reported talking about IM at school, making arrangements to meet on-line later. Some participants reported asking their friends to "IM me" after school. This integration of technology references into everyday speech was also found in studies of shared calendar use, where users would use a specific calendar software name to instruct others to "Schedule Plus me," for example [18]. This language use then re-asserts technology use within the social group, a reciprocal process Giddens calls "structuration," a concept Orlikowski in turn applies to information technology use phenomena [7, 17].

Additionally, as best as the interview data could indicate, it appeared that the participants developed expectations for when they could find their friends on-line. These times varied, but they had enough local cultural and personal knowledge about their friends to make educated guesses. They employed cultural knowledge about events and activities in which their friends would be involved, such as watching a popular television show. Personal knowledge of friends' schedules, such as extra-curricular activities and domestic rhythms of their homes, were also calculated into decisions about when to go on-line.

Times for IM use were different for the high school- and college-aged teens. For high school teens, use of IM commenced after school, a time of reduced resource contention for those who shared computers or Internet access with other family members; later in the evening, computer access often had to be negotiated with family members. Logging on immediately after school also offered continuity to the day's events, the primary topic of conversation. Even when high school teens owned their own computer and had their own connection (P9-14), computer time still had to be balanced against other family activities. The college students, all of whom had dedicated computers and continuous Internet connectivity, had less

predictable schedules, leading to an IM pattern of use where participants reported simply leaving IM windows up for particular friends, adding to the conversation every now and again.

Three primary activities characterize teenage IM communications: informal talk or socializing, event planning, and schoolwork collaboration, any or all of which might occur in a single IM conversation (similar uses have also been reported in [12]). IM communication for both teens living at home and at college can be broadly described this way, although the nature of their engagement with these concerns varies with the degree to which school activities overlap with peers and degree of personal autonomy. We highlight some of these differences here, but explore the factors that explain the differences more deeply in the Discussion.

Socializing

Participants explained that informal conversation —everyday chitchat—was the primary use of IM. Unlike Usenet Newsgroup or even most IRC chat, the conversation was not dominated by specific topics. Since IM peers knew each other in real space, and often shared school experiences, the nature of their conversation was reported to be much like what they have in real space: reflections on the day's events, gossip about others including what clothes were worn and who was seeing whom, and so forth. Another category of IM chat among this age group that has been reported elsewhere is "chatting up" or flirting and even breaking up with boyfriends and girlfriends [12, 21].

We found differences between the college and high school students in the reported nature of the talk. Because the college teens no longer shared as many of their daily activities with their friends due, in part, to different class schedules, accounts of personal daily experiences tended to be shared as news updates, rather than as rapid-fire, gossipy exchange. It would appear that as people develop more autonomy, the nature of the conversation with their peers changes.

Event Planning

Social congregation enabled by IM systems also involved event planning, such as meeting others for shopping, seeing a movie, and so forth. The younger the teen, the less spontaneously and independently they could engage in such social activities, in large part because of access to transportation, as well as because of their own family's internal rules and obligations. For this sub-population of teens, IM was surprisingly efficient at enabling multiple people to coordinate around these numerous constraints all at once, coordination that was once subject to multiple iterations of dyadic telephone conversations until appropriate arrangements for all could be met. As P5 explained, making arrangements by phone "took forever to get it sorted out."

IM removed some of the complexity in many-person coordination. Participants described instances where friends proposed a plan together in a group chat session, sometimes accompanied by simultaneous use of the WWW to gather relevant information, such as film start times.

After leaving the computer briefly to request parental permission and transportation to the meeting location, they described rejoining the conversation and either confirming or revising plans until everyone's criteria had been met.

The older teenagers in college did not have the same constraints, and this was reflected in the nature of their IM conversations. A much more salient use for these users was spontaneous event planning, similar to the informal planning use reported by Nardi et al [15]. Because of their greater autonomy, college students were able to exploit the immediacy of IM to issue spontaneous invitations to meet for coffee, for example, to friends who also had few constraints imposed by others.

Schoolwork Collaboration

All participants reported using IM for some kind of homework support. This use of IM seemed to increase with age, with the younger teenagers valuing camaraderie while working on homework, and older teenagers either actively preparing for or already in college wanting to coordinate with friends on-line to ultimately improve course grades.

