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Assessing new cell phone text and video services

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ABSTRACT

The cell phone is a social medium developing into a multimedia digital platform that provides, obtains, and shares personal and social information. Thus, digital divide, social support, and privacy issues familiar to students of the Internet are here applied to understanding why people may be more or less interested in new text and video cell phone services. The first part of this study develops a basic model of demographic, social, and prior technology use influences on interest in three categories of cell phone text and video services derived from uses and gratifications studies of traditional and new media services—surveillance, entertainment, and instrumental. Hypotheses from this model were tested using data from an April 2007 US national random-digit dialing telephone survey. The by-now familiar digital divide demographics had both indirect and direct influences on assessments of these sets of services, although primarily for entertainment services (which were also negatively influenced by concerns about privacy threats). Surveillance services—here, providing location of family, friends and self to each other—were more positively assessed when family and friends lived closer, and with less prior communication technology use. Instrumental services—such as directions when lost and health emergency information—were more positively assessed by those with greater social support and a stronger belief in privacy rights. Thus, while overall only the entertainment services were even moderately explained, there were understandable differences in influences among the three sets of services, with demographic factors predominating.

1. Introduction

1.1. Emerging cell phone services

The Internet was initially a text-based medium, but that is no longer true in the multimedia, interactive, broadband Web environment. A similar process of convergence is occurring with the cell phone; it is no longer solely a voice medium or even a voice–text messaging medium. Rather, ever more diverse multimedia services are available through both media (Katz, 2008; LaRose & Atkin, 1992; Lin, 2002). The cell phone can, e.g., provide audio interpersonal communication, digital music, video content (personalized as well as mass-mediated), text (if not yet actual printing), locational information, support for consumer transactions, and computing capabilities. This continuing expansion of what a "cell phone" is raises questions as to what additional features and media capabilities may be attractive to potential adopters, and why.

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The factors influencing assessments of new cell phone services are likely to differ somewhat depending on the media orientation of those services, their functions, social factors, and user needs.

In early 2008, there were over a quarter billion cell phone subscribers in the United States who in the first half of 2007 used over 1 trillion minutes, more than a 20% increase from the second half of 2005 (CTIA, 2007, 2008). A snapshot of changes even over a few years is enlightening: in an October 2004 report, when US cell phone subscribership had reached 66%, about 8% did not have a landline phone. Younger (18–29) users were twice as likely to say that they were "very" or "somewhat likely" to give up their landlines for a cell phone. By the end of 2006, around 14% of US adults had cell phones but no landline phones; about 30% of people 18–29 years of age had only cell phones; and nearly 59% of all US adults had both, while 24% had only landline phones, and about 2.2% had no telephone service (Blumberg & Luke, 2007).

A recent Pew national survey provides a valuable overview of how, at least by mid-2004, Americans were using their cell phones (e.g., while driving, waiting, in an emergency, or as a fashion accessory), what problems they experience (public irritation from loud public calls, high monthly bills, and unwanted intrusion), and what new services might interest them (Rainie & Keeter, 2006). The most desired (47%) service was obtaining mobile maps. The next two most desired services (by those not already using them) were more familiar activities such as sending/receiving email (24%) and performing internet searches for movie listings or stock quotes (24%). Other services mentioned by at least 10% include playing music, taking still pictures, recording their own video clips, accessing the Internet, and watching video or TV programs.

In August 2007, the most frequent non-voice cell phone uses were: sending/receiving text messages (43.2%), photo messaging (19.2%), personal e-mail (9.3%), purchasing a ringtone (9.1%), mobile instant messenger (6.8%), work e-mail (5.6%), downloading mobile games (3.3%), and purchasing wallpaper or screensavers (2.9%). In August 2005, 14.0% retrieved news and information via browser, sought weather information (57%), maps and directions, sports scores and news, national news, and movie and entertainment listings (all greater than 40%) (M:METRICS, 2007). A February 2007 UK survey found that 20% of cell phone subscribers searched for content on the mobile Internet (though only about 2% searched daily) (3g.co.uk, 2007). The four most frequently searched content types were ringtones (54%), full track music downloads, sports results, and games. Mobile video viewing is just starting, with 3.2% of cell phone subscribers watching video sent by family or friends and 3.7% watching mobile TV (M:METRICS, 2007).

The Pew report concluded that "there are notable numbers of cell owners who know about and want access to the new applications that are being installed in cell phones … it is possible to see how the cell phone might become the Swiss Army knife of media and communications for a considerable number of users" (p. 11). Even in 1998, Batt and Katz foresaw a major transformation from voice services toward video and information services. Digital data and media now support the convergence of features and modes through an increasingly wide array of technologies. For example, multimedia messaging services (MMS) extend short message service to all kinds of multimedia, such as text, graphics, images, games, audio, video (Lee, Cheung, & Chen, 2007).

The general issue of identifying possible new cell phone services is salient for obvious commercial reasons but also for more general US telecommunications policy. For example, overcoming digital divides and meeting universal service obligations may be more easily met through wireless telephony (Burkart, 2007; Wareham, Levey, & Shi, 2004), partially because of the constraints and risks of fixed-line telephone and cable investment compared to the less geographically dependent and more modularized components of cell phone service (Andonova, 2006). Identifying and diffusing new services may also help what is called the "startup problem", especially in Western mobile Internet markets, where there are pre-existing strong direct (telephone) or indirect (complementary products and services) network effects (Funk, 2007).

