

RESEARCH ARTICLE

Implications of Mobility: The Uses of Personal Communication Media in Everyday Life

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This study examined the impact of mobile communications on interpersonal relationships in daily life. Based on a nationwide survey in Japan, landline phone, mobile voice phone, mobile mail (text messaging), and PC e-mail were compared to assess their usage in terms of social network and psychological factors. The results indicated that young, nonfamily-related pairs of friends, living close to each other with frequent face-to-face contact were more likely to use mobile media. Social skill levels are negatively correlated with relative preference for mobile mail in comparison with mobile voice phone. These findings suggest that mobile mail is preferable for Japanese young people who tend to avoid direct communication and that its use maintains existing bonds rather than create new ones.

doi:10.1111/j.1460-2466.2006.00023.x

Since their rapid growth in popularity in the late 1990s, mobile phones have become an almost essential part of daily life. Currently, mobile phones are also used for purposes other than voice communication. In some countries, there has been a trend for young people to create their own unique subcultures in which they communicate predominantly through SMS (short message service), or by e-mail over their mobile phones (Ishii, 2004; Kasesniemi & Rautiainen, 2002; Skog, 2002). To explore the implications of media mobility, this study compared the impact of four types of personal communication media—landline phone, mobile voice phone, mobile mail, and PC e-mail—on interpersonal relationships, based on a representative survey. More specifically, egocentric network data were analyzed to examine the factors affecting the use of these media in daily life. In this study, empirical data were collected in Japan where cutting-edge mobile technologies (e.g., “i-mode” and 3-G phones) are widely used and where a unique mobile communication culture is prevalent among the youth. Henceforth, the term “mobile mail” will be used to refer to both SMS and e-mail via mobile phones because in Japan, SMS and e-mail

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have almost converged into one service (mail) and users usually cannot clearly distinguish between these two services.

The concept of mobility

Portability, or *mobility* as it is often called, is a new paradigm that outlines the vision of communication media today. Katz and Aakhus (2002) used the term *Apparatgeist* to describe the development of personal communication technologies in our society. The neologism *Apparatgeist* serves as a rhetorical tactic “to suggest the spirit of the machine that influences both the designs of the technology as well as the initial and subsequent significance accorded by users, nonusers, and antiusers” (p. 305). Recently, an increasing number of media are equipped with mobility, namely, the portable radio, Walkman, mobile phone, pager, PDA (personal digital assistance) and wireless LAN (local area network). However, most studies on these new media have overlooked the significance of mobility, and as a result, the concept of mobility is not fully appreciated in communication studies.

Paradoxically, if a “mobile communication medium” signifies an instrument that accompanies physical travel, the mobile phone is not very mobile. A survey shows that mobile phone users make most calls from home (57%), followed by from work (41%), with only one tenth (9.4%) of the users regularly speaking over mobile phones in the street (Hashimoto, Ishii, Kimura, Tsuji, & Kim, 2002; Ishii 2004). A study of uses and gratification also indicates that mobility in the narrow sense is not adequate to understand its full utility (Leung & Wei, 2000).

Consequently, “mobility” cannot be defined as purely physical travel. Mobility should be understood in a broader sense to include at least three interrelated dimensions of human interaction; namely, *spatial*, *temporal*, and *contextual* mobility (Kakihara & Sorensen, 2002). Spatial mobility denotes the concept of physical travel, which is the most immediate aspect of mobility. Temporal mobility represents the consequences of spatial mobility, as in speeding up and saving time. These two dimensions represent the function of efficiency resulting from mobility. The so-called microcoordination is a typical daily-life example, in which two people with mobile phones flexibly and progressively make precise arrangements for a meeting (Ling & Yttri, 2002).

The third dimension, contextual mobility, is the key to understanding the social consequences of the introduction of mobile phones into our society. Context is an important factor influencing interpersonal behavior. In face-to-face interactions, communicators need to conform to the contextual aspects that continuously reframe their interaction (Goffman, 1973). These include, among others, their cultural background, the particular situation or mood, and mutual recognition (Kakihara & Sorensen, 2002). Mobile media enable relatively free communication from a specific context. For example, mobile phones allow adolescents to communicate with each other without the constraints imposed by the presence of family members.

Context mobility has two aspects. On the one hand, it provides mobile phone users with more freedom because they can control incoming calls by themselves.

However, on the other hand, unless they can freely control incoming calls by switching off their phones or ignoring some calls at will, the mobile phone reduces the freedom of users. Private users enjoy newfound freedom, whereas business users experience a loss of freedom associated with the use of a mobile phone. A survey indicates that 58% of business users agreed with “mobile phones restrict my freedom,” whereas less (27%) private users agreed with the statement ($\chi^2 = 30.4$, $df = 1$, $p < .0001$). In contrast, 26% of business users agreed with “mobile phones increase my freedom,” whereas more (38%) private users agreed with the statement ($\chi^2 = 4.95$, $df = 1$, $p = .026$).¹

Contextual mobility explains why some technologies with high media richness have not always been successful. For example, as of 2003, only a few (0.6% of mobile phone users) use TV phones despite their modest price in Japan (Hashimoto, Ishii, Kimura, Tsuji, & Kim, 2004). It is difficult to explain why such highly advanced technologies have not been accepted, although some “media-poor” technologies have gained popularity (e.g., text-based i-mode). One possible reason is that the high media richness of TV phones prevents users from enjoying context mobility. For example, in response to a sudden call at home, some women would not be willing to appear on the screen without their makeup. Consequently, contextual mobility can add an important framework for understanding the manner in which new telecommunication services are accepted.

