

CORNFIELDS, COUNTRY ROADS AND A TRICKED-OUT BIKE: RURAL USERS OF EMERGING TECHNOLOGY

Eric Gilbert, University of Illinois at Urbana-Champaign

INTRODUCTION

A Sun Microsystems poster hangs in my building that shows a boy on a country road (see Figure 1). He is alone, looking over an empty field. Trees and a few houses dot the background. The small boy straddles a bike; but, this is no ordinary bike. The bike sports at least 5 headlights and what looks like a small jet engine. The title of the poster reads, “Innovations Pays. Transform Your Infrastructure.”

The poster demonstrates what this paper is all about. In Sun’s eyes, the boy is alone in the country and in need of “transformation.” The boy waits on a road, waiting to go somewhere else. Some technologist clearly helped him get this far. Furthermore, the poster implies, by its location and its message, that technologists can help him go farther.

In this paper, I reflect on the relationship between rural people and emerging technologies. Like many marginal groups (rural people account for 24% of the U.S. population [22]), rural people are second-class technology consumers. Yet, unlike many marginal groups, rural people loom large in the stories of many new technologies. The inventors, designers and marketeers of many emerging technologies hoped to lift rural people out of their stultifying isolation. Apparently, as evidenced by the boy in the poster, the story continues to this day.



Figure 1. A photograph of a Sun Microsystems poster in the Siebel Center For Computer Science at the University of Illinois. The poster imparts many traditional views of rural users: they are isolated and need “transformation.”

While people concerned with developing new technologies celebrate rural users, they do not design for them. Design education often instructs designers to build for 80% of the population [1]; rural people are the other 20%, both literally and figuratively. Rural people often resist initial technology designs and appropriate them for their particular uses. In his book *Consumers In The Country*, Ronald Kline recounts stories of rural people adapting emerging technologies (radio, telephone, automobile and electricity) in distinct and often surprising ways [13]. Rural people did not passively consume technologies that were not designed for them; they changed them to fit their needs. The cover of *Consumers In The Country* shows a farmer using a car's axle to run a washing machine for his daughter.

I wondered if rural users are re-appropriating emerging technologies right now, under our noses. If the narrative of the rural user in need technological liberation continues to this day, does the re-appropriation continue too? In this paper I take a step toward answering this question. I present the results of a quantitative study on the usage of social networking software by rural people. I compare the usage patterns of rural people to the usage patterns of urban people and find that rural people use social networking software very differently than urban people. In particular, as compared with urban users, rural users sign up later, sign in more frequently, have fewer friends but have stronger relationships with those friends.

The contributions of this paper include: a review of rural users in the emergence of wireless and the telephone; a quantitative analysis of rural users' behavior patterns in social networking software; and a call for explicit design for rural users.

RELATED WORK

I primarily review the work of Fischer and Douglas concerning rural users of the telephone and wireless [5, 6]. I also briefly review the work of Kline and others on rural resistance and re-appropriation of other emerging technologies.

Claude Fischer dedicates a large part of *America Calling* to rural users. When rural users appear in story of the telephone, the themes of isolation and active consumption soon follow:

The 'telephone takes from the farmer's family its sense of loneliness and isolation . . . Largely through its influence will disappear [the] pathos and tragedy of the lives' of farm women . . . The 1907 census of telephones argued that in regions of isolated farm houses, 'a sense of community life is impossible without this ready means of communication . . . The sense of loneliness and insecurity felt by farmers' wives under former conditions disappears and an approach is to the solidarity of a small country town.' (Fischer 99)

Two advertisements from the period provide further illumination into industry's mental model of rural users. The two early twentieth-century advertisements, called "Your Home Deserves Protection" and "Making Farm Life Enjoyable," lock onto the loneliness of rural living:

"The farm without a telephone is isolated from outside assistance." ("Your Home Deserves Protection," 164)

"The old time isolation and lonesomeness of farm life is a thing of the past. Modern communication has increased the activities and broadened the social life of the rural family." ("Making Farm Life Enjoyable," 165)

The history of wireless provides some interesting insights into how technologists conceived of rural people, as well. Douglas quotes Theodore Vail, AT&T's president, as saying:

That profit [the benefit of wireless] included reduced isolation and 'free communication between people,' which Vail maintained would educate Americans and 'do away in this country with prejudice.' Those most in need this 'interchange of ideas and thought' were members of America's 'unassimilated masses.' (Douglas 248)

While the passage makes no explicit reference to rural consumers, the key word, "isolation," lets us in on what Vail means. Vail references the "unassimilated masses" that inhabit the nation's hinterland. The *New York Times* also saw wireless providing important benefits to farm families:

The *New York Times* foresaw a time when ‘wireless telegraphy would make a father on the old New England farm and his son in Seattle . . . neighbors—perhaps by the use of their own private apparatus.’ (24)

Government leaders worried enough about farm women and rural sociality to establish a special commission to examine the issue in 1911 [23]. In summarizing the report, Fischer paradoxically explains, “that 69 percent [of farmers] were dissatisfied with ‘social intercourse,’ but 73 percent, the highest level in the survey, were satisfied with their postal and telephone service” (342). Fischer explains that before the Depression, rural users expressed strong enthusiasm for the telephone:

A few themes emerge from the history of rural telephony. One is the active role of the consumer. Rural Americans largely discovered, demanded, and developed telephone service for themselves. While telephone companies tried to create needs for city-dwellers, farm families recognized their own practical and social uses for the telephone. (Fischer 107)

Innovations generally spread from the well-off to those of modest income and from urban residents to rural people. The telephone’s diffusion is both typical and uncharacteristic of this pattern. After the first few decades, it was not the people in the metropolitan areas but those in the hinterland who most often had telephones . . . (86)

States destined to add many telephones had relatively large nonurban populations (and, other analysis shows, smaller rather than larger cities) . . . The thrust of the analysis is that in these early years, the spread of telephony largely responded to rural conditions. (279)

Yet, though rural consumers wanted the telephone, even more than urban consumers, the industry struggled to serve them:

Given that rural telephony outdistanced urban telephony through 1970, why were Bell and independent executives so reluctant and ambivalent about pursuing farmers? The simplest answer is that they saw no profit in it . . . Simply put, many in the industry claimed that farmer demand was limited; that rural people did not want or appreciate the telephone enough to pay the real cost of providing it . . . Mixed in with these economic concerns was some measure of cultural prejudice, expressed in ‘rube’ jokes and cartoons in the industry press and more subtly in industry discussions of rural service. (97—98)

The telephone companies themselves encountered difficulties in understanding how to sell this product . . . The patterns of demand sometimes differed from the preconceptions of industry men, as the stories of rural telephony and women' use of the telephone demonstrate. (261)

The industry avoided the rural market until the early years of the twentieth century. Even later, arguments for serving farmers had a defensive, beleaguered tone. (92)

I argue, as Kline would, that this pattern shows up in a number of stories about emerging technologies. Urban people usually invent and market new technologies. In the case of the telephone, however, rural people saw more immediate uses for it than urban people. However, the industry struggled to understand rural users. Some of this had to do with "cultural prejudice," as Fischer notes above.

At the same time, rural users did not passively accept technologies from urban technologists. The work of a number of technology historians documents the process of resistance, re-negotiation and re-appropriation that often occurs when rural people first encounter an emerging technology [2, 7, 19].

RURAL SOCIAL NETWORKING USE

Figure 1 shows, at least anecdotally, that the discourse of isolation from earlier technologies persists to this day. What about re-appropriation? Do rural people put modern technologies to surprising uses that differ significantly from urban people? If so, what are those uses and what purposes do they serve? In order to take a step toward answering this question, I chose to empirically investigate one widespread, modern technology: social networking software.

My analysis takes the same user-centric approach as Fischer:

Who adopted the device? With what intention? How did they use it? What role did it play in their lives? How did using it alter their lives? This angle, an extension of social constructivism, emphasizes human agency and intentionality among end users. (17)

Fischer adopts a broad mandate in *America Calling*. My study focuses specifically on the “How did [do] they use it?” question. Furthermore, my study compliments and extends recent empirical work on online communities [4, 10, 14, 15].