There are also general and research concerns about the possible social implications of cell phones, motivating a better understanding of why people might be more or less interested in different features. Katz's (1999) review of possible social and organizational consequences of cell phone use noted positive and negative first-, second- and third-order effects in the areas of (a) social/nonwork lives (uncertainty reduction, personal security, efficiency, tighter coupling of domestic production, immediacy, availability, social interaction, intrusiveness, social control, innovative uses), (b) work lives (productivity, control of organizational resources, merging of work and leisure, fewer entry barriers for small businesses, economic growth, better relations with clients, and organizational control over workers), and (c) organizational structures (changing forms of business, changing information processing capacity, physical mobility and work space, bypassing landline infrastructure, shrinking of middle management, and growing employment opportunities). Thus, social factors (such as social relationships and concerns about social control and privacy) should be considered in any analysis of potential new cell phone services.

1.2. Some potential influences on assessments of text and video cell phone services

This section briefly reviews prior research on basic gratifications of new media, and proposes three major conceptual factors influencing how people assess potential text and video cell phone services: demographic bases for the digital divide, social factors (relations with others, and concern for one's privacy), and prior communication technology use.

1.2.1. New cell phone text and video services as basic gratifications

One way to categorize potential new text and video cell phone services is to consider them as representing capabilities for meeting users' needs, thus providing gratifications. Uses and gratifications theory was developed for studying the use

and evaluation of the mass media. Initially, five broad categories of needs possibly met by traditional mass media were identified—integrative (credibility, confidence), affective (aesthetic, emotional), cognitive (understanding), escape/tension release, and social contact (Katz, Gurevitch, & Haas, 1973). However, this theory has also been used to help explain gratifications from telephone use, and, more recently, new media such as Internet and cell phone use (Atkin, Jeffres, & Neuendorf, 1998; Dimmick, Sikand, & Patterson, 1994; Eighmey, 1997; Garramone, Harris, & Anderson, 1986; James, Wotring, & Forrest, 1995; Kim, Kim, Park, & Rice, 2007; Leung & Wei, 2000; Lin, 1999, 2002; Ruggiero, 2000; Williams, Phillips, & Lum, 1985). These and other studies have identified dimensions of gratifications such as surveillance (i.e., monitoring one's environment), personal identity, diversion, informational learning, socialization, interaction, and entertainment. Lee et al.'s (2007) study of multimedia messaging services found that motivations (both extrinsic, measured as usefulness, and intrinsic, measured by enjoyment and ease of use, as derived from the technology acceptance model; (Davis, Bagozzi, & Warshaw, 1992)) as well as media richness explained their respondents' intention to use MMS in the future. Van Viljon, Kotze, and Marsden (2007), in an attempt to persuade system designers to begin considering social aspects of cell phones, identified three clusters of motivations for cell phone use, with associated features: safety, security, and relationships (such as caller identity and SMS), organization (such as reminders and profiles), and personal history (such as camera and MP3).

1.2.2. Digital divide demographics

Many studies have analyzed influences on Internet and cell phone adoption, both from the "diffusion of innovations" approach (Rogers, 2003), and the "digital divide" perspective (Katz & Rice, 2002). Many of the same demographic variables are used in both perspectives—gender, race, education, income, and marital status. In general, controlling for other variables, gender (and, for the most part, race) differences in Internet adoption began disappearing by 2000, but adopters still differ from nonadopters on the other demographics (Katz & Rice, 2002; Rice, Sheperd, Dutton, & Katz, 2007). A similar process has taken place with cell phones. Early adopters were largely white males of middle and upper income (Robbins & Turner, 2002). These digital divides have largely disappeared, with senior citizens and very low income groups about the only categories that appear to be lagging in terms of subscription levels, and even these groups are seeing substantial adoption. African-Americans and Hispanics are now early adopters and innovators of wireless technology, a trend that is also typical of many other non-white groups (Young, 2005).

1.2.3. Social factors

As digital media in general, and text and video cell phone services in particular, provide users access to information and communication with others, as well as provide others access to information about and communication with the users, one's existing extent of social support, and one's beliefs and concerns about privacy seem relevant influences on assessments of such services.

1.2.3.1. Social support. A central debate in early studies of Internet use was whether interpersonal and community ties would weaken, due to a diversion of attention and time to online, isolated communication, video games, and web surfing. While results are somewhat inconsistent (Shklovski, Kiesler, & Kraut, 2006), Internet use has been positively associated (though slightly) with indicators of social relations such as greater use of other communication media, more communication through other media with friends and family (except for, especially in UK survey data, one's very closest neighbors), and greater involvement in community and organizations (Katz & Rice, 2002; Rice & Haythornthwaite, 2006; Rice, Sheperd, Dutton, & Katz, 2007), as well as, of course new forms, such as online communities, multi-player video games, and meeting people from distant locations.

Recent analyses have emphasized the central role of the cell phone in developing, maintaining, and changing social relations, due to the pervasiveness of the cell phone and the ease with which others can be contacted or have their information just displayed on the screen (Boneva, Quinn, Kraut, Kiesler, & Shklovski, 2006; Katz & Aakhus, 2002; Licoppe & Smoreda, 2005). People with well-established social support networks may need less purely text-based informational resources, or may need services that would allow them to manage those networks more easily. Close friends or family members who live far apart may have needs for different textual or visual services than those living close by (Baym, Zhang, & Lin, 2004). Proximity has long been associated with contact and communication intensity (Brandon, 1980).

