

## WHICH NETWORK DETERMINES CELL PHONE ATTITUDES?

Marlene E. Burkhardt, Juniata College  
Jesse Leonard, Gerald Miceli, Tom Kimmel, Will Russell, Juniata College

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### ABSTRACT

A cell phone attitudes survey was conducted on sports teams within a small liberal arts college to assess cell phone usage patterns and attitudes toward the use of cell phones. Social network data was collected from team members listing which team members are in one's cell phone directory and which team members they text message. The network data was analyzed with the survey data to shed some light on how cell phone attitudes and usage patterns diffuse. As hypothesized, findings indicate that the cell phone directory network is related to similarity in the belief that cell phones are helpful in one's daily life, easy to use and that they are worth the money. Hypotheses regarding cell phone attitudes and a text messaging network were not supported but rather evidence was found to the contrary. The text messaging network was negatively related to similarity in the belief that cell phones increase your social life and the belief that cell phones are easy to use.

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### INTRODUCTION

Without a doubt, technology has changed the way we communicate with one another. A fast paced world has replaced much of our face to face interaction with digital exchanges. Mobile technology enables meaningful exchanges almost regardless of one's location. Inherent in this new exchange is the possibility of new networks of social influence.

Informal structure, the pattern of who interacts with whom, delineates relationships among individuals and consequently can identify how they are influenced (Burkhardt, 1990). Learning may take place through observing and then modeling the behavior, emotions, and/or attitudes of others. Evidence for this can be found in a wealth of social network research (Coleman, et. al, 1966; Erickson, 1982; Contractor and Eisenberg, 1990) and in neurological research on mirror neurons (Ramachandran, 2000). Mirror neurons were found to delineate a modeling process that is central to human learning (Sylwester, 2002) Ramachandran (2000). This finding addresses the importance of the behavior and emotions of others in individual learning. But, how will learning take place in the digital world? What types of networks will provide information about whose attitudes and behaviors will be modeled? In order to answer these questions, this research investigates the diffusion patterns of behaviors and attitudes in a mobile environment.

For over a half of a century, many theorists (beginning with the work of Homans, 1950; Festinger, 1954; Lieberman, 1956) have addressed the role that social context plays in developing attitudes and behaviors. Burt (1987), Erickson (1988) and

Contractor and Eisenberg (1990) proposed that people are influenced by and will in turn influence those with whom they have direct contact. Salancik and Pfeffer (1978) in their social information processing theory proposed that the most direct way of providing social information is through overt statements about an object or event. Most of the research that followed tested this theory using face-to-face interactions. However, Burt (1987) proposed that individuals may be influenced by others who have similar interaction patterns as themselves even if they do not interact directly with one another. Regardless, the likelihood of being influenced by others is a function of an individual's personal characteristics such as self monitoring style and is often increased during times of uncertainty (Burkhardt, 1994).

The introduction or use of a new technology often increases uncertainty for those involved. In particular, Barley (1986) postulated and provided evidence that technologies provide occasions that trigger social dynamics. Burkhardt (1994) demonstrated that individuals' attitudes and behaviors toward a technological change are affected by their social context. As such, new technologies provide excellent opportunities for studying social influence processes. While much research has already been accomplished on this topic, data was typically collected on face-to-face interactions. One exception is the work by Igarashi, Takai, and Yoshida (2005) who found that intimacy of friends was higher when they communicated via face to face and mobile text messaging and that females tended to expand their mobile text messaging network more than males. Because of differences in communication mediums, namely computer and cellular methods of interaction, more research is needed to determine the role of social

influence beyond face-to-face interaction. In particular, this study examined mobile technology networks of cell phone directory membership and text messaging partners to identify new networks of social influence.