Discussing the role of online communities and social networking software, Cliff Lampe, an online communities researcher at Michigan State University, puts it this way:

Online communities have different goals, but a common and important enterprise is forming connections between users. This is especially true for online communities that focus on articulating social networks, such as Facebook, MySpace, Friendster and Orkut, where the number of friends a user lists may act as a simple proxy for their connectedness in the network. Connections between users in an online community may be important for facilitating other tasks of the group, reducing misbehavior, and building types of social capital, among other potential benefits. (Lampe 1)

Social networking software shares technological properties with the telephone and radio: they are all social technologies, facilitate interpersonal communication and augment traditional face-to-face social relationships [24]. On the other hand, social networking software encourages people to “live out-loud,” facilitates textual communication, not voice, and also leaves the online data shadow that permits this study.

METHOD

Many social networking sites serve the United States: MySpace, Facebook, Friendster, Orkut, etc.

Any one of them could provide an interesting site for this research. However, MySpace presents the best opportunity. Unlike Facebook, which initially required a “.edu” email address to start an account, MySpace has always encouraged the general population to sign up. On June 11, 2006, MySpace became America’s most visited social networking site [12]. It now claims to serve over 100 million users [16]. While some commentators dispute MySpace’s 100 million figure, the site clearly plays a major role in the U.S. social networking world, and serves a broad American user base. For these reasons, I chose MySpace as the site for this study.

Since MySpace serves such a large user base, it was not feasible to collect data from every user's profile. In order to make the study tractable, I randomly selected (using a process based on a random number generator) 6 rural and 5 urban American locations from a database supplied by the Rural Health Research Center at the University of Washington [11]. I chose 11 locations because initial analysis showed that this number of locations would show significance. The database codes each zip code along a continuum from urban (1) to rural (10). To form the database, its authors primarily considered two variables in determining a zip code's classification: population and relationship to a metropolitan area. For example, a small town with a population of 3,000 in the Adirondacks Mountains receives a rural classification; on the other hand, a small town of 3,000 whose residents commute daily to New York receives a more urban classification. Table 1 lists the locations that took part in this study.

Table 1. The 11 randomly sampled locations in the rural social networking usage study. I selected the locations using a random number generator and a rural/urban coding scheme from the University of Washington [11]. The numbers in parentheses in *Rural or Urban* come from the University of Washington coding scheme. Populations correspond to the zip code sampled and come from 2000 U.S. Census [21]. (In some cases I only sampled one zip code in a city.)

Location	Rural or Urban	Population	Description	Number of Samples
Irasburg, Vermont	rural (10.0)	1,113	small town near Canadian border	170
Olivia, Minnesota	rural (10.0)	3,384	96 mi. from Minneapolis	156
Stockton, Kansas	rural (10.0)	1,994	small town in Northern Kansas	45
Lakeland, Georgia	rural (10.4)	4,825	small town in Southern Georgia	143
Santa Anna, Texas	rural (10.6)	1,567	191 mi. from Dallas	171
Holyoke, Colorado	rural (10.0)	2,990	173 mi. from Denver	104
West Chicago, Illinois	urban (1.0)	32,936	suburb of Chicago	171
Hayward, California	urban (1.0)	11,145	small city in Bay Area	172
Glen Allen, Virginia	urban (1.0)	15,540	suburb of Richmond, Virginia	136
Little Rock, Arkansas	urban (1.0)	36,847	79 th largest U.S. city	149
Staten Island, New York	urban (1.0)	26,451	borough of New York City	159
Total				1576 (790 rural, 786 urban)

Hypotheses

I wanted to empirically establish hypotheses regarding rural social networking use. To establish my hypotheses, I drew an initial sample, collected 23 numerical measures and ran statistical tests on the data. I found very large differences between rural and urban users. For example, I looked at the data as categorical, labeled data and ran a set of machine learning algorithms on it [25]. To my surprise, the machine learner I chose, AdaBoost using 10-fold cross-validation J4.8 decision trees, accurately classified the samples as rural or urban with 98.35% accuracy.

The high level of separability in the initial sample pointed to one overarching hypothesis: rural people use MySpace very differently than urban people. In particular, the initial sample suggested testing the following hypotheses:

Hypothesis 1. Rural users sign up for MySpace accounts far later than urban users.

Hypothesis 2. Rural users have fewer MySpace friends than urban users.

Hypothesis 3. The MySpace friends of urban users live farther away than rural users' friends.

Hypothesis 4. Rural users have fewer comments on their MySpace pages, but have stronger connections to those commenters.