1.2.3.2. Privacy concerns. People are increasingly concerned about online privacy and surveillance (Fox & Lewis, 2001; Katz & Tassone, 1990; Klosek, 2000; Metzger & Docter, 2003; O'Neil, 2001). In one study, over 80% of heavy Internet users were somewhat or very concerned about online personal privacy threats, especially about sharing provided personal information with other organizations (Ackerman, Cranor, & Reagle, 1999). Yao, Rice, and Wallis (2007) reported that concerns about online privacy were positively influenced by individuals' need for privacy and their beliefs in privacy rights. Women tend to be somewhat more concerned about only a few privacy issues (Nowak & Phelps, 1992; Sheehan, 1999). However, most users are likely to be unaware of the potential for collection of personal data and subsequent re-use and storage (Lyon, 2001; Stanton, 2002). Cell phones allow "perpetual contact" (Katz & Aakhus, 2002), both in allowing one to access others as well as making one continually accessible to others. Alongside its many benefits, the cell phone can increase (for private users) and decrease (for business users) control over incoming calls, including invasion of privacy in public spaces by other cell phone users (Ishii, 2006; Rainie & Keeter, 2006; Rice & Katz, 2003b). Indeed, some data suggests that, unlike civil

libertarians, ordinary people are more concerned about the snooping of ordinary neighbors and workmates than about either a corporate or governmental Big Brother (Katz, 1991). People who are more concerned about threats to their privacy and have a strong belief in privacy rights may be less supportive of cell phone services that reveal or collect more information or allow greater intrusion.

1.2.4. Prior communication technology use

Other potential influences on adoption and assessment of new media depend on the theoretical orientation. For example, Atkin et al. (1998) combined media substitution, and uses and gratifications, with diffusion theory to explain Internet adoption. Beyond the typical demographic influences (higher education, lower age, greater income, more people in home, but no effect of gender even then), they found that people with more distant communication activities and orientations, those who had adopted more technologies, and those who used less TV but more film, magazines and video, were greater Internet adopters. Others have also found that adoption and increased used of other technology also influence adoption of newer media (LaRose & Atkin, 1992; Leung & Wei, 1999). Two primary reasons for this influence are that newer media may be associated with already adopted (or rejected) "technology clusters", and that experience with other technologies reduces uncertainty about, and increases ability to use, a new medium. However, in two studies attempting to predict the adoption of potential online services in general (Lin, 2001), and online media services in particular (Lin, 2002), neither use of traditional media nor a cluster of other adopted communication technologies were influences, indicating that online media services could be functional supplements rather than substitutes for traditional media and other previously adopted new media. Finally, it is not clear whether generalized prior technology use fosters necessary expertise and positive attitudes, or whether specific prior technologies are more relevant.

Here, for the sake of parsimony and clarity, the present study focuses only on prior adoption and use of the Internet and of cell phones as indicators of prior communication technology use. The Internet has for many become a multimedia technology that offers services comparable to those studied here. Further, based on prior research, it is reasonable to consider prior cell phone use as a potential influence on assessments of new cell phone services (Campbell, 2007). Thus, it is important to distinguish between Internet adopters/non-adopters relative to cell phone adopters/non-adopters because the two groups do not overlap completely, and different combinations of demographic influences are associated with each of the four categories (Rice & Katz, 2003a). Significantly, few prior studies have considered or analyzed the overlapping adoption categories of these primary new media and their discrete influences.

1.2.5. Research model

Fig. 1 organizes the prior brief discussions into a basic conceptual model and integrates the following hypothesized relationships:

H1. Demographic factors are associated with adoption of prior communication technology (here, the Internet and cell phones).

H2a. Demographic factors are associated, though weakly, with extent of social support.

H2b. Demographic factors are associated, though weakly, with perceptions of privacy threats and beliefs in fundamental privacy rights.

H3a. Extent of social support is associated with assessments of new cell phone services, especially services involving social interaction.

H3b. Privacy beliefs are associated with assessments of new cell phone services.

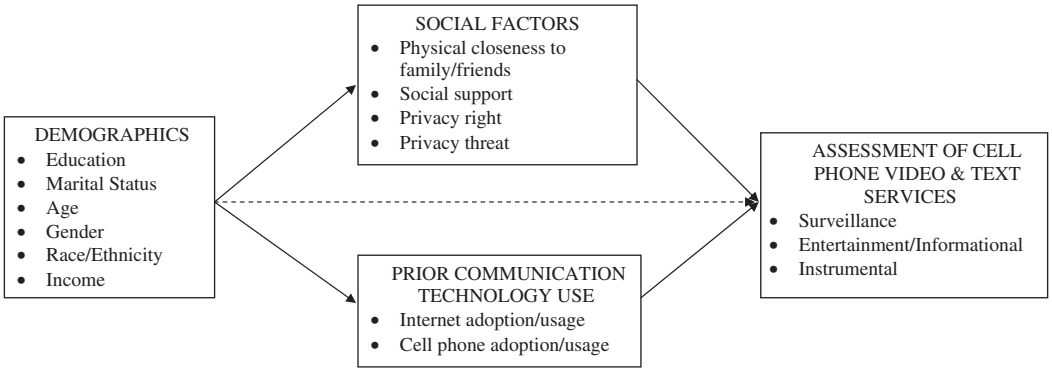

Fig. 1. Conceptual model of influences on assessment of three types of cell phone text and video services.

H4a. Prior use of Internet technology is associated with assessment of new cell phone services, especially services involving surveillance and entertainment.

H4b. Prior use of cell phones is associated with assessment of new cell phone services, especially services involving entertainment and emergencies.

H5. Demographic factors may be weakly associated with assessments of new text and video cell phone services after controlling for social and prior use factors.