Contextual mobility occasionally constitutes a public nuisance to nonusers. Mobile phones blur the boundary between public and private space; consequently, some people find that phone users invade the sanctity of their public space. In many countries, the use of mobile phones in public areas such as in trains and restaurants has attracted widespread criticism. A study has recorded that many respondents complain about mobile phones ringing and users talking in public spaces (Wei & Leung, 1999). Japanese railway companies request their passengers to mute the ringing and abstain from talking on their mobile phones on trains. Mobile phone users are criticized for violating the implicit rules of public space. In fact, this is not a recent phenomenon. Even before the advent of mobile phones, new portable media had already raised the issue of defining the boundary between public and private spaces. For example, in the 1960s, the older people in the United States and other countries criticized young people for using portable radios in public places (Goffman, 1963). In the 1980s, the widespread use of Walkman portable cassette players in trains also attracted strong criticism in Japan (Shinozaki, 1995).

Family context is an important aspect for media usage. Young people use mobile phones to maintain their social networks outside of parental supervision. Because landline phones are mostly shared with family members at home, their use is closely embedded in the family context. Evidence from many studies worldwide reveals that a common reason for using mobile phones among young people is to obtain freedom from the family grip (Kim 2002; Oksman & Turtaainen, 2004). For example, U.S. college students use mobile phones to maintain or manage privacy and to keep in touch with parents (Aoki & Downes, 2003). According to a survey in Japan, 53.2% of

young users (aged 15–29 years) agreed with “do you use a mobile phone because you can talk to someone in privacy from family members at night?”, whereas only 14.9% of the middle-aged (aged 30–49 years) users concurred ($\chi^2 = 83.4$, $df = 1$, $p < .0001$)² (Hashimoto et al., 2000). The mobile phone is recognized, particularly in the case of teenagers, as a technology that provides freedom from the family.

Youth culture and mobile communication

In Japan, the core communication technology in the youth culture is the *keitai* (mobile phone), and not the PC. As of 2003, 63% of Japanese teens (aged 12–19 years) used the mobile-based Internet, whereas 53% accessed the Internet from their PCs (Mikami, 2004). Japan is unique in that the rate of mobile-based Internet users is very high. In contrast, in many countries, except Japan and South Korea, the mobile phone Internet compatibility rate was even lower than 20% (Ministry of Public Management, Home Affairs, Posts and Telecommunications, 2002). The major Japanese carriers provide a variety of advanced services on the mobile phone including Global Positioning System, Java applications, and picture and video mail, in addition to standard e-mail and web browsing services (e.g., i-mode).

The characteristics of this new communication media and the Japanese youth culture appear to have reinforced each other over the last decade. For example, *beru-tomo* (pager friends) was a unique form of communication that appeared in the mid-1990s, especially among schoolgirls. Pager friends did not know each other’s names and had never met; however, they knew the pager numbers of their correspondents. They exchanged short messages such as “hello” and “good night” on their pagers almost everyday and sometimes even talked to each other about their personal problems via pagers (Ishii, 2004).

In addition to its relatively low cost, another possible reason for the popularity of text messaging among Japanese youth is the psychological meanings resulting from context mobility. Nowadays Japanese youth increasingly seek to avoid conflict and friendships with deep involvement (Sengoku, 1994). An extreme form of conflict-avoiding behavior is called “hikikomori” (long-term withdrawal from society), which has become a serious social problem in Japan. Hashimoto (2002) suggested that anxiety regarding direct communication among some Japanese youth was such that they avoided calling on the phone and instead preferred text messaging. The asynchronous communication of text messaging means that both parties are not required to be present for contact to occur. Young people, especially teenaged girls, found that communication needs were better served by text messaging through mobile media, and they readily adopted it.

Such evidence suggests an association between the unique use of text messaging and the lowering of social skills among Japanese mobile media users. Since the 1990s, some researchers have been warning that the level of social skills among the Japanese youth is much lower than that of their counterparts in other countries. For example, 32% of Japanese adolescents agreed with “I can easily start talking straight away to someone I do not know,” whereas 65% of their U.S. counterparts

and 34% of their Korean counterparts agreed with the statement. Further, 34% of Japanese adolescents agreed with "I can easily participate/join in a conversation among a group of friends, acquaintances, or strangers," whereas 68% of their U.S. and 41% of their Korean counterparts agreed (Youth Affairs Administration Management and Coordination Agency, 1999). Lack of social skills further leads to undesirable responses from others, which in turn makes the life of the socially inept more unpleasant. Previous studies in Western countries have revealed that extroverts flourish online (Chen, Boase, & Wellman, 2002). These people with higher social skills could use the Internet in a better manner to extend their relationships beyond their local networks (Wellman & Haythornthwaite, 2002). Limited attention has, however, been paid to the social skill levels as associated with mobile media use. This study utilized a survey to examine the relationship between the level of social skills and mobile media use.