The older school teens reported using IM for a number of different types of school activities. P9-P14, who all attended the same school, described using IM to discuss course readings. P14 also reported using the text-based properties of IM to practice writing French by having French-only conversations with school friends.

The growing shift from using IM as primarily a social medium to one that incorporates discussion of work activities culminated at college age for our participants. Entirely responsible for their own schedules, commitments, and schoolwork, the college students reported using IM in ways that resemble the IM practice of office workers. For example, P15 explained that she used IM to schedule face-to-face meetings with a group of people who were working together on a course assignment.

Finally, one of the college-age teenagers was using IM as a teaching tool. P4 worked as a teaching assistant for an undergraduate college class, advertising the times he would be available on IM to discuss programming problems with students. (Anecdotal reports also suggest that adult teachers are experimenting with IM as a medium to field questions from students.)

Multitasking

All participants reported that they regularly used IM while engaging in some other computer-based activity, such as completing schoolwork, web surfing and emailing. Multitasking across several applications is a common feature of use across populations of users, as demonstrated by the findings of Lenhart et al [12] and Nardi et al [15].

Participants also reported engaging in concurrent IM conversations. Some participants reported that they would often be involved in a central group conversation while concurrently engaging in multiple, side one-on-one conversations, often with the some of the same people involved in the group conversation. These side

conversations were often spawned to make comments that are inappropriate for group consumption.

Multiple conversations resulted in multiple windows for the user to track. Some participants felt that they had a personal threshold (that depended on the amount of attention they could devote to IM at any one time and their own capacity for multitasking) beyond which keeping track of the multiple threads was difficult, and that finding the right window to place an appropriate reply required careful attention. That all the windows look the same made tracking the conversational threads even harder. There is a design opportunity here: the windows in each thread could be given a different appearance, perhaps different colors, to make them visually distinct.

Although the affordances of IM conversation make it socially, cognitively, and technically possible to participate in concurrent conversations, doing so is not without its difficulties. Managing multiple windows can go beyond mere inconvenience to also have significant social repercussions. Two participants (P1 and P5) described situations where they accidentally replied in the wrong IM window. In each case, they were gossiping about a friend (A) to another person (B) *while* concurrently carrying on a different IM conversation with A. Mistakenly they had replied to B *about* A into A's window. As best, such a mistake risks embarrassment and requires apology, which was the result in these two reported cases. At worst, one could alienate a friend.

IM in Domestic Ecologies

Just as surroundings and institutional imperatives influence collaborative technologies in the workplace, so, too, they affect teenage use of IM in the home. Domestic schedules or rhythms [29], obligations and expectations mediate interaction with technology in the home [16, 26]. The effects of domestic ecologies become particularly apparent when looking at the differences between the high school and college participants.

Some high school participants reported that tight school schedules and after-school activities limited their opportunities to socialize with each other face-to-face during the school day. For those teens living at home, obligations to one's family, including expectations about completion of chores and participating in the family dinner, affected how and whether they could communicate with friends outside the home. In the evening, opportunities to use IM were influenced by outstanding homework commitments, the ability to negotiate use of a shared computer, as well as bedtimes for themselves and family members. These temporal rhythms and their constraints change on the weekend, with curfews applying but varying across a group of friends. In contrast, college teens—because their schedules differ from person to person, day-to-day and term-to-term—reported using IM at a wide variety of times during the day, and at their discretion.

Indeed, IM use is highly responsive to domestic rhythms. Users conform to the expectations of domestic rhythms while simultaneously using the technology to work around

these constraints. IM can even provide a window into peers' domestic schedules. Participants report using the buddy list feature to find out whether friends are on-line, as other IM studies of adult populations also report [15]. In adult work settings, buddy list availability indicators can be ambiguous—people might be on-line but unavailable, or away from their desks altogether. For teenagers who share a computer at home, being on-line tells others that there are probably no other family-related activities underway. As P5 explained about contacting a friend, "I know she's not having dinner." For this sub-population of users, logging on is a deliberate act that has been fit in to household schedules and expectations. Even when these users are on the computer for other reasons like completing homework, the desire to assert peer group membership obligates them to unambiguous IM availability.