Hypothesis 5. Urban users set their profiles to "private" more often than rural users.

*Hypothesis 6. Rural users have younger MySpace friends than urban users.
Rural users also have friends younger than themselves.*

Data Collection

I performed searches [17] for users within the zip codes reported in Table. 1. For each location, I searched within 10 miles of the zip code using the facility provided by MySpace. I searched for both males and females within as broad an age range as MySpace allows (18 to 68). By default, MySpace searches only for users who upload profile photos (a small photo that represents a user). I chose to keep this restriction since it limits the search results to only those users that have some

basic relationship with MySpace. Many users quickly abandon their profiles. I was interested in those users who *actually use* MySpace. While it would be interesting to look a broader user base, I introduced this restriction to test the basic hypotheses in this study. From each search, I took at most the top 200 users, sorted by their physical distance from the center of the zip code (up to a maximum of 10 miles).

Between April 1 and April 21, 2007, I collected data from users' profiles using automated scripts [8]. The scripts looked for specific features of each user's profile and recorded them in offsite databases. Tables 2 and 3 report all of the measures collected, and an upcoming section entitled *Dependent Variables* describes them in more detail. MySpace allows users to make their profiles private, in which case MySpace only shows very basic information to people outside the user's network of friends. In these cases, the automated scripts could not record all of the measures, but noted the ones available and recorded the profile as "private." In addition, the scripts could not gather every measure from every user. Consequently, some measures have slightly lower n .

In total, I collected data from 790 rural and 786 urban MySpace users. The scripts visited over 468,000 MySpace pages (mostly profiles) to collect the data set, because many measures derived from data held on friends' profile pages (see Table 3). Since no authority verifies the information users put on their MySpace profiles, some pieces of information clearly represent errors, oversights and outright lies. For example, for a time MySpace only allowed users under the age of 14 to set their profiles to "private." This decision prompted many users to change their profile ages to 13 in order to gain access to the new privacy feature. MySpace has since changed this policy. However, for one reason or another, some data I collected is clearly wrong. In a classic study devoted to retrospective survey data, Bernard found shockingly high rates of poor recall among study participants [3]. While users self-report their MySpace profiles, they are not surveys. Users freely report personal information (e.g., age, lists of friends, city of residence) to participate in a desirable com-

munity. At this time, it is not clearly understood how much deception and reporting error happens in communities like MySpace. In a recent paper, Hancock and Ellison found patterns of lying in online dating communities, but the amount of lying did not extend very far [10]. This is an intriguing problem. I view errors and deception in my data as a limitation of the study and treat it as noise. If MySpace behaves anything like the online dating communities studied by Hancock and Ellison, the data set should contain only a slight skew.

Independent Variables

I considered one variable as independent in this study: location, a categorical variable that may take on the values of rural and urban. This variable came from users' reported locations on their profiles. I wanted to look at demonstrated MySpace behavior patterns as a function of "rural-ness" and "urban-ness." I could have considered other variables as independent and impacting users' MySpace behavior. Some candidates are sex, education level and income level (either reported or the median from Census data). However, as a first pass, I wanted to look at the coarse level of rural vs. urban for differences in social networking behavior. Other studies might consider following up on this analysis using more or different independent variables.

Dependent Variables

I collected 30 dependent variables from users' MySpace profiles (see Tables 2 and 3). Some of the variables come directly from text reported on a user's profile page. Others, like those in Table 3, derive from text reported on friends' profile pages. Many of the variables are self-explanatory; however, some of the variables require clarification. *Number of reciprocal relationships* counts the times a user and a friend have commented at least once on each other's profile pages. *Age difference with friends* means the user's age minus the age of each friend, taken as an average across all friends. *Inbound comments* refers to comments left by friends on the user's profile page. *Outbound comments* refers to comments left by the user on friends' profile pages.

I computed three *Relational* scores as a function of comments on a user's profile and the user's friends' profile: *Relational balance*, *Relational sum* and *Relational minimum*. It can be difficult to measure a relationship. In this study, I tried three different measures of the strength of a relationship—each one captures a different aspect of a user's relationship with MySpace friends.

While 30 dependent variables measures a good deal of online behavior, it clearly leaves lots out. For example, I could have measured uses of design features of MySpace, like transparent images and embedded streaming music. I hope that follow-up studies will examine these features. However, I believe that these 30 variables represent a broad and important spectrum of online social networking behavior.

