Exploring Technology Adoption and Use Through the Lens of Residential Mobility

Irina A. Shklovski
Human Computer Interaction Institute
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213 USA
ias@cmu.edu

Scott D. Mainwaring
Intel Research
Mail Stop JF3-377
2111 NE 25th Avenue
Hillsboro, OR 97124, USA
scott.mainwaring@intel.com

ABSTRACT
One of the outcomes of massive adoption of technology is that much of daily technology use and consumption is embedded into "unremarkable" daily life routines. Occasionally, these routines undergo major shifts, often in conjunction with major life events such as marriage, birth of a child, or a residential move. We propose a model of settling into a new location as a function of balance between the pull of the things left behind and the demands of the new and unknown. It is through this experience of being unsettled that we explore the processes of behavior adjustment and re-evaluation of old patterns of technology use as it relates to the old location and the demands of the new location.

Author Keywords
Ethnography, residential mobility, behavioral science, technology adoption, social relationships

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
One of the outcomes of massive adoption of technology is that much of daily technology use and consumption is embedded into "unremarkable" daily life routines [27]. Existing research into daily use of ICT's has produced valuable insights [e.g., 8,12,17], illustrating that people use available technologies to interact with their surroundings and their social network, to keep track of their environment, life plan, possessions, finances, hobbies, in ways that fit existing habitual practices. As Hoffman, Novak and Venkatesh point out, "it is the small things that people use the Internet for on an everyday basis that makes it so integral to people's lives" [9]. Yet the routines of daily life are not static. Adjustments and reconfigurations are made continually to satisfy emergent contingencies [21]. Occasionally, these routines may undergo major shifts in conjunction with major life events such as marriage, birth of a child, or a residential move [23]. In order to cope with new circumstances and possibly even new senses of self and identity, routines and habits are re-evaluated and re-negotiated. Such disruptions are not only opportunities for new technologies to provide valuable, foreground support; the can also uncover hidden structures within the more settled periods they punctuate.

This paper reports on an exploratory ethnographic study of the role of contemporary ICTs in the event of a long-distance residential move. This is a common major life event particularly interesting from the perspective of wireless and location-sensitive technologies. In addition to the obvious physical challenges of transporting people and belongings, long-distance movers must disconnect from a set of infrastructures, routines, and social contacts that had been "home," and then somehow reestablish these in a distant locale. Historically, technology has been associated with residential mobility through advances in transportation, information access and long-distance communication [11]. In this study, we found ICTs to be implicated throughout, as they were used in planning and executing the move, orienting to the new location, keeping in touch with the old location, and re-balancing one's social network between old and new locations.

Residential mobility is a large and complex domain. In this paper we take as a starting point long-distance interstate moves within the United States. We expect shorter-distance or intrastate moves to share many of the features of their longer relatives, but perhaps in forms more subtle, attenuated, and less amenable to detection. Conversely, we chose to exclude from our research scope more extreme types of relocations, such as transnational migrations, because these have already received substantial attention [e.g., 24,13]. Such relocations also introduce a host of complicating factors such as cultural and linguistic differences, as well as political immigration barriers [13],

CHI 2005, April 2–7, 2005, Portland, Oregon, USA.

which are unlikely in intra-national migrations. Though the generalizability of our findings to the phenomena of long-distance residential mobility in other countries and cultures is an open question, we focus on the United States as a kind of best-case scenario, in which barriers to internal migration are relatively low, yet distances can vary dramatically. Even so, we expected (and found) people engaged with long-distance moves to be facing considerable challenges.

BACKGROUND

Historically, Americans have been a restless nation, associating voluntary physical relocation with self-improvement [10]. Although moving rates have declined somewhat over the past 50 years, according to the US Census, 14% (over 40 million people) of the country's population moved within 12 months in 2002-2003 [22]. Over 5% (15 million people) moved long distance (outside of their county or state). Thus, the great majority of Americans have experienced residential mobility if not by moving themselves, then by negotiating the moves of the people close to them. Although more than half (60%) of the annual moves are local, made for various housing reasons, nearly 20% of yearly moves are made long distance, across state lines [22].

A long distance move requires packing, finding lost items, discovering forgotten memories, making choices. Although any move is a hassle, long distance moving is a commitment to a significant change of place and, in some cases, life style [5]. It may be more of a shock to the system than movers expect, or it may be far easier and smoother than they predicted. Pre-move expectations often differ from post-move success analysis [3,19,29]. Moving is an event, a chance to change aspects of life that have been deemed unsuccessful, an opportunity to try new things, a moment when life can sometimes feel as if it begins anew [10, p. 63].

When people move the needs for communication (such as keeping up relationships, coordinating events) and information seeking (such as finding maps, getting directions, learning about a new locale, shopping for moving services, jobs, housing, etc) become more relevant and focused. Individuals may have to consider the availability of high-speed internet, mobile phone coverage, and the process of unplugging and plugging back into these networks as they select where they will live and how they will organize their "new" life. Pent-up impulses to reorder, abandon, or acquire technologies and services can be catalyzed into action, feeding the desire to "settle" into a new life in a new location.