This model is quite rudimentary, and does not reflect by now familiar models explaining the adoption of new information systems or new media. For example, the Technology Acceptance Model (Davis et al., 1992; Venkatesh, Morris, Davis, & Davis, 2003), in its simplest form, has been widely used to explain intentions to adopt new information technology. While this approach seeks to explain substantial variance in intentions, it is too simplistic in general (Kaplan, 1998), requires on the part of the subject at least some familiarity with the technology to develop perceptions of ease of use and usefulness, emphasizes his/her intentions to use or adopt, and tends to analyze a study-specific information technology. The Theory of Planned Behavior is somewhat similar in predicting intentions to adopt or use an information technology (George, 2004), although it also incorporates social norm influences, which, for a rigorous test, requires an identified social context (such as organizational coworkers) and measures of others' attitudes, norms and usage (Rice, 1993). The media richness model (Daft & Lengel, 1986), developed primarily for organizational and managerial contexts, either asserts or requires respondents to rate richness characteristics of media. Moreover, it generally finds greater support for media richness ratings (though not consistently for new media) than for the central theoretical proposition that the fit between information processing requirements and media richness affects communication performance (Rice et al., 1992), or, in later versions, that media richness perceptions would predict media choice. The diffusion of innovation model is arguably the most widely used approach in studies of new media adoption (Rice & Webster, 2002; Rogers, 2003), but presumes adoption of the new medium and sufficient understanding of the primary innovation attributes (such as relative advantage). Indeed, some studies have integrated several of these approaches, such as social influence, media richness, diffusion factors and critical mass (Rice, Grant, Schmitz, & Torobin, 1990).

These prior studies are generally oriented towards analyzing intentions to adopt or adoption or usage, perceptions of media richness, ease of use or usefulness, and task-media fit. The present study contributes to this general line of inquiry by specifically testing for the influences of digital divide demographics, social support and privacy concerns, and prior use of both the Internet and cell phones, on simple assessments of potential text and video cell phone services. Lin (2002) tested a somewhat similar model of influences on online media services, including uses and gratifications, existing media use, home communication technology infrastructure, and demographics. She did not find much influence of prior communication technology use or infrastructure, but did find a strong influence of expected media gratifications (information and escape/interaction), younger age, and lower education, and that online media served more as a functional equivalent to traditional media.

Thus, the research reported here contributes theoretically meaningful statements about areas which are not the focus of market-predictive research nor are generally considered in academic studies that, e.g., stress uses and gratifications or diffusion of innovations. Rather, this study fits within a theoretical perspective termed "Syntopia," which emphasizes the social connectivity and cultural meaning of the daily uses of communication technology (Katz & Rice, 2002). The Syntopian perspective rejects both dystopian and utopian perspectives on the social uses and consequences of information and communication technology. Rather, it emphasizes how people, groups, organizations and societies adopt, use and reinvent technologies to make meaning for themselves relative to others. Hence, while possibilities are limited by the nature of the given technological tools, systems and their uses are (potentially) surprisingly flexible.

2. Method

2.1. Sample

The survey was conducted through random-digit dialing computer-assisted telephone interviewing, as a stand-alone academic consumer study, sub-contracted to a private sector firm that serves many universities (as well as non-profit, research, business, and governmental groups). The survey was conducted from late February to early March 2007 using "the most recent birthday" method to obtain a nationally representative sample of 1163 US respondents over 18 who had a residential telephone. The response rate was 22.6%, which is slightly above the level that is considered a typical number for surveys of this type. This sample was supplemented with random-digit dialing calls to a national list that had been pre-screened in order to over-sample young males, Hispanics and African-Americans ($n = 241$), who were underrepresented in the initial sample. Both surveys called from 9 a.m. to 9 p.m., weekdays and weekends, with up to five callbacks. The final sample is similar the to US Census Bureau "Fact Sheet" (2007) statistics for people 18 and over except for age:

- *Gender*: 46% male, 54% female (vs. US 49, 51%);
- *Ethnicity*: 81% white, 10% black (vs. US 74, 12%); 1% South Asian, 1% Pacific Rim (vs. US Asian 4%); 13% Latino (vs. US 14.5%); and 6.6% "other"; and

- *Age*: the median age was 52 (vs. US approximately 47; this had to be derived because the US data are for all ages whereas this sample included those 18 years and older).

2.2. Measures

Demographic variables included *gender*, *education*, *marital status*, *race/ethnicity*, *income*, and *age*. Marital status included responses of never married/single, married, living with partner, divorced, widowed, married but separated, and other; these were recoded into not/never married or married/living with partner. *Race/ethnicity* initially offered seven categories, but the largest by far (81%) was white/Caucasian, so these were recoded into non-white/non-Caucasian and white/Caucasian. (Asians have quite different Internet adoption and usage patterns compared to African-Americans and Hispanics—see Katz and Rice (2002)—but the sample sizes were too small to analyze separately.)

Communication technology usage was measured both as adoption (use/non-use), and extent of use, of Internet and of cell phones. Respondents were asked if they used the Internet or world wide web or not; if so, they were asked how many hours they spent online in a typical day, which was recoded into tertiles. Respondents were asked if they had a cell phone or not; if so, they were asked how many years they had had it, which was recoded into quartiles. Because Internet and cell phone users are not necessarily the same people (Rice & Katz, 2003a), three dummy variables were computed: Internet adoption only, cell phone adoption only, and both Internet and cell phone adoption.

Social support was measured in two ways: closeness and support. *Physical distance to family and friends* was measured by whether most of one's friends and family that the respondent keeps in touch with live closer than 25 miles (= 1), about evenly split (= 2), or farther than 25 miles away (= 3). *Social support* was measured by one question about each of three sources of social support—family, friends, and a special person—from Zimet, Dahlem, Zimet, and Farley's (1988) survey, as well as one overall question about satisfaction with one's personal relationships. Response options were from 1 = strongly disagree to 5 = strongly disagree.

