Expectation of Connectedness and Cell Phone Use in Crisis

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ABSTRACT

The wide distribution of cell phones with messaging, email, and instant-messaging have enabled the emergence of a culture of connectedness among segments of society. One result of this culture is an expectation of availability that exists among members of these social networks. This study explores the potential for this expectation to influence perceptions of using information communications technologies (ICT) during and after a crisis. Online survey and follow-up semi-structured interviews were conducted with Virginia Tech (VT) students, faculty and staff to understand whether expectations of connectedness affected their perceptions of their reach-ability during crises. Participants with higher expectations of connectedness also reported more problems with reach-ability. Those with the most problems with reach-ability differed from those with no reach-ability problems for many variables including satisfaction with the cell phone service, age, number of calls/text messages, and extroversion. Results suggest these communities consider planning how to use ICT during emergencies.

Keywords

Emergency communication, cell phone technology, structured interview, qualitative.

INTRODUCTION

The ubiquity of information communication technologies (ICT) and social networking sites have engendered a culture where members of some social networks have high expectations of connectedness. When cell phone networks were overwhelmed during the tragic shootings at Virginia Tech on April 16, just as they were during Katrina and 9/11 (May, 2006; Weiser, 2006), those with higher expectations of connectedness experience reported greater problems. While these failures cause problems for all segments of society, the problems are not felt equally by all. Those with higher expectations of connectedness and corresponding higher levels of use during normal activities will experience greater problems when systems upon which the depend fail. This paper builds on studies that have focused on lay persons' use of communication networks, including citizen use of government websites, and fixed and mobile telephone services (Owen, 2005; Steinberg, 2006). We focus on

ordinary citizens' use of ICT to share information and suggest the socio-technical environment prior to crises include plans for emergency communications, especially for those with higher expectations of connectedness.

PRIOR RESEARCH

Mobile communication (particularly, cell phone usage) by citizens is of special interest given that it is the communication device that ordinary people are most likely to have close at hand in the moment of an emergency. Moreover, in future crises, the cell phone is likely to be used increasingly for high bandwidth services, as some people caught in an emergency will also attempt to receive information over their mobile devices from the internet and other networked sources (e.g., to obtain web-based news over their cell phone), with the effect of putting more stress on network bandwidths (Palen and Liu, 2007). These advances in device capabilities will only cause currently incapable networks to fail more quickly.

The expectation of connectedness is an emergent phenomenon that is apparent in other crises situations. For example the collection of photos via Flicker (Liu et al., 2008) from fires and the VT tragedy show that people use the tools at hand to collaborate to accomplish their goals of information collection and distribution. Vetig et al. 2008 describe how Facebook emerged as the mechanism for the community to identify the victims before the information was officially released. These activities were enabled by the social networking technology and the culture of the community attuned to applying it. We investigate one aspect of this culture, the expectation of connectedness, to understand its affect during crisis.

RESEARCH METHODOLOGY

We used an online survey followed up by one-on-one interviews to collect participants' perceptions of their cell phone use on April 16th. We contracted with the VT Center for Survey Research to provide a random sample of students, faculty and staff from the total VT population (about 36,000). We used the Dillman method (1999) in administering the online survey and received 470 complete responses. We then conducted follow-up interviews with a stratified sample of 31 individuals from the pool of 470, including faculty, students and staff, again roughly proportional to the campus population. Specifically, we interviewed 21 students (undergraduate and graduate), 5 faculty and 5 staff.

To elaborate on the surveys, in the interviews we solicited more of the rationale and other motivating factors about their cell phone use on April 16. Two areas we focused on in the interviews were: 1) the participant's expectations of connectedness with parents and others and 2) whether they experienced increase concerns due to the inability to be reached or to reach others during and after the crises. Interviewers hand recorded notes on the responses during the interviews, intended to capture the meaning of participants. We followed a standard social network analysis of individuals' relationships with others with whom they communicated on that day: specifically, strong and weak tie relationships. The strength of a tie is a combination of the amount of time, emotional intensity, intimacy (mutual confiding) and reciprocal services that characterize the tie (Berkowitz, 1982; Marsden and Lin, 1982).

RESULTS

We summarize the findings in several sections, including participant's expectations for connectedness in normal situations, their expectations of connectedness with their parents, and the relationship of expectation for connectedness and concerns about their ability to contact and be contacted on April 16. Expectations for connectedness in normal situations likely impacts perceptions in crises situations. We asked questions about whether the participant expected others to be immediately available and if others expected them to be immediately available. To examine expectations in the context of strong social ties we also asked about expectations of immediacy of relationships with parents.