The concept of "feeling settled" is difficult to define, yet our respondents were very clear about knowing when they were not settled. "Feeling settled" seemed to relate to the concepts of happiness, contentment, being familiar with your surroundings, having a developed local social network, etc. It was not the same as any of these concepts, but seemed to encompass some aspects of all of them at least for our respondents. Yet getting to the point of "feeling settled" in the new location was often an important goal. For some participants, the term "settled" had negative connotations of stasis and loss of youth; even so, they engaged in settling behavior. Based on the interviews, we identified three major aspects to "feeling settled":

1. Having possessions and the living space set up in a way that is familiar and satisfying
2. Developing a level of local knowledge of the new location that is perceived to be impossible unless one lives in that location (knowing the best places to eat, the shortcuts and back roads to avoid traffic, etc.),
3. Balancing long-distance, technology-mediated and geographically proximal social ties in a way that is habitual, consistent and devoid of major conflicts.

In the rest of this paper we explore the three aspects of "feeling settled," and focus on how movers use and don't use ICTs to help them adjust to the new location.

THE STUDY

The goal of this study was to collect a variety of real-world, detailed stories about recent (or immanent) long-distance moves. These stories helped us understand such experiences from the mover's points of view. Throughout the interviews we focused on the way movers used ICTs and value they did (and did not) find in ICTs, before, during, and after the move. Two-person research teams conducted a total of 11 interviews in the form of 2-3 hour home visits. Interviews were informal, asking people about their reasons for moving, the process of moving itself, and the mechanisms they used to adjust to the new location. The home interviews included several sketching exercises centering on the time-line of the move and discussing geography and social relations in the current and previous residential locations.

We limited our sample to long distance movers (300 km [186 mi] or more) who have moved (or were about to move) across state lines within previous 6 months. The sample was geographically limited to the Los Angeles and Portland metropolitan areas, two rapidly growing regions but with disparate reasons for their popularity [18]. Participants were selected using the snowballing technique by asking friends of friends and acquaintances, as well as our participants, if they knew anyone who had recently moved or were about to move to or from Portland or Los Angeles metropolitan areas. Six of our interviews were in Portland, 4 in Los Angeles, and 1 in Seattle. Table 1 illustrates some of the properties of our sample including origin, destination, distance moved, and length of tenure at the new location.

The body of migration research suggests that the experiences of moving over long distances are different, depending on the life-stage of the movers, their gender [15], their socio-economic status, whether they rent or own [3], whether the move was assisted (corporate relocation program) or self-organized [19]. Despite the diversity in our

	Origin	Destination	Distance	Reason	Size	Examples of ICT use for "getting settled"
A	Seattle, WA	Portland, OR	315 km 196 mi	Employment relocation	2 adults 2 children	Collected e-mail addresses from everyone even if wasn't planning to keep in touch – to not hurt anyone's feelings
B	Mendocino, CA	Portland, OR	891 km 554 mi	Lifestyle change	2 adults 1 child	Decided where to live based on suggestions received on Craigslist.
C	Los Angeles, CA	Portland, OR	1577 km 980 mi	Employment relocation	2 adults	Decided to purchase a computer, but worried that they would spend too much time using it – too available.
D	Las Vegas, NV	Portland, OR	1908 km 1186 mi	Lifestyle change	2 adults	Sent postcards of Portland, because it meant more. Felt that cell phones/email made voice contact cheap.
E	Phoenix, AZ	Portland, OR	2148 km 1335 mi	Employment relocation	2 adults 1 child	Read online publications from the old location in order to maintain a sense of context when talking to friends.
F	Phoenix, AZ	Portland, OR	2153 km 1338 mi	Employment relocation	2 adults 2 children	Made the decision to buy the house based on pictures sent through email.
G	Portland, OR	Nashville, TN	3873 km 2407 mi	Employment relocation	2 adults 5 children	Found realty listings online. Acquired cell phones to talk to realtors and to family and friends long distance.
H	New York, NY	Los Angeles, CA	4497 km 2795 mi	Lifestyle change	1 adult	Made a decision for a major lifestyle change because of an email exchange. Met people through Friendster.
I	Providence, RI	Los Angeles, CA	4803 km 2985 mi	Employment relocation	2 adults 1 child	Wanted a way to de-clutter, keep memories but get rid of the volume of physical things.
J	Boston, MA	Los Angeles, CA	4816 km 2993 mi	Lifestyle change	1 adult	Used elaborate methods of keeping in touch through mailing lists, email, Friendster, SMS, IM, cell phone.
K	Providence, RI	Portland, OR	4956 km 3080 mi	Lifestyle change	1 adult	Disliked e-mail but found it an affordable way to communicate. Missed the "community" feel of a landline.

Table 1: Basic properties of the study sample

sample, however, the moves of our respondents had many things in common. For example, all of our respondents agreed that "the move started long before moving day and carried on long after the furniture arrived." They repeatedly stated that there were two parts to the move – the physical part, involving actual packing, heavy lifting, physical relocation, and the psychological part, involving reconciling with the reality of the move and all that it entails.

Our respondents shared several seeming invariant aspects to the move – all of them went through the process of sorting their possessions (a form of cleaning), integrating into their new surroundings (exploring the new geography, re-arranging the new location to fit tastes and preferences), and renegotiating social relationships (adjusting newly long-distance relationships, rekindling old and weak ties, meeting new people). It is the latter aspect of the move that also seemed the most complicated and painful. All of our respondents related these aspects of the move to the process of "getting settled" in a new location.