We found a difference here between the discretely and continuously connected users. Continuous connectivity means that logging on is not a deliberate act, and intersubjective knowledge of this (friends know that the user knows that friends know of the continuous connectivity) makes availability status ambiguous. Social obligation to be available weakens when ambiguity around technical states exists.

While IM use is responsive to expectations and rhythms of domestic ecologies, it is simultaneously used to work around the constraints imposed by the same. IM is used to talk with friends outside the times that would be allowed either by natural constraints or by socially-determined constraints. Parents who might discourage phone calls or visitors at certain times take less notice of IM use because it does not so explicitly disturb others, although teens take care to not advertise use at times when their parents might not approve. Technologies that disturb dinner too many times can annoy other household members to the point of restricting use. Since the teenagers' use of technology is made indirectly possible by parents' consent and pocketbooks, the need to minimize disruption is of significant concern for the participants.

In domestic ecologies, IM operates "below the radar": it is a quiet technology that is easily integrated into the conduct of other activities (similar to SMS [8]). Use can be unobtrusive, go unnoticed, or even be covert. Indeed, the quietness of IM was recognized as an important advantage by all participants. Specifically, IM neither rings nor requires talking aloud. During late hours, when phone calls can disturb others and, for high school teens, sabotage efforts to communicate with friends, IM is a boon. IM supports college teens who do not want to disturb roommates nor tie up the shared telephone. When even the soft default tones were too much, participants reported turning the sound off and relying on visual messaging alerts. The advantage of using IM silently suggests that for some occasions and situations, systems that emphasize audio feedback features, such as HUBBUB [10], would require a "mute" option.

Finally, although IM was used to communicate with people outside the home, once adopted, participants reported that they used it internally as well. P12 used IM with his

brother in the same home. Both constantly connected in their own bedrooms, they used IM to chat while working on homework. College teens reported using IM to communicate with roommates and housemates rather than meeting face-to-face or overtly disrupting them. Notably, P15 reported using IM to talk with her roommate about the music they were both listening to together in the same room, so as not to disturb the audio environment.

DISCUSSION

We have characterized teenage IM use in terms of frequency patterns, incentives to adoption, on-line cohorts, and the nature of IM-based social congregation, as well as in the context of the domestic environments in which its users reside. We now discuss the data in terms of what we see as two foundational objectives that drive teenage IM use: the means and nature of privacy management, and the use of the technology as a function of autonomy development.

Privacy Management

"Privacy," when applied to discussions of information technology investigations and design, is an oft-conflated term. Users, researchers and developers may address a range of important issues around privacy, but the liberal use of the term limits its accuracy and, therefore, its potency and usefulness. For this particular study of teenage IM use, we found that users would apply "privacy" as a general term while pointing to specific private-public boundary regulation concerns. We organize our analysis by distinguishing between two privacy management domains: privacy management of communications and information *within* IM systems, and privacy management of personal space in domestic environments *with* IM systems.

Privacy Management Within *the System*

By deconstructing participants' talk around privacy regulation and IM communications, we found that they were primarily attentive to protection of communications and access management issues.

Communications-Data Protection. Because so much of teenage talk is about the inner workings of social circles, conversations are often highly sensitive. Gossip and information about others is part of teenage social currency [23], requiring dissemination balanced by the perception of trust. Therefore, sharing information about oneself as well as about others is an essential part of IM conversation, and one for which teens have concerns about protecting.

IM is a double-edged sword in this regard: the text is ephemeral, existing only as long the session is active, unless users save, log or copy the text elsewhere (something IM systems cannot prevent). That text is not locally stored and so therefore disappears upon session close is an advantage to users sharing a computer with others at home. However, surreptitious copying and pasting of text into email messages to be delivered elsewhere is a present concern for some of the participants, yet it apparently fails to limit IM use to any great extent. One participant (P4) did mention that when she switches from IM to the phone, it is almost always because of concern that what she writes will be viewed by someone

else. Risks associated with participating in social exchange under the terms required of particular social circles are balanced by engaging in such talk with those believed to be trusted partners.