The effects of mobile phone use

Previous studies have examined how the use of communication technologies has been associated with relationships with friends, neighbors, relatives, and workmates. In the pre-mobile phone era, Wellman and Tindall (1993) found that landline phones were used primarily to maintain local ties rather than across long distances and continents. With regard to organizational behaviors, many studies have investigated communication modes (Trevino, Lengel, & Daft, 1987). Recently, a number of studies have examined the effects of the Internet on interactions among friends. The Internet Paradox study initially found evidence that Internet use decreases social capital and commitment to the community (Kraut et al., 1998). However, in the 3-year follow-up of the original sample, the study found an overall opposite effect (Kraut et al., 2002). Furthermore, LaRose, Eastin, and Gregg (2001) found that the Internet could reduce depression by providing a means to obtain social support through e-mail exchanges with known associates. The Internet supplements the preexisting forms of communication and appears to be a positive force in social-capital formation (Katz & Rice, 2002). Taken together, these studies suggest that a modest use of the Internet increases social capital. However, very little systematic information is available regarding the impact of mobile communication media use on interpersonal relationships in daily life. Some evidence in Japan suggests that Internet use via mobile phones is associated with a greater level of social activities (Ishii, 2003). On the basis of survey data, this study also compares the consequences of using mobile mail and PC e-mail.

Research questions

Context mobility enables mobile phone users to communicate more freely from an existing social context such as family or the workplace. Accordingly, it is hypothesized that landline phones will be more likely to support family networks than mobile phones (H1a).

The medium itself sends out its own symbolic cues, which have their own symbolic meaning. Trevino et al. (1987) suggested that each communication medium provides its own symbolic cue. PC e-mail and mobile mail are expected to convey different cues to recipients even when sending the same text message. This is because in Japan, mobile mail is mostly used by students (Figure 1), whereas PC e-mail is mostly used for business. Hence, it is expected that mobile mail, which cues “peer group,” will be more likely to be exchanged among close friends (H1b).

H1a: Mobile voice phones will be associated more with nonfamilial relations, as compared to landline phones.

H1b: Mobile mail will be used more for communication with close friends, as compared to PC e-mail.

Based on the relationship between low social skills and mobile mail use as described above, it is hypothesized that people with low social skills prefer mobile mail to mobile voice phone as compared to people with higher social skills. This is because people with limited social skills need to overcome the awkwardness and inhibitions arising from direct communication via mobile voice phone. To quantify the relative preference for mobile mail in comparison with mobile voice phone, the relative preference for mobile mail (RPM) is defined as: $RPM = MM / (MM + VP)$, where MM is the frequency of using mobile mail and VP is the frequency of using mobile voice phones.

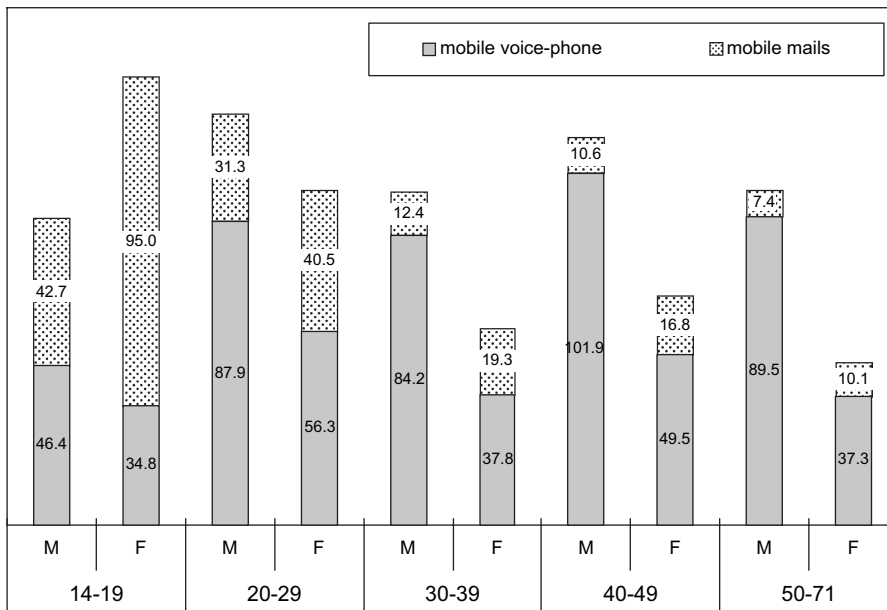


Figure 1 Frequencies of mobile voice phone and mobile mail communications per week by gender and age for the users.

H2: People with low social skills will have a stronger relative preference for mobile mail than those with high social skills.

Finally, this study will explore whether the new communication technologies promote social relationships with new friends.

RQ: Do mobile phones, mobile mail, and PC e-mail promote social ties with friends?

Method

Survey method

A study based on a two-wave panel survey was conducted in Japan (Hashimoto et al., 2004). The first wave of the survey was completed in December 2001. The sample was randomly selected from among the population aged 12–69 years across the country using a two-stage random sampling method. In the first step, 150 survey areas were randomly chosen in proportion to the share of the population. In the second step, 20 people were randomly chosen from among the residents' list in the local government office in each survey area.

Self-administered questionnaires were distributed to the homes of 3,000 respondents³ by a research company and collected following completion. A total of 62.6% ($N = 1,878$) of the respondents successfully completed their questionnaires in the first wave of the survey. In December 2003, 2 years after the first wave of the survey, the second wave was conducted among the successful respondents of the first wave. In the second wave, 1,245 respondents, which accounted for 66.3% of the first-wave respondents, were successfully surveyed.

