

**The Impact of Computer Networking on Community:
A Social Network Analysis Approach¹**

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Abstract

The quality of life in a community can be seen as the nexus of 'social capital' and civic engagement (Putnam 1993, Coleman 1988). 'Social capital' accumulates through social networks and trust, and the norms of mutual reciprocity that these relationships foster (Putnam 1993). This paper explores the relationship between computer networks, social networks and civic engagement in a geographic community using surveys and interview data collected among residents of Blacksburg, Virginia, over a three year period (1996 through 1999).

Social relationships are the basis of social networks. Relationships form through interaction among individuals, whether face-to-face or mediated by communication technology (telephone, computer networks). Computer networks, like the telephone, can reinforce existing social networks. In fact, according to Wellman (1996), when computer networks link people as well as machines, they become social networks. The evidence described in this paper shows that computer networks are not just reinforcing -- but even expanding -- existing social networks within a geographic community. The Internet is an important medium for garnering resources -- friendship and aid, including information -- from other members of social networks. Furthermore, increased civic engagement and community involvement can be attributed to the Internet among about a fifth of Internet users. The survey data shows that this is a subgroup that is 'pre-disposed' to be engaged. The Internet provides tools and services that enable them to act on their predisposition.

Social Networks and Computer Networks

Census data, analyzed over the past three decades by Putnam (1993, 1995a, 1995b, among others) shows that since 1965, surveys of collective attendance at meetings between 1973 and 1993 show a decrease of 36%; attendance at town meetings is down 39%. The number of Americans working for political parties has dropped 56%; the amount of time spent in local clubs is down by one half. Putnam links the decline in civic engagement to decreasing social capital and attributes both to the electronic revolution, especially television. He argues that we need to meet in groups face to face in order to strengthen connectivity and social networks that help us become involved in the community and work together to achieve common social goals.

People generate and cultivate social networks, trust and norms of mutual reciprocity -- what Putnam calls a community's 'social capital' -- to meet human needs for companionship and individual as well as collective aid. Social networks evolve as people meet together in informal social groups (bowling leagues, bridge clubs, coffee klatches, carpool and childcare arrangements) and in formal groups (work, school, church, and voluntary associations, such as the soccer league, Parent Teachers Association, and the Weight Club).

The analysis of social networks -- which has roots in sociology and structural analysis -- is important in understanding social capital. Social network analysis investigates the ordered arrangements of relations that are contingent upon exchange among members of social systems -- whether people, groups or organizations (Wellman and Berkowitz 1988). Members of social networks garner or mobilize scarce resources through a process of exchange, competition, dependency, or coalition. The analysis of social networks examines concrete

social relations among specific social actors. Its emphasis on exchange puts it closer to input-output economics than to Levi-Straussian structuralism with its emphasis on symbols, meanings and values.

The people, groups or organizations that are members of social systems are treated as 'sets of nodes' or networks, which represent social structures (see Figure 1). These 'sets of nodes' or networks can even represent institutions, nation states or world systems. In this paper, the author considers the social networks among individuals and small organizations in Blacksburg, Virginia, a university town in the foothills of the Appalachian mountains.

Social structures are also represented as sets of ties -- or flows of resources -- depicting members' interconnections. These ties or flows of resources typically involve symmetrical friendships, or aid transfers, including information. Patterns of ties suggest how members allocate resources in a social system.

Computer networks can reinforce existing social networks. In fact, Wellman (1996) argues that when computer networks, such as the Internet, link people as well as machines, they become social networks. Not only do people and groups use the Internet, like the telephone, to maintain friendships. They also use the Internet to access resources, especially those related to information.

Social networks help to build trust among members. Social trust, also a feature of social capital, increases as people get to know each other, to learn who is trustworthy, and through experience doing things together (e.g., the bowling league, the PTA, and other informal or volunteer work). Williams (1988, p. 8) and Newton (1997, p. 578) distinguish between "thin" trust and "thick" trust in social networks. In small face-to-face communities (tribes, isolated islands, rural peripheries), "thick" trust is generated by intensive, daily contact between

people. These tend to be socially homogeneous and exclusive communities, able to exercise social sanctions necessary to reinforce thick trust (Coleman 1988, pp. 105-108).

Thin trust is less personal, based on indirect, secondary social relations. It is the product of what Granovetter (1973) distinguishes as weak ties among members. Weak ties can link members of various social groups to help integrate them in a single social environment or geographic setting. There is evidence from the research reported in this paper that the Internet regularly facilitates linkages between groups or social networks, as members of one group have membership in several other groups, using listservs and email. Thin trust is also the basis for social integration in modern, large-scale society (Newton 1997, p. 579). Where people extend trust to others who are distant and unknown, but nonetheless share similar values or beliefs, trust is abstract. Abstract trust is increasingly engendered or undermined in modern society, through the institutions of the mass media and education (Wellman 1996).