Renegotiating the relationship with possessions

The home domain has enjoyed an increasing amount of interest as a site of technology adoption and use [e.g., 1, 16]. Yet a household is not just a space filled with appliances and ICTs. A household is usually filled with our possessions, both technological and not. Over the course of use, we develop relationships with our possessions. We grow attached to things that end up defining our personal space – the art on the walls, the pictures on the table tops, the furniture, and the appliances. Things can collect dust of sentimental memories on them even as they get relegated to the basement or the boxes we rarely open. These caches of forgotten things lie undisturbed until their owners are forced to reconsider every corner of their dwelling when they are getting ready to move. As most "moving tips" leaflets will readily point out, any kind of moving is often a catalyst for a thorough "spring cleaning," an excuse to get rid of things, give, donate, or throw them away.

Confronting the weight of one's possessions was an important theme throughout our home visits. For example, consider the case (I) of Mary and Ryan, who had just completed a move from East to West Coast. Ryan's employer was taking care of all the expenses, but Mary was eager to do some spring cleaning before the packers and movers arrived. She saw moving as a "nice reason to get rid of stuff you don't really need anymore." She firmly believed that "material things weigh you down" and liked getting rid of them, giving them away. "Throwing things out becomes easier as you do more of it," she recounted.

However, we found that "spring cleaning" is not necessarily a straightforward process. It can be an emotion-laden balancing act between the desire to keep cherished memorabilia and the desire to cast off the oppressive weight of physical clutter. One of our participants explained that he was reluctant to throw away things, because these objects made him feel "more at home in the new place." This "stuff" that Mary saw as old and disused was really "part of who Ryan was, things that brought memories." Yet both Ryan and Mary agreed that accumulating things was a perpetual process. Another of our respondents lamented that "sometimes, you can't even remember when the last time you used some of these things was." Not only do items grow old with disuse, but the uses of many possessions and their necessity are often a mystery even to their owners. While to some, possessions are fraught with memories, to others, they are simply causes for clutter and hassle. ICTs have yet to adequately address "inventory control" issues within the home that deal with possessions as both objects

and memories. Could ICTs help reduce the clutter by somehow retaining memories beyond the objects?

Although cleaning is part of the moving process, movers rarely rid themselves of all their possessions to start wholly anew (household E came close, however, discarding their previous "Las Vegas" décor to embrace a new "Northwestern" sensibility). A substantial part of what they own gets transported to the new location – an activity that has fostered a whole industry. While local and regional moves can often be done by the movers themselves, long-distance moves are much more involved and require assistance from others to varying degrees. This is especially true for coast-to-coast moves, where large distances make hiring professional movers more cost-efficient. With long-distance moves come the horror stories of moving, where packers don't pack things right, possessions get damaged for any number of reasons, and it is often impossible to tell when and in what condition your "stuff" will arrive.

Our respondents expressed anxiety over not being able to track their possession as they were transported to the new location by someone else, not knowing where their possessions were at any given time, or what may have been happening to them. In fact, one of our respondents even suggested the use of RFID tags as a way to track possessions in transit. This concern over "is my stuff safe" was more than just an economic concern over possible replacement expense, it was a concern over material that bore great personal meaning and in many respects signified personal (and household, familial) identity. Apart from some initial forays by the home-alarm and security industry, the potential for technologies to address these concerns both in the context of a move and the larger context of "settled" life is, for the most part, unexplored.

While moving presents a kind of imperative for casting off unwanted things, and for transporting the bulk of one's possessions to create continuity in a new context, it is also an occasion for acquiring new things – and new forms of connectivity. In some cases, the new possessions are acquired in direct support of the move, though they may persist long afterwards, marking the beginning of new habits and behavior patterns.

For example, one of the families we interviewed (G) found that it was difficult to communicate with real estate agents without a cell phone. At the same time, they were expecting to spend a large amount of time communicating long distance because their oldest sons were staying behind. Suddenly, it became cost efficient to adopt cellular phones and national calling plans. Another family (C) decided to purchase a computer for the household. Their living situation was about to change due to the move which required both spouses to change jobs. Where previously it was convenient to use computers available through their school and place of employment, uncertainty of future employment, plans for having a child, and change in the size of the living space due to the move, provided enough reasons for the purchase.

Notions of physical stuff, technological connectivity, and personal identity were particularly intertwined when it came to questions of outfitting a new home with the internet, telephone, and/or television service. While most of our respondents already owned various types of technology equipment, including computers, cellular phones, and televisions prior to the move, they found that they had to make a set of decisions about reconnecting to the infrastructure that provided various ICT services at the new location. In many cases, it became clear that their relationships to these meaning-laden technologies were ambivalent.

For example, family (I) decided that they did not want to reconnect to cable TV, in order to encourage a less TV-oriented lifestyle; nor did they want to reconnect a landline telephone, seeing it as superfluous given their increasing reliance on cell phones. However, they wholeheartedly continue to embrace the internet as central to their lifestyle, and perceived broadband Internet access to be a requirement. They found that satisfying all three of these lifestyle statements to be impossible, however, as DSL apparently required a landline telephone connection, as a cable modem would cable TV. Paying for a "side effect" service they would not use was most unpalatable.

In the end, they decided to reconsider getting landline telephone after all. They were unwilling to give up the greater reliability it offered. They were also bothered by a secondary, unexpected effect of switching from a landline to cell phones. They found that after dropping a landline, they lost incidental interactions with their spouse's friends. These friends did not call the shared phone and talk to their spouse for a minute or two anymore, losing the opportunity for polite chit-chat of life updates with their friend's spouse. The couple realized they were missing these spontaneous moments of inclusion into each other's social lives. This effect was similar to one documented several decades ago, when "party lines" disappeared in favor of more private phone lines and families felt they had lost an intimate connection with their neighbors [5].