The average age of the total respondents ($N = 1,878$) was 41.4 years in 2001, whereas the average age of the panel respondents (the successful respondents of the second wave) was 42.6 years in 2001. Males comprised 49.1% of the total respondents in the first wave and 47.7% of the panel respondents. The panel respondents comprised 50.0% full-time workers, 13.3% housewives, and 9.1% students. Due to the panel attrition, the panel respondents may be less representative than the total respondents of the first wave. However, in order to avoid complexities, weighting adjustments were not applied and only the panel respondents ($N = 1,245$) are considered in the following analyses unless otherwise indicated.

Measures

Media use

Respondents were questioned on the frequency of using various communication devices, including mobile voice phones ("how many phone calls do you make and receive in a week?"⁴), mobile mails ("how many mobile mails do you send in a week?"), and PC e-mails ("how many PC e-mails do you send in a week?"). We constructed measures of weekly frequencies for each medium. Receiving mobile mail

and PC e-mail is not considered because the frequency of receiving such mail depends considerably on the number of spam mails. Additionally, several detailed questions on usage patterns and perceived merits of media use were also asked.

Egocentric network (dyad) of intimate friends

Respondents were asked to name at most 10 intimate people, excluding family members whom they cohabited. For each one-to-one personal relationship, or *dyad*, with a partner, respondents were asked to record the following items: (a) partner's gender, (b) partner's age, (c) partner's role type (family member living separately, relative, girlfriend/boyfriend, friend,⁵ others), (d) frequency of face-to-face contacts with the partner, (e) communication medium (multiple question) such as landline phone, mobile voice phone, mobile mail, PC e-mail, chat on the Internet, facsimile, and postal mail, (f) frequency of communications via these media per month, and (g) residential distance as measured in terms of time required to visit his/her home (minutes). To ensure the privacy of the respondents, we requested them to erase the names after filling in the items; thus, it is impossible to know how a specific dyad changed across the 2-year period, although it is possible to compare the total change. Of the target respondents, 950 constituted a total of 5,935 dyads (an average of 5.6 dyads for each respondent) in the second wave. In the analyses of these data, the unit of analysis is not the individual, but the dyad (one-to-one network).

Number of friends

Respondents were asked the number of their nearby and distant friends. "Nearby" friends refer to those who live in an area within 1 hour of travel, and "distant" friends refer to those who live in an area of over an hour's travel time.⁶

Social skills

Fifteen items from Kikuchi's Social Skill Scale (Kikuchi, 1988) were employed. The items were rated on a 1–4 Likert-type scale (4 = *agree*, 3 = *weakly agree*, 2 = *weakly disagree*, and 1 = *disagree*). Statements included "I can maintain conversation with people," "I can talk to a stranger," "I can ask people to do something I want them to do," and 11 other items regarding interpersonal skills. Based on the item analysis, one item was excluded. The social skills score was defined as the sum of 14-item scores, and Cronbach's alpha was 0.917.

Results

Descriptive results

In 2001, 62.9% of the respondents were mobile phone users, 54.5% of whom (34% of the total respondents) were mobile mail users and 20.0% were PC e-mail users. In 2003, 74.5% of the respondents (an increase of 18%) were mobile phone users, 72.6% of the mobile phone users (54% of the total respondents) were mobile mail

users and 26.3% (an increase of 32%) were PC e-mail users. In 2003, 55.3% of the respondents accessed the Internet, whereas 21% of the Internet users did not use PC but used only mobile phones to access the Internet.

The frequencies of voice and mail use on mobile phones were not significantly correlated ($r = 0.042$, $df = 545$, $p > .05$), whereas the frequency of PC e-mail use was significantly correlated with the frequencies of both mobile voice phone use ($r = 0.195$, $df = 335$, $p < .001$) and mobile mail use ($r = 0.477$, $df = 238$, $p < .001$). The frequencies of mobile phone and mobile mail uses differed according to several demographic characteristics. Figure 1 shows that older people used mobile voice phones more often than young people, and males used mobile voice phones twice as often as females (86.9 times for males and 43.3 times for females⁷). In contrast, females, particularly teenaged girls, used mobile mail most frequently. A similar result was obtained for the relative preference for mobile mail (RPM⁸). The average of RPM is 0.427 for females and 0.228 for males. The average for teenaged females is 0.757, showing that young females predominantly choose mobile mail rather than making a call. Analysis of variance was conducted in order to examine whether frequencies of using mobile media varied with age and gender. With regard to the frequencies of using a mobile voice phone, a main effect of age was found, $F(4, 902) = 3.05$, $p < .001$. Older people use more mobile-voice phones. A main effect of gender, $F(1, 902) = 42.0$, $p < .001$, was also found. With regard to the frequency of using mobile mail, a main effect of age, $F(4, 639) = 35.4$, $p < .001$, and a main effect of gender, $F(1, 639) = 21.6$, $p < .01$, was found. Interestingly, an interaction effect between age and gender, $F(4, 639) = 5.73$, $p < .001$, was also found. The particularly high frequency of mobile mail use among teenaged girls (95.0 mails per week) suggests that there are parallels between the current *keitai* (mobile phone) culture and the pager-friend culture of the 1990s.

