

# Going Wireless: Behavior & Practice of New Mobile Phone Users

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## ABSTRACT

We report on the results of a study in which 19 new mobile phone users were closely tracked for the first six weeks after service acquisition. Results show that new users tend to rapidly modify their perceptions of social appropriateness around mobile phone use, that actual nature of use frequently differs from what users initially predict, and that comprehension of service-oriented technologies can be problematic. We describe instances and features of mobile telephony practice. When in use, mobile phones occupy multiple social spaces simultaneously, spaces with norms that sometimes conflict: the physical space of the mobile phone user and the virtual space of the conversation.

## Keywords

Wireless communications; mobile, cellular, and digital telephony; communicative practice; qualitative research.

## INTRODUCTION

Mobile telephone use has proliferated in recent years. Some areas of the world have enjoyed especially rapid deployment and high penetration of mobile telephony, with Finland leading the way at 65% [1]. It is no longer unusual to see people using mobile phones in a variety of contexts. Indeed, use is so frequent and common in some places that people are regularly and formally reminded to turn off mobile phones in movie theaters, at public performances, and in restaurants to avoid negative social repercussions. (e.g., [4]). Reminders in hospitals and airplanes are also provided, but usually for safety-critical reasons.

Although mobile phones are perceived as devices that directly serve the individuals who own them, they are also social artifacts. As a communications technology, they support coordination with others. Additionally, mobile telephony communicative practice is influenced by the social contexts in which the phones are used. Communicative practice is also influenced by attributes of the owners' lifestyle, including their social networks. Furthermore, because they are devices that are now present

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in a variety of contexts, and can be remotely and unpredictably activated, mobile phones are subject to social scrutiny and play a role in the social world. They are surrounded by a system of actors who wittingly or unwittingly play a role in mobile phone conversation. Finally, a user's understanding of how mobile telephony works is not only a matter of learning about its multiple technical components (hardware, software, and network services), but also of understanding service provider policies and integrating information garnered from sales, marketing, and billing communications.

Mobile telephony is rapidly becoming a feature of our culture, yet we do not understand its effects on communicative practice and behavior, especially with respect to the interaction and co-evolution of the technology and human activity. As wireless communications and information management applications proliferate, empirical understanding of practice and social impacts becomes relevant for scholars and practitioners alike.

We report here on a study of 19 first-time mobile phone users followed closely during the first six weeks after service acquisition. The objective of the study was to understand how and why people use mobile phones in a range of situations, and to understand their processes of discovery and integration of mobile telephony into daily life. We conducted multiple interviews over the course of the six weeks, were in regular phone and voicemail contact with the subjects, and captured actual calling behavior data.

We report on:

- evolving expectations and communicative practices of new mobile phone users;
- perceptions of and adaptation to social norms; and
- user comprehension of mobile telephony technology as a construction of technological and social components.

From these observations, we extend our discussion to include an analysis of how mobile phones occupy multiple social spaces simultaneously, and how that affects public perception and norm development. We also present temporal and spatial aspects of social coordination that we believe are important to mobile telephony practice.

## RELATED RESEARCH

The popular literature is rife with information about mobile telephony products, as well as with anecdotal commentary about its social propriety. Published empirical research on mobile telephony practice has emerged only recently. In addition to this small corpus of work, Fischer's work on landline telephony [2] is briefly reviewed here.

### Landline Telephony

Accounts of the socio-historical development of the telephone are useful in understanding parallels in mobile telephony. Claude Fischer's "America Calling" [2] is notable; it reviews the emergence of landline telephony in social life through the mid-twentieth century.

There are some parallels between the early acceptance of landline telephony and mobile telephony, as well as some interesting differences. Fischer found that justifications for acquisition of landline telephony tended to be more functionally, rather than socially, focused. In the early 20<sup>th</sup> century, safety was a primary reason for telephony adoption, with "business reasons" operating as another justification for acquiring a landline phone. However, Fischer notes that despite these more functionally-focused reasons for acquisition, the telephone grew to become associated with acts of sociability even as early as the 1910s, which soon became a reason for acquisition itself. As will be discussed, our work has also found that "safety" and "business" uses were frequently cited reasons for mobile telephony adoption. However, "social use" was conspicuously absent among the reasons cited for initial mobile telephony adoption. Despite this, acts of social coordination quickly grew to become a very important part of communication practice for nearly all subjects.

Fischer also notes that early landline phone users had to deal with evolving norms around phone greetings, publicity of conversations (in the context of the day with party lines and eavesdropping operators), and with resolving negative feelings of ease of accessibility—issues that mobile phone users contend with today.

By studying Fischer's work, differences between landline and mobile telephony also become clear. In particular, we observe that a major difference between the social milieu of the fledgling days of landline and mobile telephony is the agency of privacy violation. Privacy violation concerns have shifted from the surrounding public's infringement upon the landline speaker's conversational space, to the mobile phone speaker's infringement upon the surrounding public's acoustical space.

### Mobile Telephony

Studies of mobile telephony are few, with most pertaining to design issues for small screen displays and text input (for example, [11]). Väänänen-Vainio-Mattila and Ruuska [13] performed interesting field studies of mobile phone users in an effort to understand use in context. Their reported findings, however, are constrained to a discussion of design outcomes, with little description about the nature of use.