RESULTS

Overall, rural users demonstrate significantly different MySpace behavior than urban users. On 24 of 30 dependent variables, rural users show statistically significantly different MySpace usage (most at the $p < .001$ level). While the p-values show high levels of significance across many variables, it may be best to focus on variables with large differences because of the large sample size. In addition, since many of the variables did not tend toward normality, I chose to abandon the normality assumption and only perform non-parametric tests: the Wilcoxon and Chi-square tests. While parametric tests might work on a handful of variables, any significance in the results I present here would definitely show up in parametric tests. Furthermore, because the variables do not tend towards normality, I report the median as a measure of central tendency. In this section I focus on variables that show large behavioral differences between rural and urban users.

Table 2 reports 10 variables that derive directly from a user's MySpace profile. Rural users show a huge difference in MySpace ID, a number that MySpace assigns to users sequentially as they sign up. Consequently, MySpace ID gives us some information on who signs up first. With the median urban ID a full order of magnitude less than the median rural ID, rural people clearly sign up much

Table 2. 10 of 30 dependent variables collected from each sample's MySpace profile in the rural social networking study. These measures come directly from a user's profile. MySpace hands out IDs sequentially, so they represent the order in which users joined. *Reciprocal relationships* refers to relationships in which a user and a friend have commented at least once on each other's profiles.

Measure	Rural (median)	Urban (median)	Wilcoxon z or $\chi^2(df1, df2)$	p-value
MySpace ID	66M	6M	$z = -32.2$	$p < .001$
Number of friends	36	111	$z = -14.2$	$p < .001$
Age	23	22	$z = -1.59$	$p = .111$
Days since last login	32	195	$z = -6.05$	$p < .001$
Number of comments	31	141	$z = -14.25$	$p < .001$
Number of unique commenters	9	31	$z = -14.32$	$p < .001$
Ratio of unique commenters to comments	0.35	0.28	$z = -7.18$	$p < .001$
Number of reciprocal relationships	5	12.5	$z = -11.15$	$p < .001$
Number of males	total = 397	total = 481	$\chi^2(2,2) = 19.12$	$p < .05$
Number of private profiles	total = 3	total = 3	$\chi^2(2,2) = 3.88$	$p > .05$

later. For the time being, it looks challenging to associate a MySpace ID with a creation date. However, the vastly different IDs indicate a substantial time difference. Rural users also have much fewer MySpace friends (36 vs. 111) and profile comments (31 vs. 141), both of which are highly significant at the $p < .001$ level. Rural users show higher levels of activity on the site, as indicated by the median of 32 days since last login; urban users, on the other hand, go much longer without logging in, 195 days on average.

Table 3 reports 20 variables that derive from text reported on users' friends' profiles. Collecting this data took the most amount of time and work, accounting for a majority of the 468,000 MySpace accesses by the scripts. For each user in the study, the scripts collected an aggregate value that derived from all of the user's friends. For example, in the case of *Physical distance to friends*, the script visited each of a user's friends, recorded each friend's location and then computed the dis-

Table 3. The other 20 dependent variables collected from each user in the rural social networking study. Whereas the measures in Table 2 come directly from a user's profile, the measures here are aggregate statistics over all of a user's friends. The *Rural* and *Urban* columns list weighted means of medians (see *Results* section for more details). *Inbound comments* refers to comments left by friends on a user's page; *outbound comments* refers to comments left by a user on friends' pages.