When individuals are given the opportunity to collect phone numbers in their cell phone they may in essence be developing a social influence network. In all likelihood this may be equivalent to one's friendship network (although work partners may also be represented here). Thus, individuals decide who is going to be a source of frequent communication. Often we find that such a relationship is decided for us by work groups or extracurricular activities. However, cell phone directories allow one to be selective regarding who will be a frequent interaction partner. As a result, the likelihood of being influenced by these individuals appears to be high. In addition, those with whom one sends text messages are also a likely source of social influence. Thus, it is hypothesized that

- H1: Individuals who list one another in their cell phone directory (H1a) as well as those who text message one another (H1b) will similarly believe that cell phones are *helpful in their daily life*.
- H2: Individuals who list one another in their cell phone directory (H2a) as well as those who text message one another (H2b) will similarly believe that cell phones are *easy to use*.
- H3: Individuals who list one another in their cell phone directory (H3a) as well as those who text message one another (H3b) will similarly believe that cell phones are *worth the money*.

H4: Individuals who list one another in their cell phone directory (H4a) as well as those who text message one (H4b) another will similarly believe that cell phones *increase their social life*.

## METHODS

### Research Setting

The research was conducted at a small liberal arts college in rural Pennsylvania, which was responsible for the collection, analysis, and dissemination of information about cell phone diffusion. Twelve students mentored by one

professor carried out these tasks. The cell phone survey was structured into seven parts including cell phone attitude, self-efficacy, demographic, disposable income, self-monitoring, stress and features. The survey was constructed using an open source web based survey development tool. Each student was responsible for constructing different parts of the survey. These students were also asked to collect the network data from various college sports teams.

### Procedure

Participants in this study were asked to fill out a survey and a form. Respondents were asked to include their names on the instruments so we could match both pieces of data together.

All members of several sports teams were asked to participate in survey requiring they complete a questionnaire. Survey participants were invited to fill out the survey through a link attached to an email. Participants were sent two reminder emails to fill out the survey.

Sports teams were also asked to fill out a form which revealed who on their team was listed in their cell phone contacts directory. The questionnaire was developed using different sports team's rosters to measure social interaction and communication. Participants were also asked to indicate what teammates they contacted via text message and instant message.

## MEASURES

### Network measures

Respondents were provided with a list of all agency employees and asked to circle the names of people with whom they communicated with on their sports teams. This data was used to construct an adjacency matrix.

### Cell phone attitudes

The extent to which a worker had positive or negative feelings about cell phones was measured. Athletes were asked to respond to the question "Do you believe cell phones: increase your productivity, increase you social life, are easy to use, are worth the money, and are helpful to your daily life."

## Efficacy

This variable reflected the degree to which individuals felt they could competently use cell phones in their everyday lives. A five point scale (1=disagree strongly, 5=strongly agree) was used to rate the variable. A sample question is, "I am fairly good at using most of the features on my cell phone."

## Self-monitoring

This variable measured the extent to which individuals altered their actions on the basis of contextual cues. The revised Self-Monitoring Scale, a 13-item scale developed by Lennox and Wolfe (1984) and composed of six-point Likert-type items, was used to assess this variable.

## Disposable Income

Questions were framed to measure the amount of disposable income the respondents have to spend on new cell phone technologies. A sample question is, "On average, about how much money do you spend on leisure activities in a given week?"

## Stress

This measurement revealed how participants felt their general stress level is in their everyday lives. Three questions asked the respondent to indicate the degree to which they agreed or disagreed with each statement. One statement asked, "I consider my days to be hectic."

## Features/Actions

Participants were asked to select features from a list that they currently use on their cell phones. They were also asked to identify from a list, options they would use if they were available on their cell phones.

## Demographics

The demographic characteristics used in the survey included: graduating class, age, gender, place of residence (rural, urban, or suburban). Respondents were also asked if they currently own a cell phone.

## ANALYSES

To test the hypotheses, we correlated matrices representing the independent and dependent variables with one another. Independent variables assessed

include interaction patterns reflecting who communicates with whom via cell phone, text messaging, and instant messaging. A network reflecting who is in your cell phone directory was generated by placing a 1 in the matrix cell for every *i* and *j* on the sport's team being analyzed. The dependent variables are represented by dissimilarity matrices. Specifically, we determined the degree of dissimilarity in the cell phone attitudes of two people for each dyad in the network. A vector of individual attitude ratings was transformed into a square matrix composed of similarity scores (1 if similar, 0 if dissimilar). To evaluate whether or not this matrix was related to the matrix that represented cell phone directory and text messaging networks the quadratic assignment procedure (QAP) in the UCINET (Borgatti, Everett, and Freeman, 2002) package was used. QAP (Hubert, 1983) is a nonparametric test of whether two matrices are significantly and nonspuriously related. This test involves randomly permuting the rows and columns of one matrix while holding the other matrix constant and calculating the correlation between the two after each permutation. A distribution is produced from each of these correlations to determine its significance.

