

We use cookies to enhance your experience on our website. By clicking 'continue' or by continuing to use our website, you are agreeing to our use of cookies. You can change your cookie settings at any time.

[Continue](#)
[Find out more](#)



JOURNAL OF COMPUTER-MEDIATED COMMUNICATION

Article Navigation

Studying Online Social Networks FREE

Laura Garton ✉, Caroline Haythornthwaite ✉, Barry Wellman ✉

Journal of Computer-Mediated Communication, Volume 3, Issue 1, 1 June 1997, JCMC313, <https://doi.org/10.1111/j.1083-6101.1997.tb00062.x>

Published: 01 June 1997

Cite Permissions Share ▾

Abstract

When a computer network connects people or organizations, it is a social network. Yet the study of such computer-supported social networks has not received as much attention as studies of human-computer interaction, online person-to-person interaction, and computer-supported communication within small groups. We argue the usefulness of a social network approach for the study of computer-mediated communication. We review some basic concepts of social network analysis, describe how to collect and analyze social network data, and demonstrate where social network data can be, and have been, used to study computer-mediated communication. Throughout, we show the utility of the social network approach for studying computer-mediated communication, be it in computer-supported cooperative work, in virtual community, or in more diffuse interactions over less bounded systems such as the Internet.

Issue Section: Original Article

What is Social Network Analysis?

The Social Network Approach

When a computer network connects people or organizations, it is a social network. Just as a computer network is a set of machines connected by a set of cables, a social network is a set of people (or organizations or other social entities) connected by a set of social relationships, such as friendship, co-working or information exchange. Much research into how people use computer-mediated communication (CMC) has concentrated on how *individual users* interface with their computers, how *two persons* interact online, or how *small groups* function online. As widespread communication via computer networks develops, analysts need to go beyond studying single users, two-person ties, and small groups to examining the computer-supported social networks (CSSNs) that flourish in areas as diverse as the workplace (e.g. [Fulk & Steinfield, 1990]; [Wellman, Salaff, Dimitrova, Garton, Gulia & Haythornthwaite, 1996]) and virtual communities, e.g., [Wellman & Gulia, 1997]. This paper describes the use of the social network approach for understanding the interplay between computer networks, CMC, and social processes.

[About Journal of Computer-Mediated Communication](#)
[Editorial Board](#)
[Author Guidelines](#)
[Facebook](#)
[Twitter](#)

[Recommend to your Library](#)
[Advertising and Corporate Services](#)
[Journals Career Network](#)

JOURNAL OF COMPUTER-MEDIATED COMMUNICATION

Online ISSN 1083-6101
Copyright © 2019 International Communication Association

About Us	Connect	Resources	Explore
Contact Us	Join Our Mailing List	Authors	Shop OUP Academic
Careers	OUPblog	Librarians	Oxford Dictionaries
Help	Twitter	Societies	Oxford Index
Access & Purchase	Facebook	Sponsors & Advertisers	Epigeum
Rights & Permissions	YouTube	Press & Media	OUP Worldwide
Open Access	Tumblr	Agents	University of Oxford

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide
OXFORD
UNIVERSITY PRESS

Copyright © 2019 Oxford University Press [Cookie Policy](#) [Privacy Policy](#) [Legal Notice](#) [Site Map](#) [Accessibility](#)
[Get Adobe Reader](#)

may ask whether and to what degree friendship is transitive. He [sic] may examine the logical consistency of a set of kin rules, the circularity of hierarchy, or the cliquishness of friendship” [[Levine & Mullins, 1978, p. 17](#)].

Social network analysts look beyond the specific attributes of individuals to consider relations and exchanges among social actors. Analysts ask about exchanges that create and sustain work and social relationships. The types of resources can be many and varied; they can be tangibles such as goods and services, or intangibles, such as influence or social support [[Wellman, 1992b](#)]. In a CMC context, the resources are those that can be communicated to others via textual, graphical, animated, audio, or video-based media, for example sharing information (news or data), discussing work, giving emotional support, or providing companionship [[Haythornthwaite, Wellman & Mantei, 1995](#)].

Relations

Relations (sometimes called *strands*) are characterized by content, direction and strength. The content of a relation refers to the resource that is exchanged. In a CMC context, pairs exchange different kinds of information, such as communication about administrative, personal, work-related or social matters. CMC relations include sending a data file or a computer program as well as providing emotional support or arranging a meeting. With the rise of electronic commerce (e.g., Web-based order-entry systems, electronic banking), information exchanged via CMCs may also correspond to exchanges of money, goods or services in the “real” world.

