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PERSONAL NETWORKS AND THE PERSONAL COMMUNICATION SYSTEM

Using multiple media to connect¹

In contrast to technologically deterministic approaches that focus on how communication technology affects social relationships, this paper examines how individuals draw on a variety of commonly used communication media in conjunction with in-person contact to stay connected to their personal networks. I term this use of multiple communication media the 'personal communication system'. Findings are based on a random sample telephone survey of 2,200 adults living throughout the continental USA. Descriptive statistics show that despite the popularity of e-mail and mobile phones, in-person and landline phone contact are still the most common ways of connecting with personal networks. Multivariate analysis reveals a more complex picture of media use, showing that the extent to which each medium is used varies to differing degrees with the size and diversity of personal networks. Hierarchical cluster analysis is used to explore the possibility that individuals may have different types of personal communication systems. Results show only two distinct clusters: those who draw heavily on all types of media to connect with their personal networks and those who draw less heavily on all types of media. Heavy communicators typically have larger and more diverse personal networks than light communicators. When taken together, the results presented in this paper suggest that rather than radically altering relationships, communication technology is embedded in social networks as part of a larger communication system that individuals use to stay socially connected.

Keywords Community; social networks; personal networks; computer mediated communication; Internet; telephone; mobile phone; e-mail; communication networks; social capital; personal relationships; informatics

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Introduction

The development of communication technology during the past century has altered how individuals connect with their personal networks. With the rapid diffusion of the telephone, mobile phone, and e-mail, people now have the ability to contact friends, family, and workmates outside of their immediate vicinity, both synchronously and asynchronously. But however profound communication technology has been for *how* social interaction occurs, the empirical work reviewed below suggests something even more profound: personal networks remain robust in spite of their newly mediated existence.

How then to understand the social significance of communication technology? Rather than viewing relationships as directly impacted by communication technology, I propose a new framework that emphasizes how purposeful individuals draw on multiple types of communication media – including in-person contact – to stay connected to their personal networks. I call this purposeful use of multiple communication media the ‘personal communication system’. Using this framework I analyze data collected from a random telephone survey of 2,200 Americans to examine the extent to which individuals draw on communication technology and in-person contact, how the use of each of these media vary with personal network composition, and how these media are combined to maintain contact with personal networks.

Communication technology and the personal communication system

By focusing on whether or not using communication technology replaces in-person contact with less rich and meaningful contact, researchers have often assumed that technology is an external force which affects social relationships. This assumption is typically guided by concern that using communication technology may weaken social ties, increasing the prevalence of social isolation throughout society (e.g. McPherson et al. 2006). However, with the exception of a few studies conducted using unrepresentative samples in contrived settings (Kiesler & Sproull 1991; Nie & Hillygus 2002), a great deal

of empirical research has shown that telephones and the internet have not weakened relationships by acting as insufficient substitutes for in-person contact (Dennis & Kinney 1998; Fischer 1992; Anderson and Tracy 2001; Gershuny 2002; Robinson, et al. 2002; Walther 2002; Hampton & Wellman 2003; Cummings, Lee & Kraut 2006; Hampton 2007; de Gennaro & Dutton 2007; Shklovski et al. 2006). To the contrary, these studies suggest that individuals draw on various media to fit their social needs and lifestyles.

In this section I will propose a new approach that builds on existing literature by viewing the use of various communication technologies as a set of tools used in conjunction with in-person contact to maintain contact with personal networks. This approach has four important elements that call attention to the significance of: a) multiple communication media, b) social affordances of communication technology, c) personal networks, and, d) the cognition and behavioral elements of social ties.

Multiple Communication Media - The Personal Communication System

I use the term ‘personal communication system’ to convey the idea that individuals draw on multiple kinds of communication technologies together with in-person contact for two reasons.²

First, the word ‘personal’ connotes that the use of communication media is centered on the individual. The variety of communication media currently available – as evident in the wide adoption of landline phones, mobile phones, and e-mail – means that individuals can combine different media differently, to suit their needs and personal preferences. Paying attention to how individuals use a variety of communication technology stems from Fischer’s (1992) ‘hermeneutic approach’ that empathizes the purposeful user as being the main force that accounts for the use of communication technology. According to Fischer, this approach helps avoid billiard ball metaphors that over emphasizes the

² Although ‘personal communication system’ is sometimes used in the technology industry to refer to cellular technology in America, it is not widely used in academic writing about the social significance of communication technology.

causal influence of technology and ignores how individuals can intentionally use communication technology to suit their own personal needs.