O'Hara, Perry, Sellen and Brown [8] examine the communication practices of mobile professionals with attention to the use of mobile telephony. They closely

examine the relationship between mobile phone communications and document management, resulting in taxonomies of what they call "docucentric interactions" and "telecentric interactions." Of note is their observation that mobile phones are flexible, convenient, and versatile in supporting mobile work; in this way they share characteristics with paper documents but less so with laptop computers. Their focus pertains to the mobile telephony practice of white-collar workers with document-based activities, whereas our investigation attempts to examine behavior and practice of a wider population.

Ling and Yttri [6] empirically examine use and attitudes among multiple populations, but primarily document teen use in an area of the world where adoption is particularly high (i.e., Scandinavia). They discuss the phone as an indicator of social status, as a means by which teens express belonging in social groups, as well as to manage what Ling and Yttri call "hyper-coordination," a kind of coordination that transcends activity-based coordination to include social and emotional interaction.

Ling has also made important contributions in the documentation of attitudes and social propriety of mobile phone use in public locations, with an emphasis on restaurant venues [5]. This study and the Ling and Yttri study [6] are used as a basis for some of the analyses of the findings reported here. Our work extends their findings as well, particularly with respect to our documentation of users' rapidly changing perceptions of social propriety with direct mobile telephony experience.

## METHOD

Qualitative techniques were used to collect data over the course of six weeks, including interviews and voice-mail "diaries." Calling behavior data was also collected for approximately the first four months of use.

### Subject Selection

Nineteen people participated in the study. Prior to our intervention, subjects had ordered mobile telephony service just days before and had qualified as having no previous direct experience with it. We did make one exception by including a subject who had previous mobile phone experience, but had special access and safety needs thought to be important to the investigation (Subject 13; see Table 1). Subjects also had to be geographically proximal to the researchers to allow for frequent interviews.

The first subjects who fit the criteria during a two week recruitment period were invited to participate. Hence, distribution across gender, age, profession, socio-economic status, etc., was not experimentally controlled, but our population was nevertheless quite varied. Only about one out of 10 people contacted fit the criteria and was able to participate. Subjects received monetary compensation for their time. One subject, S12, dropped out of the study midway, but the partial data for her are used where appropriate.

### Interview Data

Three interviews were conducted with each subject, lasting 1-2 hours each. The interviews were open-ended such that central issues were discussed with everyone, but

professional and personal factors that were unique to each subject could emerge, be explored, and documented. Most interviews took place in our office location, although when possible, some interviews were conducted in people's homes. Family members were invited to participate in the discussion when they were actively involved in some aspect of acquiring, using or paying for the mobile phone.

The first interview was designed to capture the "out of the box experience." This interview was scheduled immediately after the subjects acquired the telephone handset, but before they used their phones. Subjects were asked to look at their handsets (and other materials if they desired) as though they were at home doing the activity. Some subjects wanted to consult a friend or family member at a certain point; we documented only the extent to which subjects worked on the phones themselves, following up later on their collaboration with others. The second interview took place approximately two weeks after acquisition and focused on the changes in behavior and use over that period. Changes to the handset settings were noted. The third interview took place after users received their first mobile phone bills. This interview took place 4 to 6 weeks after acquisition and included a discussion centered on the interpretation of their bills and the calling behavior that the bills documented. All interviews were videotaped.

#### Voice Mail "Diary"

To capture mobile phone activity as well as discoveries and insights subjects had about their newly acquired phones, we instituted a new version of the "diary" method of data collection. Instead of having subjects record events on paper, we invited subjects to call in to a dedicated voicemail line and talk about their experiences. This was an optional activity, but subjects were given \$1 for every day they called in, even to report that they did not use their phones that day. Although experimental, this method turned out to be a successful way of capturing activity that is very transient. On average, subjects called in about 1 out of every 2 days, although variance was high. These data were also important for reminding subjects during interviews about certain activities that could then be queried further. All diary reports were transcribed verbatim.

#### Calling Behavior Data & Phone Bills

Calling behavior data was collected over approximately the first four months of use using phone records. The subjects also provided copies of their phone bills.

#### SUBJECT DESCRIPTION

The following table describes in some detail subjects' occupation and lifestyle attributes. As this paper will show, these attributes figure importantly in understanding certain features in mobile telephony practice.

TABLE 1: Subject Description

SUBJECT	Age (yrs) & Gender	Occupation & Important Lifestyle Attributes
S1	46-55 Female	Artist, doctoral student, and clinical therapist. Commutes 30 miles to private art studio a couple of times/week, where there is no landline phone. Shares