We then evaluated the participants' experiences related to their reach-ability on April 16 and the correlation of their expectations of connectedness to their responses on reach-ability.

Normal Situation Expectations

Findings on participants' expectations for immediate connections during normal periods indicate the expectation depends on the characteristics/behaviors/desires of the contact. This is the case for both expectations of other and others expectations of the participant.

Question: Do you expect others to be immediately available?
Expectation of Connectedness: *Yes immediately available.*
"That is his hope, if he calls [it is] for a reason, he wants to get in touch- if it's important, then he'll text" Student 5373.
"Depends on who it is and their relationship; dad is always on his iPhone, when he doesn't answer he is really busy" Student 5649.
"would like" Student 3266.
Expectation of Connectedness: *Both, some available some not.*
"Understands that people are unavailable- but it's nice to get them when he first calls. It depends on the person if they won't answer but they will call back", Student 5881
"With texting, depends on the person and the time of day- will text if she knows that the person will not be able to pick up." Student 5231.
"[generally no] Husband – yes. Because he has it on" Student 2232.
"Depends on the person- some will more, some less" Student 5492.
Expectation of Connectedness: *Not immediately available.*
"Her husband is out in the field, but he carries his cell phone with him usually" Faculty 1071.
"Don't expect it, but would like it" Student 5315.
"I know better. Husband" Staff 2203.

Table 1: Expectations of others to be available.

In some cases, e.g., student 5649, the contact (her Dad) seems to have both the expectation that the participant be immediately available and the intention to be immediately available should the participant call. Such a reciprocal relationship was also mentioned by several other interviewees. Several participants suggested that it would be desirable for others to be available.

The comments presented in Tables 1 -5 below are drawn from the notes recorded during the interviews. The responses are grouped based on the general response to the yes/no question, then the selected quotes from the interview notes demonstrate the range of responses.

These responses indicate that regardless of whether the participant expects others to be immediately available or not, knowing the person's habits of cell phone use, their schedule and whether the activity will allow for voice communication, contributes to how participants use their cell phones. Several participants indicated they would like others to be available, even though they understand that they are not. Expectations for the availability of others also seems related to others expectations of the participant's availability. These expectations are central to the potential for collaboration.

Question: Do others expect you to be immediately available?
Expectation of Connectedness: *Yes immediately available.*
"Mom has her class schedule and calls when she is free" Student 9991.
"Same as he does, they would like him to pick up the phone, but they understand if he doesn't" Student 5373.
"Most of the time" Student 4161.
"Maybe- but the people that are more unreasonable are not the people that she cares about, Screens calls on her cell, Boyfriends mother- doesn't have a car and sometimes calls on cell to ask her to take her to the store" Student 5846.
"[they] Know work number, [I] pick it up quickly" Staff 2203
"Mother and best friend – cell phone abusers – at times don't answer outside calls because it will be mom or my best friend calling during driving" Student 2232.
Expectation of Connectedness: *Both, some available some not.*
"Her dad has that expectation, mom is more laid back" Student 5649.
"Some, not all. People know that he has class, parents- don't, some friends- yes" Student 4161.
"depends on situations" Staff 2302.
"Depends- maybe one or two- not that many" Student 5888.
"Parents and best friends don't (they understand how he uses it); other friends do though" Student 5047.
"Used to but not anymore- started happening when she got a cell phone. Only mother really expects her to be available." Student 5315.
Expectation of Connectedness: *Not immediately available.*
"They do a lot of leaving messages in her group of friends- her friends think that she screens her calls; expect she will get back to them in a timely manner" Student 5231.
"He is kind of lazy- doesn't carry it around, doesn't answer it" Student 4216.
"Most people know that I am not a slave to my phone." Faculty 1082.

Table 2: Others' expectations of the respondent to be available.

Normal Situation Expectations With Parents

To further understand the nature of connectedness we also asked about expectations of connectedness with parents. Reciprocal relationship test (comparison of parents' expectations to child expectations). We used a scale in this case to attempt to identify a finer granularity of connectedness. Participants provided responses for both about their expectations for reaching their parents and their perceptions of their parents' expectations for reaching them. The items used were:

> How reachable do your parents expect you to be when they are trying to contact you: Immediately, 2 hours, 4 hours, 8 hours, 12 hours, 1 day, 2 days, more?
>
> How reachable do you expect your parents to be when you are trying to contact them: Immediately, 2 hours, 4 hours, 8 hours, 12 hours, 1 day, 2 days, more?