A relation can be directed or undirected. For example, one person may give social support to a second person. There are two

organizational tie is sufficient to allow the flow of information between people who may never have met face-to-face. Connectivity among previously unacquainted people is a well established finding in the CMC research literature [[Garton & Wellman, 1995](#)]. Examples of this form of connectivity are documented in studies of large international organizations ([[Constant, Kiesler & Sproull, 1994](#)]; [[Constant, Sproull & Kiesler, 1996](#)]) as well as in dispersed occupational communities such as oceanographers [[Hesse, Sproull, Kiesler & Walsh, 1993](#)], “invisible colleges” of academics in the same field ([[Hiltz & Turoff, 1993](#)]; [[Plishkin & Romm, 1994](#)]), and members of the computer underground [[Meyer, 1989](#)].

Multiplexity

The more relations (or strands) in a tie, the more multiplex (or multistranded) is the tie. Social network analysts have found that multiplex ties are more intimate, voluntary, supportive and durable ([[Wellman & Wortley, 1990](#)]; [[Wellman, 1992b](#)]). Yet some analysts have feared that email, the Internet, and other reduced-cues CMCs are unable to sustain broadly-based, multiplex relations (see the review in [[Wellman et al., 1996](#)]; [[Garton & Wellman, 1995](#)]). These fears are extended by the boutique approach to online offerings which fosters a specialization of ties within any one of thousands of topic-oriented news groups ([[Kling, 1995](#)]; [[Kollock & Smith, 1996](#)]). However, this tendency toward specialization is counter-balanced by the ease of forwarding online communication to multiple others. Through personal distribution lists Internet participants can sustain broad, multiplex, supportive relationships ([[Wellman & Gulia, 1997](#)]; [[Wellman, 1997](#)]). As yet, there has been little research into the extent to which specialized, online, single relations grow into multiplex ties over time.

- . . .

[Richards, 1992]), this requirement places limits on the size of networks that can be examined. The number of possible ties is equal to the size of the population (n) multiplied by $(n-1)$ and divided by 2 if the tie is undirected. For a population of size 20, there are 380 links for each specific relation.

In CMC research, ego-centered and whole network views provide two ways of examining the communication links among people. Ego-centered network analysis can show the range and breadth of connectivity for individuals and identify those who have access to diverse pools of information and resources. Whole network analysis can identify those members of the network who are less connected by CMC as well as those who emerge as central figures or who act as bridges between different groups. These roles and positions emerge through analysis of the network data rather than through prior categorization.

Network Characteristics

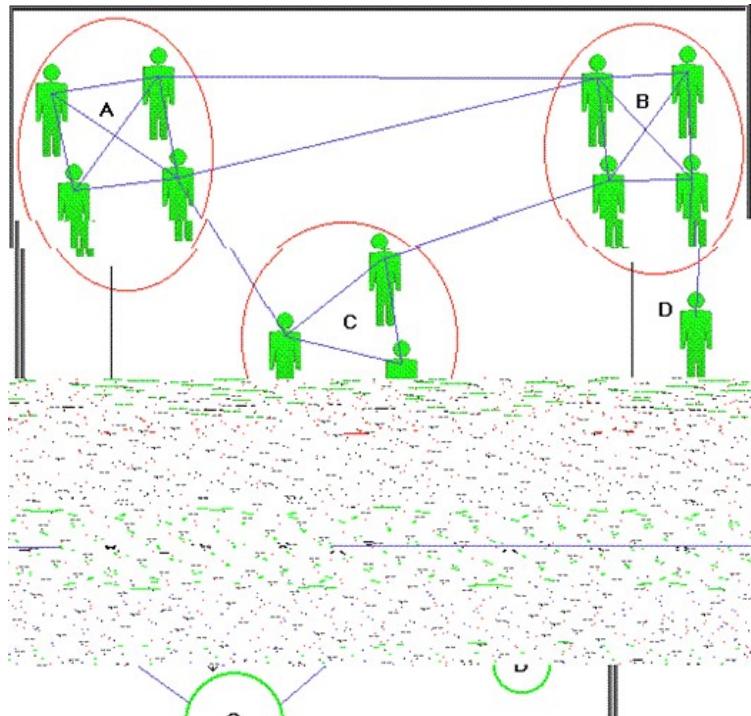
Range: Social networks can vary in their range: i.e., in their size and heterogeneity. Larger social networks have more heterogeneity in the social characteristics of network members and more complexity in the structure of these networks [Wellman & Potter, 1997]. Small, homogeneous networks are characteristic of traditional work groups and village communities; they are good for conserving existing resources. These networks are often the norm against which pundits unfavorably compare computer-supported cooperative work networks and virtual communities ([e.g., Stoll, 1995]; [Slouka, 1995]), or praise computer-supported social networks for unlocking social relations from traditional molds (e.g., [Rheingold, 1993]; [Barlow, Birkets, Kelly & Slouka, 1995]; see also the review in [Wellman & Gulia, 1997]). Yet large, heterogeneous