Two dimensions of *privacy* were measured by, respectively, two questions from Yao et al. (2007), and three questions from Katz and Tassone (1990). The first two relate to a *basic right to privacy*, based on frequently cited definitions of privacy, including Warren and Brandeis (1890), "people should have the right to be left alone," and Westin (1967), "people should have the right to control their personal information." The second three relate to *threats to personal privacy* (concern about general threats to personal privacy, organizations and agencies which ask for too much personal information, and the use of computers as a threat to personal privacy) identified in a broad review of national surveys on attitudes toward privacy and surveillance. Response options were from 1 = strongly disagree to 5 = strongly disagree.

Dependent variables—assessments of emerging text and video cellphone services. This study was primarily focused on understanding levels of, and influences on, assessments of *emerging text and video cell phone services* beyond the audio (voice, music, ringtones) capabilities of cell phones—i.e., textual and video. They were driven pragmatically by what is/will be offered, and conceptually by categories of uses/gratifications (Dimmick et al., 1994; Leung & Wei, 2000), and possibilities of mutual disclosure via telecommunications (Katz, 1999). Respondents were asked for their assessment—ranging from a very good idea (= 1) to a very bad idea (= 5)—of each of nine current things "people might want to do with their cell phone." On the basis of principal components loadings and alpha reliability values, the nine services represented what were considered to be three media gratification dimensions: (a) *surveillance* (showing location to family and friends, and the location of your friends/family to the respondent), (b) *entertainment* (watching TV, receiving ads about products respondents might be interested in, receiving brief notices about bargains where they are traveling, playing games, and receiving brief notices about important health information), and (c) *instrumental* (finding directions when lost, and having a hotline to a doctor anytime/anywhere; this dimension could also be called security). The three cell phone service scales are significantly but weakly intercorrelated, all about $r = .30$, $p < .01$.

Table 1 provides question wording and descriptive statistics for individual measures and mean scales, and principal components Eigenvalues, variance explained, and Cronbach alphas for mean scales. While the individual items for the social support scale, the two privacy scales, and the three services scales were worded in the survey with the positive valence equal to 1 to avoid positive response bias, the scales were reversed for all analyses to create consistent directionality and thus interpretability across the measures.

3. Results

3.1. Summary of social factors, communication technology use, and assessments

Respondents indicated high levels of social support ($M = 4.2$), and had their family and friend contacts evenly distributed among the three distance categories. They held strong beliefs in privacy rights (4.53), and moderate concerns about privacy threats (3.86). Just over two-thirds (67.2%) reported using the Internet, and 72.3% having a cell phone. But only 55.9% had adopted both, with 16.4% only having a cell phone, 11.3% only having used the Internet, and 16.5% reported having neither ($\chi^2 = 172.0$, $p < .001$). Instrumental services were assessed the most positively ($M = 3.9$),

Table 1
Descriptive statistics for single-question measures and scales

	N	Mean	S.D.
Use Internet or World Wide Web? (a)	1404	.67	.47
Have cell phone? (a)	1404	.72	.45
Surveillance services (screen showing map where friends/family members are any time; friends/family have screen showing where you are any time; Eigenvalue = 1.9; var = 20.6%; alpha = .87) (b)	1106	2.82	1.03
Entertainment services (watch TV; get ads about products or services you might be interested in; receive notices about bargains from merchants where you're traveling; receive brief notices about important health information; play games; Eigenvalue = 2.2; var = 24.2%; alpha = .71) (b)	1106	2.50	.63
Instrumental services (find directions when you are lost; hotline to a doctor at anytime; Eigenvalue = 1.7; var = 19.2%; alpha = .69) (b)	1106	2.89	.77
Social support (get emotional support you need from your family; get great deal of satisfaction from your personal relationships; can count on your friends when things go wrong; have special person who is real source of comfort to you; Eigenvalue = 2.4; var = 61%; alpha = .78) (c)	1404	4.18	.62
Privacy right (no one should be able to gather or disclose your personal information without your consent; people should have the right to control their personal information; Eigenvalue = 1.58; var = 31.6%; alpha = .72) (c)	1404	4.53	.56
Privacy threat (how concerned about threats to your personal privacy in America today?; organizations and agencies ask you for too much personal information; present use of computers is an actual threat to personal privacy in the country; Eigenvalue = 1.55; var = 30.9%; alpha = .53) (c)	1404	3.86	.72
Gender (e)	1404	.46	.50
Age	1359	51.99	17.80

Internet hours daily, tertiles				($N = 502$)
1 h, 48.8%		2–3 h, 30.0%	4 or more hours, 21.2%	
Cell use years, quartiles				($N = 1010$)
0–3 years, 27.9%	4–5 years, 22.3%	6–9 years, 24.5%	⩾10 years, 25.3%	
Family/friends close				($N = 1379$)
Most friends/family keep in touch >25 miles, 30.6%	They are split about equally between the two distances, 35.2%		Most friends/family keep in touch <25 miles, 34.2%	
Education				($N = 1394$)
Less than high school, 2.4%	High school, 26.7%	Some college, 27.4%	College graduate, 29.6%	Graduate work, 13.9%
Marital status				($N = 1390$)
Not/no longer married, 36.9%			Married/living with partner, 63.1%	
Race/ethnicity				($N = 1403$)
Non-white/non-Caucasian,		23.0%	White/Caucasian, 77.0%	
Income				($N = 995$)
<$25K, 18.1%	$25K<$50K, 31.0%	$50K<$75K, 19.7%	$75K<$100K, 12.8%	⩾$100K, 18.5%

Note: (a) 0 = no, 1 = yes; (b) from 1 = very bad idea to 5 = very good idea; (c) from 1 = strongly disagree to 5 = strongly agree; (d) 0 = female, 1 = male.

with fairly neutral assessments of surveillance services (2.8) and somewhat negative assessments of entertainment services (2.5).