		home with adult roommates but has own phone line.
S2	16-25 Female	High School student. Newly licensed driver. Drives long distances around metro area for sports activities. Shares mobile phone with mother. Two parents & older brother living at home.
S3	46-55 Male	Full-time church pastor. Office in the home, with a dedicated business line. Works daily outside office in multiple places. Spouse & 2 teenage children at home.
S4	16-25 Female	Community college student, part-time retail employee for small shop. Work and school schedule varies daily. Lives with partner who works regular business hours.
S5	56-65 Female	Part-time non-profit club manager; church organist; church janitor. Lives with spouse and one adult son. Uses pager to be on-call as club manager. Church she cleans does not have landline phone.
S6	26-35 Female	Homemaker and mother of two; Part-time computer sys admin. Just returned to work. Lives with spouse who works regular work hours, and two toddlers.
S7	46-55 Male	Construction sub-contractor Works on site at multiple locations per week. Spouse stays at home with toddler.
S8	46-55 Male	Engineer. Lives with spouse who works regular hours; spouse also has her own mobile phone.
S9	36-45 Female	Dental Assistant. Lives with spouse who works regular hours; spouse also has his own mobile phone.
S10	36-45 Female	Meteorologist. Lives alone. Travels and calls frequently to her large family who lives 2 hours away.
S11	66-75 Male	Retired barber; Part-time model and law firm courier. Lives alone. Modeling and courier work is on an on-call basis, which requires immediate attention.
S12	36-45 Female	Homemaker; Student; Small-business owner. Lives with spouse and teenage son.
S13	46-55 Male	Retired. Works frequently outdoors on his large property while in his wheelchair. Uses phone for safety and accessibility purposes. Lives with life partner; she works part-time out of the home.
S14	16-25 Female	Mother of 2; Works as a Housekeeper. Works multiple locations throughout week and coordinates childcare with her mother. Lives with 2 toddlers and husband, who works regular hours outside home.
S15	26-35 Female	Mother of 4 children under 10; Homemaker. Husband works regular hours outside home.
S16	46-55 Female	Professor. Lives alone. Commutes by bus or car 30 miles to work most days of the week. Uses mobile phone in lieu of physical presence in office.
S17	56-65 Male	Engineer. Shares a car and mobile phone with wife.
S18	36-45 Female	Full-time contracts administrator; part-time rodeo teacher; professional rodeo rider. Lives with roommate who is a student. Travels to shows, works outside in evening on ranch.
S19	46-55 Male	Consultant. Commutes 30 miles to city office by bus. Uses mobile phone to retrieve home office calls in his city office. Lives with spouse and teenage son.

#### EVOLVING PRACTICE

As new users, subjects typically had narrow ideas for how they would use mobile telephony initially. The first month of use was typically one of discovery during which the subjects, more often than not, rapidly modified their expectations. In most cases, subjects expanded the range of uses from their initial predictions to encompass more

sociable interactions, as well as interactions that supported tight temporal coordination with family members and others. In this section, we begin with a review of the reasons for initial acquisition and follow with a discussion of actual mobile phone communication practice.

### **Reasons for Initial Acquisition**

Although almost all subjects could articulate the primary reason for acquisition, they often had more than one reason for buying mobile phone service. Reasons for acquisition were accompanied by finding or being offered the right price point for market entry. With the exception of acquiring a phone for a particular event, reasons for acquiring mobile telephony tended to be organized around business or job-related reasons, and safety and security reasons. Although mobile phones were eventually used for "social reasons" by some of our subjects, only one cited this as a reason she acquired the service, although not primarily so (S10).

#### *Motivation by a Particular Event*

Mobile telephony service was acquired by some subjects when a specific situation or event arose in their lives where a mobile phone would be useful (S6, S12, S18). For example, one subscribed to telephony service when a relative died, because she wanted to be able to make funeral arrangements from the relative's rural home where there was no phone (S12). Another woman subscribed to mobile service upon returning to work part-time so that she could always be accessible to her children's day care (S6). Still another subject decided to acquire a mobile phone when the phone lines on the ranch where she lived were inadvertently cut by ranch personnel, leaving her without landline service for some period of time (S18).

#### *"Safety"*

In cases where particular events did not motivate purchase, a common reason subjects cited for buying a mobile phone was safety and security (S2, S8, S9, S13, S15, S17) which, as a category, has a whole spectrum of possible meaning. It is often associated with car-related safety or for unknown situations that might arise. The parents of S2, for example, chose to acquire a mobile telephone when S2 came of driving age. Her father described the phone as a kind of "umbilical cord," that would allow her some independence while ensuring bi-directional accessibility between child and parent. However, for one of our subjects, the matter of safety was a real, everyday issue because of a physical disability (S13). S17, on the other hand, expected to leave his phone in the car at all times, turned off, and used only to dial out in cases of emergency.

#### *"Business"*

Still others originally purchased the phone because their jobs put them in different, unpredictable locations throughout the day (S1, S3, S4, S5, S6, S7, S11, S14, S19). Although these subjects originally expected that the use of their phones would be mostly for "business" purposes, the calls they often made were not necessarily *about* their business, but were made *because* of the mobility of their occupation. Of note are S7 and S14, who find themselves in different locations daily and who must coordinate child care-taking duties with other adults.

#### *Mobile Phone as a Second Line*

S10 and S16 acquired mobile phones as substitutes for a second landline in their homes, to enable them to connect their computers via modem on their landlines while still being able to place calls via their mobiles. In time, other purposes overshadowed use as a second line. S18 initially acquired her mobile phone when she temporarily could not place calls on her landline phone, but had little idea how she would use it once her landline was restored.

### **Predicting Phone Practice**

Mobile telephony practice quickly evolved over time for our subjects. Those who acquired the phone to be used only minimally for safety reasons, for example, were the most likely to change their expectations as they discovered the range of possible uses after acquisition. Those who were motivated by particular events to acquire their phones had fuzzier ideas about how they would use them after or outside those events. In general, those subjects who had the least exposure to mobile phones were the worst at envisioning their own uses early on. Subjects who had friends or colleagues who owned mobile phones were much better predictors of the nature of their own phone use than those who did not, even if they had no direct experience themselves.