Regression analyses were conducted to evaluate the effects of demographic variables and social skill levels on the frequencies of media usage (Table 1). In these analyses, only the users of each medium in 2003 were considered.⁹ Table 1 shows that age, gender, and status of students were significantly correlated with mobile mail usage. In contrast, the status of students was negatively correlated with mobile voice phone or PC e-mail use. Full-time workers were more likely to use mobile voice phone and PC e-mail, but less likely to use mobile mail. Interestingly, social skill levels were significantly associated with the frequencies of PC e-mail and mobile voice phone use, whereas no such association was found between social skill levels and mobile mail usage. These results suggest the unique position of mobile mail as a medium for students. RPM was also regressed on the demographic variables and social skill levels using the Probit model. The result indicates that females, younger people, more affluent people, less educated people, nonworkers, students, and less socially skilled people tend to choose mobile mails rather than making a call. To examine determinants of changes over time, the frequencies of mobile voice phone and mobile mails were regressed on the demographic variables, social skill levels, time-lagged number of friends, and time-lagged frequencies of each medium

Table 1 Regression Coefficients of Media Use Frequencies for the Users

	Mobile Voice Phone (<i>n</i> = 795)	Cross Wave (<i>n</i> = 621)	Mobile Mail (<i>n</i> = 564)	Cross Wave (<i>n</i> = 465)	PC E-mail (<i>n</i> = 451)	RPM (<i>n</i> = 785)
Constant	40.111	22.756	21.744	17.284	-6.349	-0.035
Gender ^a	-38.253***	-20.174**	10.238**	7.191*	-0.931	0.565***
Age	-0.246	-0.155	-0.599***	-0.262	-0.508**	-0.030***
Education ^b	-2.543	-3.633	-3.797	-0.655	6.475	-0.135***
Income ^c	-1.265	-1.417	-0.246	-0.674	0.549	0.006**
Work ^d	27.674***	14.302	-0.121	-3.415	0.479	-0.283***
Student ^e	-15.147	10.883	31.074***	18.391**	-17.237*	0.409***
Social skills	2.353***	1.421**	0.162	-0.073	0.988***	-0.012***
Time-lagged variables (2001)						
Mobile-voice phone ^f		1.733***		0.063		
Mobile mail ^f		-0.157		0.462***		
PC e-mail ^f		0.131		-0.091		
No. of friends ^f		-0.049		0.138		
R ²	0.135***	0.364***	0.154***	0.435***	0.085***	—

^a Male = 1, female = 2.

^b University or higher = 1, else = 0.

^c One million yen.

^d Full-time worker = 1, else = 0.

^e Student = 1, else = 0.

^f These variables were measured at the first wave.

* $p < .05$. ** $p < .01$. *** $p < .001$.

(cross-wave models). Results demonstrate that the frequencies of each medium are not causally related to each other.

Communications with intimate friends

Egocentric network data provide more detailed information on how these communication media were used. Table 2 summarizes the characteristics of dyads¹⁰ over the egocentric network. As compared to the first wave of the survey in 2001, during the second wave in 2003, people communicated more often through mobile voice phone, mobile mail, and chat on the Internet.¹¹ More specifically, 44.2% of the dyads used mobile phones and 33.2% used mobile mail in 2003, as compared to 39.0 and 20.4% of dyads that used mobile phones and mobile mail in 2001, respectively. The usage rates of the other media decreased in this 2-year period. A remarkable decline is observed in the use of landline phone from 67.6 to 58.9%. This decline suggests that mobile phones displaced landline phones.

There were marked differences in demographic characteristics between the users of each communication medium. Mobile mails were exchanged between the

Table 2 Overall Characteristics of the Egocentric Network in 2001 and 2003

	Survey Year		By Media			
	2001	2003	Landline Phone	Mobile Voice Phone	Mobile Mail (text message)	PC E-mail
Total number of dyads	5,764	5,935	3,459	2,626	1,973	417
Respondents						
% of male	42.8	41.2	37.6	48.7	29.9	43.2
Average age (years) (SD)	41.7 (16.6)	43.0 (16.5)	51.0 (13.1)	39.0 (13.5)	31.2 (11.8)	38.7 (11.8)
Same gender with the partner (%)	81.5	82.1	82.9	80.3	84.0	74.8
Absolute difference in age (SD)	6.2 (9.0)	6.2 (8.9)	7.7 (9.9)	5.5 (8.0)	3.4 (5.9)	5.3 (7.6)
Frequency of face to face (SD)	1.71 (2.3)	1.57 (2.1)	1.2 (1.7)	1.7 (2.1)	2.0 (2.4)	1.1 (1.7)
Frequency of contacts (SD)	1.37 (1.8)	1.44 (1.8)	1.2 (1.6)	1.7 (1.9)	1.9 (2.0)	1.7 (2.0)
Average distance (minute) (SD)	70.0 (163)	62.0 (101)	65.6 (109)	49.9 (70)	60.2 (90)	113.9 (170)
Role type						
Family living separately (%)	9.4	10.2	13.9	9.6	5.6	10.6
Relatives (%)	14.0	11.6	17.0	6.7	3.7	4.8
Girlfriends/boyfriends (%)	1.5	1.4	0.8	2.5	3.1	2.2
Friends (%)	69.8	71.3	63.0	75.7	85.1	74.1
Others (%)	5.4	5.5	5.4	5.5	2.5	8.4
Media (multiple choice)						
Landline phone (%)	67.1	58.3	—	37.1	27.1	43.4
Mobile voice phone (%)	39.0	44.2	28.1	—	60.1	50.0
Mobile mail (%)	20.4	33.2	15.4	45.1	—	42.7
PC e-mail (%)	7.6	7.0	5.2	7.9	9.0	—
Chat on the Internet (%)	0.3	0.5	0.1	0.7	1.1	2.7
Facsimile (%)	3.0	2.1	2.8	2.2	2.0	6.2
Postal mail (%)	6.7	5.6	6.5	2.9	4.1	8.2