Measure	Rural (weighted mean)	Urban (weighted mean)	Wilcoxon z	p-value
Age difference with friends	1.47	1.32	z = -4.1	p < .001
Physical distance to friends	294.4 mi.	187.9 mi.	z = -8.84	p < .001
1 st quartile of physical distance to friends	153.1 mi.	57.8 mi.	z = -12.30	p < .001
3 rd quartile of physical distance to friends	603.7 mi.	682.2 mi.	z = -2.44	p = .015
Age of friends	21.4	22.4	z = -.720	p = .472
Friends' days since login	22.6	39.1	z = -5.610	p < .001
Friend's num. of comments	372.5	493	z = -19.606	p < .001
Num. friends in same town/city	0	0	z = 0	p = 1
Proportion of friends in same town	0	0	z = 0	p = 1
Friends with over 2 inbound comments	4.57	8.44	z = -12.704	p < .001
Friends with over 4 inbound comments	3.18	5.66	z = -10.914	p < .001
Friends with over 8 inbound comments	1.84	3.32	z = -11.063	p < .001
Friends with over 16 inbound comments	1.21	2.1	z = -10.642	p < .001
Friends with over 2 outbound comments	3.20	5.61	z = -9.746	p < .001
Friends with over 4 outbound comments	1.96	3.66	z = -11.059	p < .001
Friends with over 8 outbound comments	1.06	1.8	z = -7.969	p < .001
Friends with over 16 outbound comments	1.11	2.35	z = -11.632	p < .001
Relational balance score (in - out)	-0.55	-0.54	z = -3.092	p = .002
Relational sum score (in + out)	2.16	2.1	z = -.730	p = .465
Relational min score (minimum(in, out))	0.046	0.013	z = -4.515	p < .001

tance back to the user in the study. After visiting each friend, the script comes up with a summary statistic that encapsulates all of the different distances for a particular user in the study. For this study, I used median. For any one particular user, the distribution of distances did not follow a normal distribution; instead it looked more like Pareto distribution. To be safe, I used median as the

summary statistic. However, somehow I needed to combine all of the users together in a meaningful way. The descriptive statistics reported in Table 2 are weighted means of medians, weighted by the number of friends for each user. This is a common way to get at central tendency for statistics that report on non-normal sub-distributions.

Table 3 shows that rural users tend to have friends that live significantly *farther* away than urban users' friends (294.4 miles vs. 187.9 miles). The *Friends with over . . .* variables report on the relational strength between friends as manifested by comments on profiles. The results show that urban users tend to have about twice as many friends with whom they correspond frequently, at all levels of measurement (2, 4, 8 and 16). On the other hand, the *Relational* variables at the bottom of Table 3 show very little difference in how those relationships behave. If *Relational balance*, for example, had tended more positive for rural users, it would have indicated a systematic bias of users receiving more comments than they send out. However, the results show no meaningful difference between rural and urban users.

I also report briefly on a machine learner's interaction with this data set. A machine learner finds patterns in data; in this case it classifies a user as rural or urban based solely on usage data from MySpace. Machine learning algorithms do something similar to the regressions common in social science: they learn relationships between independent variables and dependent variables. Using the Weka machine learning toolkit [25], an AdaBoost algorithm correctly learned rural vs. urban with greater than 92% accuracy.

DISCUSSION

In this section I discuss evidence for and against each of the experimental hypotheses.

Hypothesis 1. Rural users sign up for MySpace accounts far later than urban users. The experimental data clearly confirm this hypothesis. Rural users possess MySpace IDs an order of magnitude larger than urban users.

Hypothesis 2. Rural users have fewer MySpace friends than urban users. Experimental data also confirm this hypothesis. Rural users have, on average, 36 friends while urban users have 111.

Hypothesis 3. The MySpace friends of urban users live farther away than rural users' friends.

The data contradict this hypothesis. The data from this study suggest that rural users' friends live, on average, almost 100 miles farther away than urban users' friends. This study's data also contradict behavior observed in the preliminary sample drawn to inform the creation of the hypotheses. In that sample, rural users possessed friends nearly 240 miles closer than urban users. I discuss this result in greater detail below.

Hypothesis 4. Rural users have fewer comments on their MySpace profiles, but have stronger connections to those commenters. Rural users certainly have fewer comments than urban users: 31 to 141. Assessing the strength of those connections is more difficult, but the experimental data point in the direction of confirming the hypothesis. Urban users have roughly twice as many friends with whom they have strong relationships (as measured by the *Friends with over . . .* variables), yet urban users have roughly three times as many friends overall. This indicates that a greater proportion of rural users' friends are strong connections [9].

Hypothesis 5. Urban users set their profiles to "private" more often than rural users. The data show no difference between the privacy settings of rural users and urban users. This finding may have something to do with the way users were sampled. I gathered the users in the study by searching only for users with profile photos. This willingness to upload a profile photo may demonstrate a desire to have a publicly available profile. I discuss this result in greater detail below.