### **Actual Communicative Practice**

As with landline telephones, mobile telephony "practice" is not exclusively a practice unto itself: Telephones are part of a suite of everyday tools that people have available to execute other activities. Nevertheless, we will refer to the stylistic uses of mobile telephony as "practice." (There are exceptions, however; studies of teenagers in Scandinavia suggest that a practice of mobile telephony is emerging that supports activities and communications that wouldn't otherwise occur [6].)

#### *Calling Behavior: Incoming vs. Outgoing Calls*

Practice can in part be described as a function of incoming versus outgoing calling behavior. The greater the number of incoming calls the more, it would seem, a user has granted accesses to other people. When outgoing calls predominate and incoming calls are few, a user can be described as one who controls communications by deliberately limiting accessibility.

Across all subjects, the *number* of outgoing calls exceeded the number of incoming calls by 2.5 to 1. However, when incoming calls were received, the *duration* of incoming calls was longer than the duration of outgoing calls, with the average duration of incoming calls at 3.36 minutes (3 minutes 22 seconds) and outgoing calls at 2.76 minutes (2 minutes 46 seconds). However, this is only significant at the .10 level ( $t(18)=1.682$ ,  $p<.10$ ), and as such only suggests that this might be a trend. If this were to bear true for a larger population, it would, by some accounts, be counterintuitive. One might expect that outgoing calls, because they can be planned according to time and place in a way that incoming calls cannot, would be longer than incoming calls. Perhaps it is the case that the mobile phone user has less control over managing incoming calls. Alternatively, because some mobile phone users want to be

accessible to certain other people no matter where they are, an awaited call might be of such importance that the phone owner is willing to suspend other activity to devote attention to it.

#### *Analysis of Practice*

By the end of the six weeks of use, subjects had each developed a telephony practice that, while still evolving, appeared to resonate with their unique life conditions. In this section, we discuss multiple subject cases in terms of the macro effect of their telephony practice. We found that, for our subjects, there were six general categories of outcome of mobile telephony adoption. We attempt to describe those here, through example of select subjects.

*Practice Outcome 1: Increase Mobility.* S3, S6, and S16 developed a practice that allowed them to maintain their contact accessibility while becoming freer to relocate.

As a pastor, S3 developed a practice that allowed him to remain highly accessible to his parishioners while working away from his home office at the university library, reading in coffeeshops, and visiting other parishioners. All of his parishioners' phone numbers were recorded in the phone for ease of contact. S3 has what Nippert-Eng [7] describes as a highly integrated life — a life where one has a great deal of temporal autonomy, where activities of one's personal and professional roles interleave temporally, and where one's professional identity transcends into one's personal life as well. For S3 and other subjects in this category, the mobile phone supported and enabled this integration while providing for a greater degree of physical unpredictability.

S16, a university professor, also used her phone to allow her to be away from her university office, even during her official office hours. In lieu of physical presence, she posted her mobile phone number in her office and allowed her students to call her from her office phone. They could then commence conversation there, or meet her in person if she was nearby. Because she had no one else living at home receiving phone calls, she had all her calls forwarded to her mobile phone, allowing her to take care of personal and professional business anywhere, which was especially helpful in light of her long travel commutes.

*Practice Outcome 2: Increase Accessibility.* Some subjects were in professions and/or life situations that made them mobile (S1, S4, S5, S7, S11, S14, S18, S19). They found that their phones yielded new opportunities to coordinate with others, in spite of their varying locales.

S7, a construction sub-contractor, works at different job sites on as much as a daily basis. There are few landline phones on such properties, which are typically shared, making them best suited for outgoing rather than incoming calls. Although S7 acquired his phone for business purposes thinking that it would be beneficial to be in easy contact with his supervisors, his use soon became primarily a means for his wife and him to coordinate throughout the day. (His business calls averaged about one a day.) With a young child at home and an erratic work schedule, the mobile phone allowed them to very tightly coordinate their comings and goings, dinner plans, and handoffs of the child in ways not possible before.

S11 is retired, but works on an on-call basis as a model and courier, jobs that require immediate response to act on opportunities. S11 also had his home calls forwarded to his mobile phone (with no competition from anyone else living at home), allowing him to continue to enjoy his leisure time away from home, but be able to respond to auditions and courier requests. As a consequence of the call forwarding, he also handled social calls throughout the day.

*Practice Outcome 3: Extend Net of Safety/Proximity.* Although similar in objective to the practice described in Outcome 1, S2 and S10 additionally had the need to maintain contact with particular people as a matter of safety and comfort, while simultaneously physically distancing themselves from them.

S2, a new driver and high school student, used the phone outside of school hours and on weekends. In part because S2 felt self-conscious about bringing the phone to school for fear of appearing to have succumbed to peer pressure, her mother ended up using the phone during traditional work hours. S2 often found herself driving alone to her many sports events that are distributed across the city metro area. Although she did eventually begin to use the phone more socially than she expected, the phone was part of an agreement between her and her parents that granted her a new freedom while still being in close, regular contact with them. In practice, S2 kept the phone in the car in the off state, using it for mostly for outgoing calls.

Unlike S2, S10 is an adult whose need to stay close to family was not as much a matter of safety and freedom as it was of maintaining social ties. She is the only one of 10 siblings to live away from their home town, so her phone became a way to maintain close ties to them. Although she originally acquired her mobile phone to work as a second line in her house when connected to the net, she discovered that special in-state calling rates as well as the convenience of its mobility enabled her to be in easy touch with them. S10 had the longest per call talk time of all subjects.