Unauthorized copying of IM text is of concern to adult users as well, but the focus of the concern is a little different. As with teens, adults understand the tension between IM as something that is simultaneously ephemeral (like verbal talk) and recordable [27]. Workplace use, however, carries with it the additional concern of corporate security protection. Whether accidental or deliberate, corporate-sensitive information might be transmitted unencrypted over the public Internet through IM sessions. Chedick reports an instance of this, where a company's stock dropped after an IM conversation was leaked [5].

Controlling Access. Our participants also generally refer to privacy protection concerns when they mean access regulation. Access needs to be regulated to keep strangers as well as particular peers away, as well as to control availability when one wants to engage in other tasks uninterrupted. We found that the manner in which users control access is determined by their connectivity status (discrete, deliberate connections or continuous availability) and the assumptions and expectations they know others have as a consequence of these states.

As found in workplace studies, participants reported being regularly waylaid by others [2, 10, 15], a behavior further facilitated by some IM systems' "pounce" feature which triggers a message when the desired respondent logs on. While often welcomed, waylaying was also viewed with trepidation: P14 explicitly factored this into her decisions about when to go on-line. Controlling access to the self is central to IM practice.

Technically, IM systems assume system presence means IM availability. But, as past research shows, availability in social contexts is determined by much more than keystroke activity. (Reflexively, as Isaacs et al [10] observe, a factor in the success of IM in the office is that people do not attribute "system idle" with "physical idle.") As such, participants report adopting and adapting other technical features of the system to further regulate access. By carefully employing access permissions, public profiles, "I'm away" messages, as well as multiple screen names (or aliases) to regulate access by others, they attempt to mitigate feelings of exclusion. In choosing to not be available to others on IM, users must consider future consequences to their own social group memberships.

Access permission settings explicitly permit ("allow") or restrict ("block") messages from certain people. The default allows anyone to make contact; this can be modified to grant access to one's entire "buddy" list, for example, or to specified users. Surprisingly, most participants allowed anyone to contact them, perhaps to ensure that friends who were new to IM could contact them after signing up.

Additionally, users can also block everyone or specific others. The block feature can be used in an interesting way: When user A blocks user B, user A simply appears to

be off-line to user B. Some participants reported using the block feature to hide from certain people in this way, making themselves appear as if they were not on-line, even while actively messaging others. Teenagers' social circles change rapidly, with people moving in and out of favor. Using the access control facility, a group of teenagers can all make themselves appear off-line to an excluded "friend," keeping plans and discussions secret, but without the person directly knowing about their exclusion.

Keeping public profiles blank also helps with access regulation, particularly in keeping unwanted communications with strangers at bay. By offering little to no public information about themselves, IM users do not convey interest in unsolicited communications, and keep themselves below the radar.

"I'm away" features explicitly tell peers of one's unavailability, with a message automatically generated in reply. However preset messages, which simply say "I'm away," were generally considered too impersonal by participants. In an effort to mitigate feelings of exclusion and avoid being rude, participants reported that they personalize the messages to explain why they were unavailable, sometimes in great detail. They used messages to justify long and short absences, communicating when they were working on homework or even making quick trips to the bathroom or kitchen. For example, P14's in-the-shower message said, "I'm currently removing all dirt, grime and other dead biological matter from my body. I can be found in the nearest decontamination center." These messages were useful for explaining other changes in one's local environment, such as the commencement of dinner. More so than office workers it appears, teens feel that availability is implied by presence, thereby compelling them to explicitly justify any unavailability.

Users adapt system capability to their own ends. By using multiple screen names or aliases, users can control their availability to others by sharing certain aliases with certain people, as Lenhart et al. report [12].

Privacy Management With *the System*
Our data suggest that teenagers use IM to carve out a private world within the public space of the home. Domestic settings are a kind of public place, where household members are subject to observation or to being overheard. IM helps users reach others outside this setting and, in so doing, they create a separate conversational space, a separate world. Westin theorizes that one function of "privacy" is to create intimacy for emotional release [28]. The knowing division between the activities of the real space and that of the IM space reinforces these feelings of intimacy, which can be likened to sharing a secret, sharing an insiders-only joke, or as a participant of Nardi et al's study explained, "passing notes" [15].

Furthermore, teens underplay IM use in the home as a means to help create this separate world, keeping it below the horizon of notice. To this end, P8, who used the family computer in the very public place of his family's living room, kept all his IM windows minimized on the task bar,

relying on alerts to signal that new messages had arrived, which he could then open when his privacy was assured.