youngest dyads (on average, 31.2-year-old respondents and 30.2-year-old partners), whereas landline phones were used by the oldest dyads (on average 51.0 and 51.2 year old). Absolute differences in age indicated that partners in the same age bracket exchange mobile mail, whereas landline phones were used between dyads whose ages were different. Dyads using mobile mail most frequently had face-to-face contact with each other. In short, mobile mails were exchanged between young dyads, who actively had both face-to-face and mobile mail contacts.

To examine what factors determined media usage, four dichotomous variables (*use* = 1, *nonuse* = 0) of media type (landline phone, mobile voice phone, mobile mail, and PC e-mail¹²) were regressed on demographic variables using the logistic regression model. Table 3 shows that the users of each medium differed according to several demographic characteristics. Females were more likely to use mobile mails and landline phones, whereas males were more likely to use mobile voice phones. Young people were more likely to use mobile voice phones, mobile mails, and PC e-mails than old people who are more likely to use landline phones. Landline phones were more likely to be used for calls between people of the same gender, whereas mobile

Table 3 Logistic Regression Coefficients of Four Media Based on Egocentric Network Data

	Landline Phone	Mobile Voice Phone	Mobile Mail	PC E-mail
Constant	-4.045	2.416	1.491	-4.275
Gender (<i>male</i> = 1, <i>female</i> = 2)	.539***	-.705***	.989***	.113
Age	.078***	-.041***	-.093***	-.024***
Same gender ^a	.384***	-.174*	-.018	-.246
Absolute difference in age	.002	-.005	-.013*	.004
Role type				
Family living separately	1.520***	.072	-.811***	-.705**
Relative	1.413***	-.469***	-.853***	-1.122***
Boyfriend/girlfriend	.857**	.755*	.678*	-.134
Friend ^b	0	0	0	0
Other	.381*	-.302*	-1.186***	.226
Face to face contact	-.089***	.020	.006	-.093*
Distance (log)	-.139***	-.112***	.066*	.581***
Student ^c	-.209	-1.205***	.275	-.955**
Work ^d	-.670***	.612***	-.187*	.257
Social skill	.036	.126***	.045	.088*
% of concordant responses	74.8	66.5	78.7	92.6

Note: Only mobile phone owners were considered in these analyses.

^a *Same gender* = 1, *different gender* = 0.

^b "Friend" is the reference category whose parameters are set to 0; thus, parameters of other categories indicate effects compared to "friend."

^c *Full-time worker* = 1, *else* = 0.

^d *Student* = 1, *else* = 0.

* $p < .05$. ** $p < .01$. *** $p < .001$.

phones were used between people of different genders. The results also indicate that dyads consisting of family members living separately were more likely to use landline phones and less likely to use mobile mails and PC e-mails than other dyads.

The means of face-to-face contacts and the residential distance¹³ were compared among users of the four media types based on egocentric network data. The means were adjusted for demographic factors such as age, gender, role type (four dummy variables as in Table 2), gender difference (a dummy variable), and absolute difference in age. Results revealed that dyads communicating by mobile mails make most frequent face-to-face contacts (on average 1.94 times per week), followed by mobile voice phone users (1.77 times per week), landline phone users (1.50 times per week), and PC e-mail users (1.19 times per week). The difference between mobile mail and PC e-mail was statistically significant based on Duncan's test ($p < .05$). Additionally, there was a significant difference in residential distance between PC e-mail users (on average 4.10) and mobile mail users (on average 3.59) at the 5% level. Partners via PC e-mail lived further away from each other than their counterparts who used mobile mail. Hence, H1b was supported.

Social skills

Age and gender show a moderate association with social skill levels. Older people (age 30–71 years) were significantly more socially skilled than younger people (age 12–29 years) ($t = 2.23$, $df = 1213$, $p = .025$). Females were more socially skilled than males ($t = -2.32$, $df = 1219$, $p = .020$). Social skill levels were significantly correlated with the sociability scale¹⁴ ($r = 0.475$, $df = 1213$, $p < .0001$), which indicates that extroverts are more socially skilled than introverts. Social skill levels were found to be a significant predictor of the amount of mobile phone and PC e-mail use but not a significant predictor of mobile mail use¹⁵ (Table 1). A higher level of social skills was associated with a greater use of mobile voice phones and PC e-mail, whereas no significant correlation was found with the use of mobile mail. Table 1 shows that, after controlling for demographic variables, the relative preference for mobile mail (RPM) is negatively associated with the social skill levels. These results support H2.

To examine the causal influences of the media use on the size of personal network, the number of friends was regressed on the media usage, social skills, and demographic variables using time-lagged variables in the first wave. Table 4 indicates that only the effect of PC e-mail on the number of distant friends was statistically significant ($p < .01$). For nearby friends, no significant effect of media use was found. Only PC e-mail use in the second wave (in 2003) has a significant effect on the number of distant friends, whereas no time-lagged variable has a significant effect. Thus, this study failed to detect a causal influence of the media use on the size of personal networks.