Several form-factor reasons also made the cell phone a poor fit for use as a home phone. Its small size, while a boon when being carried outside the home, became a liability within. At home our respondents developed a "home within the home" for their cell phones, usually next to the keys, the wallet, and the handbag - a cognitive trick used to reduce the potential of losing it. However, precisely because of the small size, the phone could be carried anywhere in the apartment during a conversation and then left, and lost, where the conversation ended.

Unlike cordless home phones, cell phones usually lack a handset locator function, producing a loud noise upon receiving a "locate" command. Instead, most have the opposite: a "vibrate" mode to help reduce unwanted, socially unacceptable interruptions. It's a good feature, unless there is a glass of water standing underneath the shelf where it resides together with keys and wallet when

someone calls and it happens to vibrate off into the water. It can also simply vibrate off the shelf and fall on the floor, vibrating itself under a desk or a cabinet, successfully hiding itself. When was the last time we had to deal with technology that walked of its own accord?

Although these issues are not new to the design community, we want to call attention to the fact that our respondents did not expect to encounter these problems when they made the decision to abandon the landline. Thus their choice of hardware was driven more by factors of "look and feel" so heavily advertised by wireless providers. While the hardware that provides some solutions for these problems already exists, it is nascent in its development. Our participants ended up working around these problems, because they found themselves locked into a year-long plan which was costly to terminate. For example, because Mary's activities at home were mainly reading and talking on the phone, she used her cell phone as a bookmark. This prevented it from vibrating off the surface and she was less likely to forget it in a random location. These examples illustrate to potential confrontations between people, their stuff, and how they want to live (i.e., who they want to be). Our respondents clearly indicated that there exists a need for better integration of the physical and the digital domains. Things designed for use in one particular space or domain may migrate to others, because people function in many spaces and domains and will carry their mobile possessions with them.

Renegotiating geography

Decades of cognitive mapping research have analyzed how individuals map their neighborhoods and how this type of cognitive mapping is essential for development of routine behavior [14]. Having a good cognitive map of the immediate surroundings may also play a comforting function, making the place where one lives familiar in an intimate way. Unlike online mapping utilities, these maps operate through obscure personal landmarks, memories and word of mouth advice. As one of our respondents explained, "it's the people you know in the favorite places you go that makes the place you live yours. It's not something you can do when you visit, only when you live there. But it's exciting to explore a new place."

Many of our participants told us that before the move they rarely felt the need to the use online mapping utilities or local information services. After the move, however, most of our respondents used online mapping utilities in some capacity to orient themselves in the new location and to gain some spatial understanding of the layout of the new environment. For example, the one family explained to us that they did not own a map of Portland but couldn't have survived without online maps. "Every time we have to go somewhere we just look at the map… and I can zoom out… and there… you see, there is our street and we can plan our route and it almost always works. Its great, we would be so lost without it." Yet few of our respondents used online information and location-based services to find out about social events or "best" places for food, shopping, entertainment, etc. When they did use online systems for this purpose, they often qualified this as something more personal than simply getting information: "we like to use Craigslist to ask advice, because it really feels personal and we feel like the people on there… they are like us… like we can trust them a little more." Some of our respondents insisted on using local newspapers and advertisements despite reliance on online services for man of their other needs: "We find what's playing and where for the movies in the newspaper and then we use the map-thing on the Internet to find out how to get there." It was as if the physical artifacts specific to the location, like local newspapers, often carried more clout and credibility than their online counterparts. As if online location-based services and information listings were too impersonal to seem credible.

Even though movers spent time exploring the new location, they also put effort into keeping in touch with their old location by following local news and checking on weather on the Internet. One of our respondents checked the weather in Phoenix every day through the Portland summer, by setting up an indicator on one of the portal sites he used, which enabled him to compare the two. This way he not only retained a sense of involvement with the old location, but also re-asserted that moving was indeed a good thing on a daily basis: "every time I look it up, its some ridiculous over 100 temperature over there… global warming getting worse… so then I just walk outside into the yard… with the dogs and enjoy the weather." Another respondent at first subscribed to the paper versions of both the New York Times and the Los Angeles Times in order to maintain connections in the old and the new location. However, he quickly realized that it was simply too much paper to read and the costs were prohibitive: "at first I wanted to really preserve that morning coffee and reading the Times on the porch, but then there were two different Times … and I didn't have enough time or money to have both… and I figured I'd keep the LA version since I live here now. I find I spend quite a bit of time reading the New York Times online though… strange, I never used to, its an inferior version, it just doesn't have the same impact… no physicality to it… like its less real." Several of our respondents insisted on subscribing to new local newspapers and reading them in their physical form, but switched to reading the old local newspapers online.

This switching from a physical object made of paper to its online version seemed to be not just a substitution, but a substitution forced by distance and a reminder of it. Some of our respondents articulated effects of the ability to keep in touch with a place in this fashion: "it's great, you can read about what happens in the old place online and you sort of are a part of it still… I email my friends when I find out interesting things, just a note here and there… just to see if they know, it's fun if it turns out I'd found out about something first and it's a good reason to start a conversation," explained a man who spent most of his time

at home as a stay-at-home dad. For him, knowing about the events in a location was a way to keep in touch with people in that location, a social vehicle and a catalyst for social interaction. Yet easy access to information about anywhere anytime was not always an advantage: "sometimes, I feel like... the more I spend reading the newspaper online, the more I realize I am not there anymore… the place has hold on me and my friends expect me to know what's going on, since I can read the paper… but I don't really have time… I am sort of more interested in what's happening here," explained another participant. The ease of access is known both to the mover and the people they have left behind, which sometimes may create burdensome expectations. While online services make it easier to follow events in any corner of the world, this ease can have an unexpected effect on social relationships, at least for those who migrate.