The social capital feature 'norms of mutual reciprocity' is very similar to the concept of 'balanced networks' in network analysis. A network is balanced by members' returning directly or indirectly aid or friendship offered by another member of the network. There is 'stock' in aid or friendship entitled to a member, in the general amount he or she has given to another member of the group.

The primary social contexts in which social capital forms and grows are in the family, the workplace, school and the neighborhood. Coleman (1988) and Putnam (1995), among others, argue that these sites of social capital formation are possibly the most important and prominent, even more so than formal

voluntary associations. Social networks facilitate community involvement. Social needs demand community involvement. Friendship and aid are basic social needs (beyond the essentials of food and shelter). Media uses and gratification research tells us that people use the media to gratify needs. The social origins of needs generate expectations of the media, which leads to differential patterns of media use, resulting in need gratification (McQuail and Windahl 1981, among others).

This paper examines social networks and user needs to explain how computer networks, particularly the Internet, are reinforcing and expanding social networks. It also explores the role of the Internet in increasing community involvement.

Methodology

This is a case study of the impact of the Internet on social networks and community involvement in the town of Blacksburg, Virginia, site of the community network known as the Blacksburg Electronic Village (BEV). The study employs both qualitative and quantitative techniques, specifically one-on-one interviews, a questionnaire distributed to a single mailing list, and two rounds of a random sample telephone survey.

The author conducted a series of one-on-one interviews over a three year period between 1996 and 1999 with members of the community, including community leaders and senior citizens. Each of the interviewees is a member of a social network that has an online presence; this is the basis for their being selected for an interview. Community leaders were identified from the civic community, the arts community and the religious community. Senior citizens

were selected from among those seniors who -- out of interest in using the Internet -- established a formal group called "BEV Seniors" in 1995. A subset of ten to fifteen BEV Seniors participated in one-on-one interviews in 1998 and 1999; similar numbers, although not necessarily the same seniors, completed online questionnaires in 1997 and 1999.

The author also collected data on social networks and community involvement from an online questionnaire given to a local school board mailing list. At the time of the survey (November 1996) the list had a subscriber base of 369 individuals within the local school district; 76 respondents completed usable questionnaires. The focus of the mailing list is the work of the School Board on local school issues and concerns. The online questionnaire inquired about uses and gratification obtained by members from the list. It also inquired about the impact of the mailing list on the flow of information and on member involvement in the school community.

The author conducted a series of one-on-one and focus group interviews with school administrators, teachers and parents in four public school districts in Virginia in 1997. Questions of interest address the flow of information resources and the impact of the Internet on community involvement in the form of communication between home and school.²

Finally, the author conducted a series of one-on-one interviews with community leaders in 1998 and 1999 who represent social networks with an online presence, either a web site, a listserv or both. Some of these groups use a

² Stephen Parson and John Burton collaborated with the author on the design and conduct of interviews among Virginia school districts.

package of these services, called 'Community Connections,' offered by the Blacksburg Electronic Village.

Findings

What evidence is there that computer networks are, in fact, reinforcing -- and even expanding -- existing social networks and ties? The interview and survey data described below reveals evidence that the Internet, especially email and discussion lists, reinforce as well as expand social networks and ties. There are clear indications from the respondents that individuals who are members of several social networks are using their membership to strengthen the weak ties across different groups. The 'weak' ties across different groups, according to Granovetter (1973), are crucial in helping communities mobilize quickly and organize for common goals easily.

The author does not attempt to interpret from this the nature of the allocation of resources, except insofar as the purpose seems to be to maximize the flow of information (ties) within social networks using the Internet for group purposes. This appears to be a clear exchange among members, in fairly balanced networks (giving and taking resources in equal amounts). There does not appear to be evidence of competition, dependency or coalition formation based on the interview data.

Community Leaders

The author conducted a series of one-on-one interviews with community leaders in 1998 and 1999 who represent social networks with an online presence, either a web site, a listserv or both. Some of these groups use a package of these

services, called 'Community Connections,' offered by the Blacksburg Electronic Village (web space, listserv and email account for the organization). From the civic community, the author supervised interviews with the town manager, the Finance Director for town government, a member of the Board of Supervisors for the county, and the president of the League of Women Voters.³ From the religious community, interviews were conducted with local leaders representing a Presbyterian Church, a Unitarian meeting, the Islamic Center of Blacksburg, a Jewish Temple, and a Baptist Church. An interview was also conducted with the president of the local arts council, an umbrella organization representing many different local performance and graphic arts groups.