*Practice Outcome 4: Substitute for Physical Agility.* Finally, S13 used his mobile phone as a kind of substitute for physical agility. Because he is wheelchair-bound, the mobile phone was critical to S13 in enabling his freedom to work on his large, multi-acre property without worry that he would be stranded if he fell off his chair. He also used his phone to contact a party he was planning to meet when encountering a physical barrier that kept him from his destination (such as a flight of stairs). S13 kept his phone physically on him or attached to his wheelchair, turned on, 24 hours a day. Because S13 had previously used an analog mode phone, he had accurate expectations of how he would use his new digital phone in practice.

*Practice Outcome 5: Enable Calling On-Demand.* Subjects 8, 9, 15 largely used their phones for outgoing calls. They typically kept their phones off, turning them on when they needed to make a call. Practice for them was quite straightforward and is best described as a convenient substitution for a public telephone. S8 and S9 are married to each other; S8 wanted to use his phone for safety purposes, which including having ready access to his wife.

However, she refused to keep her phone turned on, thinking it would make her a "slave to the phone." For this reason, S8 stopped trying to call her and eventually turned his phone off for much of the time, too.

In addition, all three subjects had adequate phone solutions during the day, minimizing the importance of the mobile phone in comparison to other subjects. S15 is a stay-at-home mom with four young children. She used her phone while doing errands with her children when it would be hard to find a public phone, stop and get out of her car. S8 has a regular day job with an office phone; S9 cannot easily make or receive calls during her workday as a dental hygienist. S9 is an example of a person with professional and personal lives that are not integrated.

*Practice Outcome 6: Share Resources.* S17 grew to use his mobile phone to coordinate with his wife over their shared car. Originally acquired for safety purposes, they planned to leave the phone turned off in the car. However, they soon saw the benefits of using phone technology to substitute for transportation technology. Whoever had the car also had the phone (turned on), making the person with transportation easily accessible.

#### *Strategies for Managing Accessibility*

Subjects had multiple strategies and attitudes around managing their access. At one extreme, some subjects took advantage of a special service of their provider that had all calls to their home phones forwarded to their mobile phones. These people wanted to enable a high degree of accessibility, even to the extent of being identified with one phone number. They could control accessibility by turning the service on and off (although only one subject did this regularly), or turning their phones off. At the opposite extreme, other subjects tightly controlled access by keeping their phones turned off most of the time, turning it on for only outgoing calls or when they expected an important incoming call.

Caller identification is provided by the service provider as another way to control access. Subjects reported mixed effectiveness with caller id, however. The name associated with a phone number is displayed only if users have programmed that number and name into their phones; otherwise, only the number is displayed. "Unavailable" is displayed when numbers are blocked. When a call came in from an unrecognizable or blocked number, subjects struggled with deciding whether to take the call. Some reported feeling *more* compelled to take such calls, simply because they could not assess their importance!

Some subjects also controlled accessibility by limiting distribution of their phone number. They could keep their phones on but feel fairly certain that any call that rang through would be one they wanted to answer. Finally, three subjects employed pagers (which they had before acquiring mobile telephony service) to manage accessibility. These subjects had people send messages to their pagers, which they would return by calling out on their mobile phones.

#### **Summary: Factors that Affect Practice**

As an everyday tool, mobile phone use is deeply reflective of other events that are happening in one's life. Therefore

activity with the phone is very transitory. The *amount* of use can vary from day to day and can be reflective of variations in work schedules, vacations and weekend time, amount of time in or out of the house, etc. The *nature* of use, however, depends on a range of life factors, which examination of our subjects' practices reveal to include the:

- *mobility* of one's profession and/or dedicated interests;
- *availability of other communications media* in locations of work or other central activities;
- *number of "roles"* one assumes professionally and personally (e.g., S5 is a wife, organist, manager, and janitor);
- *degree of integration* [7] one has across those roles;
- *degree of personal responsibility* one has for and to people living in the home (or other primary relationships);
- *schedules* of other people in the home (or other primary relationships) vis-à-vis one's own schedule;
- *degree of resource-sharing* one conducts with other people (like car sharing);
- additional factors like *physical agility* (for which a mobile phone may supplement), and *commuting and traveling conditions* and schedules.

Our study did not empirically address how socio-economic factors address mobile telephony practice and use. In terms of practice, we propose that these lifestyle factors listed above are largely independent of socio-economic circumstances; however *amount* of use could be directly affected. What did become apparent as a result of this study, however, was how useful mobile telephony was for our subjects who were blue-collar workers: These subjects (particularly S7 and S14) work without offices in different places everyday. Communications with their clients and supervisors was of fiscal importance on an everyday basis. The ability to coordinate with their families was novel. White-collar professionals, with whom mobile telephony is sometimes stereotypically associated, often have the luxury of having regular schedules with dedicated desk space and desk phones; relatively speaking, these conditions seem to dampen the urgency for mobile technology.

#### **MOBILE PHONES & SOCIAL PROPRIETY**

As a communications media, mobile telephones are artifacts that exist in and are affected by the social world. First, use of mobile phones almost always involves communicating or attempting to communicate with someone on the other end (an exception would be contacting one's own voice mail box). Sometimes the nature of the conversation is directly affected when one party uses a mobile phone. Factors that affect conversation include the quality of the call signal; the length of the call; the tone or volume of voice of the mobile phone user given their calling location; and, perhaps most importantly, the mobile phone user's behavior, which can be influenced by the user's calling environment.