Renegotiating social networks

Of the tasks that movers face, renegotiation of social relations seems both most challenging, and most amenable to technological support. Social science research on migration suggests that geographic relocation may result in disruptions of existing social networks and increase stress and depression [15]. In fact, geographic relocation has been cited as the most frequent cause of relationship dissolution [20]. Moving throws much that is taken for granted into question: How and where will I receive emotional and practical support? Which of my now-distant contacts should I try to keep in touch with, and how? How will I make new friends and local contacts? Yet as ICTs make promises, explicitly and implicitly, of continuous connection, inexpensive access, and erasing concerns of distance or location, these concerns never vanish.

Social relations were a central and serious concern for all of our participants, and all made substantial use of ICTs to address them. ICTs do enhance one's ability to maintain relationships over distance [26]. In fact, in some cases, ICTs played a central role in terms of delivering support and easing move-related stress. Some of our participants told us they felt less along and more secure and confident because they could always pick up the phone and talk to family and friends. Yet, far from "solving" the many problems encompassed by the notion of renegotiating one's social network, ICTs seemed to add additional layers of social complexity. Far from erasing effects of distance, the stories of our participants support Cummings et al.'s findings that despite the improvements in the array of ICTs, contact with many people from the past tends to trickle away to nothing [2].

Although a number of HCI researchers have given this topic much thought [see for example 6,25,27], "keeping in touch" with people may be only half of the story. Long distance moves to a new location make it necessary for the movers to establish a new geographically proximal social circle in order to eventually "feel settled" [4]. This process may take years to complete and requires a certain amount of time commitment. It may start with the revival of old social ties or activation of weak and opportunity ties (neighbors, new co-workers). Eventually however, individuals build a circle of ties they find most comfortable [4,5]. Our participants anticipated this process to last anywhere between 3 and 6 years: "it will really feel right when we meet the right people… but that takes a long time and it's not that easy."

In our study we found that there were three main types of relationships that movers had to negotiate due to the move: two types of pre-existing relationships – mediated and "left behind", and new relationships – ones that the movers initiated in the new location.

Mediated social relationships were a stock of long distance relationships that individuals have maintained mostly via ICTs for a period of time prior to the latest move. These relationships tended to experience little or no change due geographic relocation because the pattern of interaction over distance was already pre-established and proven successful. The number of such relationships seems to have been directly proportional to both the age and the propensity towards mobility of the respondent (younger, more mobile individuals tended to have much more extensive and spread-out networks), as well as personality differences (more gregarious participants seemed to simply know more people). Surprisingly, an overwhelming proportion of close mediated relationships were blood kin, rather than friends: "I call my parents a lot, once every couple of weeks… that's a lot for me … it's always been like that," one participant explained. "There is my sister, I call my sister once a week… Even when we were in Sweden, I called her… not quite as often, and we emailed more then, but we like to talk," told us another.

The mediated friendships, however, were often relegated as "important contacts" rather than as close friendships. These weak ties could be re-activated when needed, but that required less consistent maintenance: "It's like a fraternity, - said one of our respondents – we update each other about the important events, you know, birth, marriage and it's all through announcement postcards… we find out more from those announcements than through email… email and phone are kind of rare." Some movers, however, did have close mediated relationships with friends: "this family, we met them before we moved to Kansas, which was before Seattle and we always kind of kept in touch… we email a lot, and sometimes we call and spend hours on the phone, but that's not nearly as often… now we are moving again and they are moving here, which is funny… but its ok… we will keep in contact just the same."

Several of our respondents spoke about re-activating the relevant "contacts" dependant on their geographical location both as potential friends or sources of information. "Well, I didn't really know them very well before, they lived far … we didn't really keep in touch very much… but now that we are practically neighbors… I expect we will be spending some time getting to know each other," explained

a respondent about a couple she had met previously and had kept in touch with via Christmas cards for several years.

Previously mediated relationships that did not become geographically proximal due to the move, remained unchanged during the process of geographical relocation. Close relationships may have been more likely to provide the kinds of social support and warm presence that the new migrants perceived necessary while they got adjusted to the new location: "I call my mom a lot. I always call her a lot when I just move." One of our respondents (K) was having a hard time adjusting to the new location so she spent what seemed to her a huge amount of time talking on the phone to her parents: "it's amazing, I call them more now than I have before, but they … I've always mostly talked to them on the phone, since I moved the first time to Providence, so it's ok… I call and I can talk to the whole family and I feel better. I can't really call my friends from Providence too often because… they are busy." It was easier to call family because she had already established a method of long-distance communication with them. The friends who used to be in her immediate geographical location, however, were a more complicated issue. Previously mediated relationships have already withstood the test of time and distance prior to the move, and have already been selected for preservation. During this new move, they did not need re-adjustment. The pattern of communication has already been established and, most of the time, did not need to change significantly due to the new relocation. Partners already knew what was appropriate and what actions allowed this relationship to remain salient and alive.

The friends left behind in the previous location comprise the second type of relationships: ones that were heavily based on face-to-face interaction prior to the move. The number and breadth of these relationships is, of course, related to the length of tenure in the previous location as well as personality of the individual (how sociable they are for example). These relationships vary not only by how important individuals perceive them to be but also by how feasible they are to be maintained at a distance.