The merits of mobile mail are appreciated to a greater extent by young people. When the users of both mobile voice phones and mobile mail were asked if they agreed with "I feel more relaxed when making contact via mobile mail than via phone," 75% of the young users (age 12–29 years) and 60% of the old users (age

Table 4 Stepwise Regressions Predicting the Number of Friends

Selected Variables	Number of Nearby Friends (<i>n</i> = 1,171)	Number of Distant Friends (<i>n</i> = 1,163)
Constant	-0.993	-2.152
Number of nearby friends (2001)	0.237***	— ^a
Number of distant friends (2001)	— ^a	0.192***
Gender (<i>male</i> = 1, <i>female</i> = 2)	-0.832	
Student		1.514*
PC e-mail ^b (2003)		1.096**
Social skills	0.169***	0.120**
R ²	0.140***	0.106***

Note: Variables at Wave 2 (2003) were used unless otherwise indicated. The variables were selected by the stepwise regression model with PIN(0.05), POUT(0.1), and tolerance (0.0001). Age, education (*university or higher* = 1, *else* = 0), work (*full-time worker* = 1, *else* = 0), mobile voice phone^b (2001), mobile voice phone^b (2003), mobile mail^b (2001), mobile mail^b (2003), and PC e-mail^b (2001) were not selected by the models.

^a Not used in the corresponding model.

^b *Users* = 1, *else* = 0.

* $p < .05$. ** $p < .01$. *** $p < .001$.

30–69 years) agreed¹⁶ ($\chi^2 = 16.1$, $df = 1$, $p < .01$). Additionally, experiences and perceptions of PC-based Internet and mobile phone regarding personal relationships are compared in Table 5. Among those who used both PC Internet and mobile phones, more respondents made new friends via PC e-mail than via mobile mail, regardless of whether the relationship with these friends was only on the net, or whether it had developed into a face-to-face contact. Similarly, they perceived that the PC-based Internet is more useful for communicating with strangers ($t = 2.96$,

Table 5 Level of Experience (%) and Perceived Merits of PC Internet and Mobile Phones (*N* = 283)

	Via PC Internet	Via Mobile Mail	NcNemar's Test
I have a friend to whom I often send text messages via PC Internet/mobile mail but have never met in person	8.1	2.1	13.8***
I have a friend that I met in person after getting to know him/her via PC Internet/mobile mail	6.7	3.2	5.6*
I can get new friends via PC Internet/mobile mail	14.5	7.4	10.0***
I can strengthen links with people I already know via PC Internet/mobile mail	39.6	62.2	42.7***

* $p < .05$. ** $p < .01$. *** $p < .001$.

$df = 470, p < .01$), whereas they perceived that mobile phones were more useful for maintaining existing ties ($t = -11.1, df = 470, p < .001$). These results suggest that using mobile media does not lead to new ties, whereas PC e-mail allows users to form new ties at least with distant friends.

Discussion and conclusions

Prior studies have compared the effectiveness of various communication media using the concept of social presence (Short, Williams & Christie, 1976) and media richness (Trevino et al., 1987). Despite the significance of these theories to practical matters such as management and education, they fail to explain why mobility is important for communication technologies. Although mobile and landline phones are basically similar with regard to social presence and media richness, the findings indicated that these two phone types are used in fairly different manner in daily life. Context mobility is one of the keys to understanding this contradictory situation. Because the landline phone is located at home, it is more often used in a family context. Adolescents use mobile phones to communicate in a context that is independent of the family. This study indicated some unique characteristics specific to mobile communication media use in comparison to landline phones and PC e-mails. First, compared to other media, landline phones were more closely associated with family interactions. The average age of mobile phone users was also quite different from that of landline phone users. Older people tended to use landline phones, whereas younger people tended to use mobile phones. Second, the study found a significantly negative association between the level of social skills and the relative preference for mobile mail. The study also indicated that a higher level of social skills promotes the use of PC e-mail and mobile voice phone, but social skill levels are not significantly associated with the use of mobile mail. The results indicate that less socially skilled people have a stronger relative preference for mobile mail than highly socially skilled people. These results suggest that mobile mail is useful for those who have limited social skills. Given that Japanese adolescents are less socially skilled as demonstrated by some survey results (Youth Affairs Administration Management and Coordination Agency, 1999), these results suggest that mobile mail helps Japanese youth to overcome their shyness in communications. Third, mobile mail and PC e-mail are used quite differently in Japan. One of the interesting findings of this study is the high density of communication among mobile mail users. Mobile mail users exchanged mobile mail and make face-to-face contacts very frequently. However, the results did not support the possibility that mobile communication is used to create new ties in their social networks. Mobile mail appears to support only a closed network, whereas PC e-mail was found to promote friendship with distant friends.

These media are not used in a vacuum but in a social and cultural milieu. The marked differences between PC and mobile e-mail use should be understood in terms of the particular culture in which each medium is used. As described above,

the current *keitai* (mobile phone) culture is very similar to the earlier pager culture that appeared in the 1990s. Since the 1990s in Japan, the primary users of text messaging services have been teenaged girls (e.g., pager friends), whereas the primary users of PCs have been educated, young males (Ishii, 2004; Ishii & Wu, 2006). These findings suggest that cultural aspects play an important role in the use of such media.