Mobile phones are part of the social world in a second way as well: Because of their very mobility, phones exist in places where they didn't before and can be used at times when phones weren't normally used in the past. Mobile

phones are silent elements in the social world until they are engaged by the mobile phone user or activated by someone calling in. Because their existence is relatively new, social norms around mobile phone use are still evolving such that judgments about appropriate use vary widely.

### Initial Perceptions

It was not uncommon for our subjects to have thought about how and when they would use their mobile phones in public places. When asked about what they thought when they saw other people using mobile phones, reactions were surprisingly negative and strongly felt. In particular, subjects had concerns about using mobile phones while driving and in public places like restaurants.

Although feelings about other people's mobile phone use influenced expectations of their own, subjects' preconceptions were often so negative as to contradict their decisions to acquire the technology! Some examples:

*I think there are far too many [cell phones] and I think people driving them are a hazard, but now I've joined the ranks, so what can I say? ... It seems kind of bad that we just can't go somewhere without being connected to the world. 'Course you can, but people are obsessed with them: "God, can't you get off the phone?" (S1)*

Note in the following two subject statements the prevailing assumption was that mobile phones should be used for "important" conversation:

*Why would someone want to be seen having a casual conversation in certain contexts... like the movies or restaurants? (S2's father)*

*[Mobile phones are] a cultural menace. People are talking all the time and they obviously aren't saying anything. (S19)*

For some, using the phone in a public setting is readily perceived as inappropriate under all conditions:

*[On using mobile phones in any public place]: How rude! (S6)*

*[People who use phones in public] are crass. Like the guys you see driving down the road talking on their cell phone...I am not going to be that way!...So [mobile phones] are just more for the yuppie crowd...you see them in restaurants:[I think,] "that can wait!" (S18)*

### Changing Perceptions

In spite of clearly articulated feelings about improper uses of mobile phones initially, subjects very quickly began to modify these perceptions after gaining personal experience.

By the second interview—about two weeks after acquisition—some subjects began to temper and qualify their opinions about use of phones in public places. In particular, many who thought they would never talk and drive also admitted to doing so.

S19, after articulating very strong opinions about public mobile phone use, eventually ventured outside with his phone by the second meeting. He brought it to the bank near his office, but explained that it "made him nervous" to do so. By the third meeting, however, he explained that he began to see the value of coordinating with his family members and admitted to being less quick to judge how important someone's mobile phone call really was.

S6 has tempered her initial perceptions from the first week, but still had concerns about using mobile phones in public places. However, some of those same feelings were directed at her by her husband, even though getting a mobile phone was part of the solution for her to return to work:

*People are still a little rude when using cell phones. I try not to use it much in public, and I usually pull over [when driving and talking]. Only one time I didn't... My husband thinks [cell phones] are pretty rude, too. The fact that I have it, it makes him just livid! "Do you really feel you are that important that you have to take these calls?"...That's his opinion of it. (S6)*

After another month of use, the whole family had modified their feelings:

*My husband has called me on my cell phone. He seems ok with it... He uses it on the weekends when he takes the kids...he'll use it in the car so I can get a hold of him. And he's told me at times to use it when I'm out and about and he might want to call and say, "Hey, I need you to bring something home."(S6)*

Finally, S18 initially did not want to drive while talking on the phone, but after two weeks, did:

*I try to be good and not to drive and talk...but it's easier than I thought to drive [and talk on the phone]. (S18)*

By the third interview—4-6 weeks after acquisition—nearly all subjects who had concerns about how they would be perceived by other people no longer cared what others thought (S2 was an exception, who continued to be concerned that her teenage friends would think her pretentious). Indeed, when prodded, many felt the question simply was not relevant, as though having forgotten the magnitude of their initial reactions.

Attitudes about propriety will be explored in further theoretical depth in the Discussion section.

### CONFUSION ABOUT MOBILE TELEPHONY

The results of our study show that new users typically have poor understanding of how mobile telephony works which continues to persist into at least the second month of use (and, we predict, continues well beyond). We believe this affected the range of activities they could employ in their communication practices. For example, subjects restricted phone calls in certain situations for fear of unknown charges, wanting to wait until they received their first phone bills to confirm how certain charges were excised.

### The "Service Model": Comprehension of Service-Based Technologies

Understanding service-based technologies like mobile telephony extends beyond accurate comprehension of the hardware and software components of the technology alone. In addition to these technological components, there is a socio-technical component that reflects the business practices of the service provider. We think of mastery of mobile telephony use, then, as an outcome of the construction of an accurate "Service Model," an integrated mental model of technologically and socially derived components: hardware, software, "netware," and "bizware."

#### Hardware

In mobile telephony, the handset, battery and charger comprise the hardware component, with the ergonomic issues that all hardware devices face. In the development of a mobile phone mental model, however, the handset (and, indirectly, the software) becomes the "face" of the service-based technology because much of what constitutes service is invisible. When trouble-shooting problems, this often means that new users will attempt to "fix" or even replace

the hardware, when the problem really might be a matter of signal quality, for example.

#### *Software*

The system software drives the interface, providing multiple features. Mobile handsets are getting more and more complex, often suffering from “featuritis.” The multiplicity of new features can overwhelm users, as HCI professionals well know. With phone communications, in particular, where all users have landline experience to draw upon, the need for most of these features can be quite unclear and confusing. Some features that seem initially superfluous eventually demonstrate their necessity: The new mobility of an old medium requires control of ear volume and ringer volume as a user’s environmental conditions change, for example.