At the time of migration or even before, when migration becomes inevitable, geographically proximal relationships may be evaluated for utility and level of closeness. "She tends to sort of cut people off when… when she is about to move…" explained one of our participants about his wife. She confirmed: "well, not really cut people off, but I went to some baby showers… and I didn't really feel I needed to be there anymore, because … most of these people I wasn't going to see anyway [after the move]". These relationships are then "prepared" for distance through notifications of impending departure, exchange of contact information, and exchange of gifts and memento's. "I've been collecting emails and addresses from friends, you know, being so far, we will email and call, but probably email more."

Most relationships in a person's geographically immediate social circle will be dropped or at least made dormant, while a few select friendships will be relegated to an attempt to make them mediated. "This woman, we met at church, and I like her and we are kind of friends… so I think we will email each other for a while… but it's kind of like that, it will fade with time… its not that strong." In a sense, individuals have to renegotiate a set of their social relationships in their old location, making agreements on new patterns of communication – new ideas of what is/is not appropriate.

Relationship research suggests that relationships with friends need to be enacted in order to survive [4]. Each relationship needs to be injected with communication episodes in order to retain a level of involvement and perceived importance. Distance makes certain types of communication much harder and more costly; changing the opportunity costs for enacting relationships that depended on these types of communication – face-to-face interactions and landline phone calls for example [21,29]. Thus, relationships that require these types of communication to survive either fade or are recast to accept other types of communication and/or a different pattern of face-to-face meetings and phone calls. "We have wonderful neighbors here, really great people, we watch each other's kids, trade spices over the fence… but its neighbors… they move, or we move, and you never talk again…" Our respondents were aware that some parts of their existing social network will not survive the strain of a long distance move. It was a resignation to inevitability, a utilitarian approach to selection based on the feasibility of maintaining a particular connection: "there is only so much time you can spend keeping in touch … and some people… they require a lot of time… and sometimes, it's just not worth it... even with email, it does not work."

Among our respondents, we found that more experienced long distance movers had developed skills that allowed them to gage whether a particular relationship would survive the process of such renegotiation or slowly fade. Most movers still expected a large proportion of their now-long-distance friendships to endure at least for some time after the move, but their approaches to this process differed. Less experienced movers wanted to keep in touch but were at a loss of how to accomplish that: "I have emails addresses and phone numbers for so many friends… I really want to try and keep in touch… so many great people left behind… I don't really like email and calling on the phone… I run out of minutes, it gets expensive." More experienced movers simply applied previously developed processes again: "with [my business school class], we are all on a big e-mailing list, but I always create my own, small ones, for specific groups of friends, so we chat over it… I let them know when I am around… and I can select who I want to meet that way… and we text message a lot… not so much call, but text message… its nice sometimes just to know… be thought of." Some forms of communication, while low on content, such as SMS, can provide movers with an ability to remind others about themselves, to tell someone they are "being though of," without the invasiveness of a phone call. However, these forms of

communication were not common among our participants, despite the fact that all of them were comfortable with using computers and cell phones.

The Social Adjustment model

Throughout our interviews, there was a common theme of tension between the old, the things left behind, and the new, the unknown of the things discovered in the new location. This tension was evident in decisions about possessions, in exploring the new geography and social contacts and keeping in touch with the old places and people.

Social geography research has long used such "Push-Pull" models in the studies of migration [7] to illustrate tensions between the economic and individual factors that encourage individuals to stay in their old residence and those that encourage them to move to a new location. Most of these models habitually focused on institutionalized social and economic structures as potential factors that motivate or hinder migration [7, p. 440,27]. While we do not argue that economic factors play a role in migration decisions, in this study, we were concerned with behavioral adjustments that happen after the decision has been made.

Our data suggest that at the time of the move and for some time after the move, new arrivals experience a tension between the things that still draw them back to the old location and the task of negotiating the demands of settling into the new location [3]. Some of the reasons for this tension are temporal and happen due to the inelastic nature of time: "there are only so many hours in a day!" explained one of our respondents. As people move, their desire to retain connections with the things left behind run aground when the demands of the new location take up available resources. Some of the reasons for this tension are emotional and happen because it is simply impossible to "take everything with you" even if the move is supported by a corporation. Things like the existing community, personal relationships, or favorite haunts are often not transportable. We propose the social adjustment model (Fig. 1) as a way to make sense of this tension.

In order to illustrate the model fully, we will take the case social relationships as an example. While relationships that were already mediated do not require many changes, face-to-face relationships at the old location and newly acquired/reactivated relationships at the new location place different demands on the movers. Research on relationships demonstrates that maintaining personal relationships requires significant investment in time and resources [4] in order to survive. One such investment is often done in the form of communication episodes.

As face-to-face communication becomes rare due to the distance between the mover and the people in the old location, partners usually substitute other modalities to make up the lack created by this change. As such, they tend to move much of the emotional support from face-to-face communication to other modalities, such as phone or computer mediated communication, which were previously mostly used for micro-locational scheduling. As some of our respondents told us, communication episodes in other modalities, specifically via email and phone, became less frequent but much lengthier, changing in content.