Second, the word “system” implies that individuals combine various communication media together to connect with their own personal networks, rather than using them separately to connect with separate social worlds. Although it is true that individuals may sometimes form new social ties through one medium such as the internet, as these ties become close they are often contacted through other means, either in-person or by phone (Parks & Floyd 1996; Haythornthwaite & Wellman 1998; Haythornthwaite 2001; Hampton & Wellman 2003; Hampton 2007; de Gennaro & Dutton 2007). Although existing research clearly shows that individuals use multiple media together to maintain their personal networks, how and the extent to which they are used together requires further research. The term ‘personal communication system’ should serve as a useful conceptual starting point from which to begin studying how this system operates.

The Social Affordances of Communication Technology

The term ‘affordance’ was first used by psychologists to refer to the human ability of understanding how the intrinsic properties of objects allow them to be used for a variety of purposes (Gibson 1977; Gibson 1986). When applied to communication technology, the social affordance approach posits that individuals will choose to use particular kinds of communication media when there is a congruency between opportunities that they provide and the characteristics of the ties with whom they are used to communicate (Wellman et al. 2003; Boase & Wellman 2006). For example, the telephone affords individuals the ability to communicate with distant ties that would be difficult to contact otherwise. When individuals have numerous distant ties that they would like to quickly get a hold of, they use the space-transcending affordance of the telephone to meet their communication demands. The social affordance approach allows researchers to take into account how the intrinsic properties of communication technologies may factor into their

adoption and use, without making the technological deterministic assumption that these properties directly impact users.

Personal Networks

A personal network is the set of social ties that an individual knows and communicates with. In contrast to social network researchers who define the boundaries of a particular group and then focus on its interconnected relationships, those who study personal networks focus on ties that are defined as significant by a particular individual (see Wellman 2007). The personal network approach is ideally suited for understanding the personal communication system because it takes the individual's relationships as its primary focus of analysis.

Lack of personal network measures in communication technology studies have made it difficult to evaluate the social significance of these technologies for at least two reasons. First, existing research tends to examine only frequency or duration of contact using communication technology rather than examining the number of personal ties actually contacted using technology. This makes it difficult to know if additional communication made using telephones, mobile phones, and e-mail is used to connect more intensely with just a few core ties or more broadly with a large number of ties throughout an individual's personal network. Second, personal network measures have been typically limited to contact with unspecified numbers of friends and family. This has made unclear if people using these technologies typically have large and diverse or small and dense networks.

The Cognitive and Behavioral Sides of Personal Networks

Social ties have two important dimensions: cognition and behavior. The cognitive dimension includes the belief that a social tie exists, as well as feelings of closeness, memory of past interaction, and knowledge about that tie. The behavioral dimension is

interaction that typically occurs by way of mediated and unmediated communication. When thinking of ties in this way it is clear that the social significance of communication technology lies not in how it alters ties as an external force, but rather in the fact that it is embedded in behavior that is essential to the existence of ties. Much as Licoppe & Smoreda (2005) described it, it is not necessarily the content of the communication but rather the fact that it is being made which is often the most significant part of technologically mediated communication. The more that communication technology is used to maintain the active connection that is vital the existence of ties, the greater its social significance.

Thinking of social ties in this way does not imply that there is no interaction between cognition and behavior. Indeed, it is likely that there is a reciprocal process through which communication is necessary to form and maintain feelings of connection, and feelings of connection motivate continued communication. However, the point being made here is that feelings of connection alone are just one side of social ties, and that understanding the significance of communication technology means understanding how – and to what extent – it is embedded in personal networks as the means by which they are made real.

Research questions

As argued, the social significance of communication media is evident in the extent to which it is used to facilitate communication. Thus, my first research question is as follows:

1. To what extent do individuals use landline phones, mobile phones, e-mail and in-person communication to maintain contact with their personal networks?