## FINDINGS

Pearson correlation coefficients for the dependent variables under study are presented in Table 1. The table shows that each of the dependent variables is highly correlated with one another.

**Table 1**  
**Correlations for Dependent Variables**

Variable	Mean	SD	1	2	3
1. Helpful	1.67	.99			
2. Easy-to-Use	1.58	.79	.85**		
3. Worth-It	1.67	.99	.85**	.85**	
4. Incr. Social	1.50	.67	.27	.26	.27

\**p* < .05; \*\**p* < .01; \*\*\**p* < .001

Correlations between the dissimilarity matrices for each dependent variable are presented in Table 2.

**Table 2**  
**Quadratic Assignment Matrix Correlations for Dependent Variables**

	1.	2.	3.
1. Helpful			
2. Easy to Use	.76**		
3. Worth It	1.00***	.76**	
4. Incr. Social	.70**	.10	.70**

The findings are significant for the majority of these relationships as indicated by a significant Hubert's gamma coefficient. In order to test the hypotheses, Hubert's gamma coefficients were generated for each of the dependent variable dissimilarity matrices and for both the cell phone directory matrix and the text messaging matrix. Results are displayed in Table 3.

**Table 3**  
**Quadratic Assignment Results for Dependent Variables and Network Data**

	Helpful	Easy-to-Use	Worth-It	Incr. Social
Cell Directory	1.00*	1.00*	1.00*	.02
Text Messaging	-.40	-.44*	-.41	-.69*

Note: Values are Z-scores for Hubert's quadratic assignment gamma measures of association.

\*p < .1, one-tail.

\*\*p < .05, one-tail.

\*\*\*p < .01, one-tail.

These results indicate that the similarity matrices for each of the dependent variables is positively related to the cell phone directory matrix. The QAP results were negative for the text messaging network and two of the dependent variables, easy to use and increases social life.

### DISCUSSION

Hypotheses H1a, H2a, and H3a, and H4a were supported. In fact, evidence exists to the contrary. The cell phone network was significantly related to the easy to use, worth the money, and helpful similarity matrices. It may be that the cell phone directory matrix identifies a close network perhaps equivalent to a friendship or combination of friendship and work network. Although in this sample, students were not employed full time. Regardless, this network may be a valuable way to accurately assess membership in a social network.

Hypotheses H1b, H2b, and H3b, and H4b were not supported. In fact, some evidence exists to the contrary. The dependent variables "easy to use" (H2b) and "increases your social life" (H4b) similarity matrices were negatively and significantly related to the text messaging network. This demonstrates that similarity in attitudes may be a function of friendship networks. In this particular instance, close friends (those who we have in our cell phone directory) influence our attitudes toward cell phones but those we text message do not. Those with whom we share certain technologies are not necessarily similar to us in

regard to our attitudes toward these technologies or our likelihood to use additional related technologies. These results are consistent with the notion that attitudes are similar among friends in a close knit group. We can now generalize this finding to networks established by cell phone directories with dependent matrices involving cell phone attitudes. People who text message one another may not be as close as those in one's cell phone directory but rather one text messages to others simply because they too use this communication medium. Perhaps we can continue to examine friendship networks to determine specific influence processes. In other words, our networks of influence regarding traditional technologies and products may in fact be similar to our networks of influence for the adoption of new technologies and new technology features. We are; however, able to establish new methods of measuring friendship networks through the use of new technologies.

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**Dr. Marlene Burkhardt** is an Associate Professor of Information Technology and Business at Juniata College in Huntingdon, PA. She received her Ph.D. from the Smeal College of Business Administration at the Pennsylvania State University. Her research interests include technology in the workplace, cyber marketing and managing new technologies.

**Jesse Leonard, Gerald Miceli, Tom Kimmel, and Will Russell** are students at Juniata College.