Hypothesis 6. Rural users have younger MySpace friends than urban users. Rural users also have friends younger than themselves. The experimental data confirm this hypothesis, although weakly. Rural users have a larger age difference with their friends (they are, on average, 1.47 years

older than their friends). However, the difference between rural and urban users on this measure is not especially substantial.

The results of this study strongly confirm Hypotheses 1, 2 and 4, and weakly confirm Hypothesis 6. The study showed no evidence for Hypotheses 5, and contradicted Hypothesis 3. Hypothesis 6 resulted from an observed 4-year difference in friends' ages in the initial sample. It surprised everyone who looked at the initial results, so a much smaller difference here is not too surprising.

Most surprisingly, the data contradicts Hypothesis 3. The data from this study say that rural users have friends that live farther away than urban users' friends. I am shocked by this result because the initial sample showed that rural users' friends live, on average, 240 miles closer than urban users' friends. The initial sample informed the creation of Hypothesis 3. The wild fluctuation between the initial sample and this study might say something important about the study itself. I discuss some limitations of my approach in the section entitled *Limitations*.

Aside from the data relating to the experimental hypotheses, a few unexpected trends appear. I measured the *Number of reciprocal relationships* to see if rural and urban users manage differently sized networks of friends with whom they actually communicate. To be expected, urban users have a larger network of friends with whom they maintain at least some contact. Also expected, the data here implies that both rural and urban users do not maintain relationships with the majority of their friends. The surprising fact is that the ratio of reciprocal relationships to total friends is about the same for both rural and urban users: $5/36$ and $12.5/111$ are each roughly 12%. While rural and urban users differ on most of the variables measured in this study, each group seems to maintain about the same proportion of actual contacts in its network of friends. An interesting side note is that urban users seem to have around 2 "best" friends while rural people have 1, as indicated by the *Friends with over 16 inbound/outbound comments* variables. These findings warrant further study.

I am also surprised to find such a substantial gender difference between the two groups. Male users accounted for 61% of the urban sample, while they only accounted for 50% of the rural group. A Chi-square test shows that difference is indeed significant ($p < .05$). It remains unclear whether some kind of sampling bias induced this result, or if urban users tend to show a systemic gender bias. Further study should investigate this finding.

This study also suggests that rural users log in more often than urban users, every 32 days as opposed to every 195 days. Paradoxically, however, urban users make much heavier use of the site, as evidenced by their number of friends and comments. Further study should also follow up on this finding. I did not hypothesize this result because the initial sample showed no significant difference between the two groups on this measure.

LIMITATIONS

The sampling procedures used in this study may have affected the results. I picked zip codes that matched rural or urban status and then collected users from less than a dozen zip codes. While this certainly made the study more manageable in a short time frame, it may have disturbed some of the variables. For example, the fluctuation in physical distance between this study and the initial sample may have resulted from the sampling procedure I used. I hope to examine this by performing a study that samples across the U.S. in the near future.

In addition, I suspect that requiring my users to have profile photos resulted in a non-representative sample on the privacy dimension. In other words, I might have mistakenly sampled extroverts. I also hope to examine this possibility in a follow-up study. However, with the exception of these two variables, the results of this study remain consistent with those of initial sample.

FUTURE WORK

In future work, I hope to examine the relationship between physical distance and the strength of the relationship between friends. I expect to find differences between rural and urban users, with

the strength of rural users' friendships falling off more sharply as a function of distance. Given my hypothesis of the interaction between sampling and distance measurements, I will do this work on a new sample.

Also, I would like to provide qualitative findings alongside these quantitative results. I plan to interview rural and urban MySpace users to find out what social networking software means for them.

CONCLUSION

Rural people use social networking software very differently than urban people. The adoption and behavior patterns look very different for rural and urban users. While I hesitate to call this re-appropriation, because we do not yet know if rural users' profiles differ in their content and purpose, it remains clear that rural users demonstrate very different adoption and behavior patterns in social networking software. More work must be done to definitively establish the case for re-appropriation in social networking software. However, I view my work as a good first step along that path.