Although understanding the extent to which communication media is typically embedded into personal networks is an important start, it only gives a basic sense of its social significance. The extent to which individuals draw on communication technology may depend heavily on the extent to which the affordances that it offers fit the social

demands of their personal networks. Individuals with large and diverse personal networks may be more prone to use mobile phones, landline phones and e-mail because each of these technologies affords the ability to switch quickly between ties (Wellman 1999; Wellman 2001). Moreover, some of these technologies may be more useful than others, depending on the particular network property being considered. The asynchronous nature of e-mail may make it particularly well suited to help avoid scheduling conflicts that naturally arise as networks become large and diverse (Boase 2006; Gibson 2005). By contrast, landline and mobile phone contact may be suited for distant network ties and for those ties that are strong enough that individuals either know what time is best to call or are not concerned that the possible interruption of their phone call will be considered offensive (Boase & Wellman 2006).

Given the potentially strong relationship between the personal network properties and the use of these various communication media, the second research question is:

2. To what extent does the use of each communication media vary with personal network composition?

Finally, although it is clear that individuals draw on multiple communication media in conjunction with in-person contact, it is unknown if there are common types of communication systems that are prevalent throughout the general population. It is possible, for example, that some individuals draw heavily on e-mail in conjunction with in-person contact, while others mostly use telephone and in-person contact to maintain contact with their personal networks. Further, if different communication systems exist, they may reflect the prevalence of different kinds of personal networks. Accordingly, my third research question is:

3. Are there different types of personal communication systems? If so, does personal network composition vary between each type of system?

Data and methodology

The findings presented here are based on data collected from the Pew Internet & American Life Project's Social Ties Survey, a random digit dial telephone survey of 2,200 adults living in continental USA. Interviews were conducted from February 17 to March 17, 2004, and lasted an average of 19 minutes per individual. All adults sampled had landline telephones (telephones that use physical outlets connected in one place) in their households, and all interviews were conducted in English. The response rate was 35%, and approximately 96% of those individuals who began the survey completed it in full. A comparison of sex, age, race, employment, and education variables from the Social Ties Survey with the same variables in the US Census Bureau's 2003 American Communities Survey indicates that the Social Ties sample is similar to the general American population in its demographic composition (Boase 2006).

Measuring Personal Networks

Personal network size: The number of ties in an individual's personal network may affect the extent to which they use communication technology. Large-scale ego centered surveys have typically used name generators to collect personal network data – for example, asking respondents to give the names of alters with whom they discuss important matters (Burt 1984; Marsden 1987; McPherson et al. 2006). Although these methods have the advantage of collecting detailed information about a few select ties, they are generally not good indicators of network size because they focus only on relatively small numbers of alters that are not representative of the large number of ties that make up an individual's personal network (Marin 2004; Marin & Hampton 2007). Rather than using the name generator method, the Social Ties Survey uses the summation method, which was specifically designed to measure personal network size. This method calculates network size by having respondents report the number of ties that they know in different relational categories – such as friends, workmates, kin, etc. – and then adding those together to give a single estimate of size (McCarty et al. 2001). Breaking down

network size into a number of relational roles eases the cognitive burden of recall. McCarty et al. use comparative data and repeated measures to argue that the summation method is a valid and reliable proxy for network size.

To further reduce cognitive burden and give more detailed information about tie strength, a variation of the summation method used in the Social Ties Survey asked respondents to report the number of people with whom they “feel very close” to in a variety of relational roles, and then to report the number of people with whom they “feel somewhat close” in the same relational roles. Closeness was chosen because Marsden & Campbell (1984) found it to be a fundamental property of tie strength, and pre-testing showed that thinking of ties that were very close and somewhat close was a relatively easy task for respondents.

Personal network diversity: The space transcending and asynchronous social affordances of communication technologies may also be useful when connecting with diverse personal networks, because tie diversity increases scheduling conflict and travel demands. Connecting with geographically diverse personal networks often requires substantial travel time, connecting with sparsely knit ties increases communication demand because ties must be contacted in serial rather than all at once in group settings, and connecting with ties that work in diverse occupations increases scheduling conflict because people who work in different occupations often have different schedules. The measures used in the Social Ties Survey to operationalize these three types of diversity will be discussed in turn.

Geographical diversity is measured by asking respondents to report on the number of core and significant ties who live more than one hours travel from their home (see Wellman and Tindall 1993; Fischer 1996; Mok & Wellman 2007).

Having sparsely knit personal networks is measured by asking respondents to report approximately how many of their core and significant ties know each other (0 = ‘none’, 1 = ‘some’, 2 = ‘about half’, 3 = ‘many’, and 4 = ‘all’). Although this measure may be less accurate than the name generator method that asks respondents if specific ties know each

other, time constraints and the potentially large numbers of core and significant ties collected using the summation method make using the name generator method unfeasible.