Each of these community leaders represents a social network. All of these social networks had a demonstrated need to inform and communicate with its members, usually in face-to-face settings (public meetings, church gatherings, artistic exhibitions).

Two rounds (1996, 1999) of a random sample survey of Blacksburg households conducted by telephone revealed increases in the proportion of respondents who 'frequently' or 'sometimes' use the Internet for communication with members of their social networks. This includes members of their church or place of worship (Table 1), local community organizations (Table 2) and local clubs, sports teams or hobby groups (Table 3). A corresponding decrease in respondents reports that they rarely or never use the Internet for this purpose.

³ Federico Casalegno, doctoral candidate at the Sorbonne, Paris, collaborated on the design and conduct of interviews of community leaders in 1998, and on interviews with BEV Senior in 1996. The author's research assistant, Evonne Noble, assisted with interviews of BEV Seniors and community leaders in 1999.

Each of the community leaders, without exception, noted the importance of Internet services (web site, listserv, email or all three), in strengthening social ties in the network, and exchanging information among members. For example, the president of the New River Arts Council, an umbrella organization of many different artists and art groups, has seen members of this social group effected by the Internet in fundamental ways:

What has changed is the fact that this used to be not just one group but used to be small pockets of people. Small groups of people that are closer in proximity... Well, we now have artists that are in those three communities that now talk to each other because they see each other's work on the Web. And they talk to people in Blacksburg now because they see their work on the Web and say 'Oh, this person is doing the same thing I am doing' and that gives them more opportunity to communicate with people that are near by but not right next door.

It used to be small groups like the three towns I talked about... Each one of them had a group of people that talked to each other but not between the three towns. Now all three towns talk to each other. They opened up new lines of communication. Those people then often talk to people in Blacksburg or Christiansburg. And we have now some connections out to Pulaski or Floyd County where they never used to talk very much before.

This description not only emphasizes increased communication among members of the overall group, but the strengthening of 'weak' ties across the different groups. The president of the local chapter of the League of Women Voters notes the increased access to information resources for members of the League's listserv, as well as increased productivity and efficiency of the group in its work:

It is easier to get things done... Got an email is just more productive. Lots more information. I mean internally, but also with the world. Work and productivity and sharing of information must be up about ten times from what it was.

The Web master and listserv manager, as well as trustee, of the local Unitarian Universalist meetinghouse, emphasized the increased awareness among church

members, and involvement in church affairs, that can be attributed to the

Internet:

I think that the advantage of this is what the individual feels; is that you can be made aware of more things... you can get involved and you can be kept up to date.. you can link to a [Web] page and that pages with its links can lead you to a lot more information on the issue. So you can become more involved.

He refers specifically to another group with related values and interests in the community, noting that the Web links from the Unitarian pages to another organization's pages, "allows us to be able to interconnect with them in a way to make us aware of their activities." Again, not only are members increasing ties within the social network, they are strengthening 'weak' ties across different social groups in the community.

Senior Citizens Using the Internet

The BEV Seniors is an informal group in that does not have formal status or by-laws like a corporation. It does, however, have a steering committee that meets face-to-face once a month. It also holds regular monthly face-to-face meetings at the town recreation center for the full membership. Computer skills and technical assistance is a central component of their purpose. In the course of their operation, the BEV Seniors successfully lobbied for local government financial support for a computer lab in the town recreation center, open to the public. Federico Casalegno (2000) and the author collaborated on studies of the BEV Seniors, involving one-on-one interviews or online questionnaires with fourteen BEV Seniors in 1995, 1996, and 1999. In 1996 there were about 130 BEV Seniors; in 1999 there were about 170 members in the group.

All BEV seniors interviewed in 1996, and 1999 report that the Internet reinforces and expands their social networks and increases the ties, or flows of information, among members. As Casalegno notes (2000), the exchanges on the listserv, in combination with the face-to-face meetings of BEV Seniors, makes it possible for members to give a name to a face. Many of the members knew each other by sight before joining the BEV seniors, but it is thanks to their participation in the listserv and the meetings that they know each other better. Now, when they cross each other downtown, they stop to exchange a few words, which they did not do before. Exchanges in the listserv make it possible for participants to discover that there are other members who share their interest. Interviewees have made common observations about the impact of the BEV Seniors listserv on the exchange of friendship and help:

... it's been a dramatic increase in our interactions.