3.1.1. Demographic influences on intervening influences of new media use, social relations, and privacy

Table 2 presents regression results of the influences of the demographic variables on the intervening variables of communication technology use, social support, and privacy beliefs and concerns (correlation tables are available from the authors).

As found in most prior digital divide studies, both Internet adoption and cell phone adopters (i.e., users compared to non-users) are more likely to be more educated, married, white/Caucasian (though not for cell phone), and younger (as well as having greater income; but see Table 2 note). Education and race are greater influences on Internet adoption than on cell phone adoption, while the reverse is true for income.

People whose family and friends are closer tend to be more educated and married (and have more income). Greater social support is associated with being female, higher education, being married, white (and having greater income). Those with a stronger belief in basic privacy rights tend to be female, more educated, and white/Caucasian, while those more concerned about general threats to their privacy tend to be more educated (and have less income).

3.1.2. Demographic and intervening influences on cell phone text and video services

Of the 1404 respondents, 16.5% used neither the Internet nor a cell phone; 16.4% used a cell phone but not the Internet; 11.3% used the Internet but not a cell phone; and 55.9% used both ($\chi^2 = 171.9$, $p < .001$). While Fig. 1 organizes the relationships among the main concepts, because of the multiplicity of distinct demographic factors, social factors, and sets of services, testing a single structural model would be inappropriate. So, for each of the three forms of cell phone text and video services (surveillance, entertainment, and instrumental), three hierarchical multiple regression analyses follow: (a) including everyone, forcing the three dummy categories of Internet/cell phone use/nonuse in the first block; (b) including only Internet adopters, forcing entry of influences of usage hours; and (c) including only cell phone adopters, forcing entry of influences of usage years (Table 3a–c). The second block in each regression included, via stepwise entry, family/friends close, social support, privacy rights, and privacy threats. The third block, via stepwise entry, included education, marital status, race/ethnicity, and age (table notes provide results when income was included). This approach corresponds to the general model of first controlling for category or level of prior communication technology use, then testing and controlling for social factor influences (there is no obvious theoretical justification for modeling those separate influences hierarchically), and then testing for demographic influences (the widespread approach in digital divide research is to enter those stepwise as a block).

As income was a significant influence only for the "emergency" cell phone service when all respondents are included, and as 409 respondents declined to answer this question, income excluded from the demographics blocks in all regressions (but comment is made on the variable's influence in some Table notes).

3.1.2.1. Surveillance. More interest in using the cell phone for sharing locations with family and friends was explained by not using the Internet or the cell phone, having family and friends who live closer, and younger age (but these explained only 2% of the variance).

3.1.2.2. Entertainment. This set of services was explained by less education, being unmarried, being non-Caucasian, and younger age (13%). However, when Internet adopters (due to including the Internet frequency measure) are considered

Table 2
Regressions of prior communication technology use, social relations, and privacy, on demographics

	Internet adoption (a)	Cell adoption (a)	Family/friends close (b)	Social support (c)	Privacy right (c)	Privacy threat (c)
Gender (d)	–	–	–	$-.09^{***}$	$-.09^{**}$	–
Education	$.82^{***}$	$.51^{***}$	$.18^{***}$	$.09^{***}$	$.07^{*}$	$.08^{**}$
Marital (e)	$.78^{***}$	$.76^{***}$	$.06^{*}$	$.23^{***}$	–	–
Race (f)	$.47^{**}$	–	–	$.11^{***}$	$.07^{*}$	–
Age	$-.05^{***}$	$-.02^{***}$	–	–	–	–
N	1349	1349	1365	1348	1348	1348
% correct	77.8	72.9	–	–	–	–
Nagelkerke/OLS R^2	.38	.16	.04	.09	.01	.01
χ^2/*F*-ratio	420.9^{***}	162.8^{***}	27.4^{***}	34.06^{***}	7.4^{***}	4.9^{**}

Note: The first three columns are binary logistic regressions, with unstandardized coefficients, because the dependent variables are dichotomous (and thus report Nagelkerke variance explained and χ^2 values). The last three columns are multiple linear regression, with standardized coefficients (and thus report R^2 and *F*-ratios).

Because 409 respondents did not provide information about their income, that variable is not included in these regressions. However, here are the influences when income in included.

For Internet adoption, income is a significant influence (beta = $.31^{***}$), and all other influences remain significant. For cell phone adoption, income is a significant influence (beta = $.48^{***}$), but marital status and race/ethnicity become non-significant. For family/friends close, income is negative associated, and marital status becomes non-significant. For social support, income is a positive influence (beta = $.13^{***}$) while education and age become non-significant. For privacy-right, income is not significant, and education becomes non-significant. And privacy-threat is reduced by income (beta = $-.08^{**}$), and both being female (beta = $-.07^{*}$) and nonwhite (beta = $-.11^{*}$). The variance explained in these revised regressions essentially do not change. So income is a pervasive influence, and, because of some intercorrelations among the demographics, but also because of different sample size and characteristics, the influences of a few of the other demographics change slightly.

$^{*}p < .05$; $^{**}p < .05$; $^{***}p < .005$.

(a) 0 = no, 1 = yes; (b) 1 = most >25 miles, 2 = equally split, 3 = most <25 miles; (c) 1 = strongly disagree to 5 = strongly agree; (d) 0 = female, 1 = male; (e) 0 = not/never married, 1 = married/partner; (f) 0 = non-white/non-Caucasian, 1 = white/Caucasian.