Another indicator of social diversity used in the Social Ties Survey is a variation of Lin's (2001) position generator method. Although Lin's original method asks respondents if they know *anyone* in occupations of varying prestige, this variation asks respondents if they know *active ties* in occupations of varying prestige. The measure is modified in this way because the Social Ties survey focuses only on active ties, rather than all possible ties in an individual's personal network.

This paper also analyzes the data collected using this method somewhat differently than Lin. While Lin adds the results of these questions together to give a single scale indicating network diversity, this analysis adds together the results to give two scales: one indicating the diversity of ties in high prestige occupations, and the other indicating the diversity of ties in low prestige occupations. This scale is broken into two scales because I have theorized that diversity is associated with the use of e-mail, and people in high prestige occupations are more likely to have e-mail access than those in low prestige occupations. Social diversity can only matter for the use of e-mail if the diverse ties that an individual would like to communicate with have e-mail access. The first scale includes occupations that were selected at roughly equal intervals from a list of occupations with prestige scores higher than 50 points, while the second scale includes occupations selected at equal intervals from a list of occupations with prestige scores lower than 50 points (prestige scores came from Ganzeboom and Treiman 1996).

Measuring Personal Communication Systems

Understanding the extent to which these media are used to connect with personal networks is not captured well through measures that focus on frequency or duration of contact through various media. The Social Ties data includes a measure of how many core and significant ties are typically contacted at least once a week by way of landline

phone, mobile phone, e-mail, and in-person media. These core and significant tie measures are then summed together to give the number of active ties that are contacted at least weekly through each of these communication media.

Preliminary analysis shows only a few minor discrepancies between core and significant ties in terms of the associations between personal network composition and the use of communication media. Hence, the remainder of this paper reports only on active ties – the sum of core and significant ties.³

Control Variables

Answering research questions 2 and 3 involves the use of regression models that take into account a number of factors that may affect the association between personal network composition and the use of different communication media. Gender, education, type of occupation, age, and organizational involvement have all been implicated as factors in the use of various communication media, and they have also been associated with differing types of personal network composition. For a more detailed discussion of how each of these factors may influence the use of different communication media, see Boase (2006) and Boase et al. (2006).

Contact through one communication medium may sometimes lead to contact through other communication media – such as when a person e-mails a friend about getting together for coffee. To control for the potentially spurious association between network properties and the particular communication medium under consideration, the use of other communication media are treated as control variables.

³ Core and significant tie results are kept separate for density variables in this analysis because the nature of these measures does not allow them to be summed together.

Findings

Personal Networks in America

I will begin by describing the basic characteristics of personal networks in America using the Social Ties data. Overall, the results show that Americans maintain substantial numbers of active ties: a mean of 51 active ties, 24 core ties and 27 significant ties. The median measures show somewhat different results, with medians of 35 active ties, 15 core ties, and 16 significant ties. The discrepancy between the mean and median numbers of ties is due to a positive skewing of active, core and significant tie distributions (skewness = 6.6 for active ties; 6.0 for core ties, and 7.0 for significant ties).

The relational distribution of personal networks shows that active personal networks are composed of a variety of ties. The mean percent of ties in each relational category is as follows: 30 percent are friends, 22 percent are immediate kin, 20 percent are extended kin, 18 percent are known from work, and 10 percent are neighbors.

Research Question 1 – Connecting to Personal Networks by All Means

Question 1 asks:

1. To what extent do individuals use landline phones, mobile phones, e-mail and in-person communication to maintain active contact with their personal networks?

Overall results indicate that Americans draw on a variety of media to stay connected to their personal networks. However, the role of communication technologies should not be overstated, as in-person contact still plays a leading role in personal communication systems. While cell phone and e-mail technology are widespread, they have yet to be adopted by some Americans. At the time of the survey approximately 63 percent of the respondents reported using e-mail in the past month and 74 percent reported using a mobile phone in the past month. Moreover, when examining the number of ties contacted using all of these media, these results indicate that despite the recent popularity of e-mail and mobile phones, in-person and landline phone media are still the main ways in which

individuals maintain contact with their active networks. The approximate mean number of active ties contacted at least weekly by each medium are as follows: 17 in-person, 12 by landline phone, 10 by mobile phone, and 10 by e-mail. As with the distribution of network size, the number of ties contacted using each medium is positively skewed. The median number of active ties contacted at least weekly by each medium follow a similar order, but show substantially less use of mobile phones and e-mail: 10 in-person, 7 by landline phone, 5 by mobile phone, and 4 by e-mail.