There are mixed results on whether we should have the utopian hopes or dystopian fears regarding the mobile cultures of Japanese adolescents. The results demonstrated lower social skills promoted stronger relative preference for mobile mail in comparison with mobile voice phones. Social skill levels are negatively correlated with sociability. In other words, mobile mail is appreciated particularly by introverts for its usefulness in maintaining communications. This is a positive aspect of the mobile mail. The findings also highlight a negative aspect of the mobile culture. The use of mobile voice phones and mobile mail is not significantly associated with the number of friends, whereas that of PC e-mail is associated with the number of distant friends. Thus, mobile media use seems to merely supplement frequent face-to-face contacts among partners. Wellman (2002) depicted a new society in which mobile communication media would support a networked individualism by catalyzing a transition from place-to-place to person-to-person connectivity. However, contrary to this perspective, this study suggests that mobile mail does not create new ties but only maintains existing ones. Possibly, more sophisticated software will be required for mobile phones to create and develop social networks. However, in the current situations, the only commercially successful software is the *deai* (matchmaking) Web sites that provide dating services via i-mode on mobile phones, and the increase in crimes related to *deai* sites has become a serious issue in recent years¹⁷ ("Net date site crimes becoming more violent," 2003).

Limitations and directions for future work

This study has found no evidence of causal relationships between the mobile media use and other variables, although it has found a lot of significant cross-sectional associations. A possible reason is that the 2-year interval was too long to detect the causality between the media use and other variables because there were significant technological changes in telecommunications during this period. Thus, causal relationships remain to be tested in future works.

Cultural factors influence the pattern of mobile media use; however, as this study was not designed to be comparative across countries, the results should be interpreted with caution. First, as discussed previously, personal relations are unique, particularly among Japanese adolescents, who are characterized by a tendency to avoid direct communication (Sengoku, 1994) and a high disclosure of subjective self and low disclosure of objective self (Ishii, 2004). The relationship between mobile mail use and the level of social skills found in this study might be culture bound. Second, compared to mobile phones, the PC-based Internet penetration rate is low in Japan. This may also be interpreted in terms of cultural differences. For example,

cultural preferences for high uncertainty avoidance may explain the low ownership of PCs (de Mooij, 2004). Regardless of the reason, the unique media environment of Japan may have promoted different patterns of use for mobile phones as compared to other countries. Hence, a comparative study is needed to explore the possible cultural factors in a broader cultural context. For example, it appears interesting to examine why youth in northern Europe and Japan have a similar text messaging culture with regard to mobile phones. Certainly, this subject warrants further examination through additional research.

Acknowledgements

This study was supported by Grant-in-Aid for Scientific Research from the Ministry of Education, Culture, Sports, Science and Technology of Japan (No. 13410046). The author thanks Prof. Hashimoto for his valuable support.

Notes

- 1 Source: Telecommunication Media Usage Survey. This survey was conducted in metropolitan areas in Japan in 1999 by a research group including the author (Hashimoto et al., 2000). The results are obtained from analyses made by the author.
- 2 See Note 1. Only mobile phone users are considered for this analysis.
- 3 The respondents were offered a small monetary incentive (a coupon worth 500 yen) to participate in the survey.
- 4 The frequencies of receiving and making a call were separately asked in 2003, whereas only the total frequency was asked in 2001. Thus, it is not possible to compare the frequencies of mobile voice phone using these survey data.
- 5 Japanese word *yujin* is normally translated as friend; however, the word has a different nuance. *Yujin* commonly implies friends of similar age. Hence, "others" may include much younger or older friends and work-related colleagues.
- 6 Most previous studies used geographical distance; however, this study used travel time because (a) it was difficult for the respondents to correctly assess the geographical distance in Japan and (b) travel time is expected to be more closely associated with the frequency of interactions.
- 7 The averages are calculated after excluding nonusers of mobile phones and nonusers of mobile mail in Figure 1.
- 8 RPM is computed as $MM/(MM + VP)$, where MM is the number of mobile mails sent per week and VP is the number of calls made with mobile phone per week.
- 9 For nonusers of mobile mail, the value zero was assigned to RPM.
- 10 Definition of "intimate" person depends on respondent's judgment, although the corresponding Japanese word to "intimate" implies an extremely private relationship. The respondents answered an average of 5.5 and 5.6 dyads for this question in 2001 and 2003, respectively. The number of the dyads is significantly different between the genders (4.8 for males and 3.8 for females, $t = 5.13$, $df = 938$, $p < .001$) but not significantly different across age groups, $F(4, 935) = 0.47$, $p > .05$). In the following analyses of egocentric network data, only data from the second wave of the survey in

2003 were employed. It should be noted that communication media is a multiple-choice item; thus, the dyads of four groups in Table 2 (four columns at the right) are partially overlapped.

- 11 “Chat on the Internet” will no longer be considered in the following analyses because the number of the responses was extremely small.
- 12 Facsimile and postal mail were omitted because these two were used only by a small number of dyads.
- 13 Dyads who used only either one of the four media were employed for these analyses.
- 14 The sociability scale consists of two statements (Cronbach’s alpha = 0.506).
- 15 Only users of a single medium were considered for these analyses.
- 16 This question was asked in the first wave (in 2001) of the survey.
- 17 According to a National Police Agency report, there were 781 crimes involving online matchmaking sites in 2002 in Japan, and 80% of the victims in such crimes were female minors. In response to the increase in deai-related crimes, a law regulating Internet matchmaking sites was enacted in 2003.

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