Twenty-two of the interviewees answered the question on how connected they are to their parents. Fifteen participants indicated that they and their parents respond in about the same time. Nine of these participants responded that they and their parents are normally reachable immediately or within 2 hours (6 responses). They and their parents know each other's schedules and call when they expect they will be available, which facilitates immediate contact.

Several respondents indicated differences in expectations for mom and dad. In most cases mom is the more immediately responsive parent. In the following notes where the same participant provided two responses, the first response pertains to parent's expectations and the second response is about their expectations for their parents.

Expectation of Connectedness: *Participant and Parents Immediately reachable.*
"IM, cell phone, email, landline phone in evening to communicate" Staff 2014
"Call dad at work and he picks up immediately" Student 5373
"As soon as he can, if its mom or dad then he picks up" Student 5373
"Talk to them daily; they live in NJ" Student 5315
"Have her schedule on their wall" Student 5649
Expectation of Connectedness: *Participant and Parents reachable within 2 - hours.*
"mom really good, around phone" Staff 2203
"Same expectation as for her [participant]" Staff 2203
"For most circumstances, unless he knows they are off somewhere" Student 4161
"Barring something coming up" Student 4161
"Dad- 4 hours; Mom- 1-2 hours" Student 5361
"Immediately - Mom (talk 1 per month), 1 day - dad – more email" Staff 2232
Expectation of Connectedness: *Participant and Parents reachable in same interval.*
(4 hours) "Usually call and leave a message because they screen calls; if they don't need to talk, she will use email." Student 5231
"She calls them more than they call her" Student 5231
(8 hours) "Within a day is usually okay, never supposed to call the minute he gets the message" Student 5493
(1 Day) "Depends on the situation- in an emergency would expect them to call back within 8 hours. Mom is much more responsive than dad. Dad missed birthday by two days" Student 5047
"Most of the time it isn't urgent and mom just calls to chat" Student 5047
(1 Day) "Both reached. Not difficult to get to, especially mom" Staff 2039
"Lucky if a day. [I]Don't always pick up, and tell people. Family – talk and talk and talk" Staff 2039
(2 hours VS 12 hours) "Depends on when calling (before or after work)" Student 4216
"Half a day of so- not needing to talk immediately, usually calling to chat" Student 4216
(12 hours VS Immediately) "At work, call back later" Student 6388
"Most times they get through" Student 6388
(no time response) "Dad sometimes gets voice mails a week later- he is very busy. He has a good idea of when mom is available and will call her then" student 5888
"Depends if they think that he should know something" student 5888

Table 3: Expectations of parent reach-ability in normal situations.

Seven participants indicated that there are substantive differences in the expectations of their parents and themselves in terms of being reachable (see Table 4).

These responses show that even for the strong parent-child relationship, contact patterns vary substantially. Fifteen of 31 (48%) participants share expectations for rapid (immediate or less than 2 hours) communication with parents. It seems that the interruption of service due to saturation that occurs around crises is most likely to impact this segment of the population. If this proportion is representative, the number of students impacted during the VT crisis was approximately 14,000, of course also impacting a corresponding number of parents. Additional participants that have approximately equal expectations for response, e.g., 4 hours or 8 hours, shows that reciprocal relationships are most common.

We created a variable to measure expectation of connectedness using the responses to the questions reviewed above. This expectations of connectedness variable has five levels that are determined by the participant's response to the four (two for normal situations and two for parents) immediate availability questions. The

purpose of this variable is to measure how involved the participant is in immediate availability. Levels of the variable are: 1 – no immediate expectations for all four possibilities; 2 – immediately available for 1 of the 4 immediately availability questions; 3 – immediately available for 2 of the 4 immediately availability questions; 3 – immediately available for 3 of the 4 immediately availability questions; 4 – immediately available for all 4 immediately availability questions. We use this variable to investigate the association of normal expectations for connectedness and activities in crises situations.

Crisis Situation Communications

During crises two important issues are: 1) can you contact those you want and 2) can you be reached by those that want to contact you. This section presents the questions and responses pertaining to participant's ability to contact others and be contacted on April 16.

We asked the interview participants the following question:

> Were you unable to contact people that you expected to be immediately available on April 16? [probe: Did not being able to contact them immediately cause you to feel concerned? Why were you concerned?]

Nine participants indicated that they couldn't reach people they expected to be able to reach (see Table 4). The other 22 participants indicated that they did not have this problem (see Table 4). Many of these participants did not comment about why they might not have been concerned.