Research Question 2 – Communication Media and Personal Network Composition

Examining the typical use of these media in the general population only gives a general sense of their social significance. However, as discussed above, their significance may depend heavily on the size and diversity of personal networks. For example, the asynchronous nature of communication afforded by e-mail implies that e-mail may be more socially significant for people coping with the communication demands of large and diverse networks than those maintaining contact with small and densely knit personal networks. Question 2 asks:

2. To what extent does the use of each communication media vary with personal network composition?

Zero inflated negative binomial count regression is used to understand the extent to which personal network composition and other potentially intervening factors can account for the extent to which people use in-person, landline phone, mobile phone, and e-mail.⁴

⁴ Zero inflated count regression is more suitable than regular OLS regression because the dependent variables are positive count numbers with a strong positive skew and a substantial number of zero values. Negative binomial count regression is used instead of Poisson count regression because the standard variation of each dependent variable is greater than its respective mean, indicating an over dispersion that is better handled by negative binomial count regression than Poisson count regression. STATA's likelihood-ratio test confirmed the suitability of this choice.

TABLE 1 Event count and binary logistic regression of media use

| | in-person [1] | landline [1] | mobile [1] | e-mail [1] | heavy communicators [2] |
|-----------------------------|---------------|--------------|------------|------------|-------------------------|
| control variables | | | | | |
| female | 0.00 | 0.17 ** | 0.02 | 0.33 ** | 0.44 ** |
| college degree | -0.05 | -0.01 | -0.07 | 0.12 | 0.07 |
| professional occupation | 0.09 * | 0.07 | 0.05 | 0.06 | 0.10 |
| age | 0.03 ** | -0.01 | 0.03 * | -0.01 | 0.01 |
| age squared | -0.46 ** | 0.05 | -0.54 ** | 0.05 | -0.58 |
| organizational involvement | 0.03 * | -0.02 | 0.04 * | 0.08 ** | 0.16 ** |
| in-person | NA | 0.03 ** | 0.01 ** | 0.00 | NA |
| landline phone | 0.02 ** | NA | 0.02 ** | 0.01 ** | NA |
| mobile phone | 0.01 ** | 0.01 ** | NA | 0.01 ** | NA |
| e-mail | 0.01 * | 0.01 * | 0.02 ** | NA | NA |
| network size | | | | | |
| friends | 0.02 ** | 0.00 | 0.00 | 0.02 ** | 0.06 ** |
| work ties | 0.03 ** | 0.00 | 0.01 | 0.02 ** | 0.08 ** |
| neighbors | 0.02 ** | 0.02 ** | 0.00 | 0.00 | 0.02 |
| kin | 0.01 ** | 0.01 ** | 0.01 ** | 0.01 ** | 0.03 ** |
| network diversity | | | | | |
| high prestige diversity | -0.01 | 0.04 ** | 0.04 * | 0.08 ** | 0.15 ** |
| low prestige diversity | 0.03 ** | 0.04 ** | 0.03 * | 0.02 | 0.08 * |
| 1+ hours travel | -0.01 ** | 0.00 | 0.00 | 0.01 ** | 0.00 |
| core tie density | 0.06 ** | 0.08 ** | 0.09 ** | -0.01 | 0.16 * |
| significant ties density | 0.11 ** | 0.03 | 0.03 | 0.03 | 0.20 ** |
| constant | 2.62 ** | 1.07 * | 3.06 ** | 0.52 | -1.91 |
| inflate | | | | | |
| constant | -4.33 ** | -3.32 ** | -2.29 ** | -1.82 ** | NA |
| N | 2153 | 2153 | 1595 | 1359 | 2153 |
| number of zero observations | 112 | 171 | 254 | 338 | NA |
| * p ≤ 0.05 | | | | | |
| ** p ≤ 0.01 | | | | | |

[1] zero inflated negative binomial event count regression

[2] binary logistic regression

0 = light communicators

1 = heavy communicators

Overall, the extent to which each medium is used varies significantly with personal network composition (Table 1, ‘in-person’ ‘landline’ ‘mobile’ and ‘e-mail’ models).