...they're using it as a vehicle to get to know people and to know the community.

I have met many people that I probably would not have otherwise. My participation in face to face meetings has increased because of the mailing list.

...I have access to information if I need it about using the computer...

Interestingly, the Web site of social groups does not give the same sense of strengthening ties within the group. The Web site is more public, accessible to anyone in the world. The listserv is closed to outsiders, and thus has the benefits of strengthening group ties. The exchange of the messages is only among members of the social group with which the listserv is associated.

Network Ties between Home and School

School Board Mailing List

An elected school board member, James Klagge of District F in Montgomery County, initiated an unofficial newsletter, distributed via the Internet, about school board information. The mailing list was unlike a listserv in that it intended as communication between the elected official and interested individuals, rather than discussion among members. Subscribers could reply to the sender (the list owner, Mr. Klagge), but not to the other members of the list. The members of the list constituted an informal group, insofar as they are not members of an official organization like the School Board itself. Nonetheless, they shared a common interest in school board information, and, in most cases, had children of school age. While this group was able to obtain information prior to the Internet, they overwhelmingly preferred the mailing list over traditional means (radio, TV, newspaper, or attending the meeting personally) as a source of reliable, more up to date, detailed and helpful information.

The listowner set up a simple nickname file for a long list of individual email addresses, rather than using listserv software. He managed the subscription by simply adding or deleting email addresses from his nickname file. The content of the mailing list summarized discussions and decisions taking place at school board meetings. Mr. Klagge highlighted processes and votes in a relatively impartial manner, presenting pros and cons of issues under debate, as well as the rationale for his own vote on an issue. He subscribed members initially whom he knew were in his election district or had an interest in school issues, and had email. He offered subscribers the option of unsubscribing, simply by request. He added more members as he received requests for

information or subscription from individuals at meetings, or by email, phone or letter.

The author, in collaboration with Mr. Klagge, and Virginia Tech Professor of Education, Stephen Parson, designed a questionnaire entitled "Users' Perspective on the School Board Mailing List." Mr. Klagge, as list owner, used the mailing list to distribute the questionnaire to subscribers, with instructions to forward the completed survey to the author. Of the 369 members of the mailing list (at that time), 76 subscribers (20% of the sample) responded with usable surveys.

Most respondents (70%) had been on the list between 7 and 12 months at the time of the survey (the age of the list was roughly nine months at that time). The most commonly cited reason for joining the list was to obtain more information about the local schools (this was an open ended question). The vast majority -- almost 79 percent (78.9%) -- gave high marks (a 4 or 5 on a five point scale) for the 'helpfulness of the list in clarifying issues;' 87.3% gave high marks (a 4 or 5) for the 'helpfulness of the list in keeping up to date with school issues.'

As for civic engagement and community involvement, the majority (81.7%) of respondents reports that having school issues communicated to them via the list has made them feel more involved in school issues than they felt prior to subscribing to the list (see Table 4). Seventy-six percent (76%) rate the reply function of the list very highly (4 or 5). This demonstrates the value that they assign to the 'exchange' of communication, even though it is only with the list owner, their elected representative, and not the entire group. The majority (78.9%) reports no increase or decrease in their participation in public meetings regarding school issues since becoming a member of the mailing list.

Nonetheless, a handful (12.7%) reports their participation has increased, and attributes the increase to communication from the list. The majority (59.2%) reports never having called a public official or school administrator as a result of communication exchanged via this list. However, almost a third (31%) reports having called public or school officials 1 to 5 times as a result of the list. A much greater proportion -- half the respondents (50.7%) -- reports having written a letter to an elected official or school administrator as a result of communication exchanged via this list. As for exchanging information with others in their social networks, over half (53.5%) of respondents report having told other people about the list.

Select Virginia Districts: Parents, Teachers and Administrators

The author conducted a series of one-on-one and focus group interviews with school administrators, teachers and parents in the Blacksburg public school district in 1997. Questions posed to interviewees related to network 'ties' -- the flow of information resources between home and school -- and the impact of the Internet on communication between home and school. Communication from the home (parents) to the school (teachers, principal, School Board members and other administrators) is a form of community involvement.

The interviews revealed that parent teacher communication is successful with email and the Internet when conditions related to access, money, interest, support, and experience are satisfied. The majority of families and teachers in Blacksburg (part of the larger Montgomery County School district) does not lack either technical access, financial resources, motivation or adequate familiarity with the Internet to use it for home-school communication and information

exchange. Most interviewees had a few examples about using email, and some had a few parents who communicate with them regularly. Most referred to this kind of communication as “in the future”. Their predictions were usually positive about the possibilities of using email to communicate in general, as most people thought that the importance of technology, increased computer literacy, and the increasing affordability of computers would make it a more widespread form of communication over time.