Table 3
Hierarchical regression of cell phone service assessments on demographics, prior communication technology use, social relations, and privacy: (a) all respondents; (b) Internet adopters only (including influence of hours of Internet use); and (c) cell phone adopters only (including influence of years of cell phone use)

	Surveillance (b)	Entertainment (b)	Instrumental (b)
(a) *All respondents*			
Block 1			
Internet only	−.9*	−.01	.001
Cell phone only	−.12+	−.01	−.02
Both Internet and cell	−.19**	−.10	−.02
Block 2			
Family/friends close (d)	.10***		.06+
Social support (c)			.09**
Privacy right (c)			.12***
Privacy threat (c)			
Block 3			
Education		−.08**	
Marital (e)		−.11***	
Race/ethnicity (f)		−.13***	
Age	−.09**	−.27***	−.17***
Adj. R^2	.02	.13	.06
F	5.4***	22.8***	10.2***
N	1050	1050	1050
(b) *Internet adopters only* (*including influence of hours of Internet use*)			
Block 1			
Tertiles of hours per day Internet use	.03	.06	.08*
Block 2			
Family/friends close (d)	.06+		
Social support (c)			.13***
Privacy right (c)			.10*
Privacy threat (c)		−.08**	
Block 3			
Education		−.08*	
Marital (e)			
Race/ethnicity (f)		−.14***	
Age	−.09*	−.28***	−.15***
Adj. R^2	.01	.14	.06
F	3.8**	24.5***	13.0***
N	747	747	747
(c) *Cell phone adopters only* (*including influence of years of cell phone use*)			
Block 1			
Quartiles of years of cell phone use	−.04	−.03	.03
Block 2			
Family/friends close (d)	.11***		
Social support (c)			.09**
Privacy right (c)			.10***
Privacy threat (c)			
Block 3			
Education		−.09**	
Marital (e)		−.11***	
Race/ethnicity (f)		−.13***	
Age	−.07*	−.23***	−.16***
Adj. R^2	.02	.10	.05
F	5.8***	18.9***	12.9***
N	957	957	957

Note: The three adoption dummy variables were force entered in the first block; family/friends, social support, and privacy were entered stepwise second block; and demographics were entered stepwise third block. Income was a significant influence only on instrumental services (lower income, beta = −.10**), so to avoid the loss of 409 cases, was not included in this regression results table.
+$p<.10$; *$p<.05$; **$p<.01$; ***$p<.005$.
Note: (a) 0 = no, 1 = yes; (b) from 1 = very good idea to 5 = very bad idea; (c) from 1 = strongly disagree to 5 = strongly agree; (d) 1 = most >25 miles, 2 = equally split, 3 = most <25 miles; (e) 0 = not/no longer married, 1 = married/living with partner; (f) 0 = non-white/non-Caucasian, 1 = white/Caucasian.

(about 300 fewer respondents), those who were more concerned about threats to their privacy, in addition to those with lower education and younger age, were more negative about this service.

3.1.2.3. Instrumental. More interest in using a cell phone for instrumental purposes such as emergencies was explained by greater social support, having most of one's family and friends living closer ($p<.1$), a stronger belief in basic privacy rights, and being younger (6%). Greater daily use of the Internet is also positively associated with this service.

4. Discussion

4.1. Summary

Traditional *digital divide concerns* about differential access, use, and assessment of new communication technologies receive continued support here, based on first-half 2007 US national data (H1). Except for gender, and race for cell phone adoption, the familiar factors—education, marital status, age and income—still significantly distinguish between adopters and non-adopters. Demographics have some (albeit much less) influence in largely the same direction on the intervening social factors such as social relations and privacy concerns (H2a, H2b). Finally, in spite of Fig. 1's simple model proposing that demographic factors influence assessments of new text and video cell phone services only indirectly (through prior Internet and cell phone use and through the social factors of privacy concerns and social relations), they also have direct influences depending on the service dimension (H5), as indicated by the dotted arrow. Overall, younger people are more positive about all three service dimensions, while those who report the status of lower education, unmarried, and non-white have more positive assessments about the entertainment services.

The *social factors* measured here play only a minimal role, in somewhat predictable ways (H3a, H3b). Those with physically closer family and friends with whom they communicate most frequently, are more positive about sharing each others' location via mobile phone. Those who have physically closer friends, greater social support, and a stronger belief in privacy rights, are more positive about emergency information services. The first two are easily understandable, as they reflect a greater sense of social embeddedness. The third seems counter-intuitive, but it may be that a greater belief in general *privacy rights* might also be associated with greater trust in secure information when it is needed. It may also be that these attitudes are part of a larger set of belief in, or openness towards, relying on socially embedded contacts for support along several dimensions. Stronger concerns about *privacy threats* are associated with more negative assessments of entertainment services (primarily entertainment and consumption-oriented), but only for people who have adopted the Internet. Possibly such people are far more aware of Internet ads and commercial intrusiveness, and privacy invasions via computer networks. It may be that those with higher privacy concerns choose not to adopt these services because of the often public nature of using a cell phone, such as occurs on public transportation or in restaurants, or even movie theaters, wishing to avoid disturbing others, or being disturbed (Rice & Katz, 2003b). Concern over data collection, physical location and calling patterns—all data that are continually collected by cell phone service providers—may reduce interest in such cell phone applications. However, overall, privacy issues have very little influence on interest in these services.

Finally, distinctions between prior *new communication technology* (Internet, H4a, and cell phone, H4b) adoption and usage levels have some differential influence across the three service dimensions. In the case of sharing surveillance of friends, family and self, elevated interest levels exist among those who are *not* using the Internet and/or a cell phone. It is possible that not having experience with these prior technologies fosters a less informed, more supportive assessment of personal location services. But it may also be the case that precisely because this set of respondents does not use these primary media they have a greater need than do users for being able to share their whereabouts with friends and family. This would tie into the media gratifications of "keeping up to date" and "reassurance" that was found in the research of Dimmick et al. (1994). It also makes sense conceptually from the standpoint of Rakow's work (1992), which has emphasized the use of the phone for keeping appraised of what significant others are doing, and may be quite practical in terms of coordinating moving about a shared region.