Personal Network Size: Generally these results suggest that people draw more heavily on in-person and e-mail contact as the numbers of friends, work ties, and kin in their active personal networks become large. By contrast, landline and mobile phones are not typically used to maintain contact with large numbers of friend and work ties. Considering only those associations where $p < 0.05$, the results suggest that:

- in-person contact is made when active personal networks include large numbers of friend, work, neighbor and kin ties;
- landline phones are used when active personal networks include large numbers of neighbor and kin ties;
- mobile phones are used when active personal networks include large numbers of kin ties;
- e-mail is used when active personal networks include large numbers of friend, work and kin ties.

Personal Network Diversity: These results show that the relationship between active personal network diversity and the use of various communication media is complex.

Considering only those associations where $p < 0.05$, the results suggest that:

- in-person contact is made when active personal networks include diverse ties in low prestige occupations, ties that are physically close, and dense groups of core and significant active ties;
- landline phones are used when active personal networks include diverse ties in both low and high prestige occupations, and dense groups of core ties;
- mobile phones are used when active personal networks include diverse ties in low and high prestige occupations, and dense groups of core ties;
- e-mail is used when active personal networks include diverse ties in high prestige occupations, and ties that are geographically distant.

Research Question 3 – The Personal Communication System

The results presented so far only show how the use of each communication medium varies with personal network composition. To explore the ways in which these media may be combined together and how those different combinations vary with personal network composition, research question three asks:

3. Are there different types of personal communication systems? If so, does personal network composition vary between each type of system?

Because this question is exploratory in nature and emphasizes the importance of understanding how communication media are combined to form a complex whole, I use hierarchical cluster analysis to look for different patterns in the ways that in-person, landline phone, mobile phone, and e-mail are combined.

Although hierarchical cluster analysis has the advantage of avoiding assumptions about the number and kinds of different personal communication systems that may exist in the general population, it has been criticized for not providing any standard way of deciding if clusters differ from each other significantly. In this analysis I first use Ward's Method to cluster in-person, landline phone, mobile phone, and e-mail contact.⁵ A Calinski and Harabasz index is then used to determine an optimum number of clusters.⁶

The Calinski and Harabasz index shows that two clusters are more distinctive than three or more clusters. Moreover, breaking communication media use into more than two clusters creates at least one cluster that is too small to be included in the analysis that follows ($N < 10\%$). For these reasons I use two clusters in the analysis that follows.

The two kinds of personal communication systems showing in these two clusters differ mostly by the number of active ties contacted at least weekly by each medium rather than by the way that media are combined. Because of the similar ways communication media are combined in both clusters and because they are only distinguishable by the extent to which these media are used, I will refer to these two clusters simply as the 'heavy communicators' and the 'light communicators'. For

⁵ Ward's Method is an efficient way of sorting data that uses an analysis of variance approach to minimize the Sum of Squares between separate clusters.

⁶ A Calinski and Harabasz index gives a value reflecting the overall distinctiveness of clusters at each stage of a cluster analysis. Larger values generally reflect more distinct clustering.

light communicators, the median number of ties contacted at least weekly is as follows: 9 in-person, 7 by landline phone, 4 by mobile phone, and 2 by e-mail. For heavy communicators, the median number of ties contacted weekly is as follows: 31 in-person, 21 by landline phone, 13 by mobile phone, and 12 by e-mail.

To answer the second part of Research Question 3, binary logistic regression analysis is used to examine how personal network composition varies between light and heavy communicators (Table 1, model “Media”). Considering only those associations where $p < 0.05$, the results suggest that:

- heavy communicators have greater numbers of friend, work, and kin ties in their active personal networks than light communicators;
- heavy communicators know a greater diversity of ties working in both high and low prestige occupations than light communicators;
- heavy communicators have more dense core and significant ties than light communicators.

Discussion and conclusions

This paper uses a new approach to understanding the social significance of communication technology that focuses on how individuals use multiple communication technologies in conjunction with in-person communication to maintain contact with their personal networks.

The Social Ties data shows that in-person communication and landline phones are the most common ways that Americans maintain contact with their active personal networks, but also that mobile phone and e-mail contact still plays a significant role in this regard. By helping people stay connected to their personal networks, communication technology plays a critical role by acting as the means by which the behavioral dimension of social ties is fulfilled.