We propose that one of the prevailing reasons for IM's popularity among teens is its ability to create these private social spaces that extend outside the home. Adults certainly benefit from this privacy-making function as well, with employees communicating with family members while at work [15]. It is the young teens without a great deal of autonomy who appear to benefit most from this by creating private spaces over which they can exert newly found control.

IM Use as a Function of Autonomy
In conducting this investigation, we quickly found that teenagers are not a homogenous population, an observation obvious on its face, but different in ways we did not expect. Although the salience and use of IM varies across teens because of multiple factors, age or, more accurately, degree of autonomy turns out to be a significant one. We note that because we did not expect to see these particular differences, we could not control for them in our subject selection; we have far fewer college students than high school students in particular. Our discussion here, then, is informed by the results of empirical study, upon which we further theorize about other autonomy-related issues.

We found that IM practice is different for high school teens (who, for our participants, lived in their family home) and college teens (who lived away in dorms or apartments with roommates), as we have characterized throughout this paper. The move between home to a place of one's own is a significant marker of increasing autonomy. The composition of domestic ecologies shifts dramatically at this point, and obligations to household members and oneself correspondingly shift. Treatment of and communicative practice with IM also changes. Out from under the watchful eyes of parents, college students worry less about inadvertently advertising their use of IM at non-traditional times. They also have much more flexibility about when they can meet face-to-face with friends, and may find that they rely less on IM communications for social congregation. Growing obligations to their academic work might require that they address access regulation differently. Access to a car further increases opportunities for social congregation, and again dampens one catalyst for IM use. Indeed, we hypothesize that degree of mobility affects the salience of IM in teen life generally. Young teens, who do not have access to good public transportation nor live close by to friends, must rely on parents to transport them to meet with them. Acquisition of a driver's license and access to a car increases autonomy, decreasing dependence on others as well as information technology to congregate with friends.

Finally, as teens age and friends move away to college, their peer group changes and expands to include local and distant contacts. Even these changes affect the nature and purpose of IM conversation; distant friends share few of the same daily experiences, and are less likely to collaborate over schoolwork. On the other hand, because opportunities for meeting face-to-face are few, IM is a means by which to help maintain these long-distance relationships.

CONCLUSION

Computing in the home has become a commonplace activity. Encouraged by schools to search for project materials on-line, to write up reports using a word processor, and to conduct programming assignments in some cases, teenagers spend considerable time working on the computer at home, as well as using the Internet recreationally. Under these initial conditions, the adoption of Instant Messaging technologies is given the opportunity to flourish among this population. The ever-present desire to communicate with friends and be an active part of a social group, coupled with the ability for IM to exist without disrupting domestic environments, are the additional conditions that set the scene for widespread adoption.

New information technologies are often compared, implicitly or explicitly, to existing information and communications technologies. It is the same for Instant Messaging: the temptation is to compare how teens use it relative to the phone, or e-mail, or even face-to-face. While these remain important questions, we believe others are more pressing.

As technologies become more pervasive, as it appears IM will, they get pushed below the horizon of notice and into the domain of other taken-for-granted technological innovation—from paper, to chairs, to cars, and telephones. When information technologies reach the point of being conceptualized as part of the substrate of everyday life, we believe that they will be seen as one of many means for accomplishing objectives. Even now, as we have found, technologies that are weighed against the decision to use IM are not always communications or computational media. Access to transportation figures into decisions about social congregation, for example. As researchers and developers, we can perhaps do better by the design and study of information technologies by considering them as a part of a constellation of many kinds of digital and non-digital technologies to understand how people congregate, communicate, and coordinate.

Technology choice depends on other non-technological factors as well. Understanding IM use among teenagers, a population that has not previously engaged in collaborative information technologies in such a widespread fashion, requires examining it as feature of their culture. The kind of "work" teens engage in may be different than adults—centering around communications and congregation as means for building social relationships and feelings of belonging, and of learning *how to be* a communicator—but is nevertheless fundamental to their objectives. Teenagers will communicate and build relationships without IM, of course, but the technology is made notable by how easily it supports these objectives within the constraints imposed by age and limited mobility.

ACKNOWLEDGEMENTS

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