Problems
"Try multiple times over hours or days then get really concerned. [On April 16] Took a while [for spouse] to get to job site w/phone." Staff 2302
"Wanted to contact fiancé to let her know he was okay and to contact the family. Since, he has created a list of immediate family contact information." Student 4216
"Thought she [friend that was wounded] was still at home- her incoming calls went straight to voice mail. Would have been worse if it was ringing and no answer" Student 6388
"Anybody that day 5-6 people were 90% of his calls´ Student 5888
No Problems
"Phone more for her to use at work- stays at the office" Faculty 1027
"Able to get through to those needed" Staff 2015
"Was with those people she cared about" Staff 2039
"Stayed off the phone. Went straight to email to contact people" Student 5231
"Didn't feel this" Student 5361
"Would have liked to get in-touch with parents earlier, Mom was out on a walk and dad was out, First contact was with grandparents; told to call [parents]" Student 5047

Table 4: Responses of participants that couldn't reach others they expected to be available.

Similarly, we asked the interview participants the following question about those attempting to reach them. This variable was the most significant contributor to satisfaction with cell phone network on April 16th (Paper under review):

> Do you know if other people were concerned when they were unable to contact you April 16? [probe: What about not being able to contact you immediately caused them to feel concerned? Why do you think they were concerned?]

Ten participants knew of others that were concerned about not reaching them (see top part of Table 5). Two thirds of the interviewees were not aware of others that were unable to reach them (see bottom of Table 5).

Participants that knew others that were concerned
"Daughter concerned, trying to call while talking to mother, daughter, a little upset" Staff 2203
"Cousin wasn't able to get through, same line as messages were coming through; called everyone to tell them he was okay" Student 4216
"Knew he was an Engineer, when the first news came out, they were concerned because he was an Engineer" Student 5373
"Mom was worried- first time she called (between 10:30-11) she was unable to connect" Student 6388
"Yes- Just that what if- the question if people were injured (the odds were low, but still wanted to be sure. [this is]Why [I] really wanted to send the email to let people know they were okay)" Faculty 1082
"Same, wouldn't normally expect someone to immediately pick up; Okay to contact later that day" Student 5047
Participants that didn't know others that were concerned
"Not concerned- anyone that tried to call and it failed had another approach to get in touch with him. People knew he was fine" Student 5888
"almost everybody got to her fast enough so not an issue. Using mostly internet/landline" Staff 2015
"Everyone who tried to reach him was successful." Student 4161
"multiple emails to avoid contact, lot of messages on home phone, responded to many email and phone message that evening" Student 2302
"Brothers called all phone expect to be there. Messages are not. Wanted to talk. Get through ok. " Student 2039
"Mom initially- a friend in Texas called her on her cell while she was at work (she's a preschool teacher). Mom played the message and left work early and called her on her way home" Student 5361
"got a lot of wrong numbers. Mom [contacted], then she [mom] talked to dad. Another friend from years back. Old phone calls [come through] at midnight" Student 5493

Table 5: Responses about others that were trying to reach the participant.

We used the responses from these questions to define the reach-ability problems variable. The levels of the variable are: 1 – reported no problems contacting others and that others had no problems contacting them, 2 – reported that either they had problems contacting other or other had problems contacting them, 3 – reported both problems with contacting others and that others had problems contacting them. We then used this variable to examine the interview participants' responses to the online survey variables.

Differences on Survey Variables

We expected that reach-ability, i.e., if a participant couldn't reach someone they wanted to reach and/or couldn't be reached by others on April 16th, would affect interview participant's perceptions of several survey variables. For example, participants with reach-ability problems would likely be less satisfied with their cell phone service on April 16th. Table 1 shows the results of comparing the responses of those that reported no problems with reach-ability and those that did report such problems. Several significant differences were found between these groups (see the 1st five columns of Table 1). Reachable participants were more satisfied with the network on April 16th, contacted fewer people, receive fewer calls on normal days, and would be less willing to use text messaging than those that were less reachable. Although, even with the most relaxed assumptions on significance, the groups did not differ in terms of expectations of connectedness.

To test our expectations further we looked at the endpoints of the reach-ability problems variable by comparing groups that reported no reach-ability problems to those that reported both being unable to reach others and that others were unable to reach them. The results of these comparisons are shown in the right four columns of Table 1.