The extent to which in-person, landline phone, mobile phone and e-mail communication occurs varies in complex ways with personal network size and diversity. Although each of these media may be used to a greater extent as personal networks become large, each medium has a slightly different usage dependent on the kind of tie being examined. In-person and e-mail are used to contact more ties as the numbers of friend, work and kin ties in active personal networks become large. By contrast, landline phones are used to contact more ties as the numbers of neighbors and kin in active personal networks become large, and mobile phones are used to contact more ties as the number of kin ties becomes large. These results also show that the relationship between active tie diversity and the number of ties contacted using various communication media is complex. More ties are contacted in-person when the diversity of low prestige ties, number of physically close ties, and density of core and significant ties increase in active personal networks. Somewhat differently, more ties are contacted by way of landline phone and mobile phone as the diversity of low and high prestige ties, number of distant ties, and density of core ties increase in active personal networks. Moreover, more ties are contacted by e-mail when the diversity of high prestige ties and the number of geographically distant ties increase in active personal networks.

The social affordance approach can be used to make sense of these different patterns by suggesting that they are due to a congruency between personal network composition and the different opportunities that each medium affords. Although having large numbers of friend, work, neighbor, and kin ties in one's active personal network may require substantial time and effort to communicate with in-person, the rich amount of information and emotional exchange that in-person communication affords may make it a necessary way of staying connected to these ties. Despite the importance of in-person communication, these results also show that e-mail is still useful for connecting with large numbers of friends, kin, and work ties, even though it lacks verbal and visual feedback. This is likely because the asynchronous nature of e-mail makes it well suited to the scheduling conflicts that arise when maintaining

contact with large numbers of these ties. Moreover, these results show that landline phones can also be useful for maintaining contact with large numbers of kin and neighboring ties. Because landline phones afford the ability to connect from one household to another, they are well-suited for maintaining contact with large families of kin living together and with large number of neighborhood based ties (Wellman 2001). These results also show that mobile phones can be useful for maintaining contact with large numbers of kin ties. Because mobile phones affords person-to-person contact they may be especially useful for those who need to connect with many kin ties organizing everyday activities. Unlike friend, work and neighboring ties, individuals may be more aware of what their kin ties are doing at any given time, making it easier for them to know when it is possible to interrupt their activity with a call to their mobile phone.

Social affordance can also be used to explain the complex patterns that emerge between personal network diversity and the media use. That ties in low prestige occupations may not have e-mail access helps to explain why having these kinds of ties in active tie networks is positively associated with in-person, landline and mobile phone, but not e-mail contact. By contrast, ties working in high prestige occupations are more likely to use a variety of technologies, which helps to explain why having a diversity of ties working in high prestige occupations is positively associated with e-mail, mobile phone and landline phone contact but not in-person contact. The findings showing that tie distance is negatively associated with in-person contact and positively associated with e-mail contact can also be well explained using the social affordance approach. In-person contact does not easily afford distant contact, while e-mail does. The results regarding tie density also can be explained by way of social affordance. Dense groups of core ties often involve high expectations of commitment, making intense synchronous contact that occurs in-person, by landline and mobile phone both acceptable and perhaps expected. By contrast, the opportunities for asynchronous text based communication e-mail may be less useful for connecting with dense groups.

Only two kinds of personal communication systems are prominent among the respondents: those that use all media to maintain contact with many ties – ‘heavy communicators’ – and those that do not – ‘light communicators’. Heavy communicators have significantly more friend, work, kin, high and low prestige diversity, and greater amounts of density in their active personal networks than light communicators.

When taken together, these results indicate that Americans actively draw on their personal communication systems to stay connected to complex personal networks. The more complex the personal network, the more people draw on all of these media. These findings contradict the idea that communication technology detracts from personal relationships and leads to social isolation, as suggested by McPherson et al. (2006). Instead, these results show that directing attention to the ways in which communication technology is used as part of personal communication system that is necessary for the continued existence of personal networks can make the social significance of communication technology more apparent.

Although this paper reveals a great deal about the role of communication media in personal networks, more work needs to be done in order to better understand the processes that underlie these general patterns. For example, closely examining the process that occurs when individuals choose to use one communication over another would reveal the extent to which media selection is based on active awareness of how using the affordances they offer fit with the kinds of personal networks being contacted. By better understanding the micro processes that underlie these macro patterns, how and why the various communication media are used together to form personal communication systems will become more apparent.

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