The story of rural isolation and the myth of technological salvation from that isolation persists to this day. The data from this study tend toward confirming that rural people appropriate social networking software differently than urban people, the implicit intended audience. In the face of steadily dropping populations and declining intellectual capital, rural communities have turned to advanced technologies to help them ensure the vitality of their communities [20]. However, as the history of emerging technologies and this study tell us, designs meant for urban people will not work the same way in rural communities. Rural people will appropriate them differently. Consequently, for those interested in serving rural communities, this makes explicit design for rural communities imperative.

REFERENCES

1. Apple Computer. Apple Human Interface Guidelines: Making Design Decisions, 2007.
2. Atwood, R.A. Telephony and Its Cultural Meanings in Southeastern Iowa. University of Iowa Press, 1984.
3. Bernard, R.H., Killworth, P., Kronenfeld, D. and Sailer, L. The Problem Of Informant Accuracy: The Validity of Retrospective Data. *Annual Review of Anthropology*, 13. 495-517.
4. boyd, d.m. Friendster and publicly articulated social networking. CHI '04 extended abstracts on Human factors in computing systems, ACM Press, Vienna, Austria, 2004.
5. Douglas, S. *Inventing American Broadcasting, 1899-1922*. The Johns Hopkins University Press, 1989.
6. Fischer, C.S. *America Calling: A Social History of the Telephone to 1940*. University of California Press, 1994.
7. Fischer, C.S. Technology's Retreat: The Decline of Rural Telephony in the United States, 1920-1940 *Social Science History*, 11 (3). 295—327.
8. Gilbert, E. Rural Social Networking Study Scripts:
<http://social.cs.uiuc.edu/people/gilbert/docs/myspace-study-scripts.zip>, 2007.
9. Granovetter, M. The Strength of Weak Ties. *American Journal of Sociology*, 78 (6). 1360-1380.
10. Hancock, J.T., Toma, C. and Ellison, N. The truth about lying in online dating profiles Proceedings of the SIGCHI conference on Human factors in computing systems, ACM Press, San Jose, California, USA, 2007.
11. Hart, G. Rural-Urban Commuting Area Codes (version 2.0), Rural Health Research Center, University of Washington, 2007.
12. Hitwise. Hitwise US: MySpace Moves Into #1 Position for all Internet Sites:
http://weblogs.hitwise.com/bill-tancer/2006/07/myspace_moves_into_1_position.html, 2007.
13. Kline, R.R. *Consumers in the Country: Technology and Social Change in Rural America*. The Johns Hopkins University Press, 2000.
14. Lampe, C.A.C., Ellison, N. and Steinfield, C. A familiar face(book): profile elements as signals in an online social network Proceedings of the SIGCHI conference on Human factors in computing systems, ACM Press, San Jose, California, USA, 2007.
15. Lampe, C.A.C., Johnston, E. and Resnick, P. Follow the reader: filtering comments on slashdot Proceedings of the SIGCHI conference on Human factors in computing systems, ACM Press, San Jose, California, USA, 2007.
16. MySpace. 100,000,000th MySpace Account:
<http://profile.myspace.com/index.cfm?fuseaction=user.viewprofile&friendID=100000000>, 2007.
17. MySpace. MySpace.com Browse Users:
<http://browseusers.myspace.com/browse/browse.aspx>, 2007.
18. Rogers, E.M. *Diffusion of Innovations*. Free Press, 1995.
19. Umble, D.Z. *The coming of the telephone to plain country: A study of Amish and Mennonite resistance in Lancaster County, Pennsylvania at the turn of the century* *Sociology*, University of Pennsylvania, 1991.

20. University of Maine. Maine Rural Partners: <http://www.mainerural.org>, 2007.
21. U.S. Census Bureau, Summary File 1 (SF 1) and Summary File 3 (SF 3). U.S. C. Bureau ed., 2000.
22. U.S. Census Bureau, 1790 to 1990 Population for U.S., Urban and Rural. U.S. C. Bureau ed., 2000.
23. U.S. Senate. Report of the Country Life Commission. U.S. Senate, 1911.
24. Wellman, B., Quan-Haase, A., Boase, J., Chen, W., Hampton, K., Isla, I.D.d. and Miyata, K. The Social Affordances of the Internet for Networked Individualism. *Journal of Computer Mediated Communication*, 8 (3).
25. Witten, I.H. and Frank, E. *Data Mining: Practical machine learning tools and techniques*. San Francisco, San Francisco, 2005.