#### *“Netware”*

We refer to “netware” as the basic mobile telephony service and special services that a provider makes available. The type of service (analog or digital) is also included in this category. This component of the technology is completely invisible to the user. We found that many users did not understand the difference between analog and digital service, nor did they know what service they had. All subjects in this study had *only* digital service (the only option with their service provider). Subjects seemed to be further confused by analog and digital service because most owned dual mode phones. Dual mode phones allow users to receive analog signal outside their digital service areas, by paying additional surcharges.

#### *“Bizware”*

Finally, “bizware” is what we call the last component of service-based technologies. The bizware component is a reflection of the business practices of the service provider, which in turn can be a partial reflection of the social organization of the service provider itself. Details of the service agreement, including idiosyncratic particulars that are outcomes of marketing-generated promotional deals, comprise the main portion of “bizware.”

For example, agreement plans specify how much “airtime” (in minutes) one has to use over the course of some period of time. Service plans vary within and across providers: Different levels of minute plans exist and the airtime can be distributed across “peak” and “non-peak” times. Comprehension of these plans alone is quite confusing for many new users; people are not accustomed to anticipating their local call time in terms of minutes and in advance of the month. On landline phones, there is no need for awareness of minutes as a measurement when making local calls. Only long-distance or coin-operated calling are cases when people had to previously be concerned about amount of time spent on the phone. To confound understanding even further, it is not unusual for a handset to have its own minute counter that tallies minute use independent of how the service provider actually calculates them. Because users rely on their very tangible handsets to guide them in this service-based technology space, their expectations about how they will be charged for their calls are often incorrect.

Special promotions by marketing divisions intertwine with the technical execution of mobile telephony service as well. For example, providers might have promotions that offer “free” minutes. The connotation of “free” must be made very clear: Are they free of long distance charges or are they bonus airtime minutes? New users who do not understand their service agreements can easily misinterpret this. Promotions created by marketing divisions also have to be reflected in customer bills; socio-organizationally, this can be a challenge for service providers when these departments operate independently. We found that subjects who purchased service under promotions expected to find those promotional names clearly indicated in their bills; they were concerned when they couldn’t easily identify them.

Sales and Help desks are also often distinct organizationally. Salespeople are typically motivated to sell mobile service by volume. Consequently, there is often little time or desire to adequately ascertain new users’ comprehension of the new service. Downstream, users are directed to Help desks to receive information or troubleshooting assistance. We found that new users often are satisfied by the amount of information garnered during the sales call, only to learn how little they really understand after using their phone for a couple of days.

#### **A New Terminology**

Mobile telephony has its own terminology that new users must incorporate into their fledgling mental models. Some of these terms are inherited computer lingo, which assumes computer experience. Not all users have this experience. Words like “scroll,” “icon,” and “select” have found their way into manuals, for example. Other new terms like “analog,” “digital,” “roaming,” “airtime,” etc. are often used to describe new and tricky concepts as though they are self-evident.

#### **Expectations from Other Technologies**

To understand and find applications for mobile telephony, users typically rely on their experiences with landline phones. Sometimes this carryover model is helpful but at other times, it can be misleading. It is not uncommon, for example, for new users to expect call signal quality to be like that of a landline phone in all situations. Features on mobile phones also do not necessarily carry over from landline phone models. When their mobile phones ring loudly in a public place for the first time, new users discover that the ringer volume feature, while not so important on a landline phone, is in fact of great importance on a mobile phone.

Users may also have expectations based on a pager service model—which usually has wider coverage areas than mobile telephony service, or on a radio walkie talkie model—where travel distance is tightly constrained. One of our subjects appeared to employ a walkie-talkie model, thinking that his phone would not work when a friend he wanted to call (who was also a mobile phone user) was in a distant city. S11 wanted to know “how far [apart] they could call each other” (S11).

### **Dealing with Mobility: Long Distance & Roaming**

Although long distance is not a new concept to people, new users suspect that mobile telephony puts new twists on this old concept, calling it into question. For example, about one-third of our subjects thought they were charged for incoming long distance calls, which is not true in the case of their service provider. Because new users are uncertain of cost structures and sense that their mental models are not completely reliable, it appears that they tend to err on the side of conservatism to prevent unexpected costs. The bill is often the first time the relationship between their calling behavior and charges were first clarified, which happens about one month after acquisition.

We found that the concept of "roaming" in particular is difficult for new users to comprehend and is often confused with long distance calls. "Roaming" occurs when a person is outside their specified calling area and makes or receives a call that a service provider local to that area handles. Many subjects had very poor understanding of this; in fact, their comprehension was so confused as to be indecipherable by the researchers at times! In most cases of confusion, subjects understood roaming to be a function of the destination or origination of a phone call, not a function of the location of the phone and the user. So, a call to or from outside one's home area would be considered a "roaming" call, hence the confusion with long distance. Other subjects thought that "roaming" was the state of the phone "looking for signal," and so was not associated with any potential calling charges.

The multiple components of mobile telephony service, as well as the existing communications models that people bring to bear on this new technology, are difficult for new users to synthesize into serviceable mental models with which they can plan behavior and predict outcomes.

### **DISCUSSION**

Mobile phones are devices that directly serve the individuals who employ them, but their use is influenced by social context. In studying new users, we have attempted to examine how and why mobile phones become integrated into the daily life of users and, indirectly, how they are becoming integrated into modern social life. We have identified features of practice, as well as lifestyle factors that appear to affect practice. We have also examined the challenge that mobile telephony, as a new technology, presents to users who have difficulty comprehending its complexity. In this section, we devote additional attention to mobile telephony's occupancy in the social world.