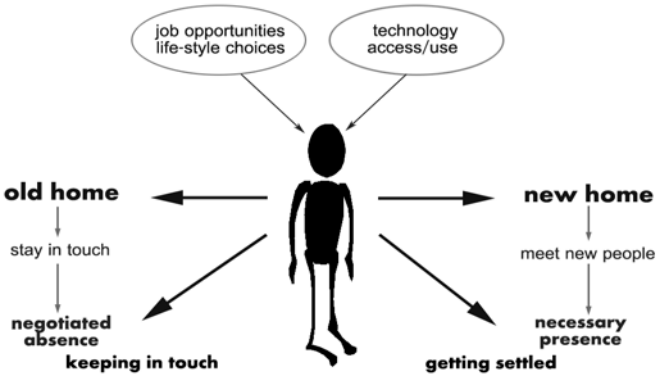

Figure 1. The social adjustment model

Prior to easy availability of the Internet and national cell phone plans, long distance communication was costly and its occurrence signaled the value of each particular relationship. Over the last decade, however, financial costs of long distance communication have drastically decreased, allowing movers to invest more time into particular relationships even at a distance. However, relationship partners in the old location may come to expect movers to pay attention to them in the form of email, IM, or phone calls precisely because it is so cheap and easy to do. Financial burden of communication is no longer a consideration or an excuse for reduction of the frequency of communication episodes. Yet, despite the selection and availability of various communication modalities and the ease with which they can be used, they still require time and effort from the mover.

Immediately after the move is the most time-intensive period of adjustment for movers. This is the time when they are largely unfamiliar with the geography of the new location and have to invest time and effort into a host of activities (such as adjustment to a new job or looking for one, adjustment to a new home or looking for one, helping children adjust to the move, etc.). In order to meet new people and recreate a geographically proximate social network, movers also need to invest time into the social landscape of the new location and go through the painful process of initiating new relationships.

Thus the demands of adjustment to the new location and the expectations of long-distance contacts borne of cheap and easy methods of communication may create a set of conflicting demands.

Our respondents dealt with this tension in different ways. At one extreme were a gay couple (D), who not only convinced some of their closest relatives (parents) to move along with them, but spent a considerable amount of time playing host to their closest friends in attempts to convince them to move as well. Essentially, they dealt with the problem of keeping in touch by attempting to simply move

the closest parts of their social network with them to the new location. They simply combined the process of getting to know the city with spending time with old friends. At another extreme was a musician (H) who was so intent on keeping the social relations from his old location, that he made 8 cross-country trips in the space of five months. In the end, he still was not able to sustain many of newly long-distance relationships. He also realized that he had "missed the window that new arrivals are granted, when locals attempt to get to know [them]." He was now faced with having to put a lot more effort into his social life because he found himself left alone in Los Angeles, with his social network in the old location still being several thousand miles away.

Ability to correctly balance the amount of time spent on keeping in touch with the old and the effort put into exploring the new seemed to be something that came with experience of long distance moving. Yet even those of our respondents that had experience, had trouble finding this balance immediately. A common theme in our data was that overcoming this tension between the old and the new, finding the right balance of keeping in touch and meeting new people, was a large part of getting settled in the new location. In part, easily available communication methods made this process harder, although other aspects of moving, such as getting information about the new location, finding places, coordinating activities or receiving emotional support were made easier by the same technologies.

SUMMARY

Long-distance residential mobility is a fruitful domain for research into human-computer interaction. As application domain in its own right, it is a common, complex human endeavor, many aspects of which have only begun to be addressed by ICT design. As a window onto the relationships people have with their possessions, local geographies, and social networks, it illuminates a range of practices around ICTs and unmet needs in which future ICTs could play a role.

In an initial exploratory study of long-distance interstate movers within the United States, our participants' experiences have pointed to a number of potential future directions for research:

- Everyday conceptions of "place" are being changed by geographic databases and other online services. Our initial study has highlighted the roles the ICTs already play in financial/economic understanding of places in terms of real estate markets, climactic understandings in terms of weather monitoring, and social perceptions in terms of bulletin board suggestions and recommender systems. However, many other aspects of place understanding and support for cognitive mapping can be expected to evolve.
- Online merchants and services such as Craigslist and eBay may be making getting rid of stuff easier, though they also ease the acquisition of new stuff, potentially making the problem worse. There may be a role for object tagging and tracking technologies to be domesticated into useful tools for households, though we could also see a system that tracked complete household inventory backfiring to produce more contention within the home, greater feelings of burden and an invasion of privacy.
- Social and cultural norms around obligations of connection and "keeping in touch" are evolving, as long distance connections drop in price and usability of ICTs continue to improve. However, sometimes natural barriers to communication are good. Removing those barriers can build sets of new expectations in social relationships which, in turn, may be damaging to these relationships in the first place. Arguably, ICTs have given their users better tools to accomplish sets of goals, but because existence of these tools is common knowledge, the social environment exerts pressure on the users creating a larger, often uncoordinated set of demands.
- Our participants benefited from the ability to easily maintain mediated relationships. They also suggested, however, that reason why most of these relationships were kin rather than friends may have had to do with the qualities of ICT-based modalities. Cell phones and email were not able to replace physical presence regardless of the level of fidelity, or produce a sense of shared social context so important in the growth and development of friendships. However, ICTs were able to give a sense of support and assurance, which was important in a situation with as many unknowns as a residential move. New designs may need to take into account how these limitations and advantages affect the people who use these technologies.
- When designers consider a need, they also must consider why that need exists and what other needs may be connected to it. For example, many ICT designs have addressed the need to "keep in touch", some have addressed the need to "meet people" and to "create or expand a social circle", yet few have considered that these needs are connected through temporal demands. The new designs then, need to address the questions of time-investment into both activities, considering potential time-management conflicts as a necessary part of the design process.