Any Reach-ability Problem (>= 2) vs High Reach-ability (= 1)		N	Reach-ability Mean	Sig.	End Point Groups (low vs high) Reach-ability	N	Reach-ability Mean	Sig.
How satisfied with our cell phone network on 4/16	>= 2	16	2.31	.058	= 3 (unreachable)	4	2.00	.050
	= 1	7	3.14		= 1 (reachable)	7	3.14	
Receiving calls on a normal day	>= 2	16	4.44	.095	= 3 (unreachable)	4	6.25	.099
	= 1	7	3.29		= 1 (reachable)	7	3.29	
Would you use text messaging if voice would not go through	>= 2	16	2.44	.030	= 3 (unreachable)	4	3.00	.033
	= 1	7	1.86		= 1 (reachable)	7	1.86	
How many people did you contact on 4/16	>= 2	15	1.60	.084	= 3 (unreachable)	3	2.33	.127
	= 1	7	1.29		= 1 (reachable)	7	1.29	
Expectation of connections.	>= 2	16	2.25	.100	= 3 (unreachable)	4	3.75	.003
	= 1	7	1.57		= 1 (reachable)	7	1.57	
Talkative	>= 2	16	3.56	.211	= 3 (unreachable)	4	4.50	.012
	= 1	7	3.14		= 1 (reachable)	7	3.14	
Text messages on a normal day	>= 2	16	2.00	.192	= 3 (unreachable)	4	3.00	.038
	= 1	7	1.14		= 1 (reachable)	7	1.14	
Age	>= 2	16	31.94	.236	= 3 (unreachable)	4	25.00	.079
	= 1	7	35.86		= 1 (reachable)	7	35.86	
Relationship with VT	>= 2	16	4.94	.227	= 3 (unreachable)	4	3.50	.062
	= 1	7	6.00		= 1 (reachable)	7	6.00	
Outgoing and social	>= 2	16	4.00	.201	= 3 (unreachable)	4	4.50	.083
	= 1	7	3.57		= 1 (reachable)	7	3.57	

Table 6: Comparison of reachable and unreachable groups for selected survey variables.

Many more of the variables were different for the comparisons of the end point groups. In addition to the variables significant in the previous comparison, reachable participants were older, sent fewer text messages on a normal day, and were less extroverted (talkative and outgoing) than the most unreachable group. They also had significantly lower expectations of connectedness. Thus, the participants that reported the most problems also had the highest expectations of connectedness, made more calls, send more messages and make more calls on normal days, and are more extroverted. Perhaps these participants represent a segment of the population that is substantially more impacted by events that impact their communications capability.

Several variables showed no significant differences for the reach-ability groups. These included how important was having a cell phone on April 16th (it was important to both groups), the number of different people contacted, and satisfaction with their cell phone network in normal situations.

We also compared participants with low expectations for connectedness and high expectations for connectedness on several survey variables. These groups differed significantly only on the age (high expectation participants were younger), relationships with VT (high expectation participants were in lower classes), the number of text-messages on a normal day (high expectations report more), and reach-ability (high expectations participants report more problems).

Finally, we investigated the association of the expectation of connectedness and the reach-ability problems variables. The correlation of .578, $p < .01$, shows they are moderately correlated, suggesting that a relationship exists between these derived variables. We believe the likely relationship is that high levels of expectations for connectedness lead to reporting of more problems when those expectations are not satisfied.

DISCUSSION

Participants report a range of expectations for connectedness under normal conditions. The majority of participants have no expectation for immediate availability. This is also true for strong social network ties, parents in this case. Strong ties differ from general expectations as they exhibit a reciprocal relationship were expectations are that participants and their parents usually respond within approximately the same time frame. Thus, collaboration in crisis situations will require a change in normal behavior for most participants.

During the VT crises the ability to reach and be reached varied for participants. The groups compared show several significant differences. Perhaps most interesting is that those participants that reported the highest levels of reach-ability problems also were more extroverted than those that reported no problems. Suggesting that their perceptions of the crises could have been impacted by existing personal characteristics. It seems reasonable that those that have the most contacts would report the most problems, e.g., the more calls made the more chance for failure to reach the desired contact.

The significant association of expectations of connectedness and reach-ability concerns confirms our primary assertion of the study, that living in the ICT environment that enables immediate communication has implications for crises situations. Specifically if technology does not meet expectations during crises, those that are the heaviest users of the technology will be most impacted. That these expectations exist for a minority of the population may provide some solace to providers. However, as ICT become increasingly embedded in modern life the percentage of the population affected will likely increase social collaboration inhibited.

Limitations of our study include the small sample size of the interview methodology. The effort also could have benefited from collecting measures of stress, yet the necessary time lag until the interviews may have limited participants' recall of stress of levels.

CONCLUSION

Participants' expectations for availability depend on the person being contacted and the situation of contact. This is the case generally and for strong social network ties represented by parents. Overall participants would like others to be available when they try to contact them. Our results suggest that expectations of connectedness are associated with problems making contact during crises. Future research should evaluate these variables in terms of stress induced on participants. It seems likely that stress could be reduced if participants were aware of their (and their contacts) expectations for connectedness and planned crisis response strategy.

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