Whether media substitution is the reason, the telephone survey data from the 1996 and 1999 rounds show marked increases in use of school web pages and email with teachers among Blacksburg parents (Tables 5 and 6).

Conclusions and Policy Implications

Putnam links declines in civic engagement to decreasing social capital and attributes both to the electronic revolution, especially television. Unlike television, however, the Internet fosters active communication within and across social networks and information retrieval and exchange among users. Online communication, particularly through web sites and group discussion forums such as listservs, are effective strategies for social networks to expand their memberships and facilitate the flow of resources, especially friendship and aid in the form of information.

By promoting online services to existing social networks through inexpensive packaging and user support, a community network strengthens social ties and increases resource flows. There are numerous social networks in the form of organizations and informal groups reported in this paper, such as the

local School Board, the BEV Seniors, leaders of community organizations, churches and clubs, that are using web sites and listservs with these results.

The logic of targetting a package of Internet services (web space, listserv, email account) at community organizations is that it uses existing social networks to diffuse communication technology and services that meet social network needs and purposes: resource allocation in the form of companionship and/or aid. Companionship and 'staying in touch' is accomplished through electronic mail, while information -- the predominant 'aid' -- is exchanged among individuals and groups via web sites and listservs or other online mailing lists.

Users report that convenient access to timely information and updates has been a major improvement over traditional communication mechanisms such as individual telephone calls or even 'telephone trees.' Community leaders find it much easier to reach their constituents with organizational information (such as minutes, agendas, background documentation) and discussion of issues. In many cases, without online outlets, these documents would not get distributed at all. The increased distribution of background information and discussion among constituents increases their depth of their knowledge of the issues at hand, as well as their sense of involvement in these issues. As a result, it strengthens their sense of belonging and association with the organization and its membership.

These effects are more common when individuals have an existing need to communicate with each other due to membership in the same social network, and therefore, already exchange resources, such as friendship and/or aid, at least face-to-face or by telephone. These results are also more likely to occur when the resources being exchanged are more narrowly defined, for example, 'School

Board News' as opposed to information or unstructured discussion about education in general.

The interview data about home-school communication is consistent with findings among the general population in Blacksburg and environs regarding community involvement (Kavanaugh and Patterson 1998). The Internet **does** appear to facilitate increases in community involvement, but that growth occurs among people who are already 'poised to be active' in the community.

The proportion of the population that seems to be drawn into community life more actively due to the Internet is a group that scores significantly higher on measures of education, newspaper readership and current community involvement levels. Thus, the Internet is not changing involvement levels of people who may be disenfranchised or otherwise remote from civic or school life. The Internet does not give them a personality or motivational change. Nonetheless, if the handful of people who are 'actively involved' in the community increases due to the Internet by even a small percentage, this helps to restore some of the eroded social capital which Putnam and others observe.

From a policy perspective, it is important for community network designers and managers target inexpensive bundled services to local organizations and groups. Diffusion of Internet services is more rapid, as a result, which also makes it possible for a greater proportion of interested individuals to become more involved in the local community and civic affairs. The listserv and related email discussion tools clearly help members of different social networks strengthen ties between different groups. When these 'weak' ties are strengthened, communities mobilize resources more quickly and organize collective action more easily.

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Table 1: Use Internet to communicate with church members

	1996	1999
Frequently	2%	8%
Sometimes	4	9
Occasionally	3	4
Rarely	8	13
Never	83	66

Table 2: Use Internet to communicate with members of local community organizations

	1996	1999
Frequently	5%	11%
Sometimes	7	9
Occasionally	5	5
Rarely	11	17
Never	73	57

Table 3: Use Internet to communicate with members of local clubs, sports teams or hobby groups

	1996	1999
Frequently	8%	11%
Sometimes	11	8
Occasionally	9	9
Rarely	9	13
Never	63	58

**Table 4: More involved in school issues since
subscribing to School Board mailing list?**

	1996	1999
Yes	82%	91%
No	13%	7%
No answer	5%	2%

**Table 5: Use Internet to get information from
local schools?**

	1996	1999
Frequently	7%	13%
Sometimes	7	13
Occasionally	5	6
Rarely	8	18
Never	74	50

**Table 6: Use Internet to communicate with
your child's teacher**

	1996	1999
Yes	9%	37%
No	91	63