Although mobile telephones have proliferated in recent years, non-users still outnumber users in most (but not all) parts of the world. Even new users who see enough usefulness in the technology to decide to acquire it maintain negative perceptions of public mobile phone use initially. Signage in public venues about mobile phone use is an overt attempt to regulate behavior. Norms for how and when mobile phones should be used are clearly in flux.

Ideas about what constitutes appropriate public mobile phone use are therefore disjoint. Opinion is in part derived from the role one plays in a social setting and the amount

of personal experience one has with mobile telephony. How people feel depends on whether 1) they are the person using the mobile phone, 2) they are a non-user witnessing someone else use the mobile phone, or 3) they are a user witnessing someone else use a mobile phone. Additionally, how one feels about mobile phones can also affect a person's willingness to knowingly call a mobile phone number.

### **Public Perception & a Collision of Social Spaces**

Ling's work on mobile telephony behavior in restaurants [5] resonates with our findings: Some people feel directly affected (and possibly intruded upon) when even strangers use mobile phones in very public places. Additionally, we found that there appears to be a direct correlation between the amount of personal mobile phone experience one has and feelings of tolerance for other users. Why is it that public use of a mobile telephone is so offensive to some? Ling's work [5] suggests that applying Goffman's theory of public "faces" or personas [3] can help with this question.

We believe that talking on a mobile phone in a public place is in part a matter of a conflict of social spaces in which people assume different faces. Mobile phone use often necessitates the interleaving of multiple activities and of multiple public faces. When mobile phone users are on the phone, they are simultaneously in two spaces: the space they physically occupy, and the virtual space of the conversation (the conversational space). When a phone call comes in (or perhaps more pretentiously, when a call is placed out), the user decides, consciously or otherwise, what face takes precedence: the face that is consonant with one's physical environment, or that of the conversational space? The greater the conflict between the behavioral requirements of the two spaces, the more conscious, explicit, and difficult this decision might be.

One's assumption of multiple faces, it would seem, is what is largely at issue for those who find public mobile telephone use disturbing or even offensive. First, choosing to be behaviorally present in a different space from one's physical location may be perceived as inconsiderate by those in the space. Second, a mobile phone user might have to violate (or at least perturb) the social norms of the physical space in order to honor the norms in the conversational space. Finally, perhaps what is most apparent to the public is that the face one presents on the phone is in contrast to the face assumed just before the phone call. This changing act brings to the fore that faces *are* publicly assumed, which then gives rise to the feeling that the new face and perhaps even the old face are false.

Also, because mobile phones are a status issue for some people (and perhaps more so for non-users than users), some are inclined to make judgments about the gravity of an overheard mobile phone call. Some of our subjects reported that overheard mobile phone calls are drivel. Because the surrounding public can hear only half a conversation with little, if any, context for its content, mobile phone calls can sound frivolous, as would most human conversation, no doubt! Most users would be hard-pressed to deliver on these high expectations that a mobile phone call be important enough to warrant public display.

## Social Coordination

Mobile phones are sometimes perceived as a kind of leash because they can make a person constantly available no matter their physical location. Many of our subjects, however, found that there is another perspective: that of mobile phones as enablers of freedom. Mobile phones can free people from the place-centeredness of schedules, which require that people commit to physical presence at certain times to be accessible to others [9, 10]. For many, mobile phones maintain or increase temporal accessibility while decreasing the physical constraints on users, enabling them to take a call while doing something far more preferable than sitting by the phone.

However, mobile phones can be also abused when another person's schedule is affected by a mobile phone user who is available anytime, anywhere. Saving time for the user could in fact violate the schedule of another person to the point of making them wait—a clear demonstration of power [9]. Subject 9, a dental hygienist, remarks:

*When patients come to have their [dental] work done, there is nobody that has needed to receive a call that has received a call [on their mobile phone]. It's all b\*@(s\*&! ... and that's really rude because we schedule time to work on them and it sets us back for the next person and that's not fair. (S9)*

With respect to coordination with others, Ling and Yttri note that mobile telephony "softens time." Mobile phone users, especially when coordinating with other users, can refine schedules as they approach an agreed upon time because fear of being late and leaving the other party waiting are eliminated. Ling and Yttri call this "micro-coordination" [6].

Mobile phone use, then, is a means by which we can perform "commitment management" [Carrie Rudman, personal communication]. The specificity with which we negotiate social commitment, and the time response required of that commitment, is affected by our accessibility. The more limited the human access, the greater the specificity required. Therefore, one can control one's level of commitment by controlling access, as users do by consciously choosing to keep their phones powered on or off and by controlling distribution of phone numbers. The ability to perform commitment management, which permeates all of social life, holds great appeal for mobile phone users and directs mobile telephony practice.

## Conclusions

Deployment of mobile telephony is accelerating in many parts of the world. During this time of rapid adoption, however, we are experiencing societal growing pains. Some people are highly enthusiastic about mobile telephony's possibilities, while others still question its discretionary and social benefits. Social norms are under development. By examining the issues that new users contend with, we can better understand how and why mobile telephony is used and how public perception of mobile phones is shaped. Documentation of such behavior supports new theoretical insights, and helps ground the design and business spaces of wireless communications technology.

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