Taken together, the survey results provide limited support for an explanatory framework involving digital divide factors, social factors—both social relations and privacy concerns—prior communication technology use, and related media substitutions, which might influence assessments of new mobile telecommunication services representing a small set of expected gratifications.

4.1.1. Limitations

There are some important limitations, both familiar to survey research, and some more specifically related to market research on new media.

A nationally representative telephone survey is clearly limited in the number of questions, and thus concepts, that can be addressed. So, as Fig. 1 shows, this study developed and tested only some of the potential influences on cell phone text and video services assessment. As most studies and models of the adoption of cell phone and other multimedia technologies point out, there certainly are many other potential influences, such as communicator style, computer self-efficacy, innovativeness, social influence and norms, availability, cost, and cultural preferences (Lee et al., 2007; Lin, 2003).

Even nationally representative surveys are at best approximate due to sampling variance. Moreover, those who are most concerned about privacy would also be least likely to engage in a telephone survey, especially one that asks about privacy concerns. Therefore, this survey sought to counteract some of these problems by attempting to use neutral questions, making the speculative scenarios quite simple, and trying up to five callbacks to reach the respondent. The forms of survey measurement are inexact, and, because of the narrow range of possible responses, do not allow much variability. The reliabilities for some of the scales were below typical minimum criteria. One area for future research is to develop other, more sophisticated measures of assessment of potential services, such as well-established indicators of customer satisfaction and loyalty, adapted for mobile services (Turel & Serenko, 2006). The statistical relationships, even while significant, were quite weak. Finally, as has been noted by others, the increasing percent of the population with cell phones, and especially with only cell phones, means even random-digit dialing telephone surveys will become increasingly nonrepresentative.

Many of the questions in the survey required speculation about future actions or services. Answers to such survey questions are easily influenced by phrasing and prior questions as well social desirability. Moreover, Von Hippel (1986) notes that attempting to assess consumer reactions to new, rapidly changing, or not-yet-existent products and services is inherently difficult. Respondents will not have had sufficient experience with or even understanding of the innovation, are still committed to their current practices, their current uses may be embedded in other existing products and services, and they may not be able to foresee how the innovation would fit or compete with those. Taking advantage of the central principle of diffusion of innovations that individuals vary along the adoption timeline distribution, he suggests focusing on "lead users", who can (and do) also contribute to product concept and design. Relative to a new or changing innovation, lead users (a) foreshadow needs of the general marketplace (thus requiring the analyst to understand social and market trends), and (b) are likely to significantly benefit from meeting those needs. Those with needs more likely to be satisfied by an innovation will also be more likely to try to understand the innovation, thus providing more relevant assessments. Von Hippel emphasizes that such lead users may be found outside the usual consumer base—i.e., from competitors or even outside the specific industry, precisely because the needs and relative benefits may have greater salience in a different (possibly more advanced, or more unique) context. It is also true, however, that early adopters differ from the more general consumer marketplace (Rogers, 2003), so insights from lead users need to control for, or be translated into, attitudes, needs and characteristics of the general population (e.g., through statistical controls or prototyping).

Moreover, this study was not intended to be a comprehensive market or economic analysis of cell phone services. Iimi (2005) analyzed late 1990 data on the Japanese cell phone market to show that it had already become very adaptable, with high product-differentiation, low influence of typical network externalities, and considerable price-elasticity. Batt and Katz (1998) summarized results from an early 1990s consumer spending behavior research program involving a literature review, market research, focus group research, a multidimensional scaling survey, cost perceptions and purchase limitations survey, and a conjoint analysis survey. The 70% who indicated purchase intent for a least one of the 11 services offered in their study were more likely to be younger, more positive toward technology, African-American/Hispanic, in the top quartile of current telecom use, work at home, and have children in the household. Household income was not a predictor, because most services were fairly inexpensive, there were no expensive equipment costs, and costs were paid in small increments. Consumers wanted a limited number of interrelated features without having to purchase unneeded features, and because it was difficult to assimilate more than a few features at a time. Overall willingness-to-pay was about 50% of the total reported when services were offered separately; i.e., people considered the total costs of multiple services rather than the separate costs of separate services. Overall, though, respondents reported a higher "willingness-to-pay" for entertainment luxuries, and for perceived necessities. "It is within this relatively free-spending entertainment luxury cluster that the developing video, multimedia, and advanced information services will probably reside". Indeed, in this study those services are the best explained, and almost entirely so by demographic factors.

4.2. Implications

It is worth pointing out that while the explanatory power of the models is not great, they rely on but a very few variables to try to explain interest in new text and video cell phone services. Given the complexity of modern life, and the diversity of lifestyles and social locations in the United States today, even a small improvement over non-significance is noteworthy. If a statistical explanation of even 1% of the population can be provided, i.e. still about three million people, and their activities could make a meaningful difference in the nature of daily life in many settings. Moreover, the economic stakes are substantial: if each of those 3 million people spend five dollars a month on their new services, the revenue stream would be $180 million annually.

In conclusion, this study has identified some additional factors to consider in understanding interest in new text and video cell phone services. It has emphasized the intersecting categories of Internet and cell phone adopters/non-adopters, and has introduced otherwise well-studied social factors (support and privacy) into this research arena. This knowledge could be useful for the understanding of both potential new service markets as well as the relationship between sociological variables and assessments of mobile multimedia services.

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