Lastly, we note that the primary author is involved in a large-scale longitudinal quantitative study of residential mobility within the United States, from the perspective of ICT use and social network health. This study will provide further information about many of the themes identified at this first look at the experience of moving long distances in this Internet Age.

ACKNOWLEDGMENTS

We thank Ken Anderson, Robert Kraut, and Jonathon Cummings for their support and advice, our anonymous

reviewers for their thoughtful feedback, and our research participants for graciously allowing us to add to the complexity of their moves. First author is funded by an NSF PhD fellowship, is supported in part by an NSF grant #0208900, and conducted the fieldwork while an intern in the People and Practices Research Lab at Intel.

REFERENCES

1. Crabtree, A., Rodden, T., Hemmings, T., & Benford, S. (2003). Finding a place for UbiComp in the home,. In *Proc. UbiComp 2003*, 208-226. Springer.
2. Cummings, J., Kraut, R., & Lee, J. (in press). Communication technology and friendship: The transition from high school to college. In R. Kraut, M. Brynin, and S. Kiesler (Eds.), *Information Technology at Home.* Oxford.
3. DaVanzo, J. (1983). Repeat migration in the United States: Who moves back and who moves on? *The Review of Economics and Statistics, 65* (4), 552-559.
4. Duck, S., Miell, D.E., & Miell, D.K. (1984) Social, cognitive and communicative aspects of relationship growth and decline. In H. Sypher & J. Applegate (Eds.), *Understanding Interpersonal Communication: Social, Cognitive and Strategic Processes in Children and Adults*. Sage.
5. Fischer, C. S. (1982). To dwell among friends: Personal networks in town and city. Chicago: University of Chicago Press.
6. Golder, S.A. (2004). The keep-in-touch phone: A persuasive telephone for maintaining relationships. In *Extended Abstracts of CHI 2004,* 1551. ACM.
7. Golledge, R. G., & Stison, R. J. (1997). *Spatial Behavior: A Geographic Perspective.* Guilford Press.
8. Grinter, R. E., & L. Palen. (2002). Instant Messaging in teen life. In *Proc. CSCW 2002*, 21-30. ACM.
9. Hoffman, D., Novak, T. P., & Venkatesh, A. (2004). Has the internet become indispensable? *Com. ACM, 47*(7), 37-42.
10. Jasper, J. (2000). *Restless Nation: Starting Over in America.* University of Chicago.
11. Kok, J. (2004). Choices and constraints in the migration of families: The central Netherlands, 1850-1940. The History of the Family, 9, 137-158
12. Kraut, R., Kiesler, S., Boneva, B., Cummings, J.N., Helgeson, V., & Crawford, A.M. (2002). Internet paradox revisited. *J Social Issues, 58*(1): 49-74
13. Levitt, P. (2001). Transnational migration: Taking stock and future directions. *Global Networks,1*(3): 195-216
14. Lynch, K. (1960). *The Image of the City*. MIT Press.
15. Magdol, L. (2002). Is moving gendered? The effects of residential mobility on the psychological well-being of men and women. *Sex Roles, 47*(11), 553-560
16. O'Brien, J., Rodden, T., Rouncefield, M., & Hughes, J. (2000). At home with technology: An ethnographic study of a set-top box trial. *ToCHI, 6*(3), 282-308.
17. Palen, L., Salzman, M., & Youngs, E. (2000). Going wireless: Behavior and practice of new mobile phone users. In *Proc. CSCW 2000*, 201-210. ACM.
18. Richardson, H.W., & Gordon, P. (2001) Sustainable Portland? A critique and Los Angeles counterpoint. Paper presented at ACSP conference, Cleveland, OH.
19. Ritchey, N. (1976). Explanations of migration. *Annual Review of Sociology, 2*, 363-404
20. Rohlfing, M. E. (1995). "Doesn't anybody stay in one place anymore?" An exploration of under-studied phenomenon of long-distance relationships. In J. T. Wood & S. Duck (Eds.), *Understudied relationships; Off the beaten track.* Sage Publications, Inc
21. Salvador, T., & Anderson, K. (2003). Practical considerations of context based systems: An example from an ethnographic case study of a man diagnosed with early onset Alzheimer's Disease. *UbiComp 2003: Ubiquitous Computing.* New York: Springer-Verlag
22. Schachter, J. (2004, March) Geographical Mobility 2002-2003: Population characteristics. *Current Population Reports, US Census Bureau.*
23. Schaefer, C., & Lazarus, R. (1981). Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events. *J Behavioral Medicine, 4*, 1-39.
24. Schmidtke, O. (2001). Transnational migration: A challenge to European citizenship regimes. *World Affairs*, 164(1), 3-16.
25. Siio, I., Rowan, J., & Mynatt, E. (2002). Peek-a-drawer: Communication by furniture. In *Extended Abstracts of CHI 2002*, 582-583. ACM.
26. Sproull, L., & Kiesler, S. (1991). *Connections: New ways of working in the networked organization.* MIT Press.
27. Tolmie, P., Pycock, J., Diggins, T., MacLean, A. & Karsenty, A. (2002). Unremarkable computing. In *Proc. CHI 2002*, 399-406. ACM.
28. Whittaker, S., Jones, Q., & Terveen, L. (2002). Contact management: Identifying contacts to support long-term communication. In *Proc. CSCW 2002*, 216-225. ACM.
29. Winstanley, A., Thorns, D.C., & Perkins, H.C. (2002). Moving house, creating home: Exploring residential mobility. *Housing Studies, 17*(6), 813-832.