By examining relations to identify network groups, CMC researchers can track the beginnings of what may become more formal groups or identify coalitions and alliances that influence others and affect social outcomes. They can link research findings on commonly held beliefs to the regular patterns of interactions among people using CMC. By identifying the group prior to its formalization, social network analysis can be used to follow the growth of CMC network phenomena. For already-defined email groups, the social network approach can be used to examine what specific kinds of exchanges define the groups. For example, online groups may be formed initially based on socioeconomic characteristics and the vague notion of access to information, such as *SeniorNet* for senior citizens [Furlong, 1989] or *Systers* for female computer scientists [Sproull & Faraj, 1995]. Analysts can examine these email or bulletin board networks for the kinds of information exchange that sustain the network.

The social network approach can also be used to see where relations and ties cross media lines. Which kinds of groups maintain ties via multiple media, and which communicate only by means of a single medium? For example, a luncheon group might coordinate meeting times through email, coordinate food delivery by phone, with final consumption face-to-face. Other network groups, such as remotely-located technicians, might exchange information about only one topic and use only one medium, such as email.

Positional Analysis

As well as partitioning social network members by groups, analysts also partition members by similarities in the set of relations they maintain. Such members occupy similar *positions* within an organization, community or other type of social



computerized media to sustain relations and ties.

Collecting Network Data for CMC Studies

Selecting a Sample

Ego-centered Networks: Social network analysts gather relational data at different levels of analysis, such as individuals, ties, clusters, or whole networks [Wasserman and Faust, 1994]. In an ego-centered network study, a set of people (selected on the basis of some sampling criteria) are asked questions in order to generate a list of people (alters) who are the members of their personal social network. For example, a person may be asked to report on the people they go to for advice about work matters and the people they go to for advice about personal matters. When the naming of alters is not restricted to a specific group, then ego-centered approaches can help identify the different social pools on which people draw for different resources (e.g., [Wellman, 1982]; [Wellman and Wortley, 1990]).

Ego-centered social network studies have almost never collected information about all the relations that people have with all the 1,500 or so members [Kochen, 1989] of their social network. Such an effort would be prohibitively expensive; one heroic researcher took a year to identify all the interactions in the networks of only two persons [Boissevain, 1974]. Thus studies purporting to be of “the social network” are engaging in literary reduction at best. What they really are doing are observing people's specified relations with a sample of their network members, e.g., socially-close network members who provide

Wellman and Mantei, 1995]; [Haythornthwaite, 1996a]).

Figure 2

	1	2	3	4	5	6	7	8	9	10
1. Overall how often did you interact with this person on work related activities?	.	*	*	*	*	*	*	*	*	*
in unscheduled face-to-face meetings?	.	*	*	*	*	*	*	*	*	*
in scheduled face-to-face meetings?	.	*	*	*	*	*	*	*	*	*
by telephone?	.	*	*	*	*	*	*	*	*	*
by fax?	.	*	*	*	*	*	*	*	*	*
by electronic mail?	.	*	*	*	*	*	*	*	*	*
by paper letters or memos?	.	*	*	*	*	*	*	*	*	*
by tele (audio) conferencing?	.	*	*	*	*	*	*	*	*	*
by video conferencing?	*	*	*	*	*	*	*	*	*	*

[View large](#)

[Download slide](#)

COMMUNICATION PATTERNS SURVEY

Respondents are often asked to recall behavior that took place over a broad time frame in order to capture as much

for monitoring, making it possible to gather information on the form of media used, the frequency of use, the timing and direction of messaging, the subject of the message, and even the content of the message itself.

The amount of information that can be gathered through automated means can be so overwhelming as to pose challenges for interpretation and analysis. Moreover, it is difficult to assess the relative importance of electronic interactions captured in a log, causing researchers to look for other ways to separate trivial communication from significant interactions. In some cases the 'Subject Header' is captured along with the who-to-whom data. However, headers may be misleading because they often remain in place long after a topic has been abandoned in the to-and-fro of messaging. Full texts of a message offer more possibilities for sorting out issues of significance and interpretation, but even within a message there may be a sentence or phrase that carries specific meanings known only to the sender and receiver.

Since electronic data can be collected unobtrusively, it is more difficult for people to maintain control over what information is gathered and how it will be used in the future. Sensitive topics may be avoided when people know their mail is being monitored. Capturing electronic communication can reveal alliances and information that may jeopardize employment or work relations. To alleviate these concerns researchers can randomly assign codes so that individuals cannot be identified [Rice, 1994]. However, privacy protections are often less prevalent and less comprehensive in private organizations than public or government institutions [Rice & Rogers, 1984]. This issue is important for studies of institutional intranets, but even more important for researchers who want to study a larger public on the Internet. How will people know when they are the subjects of a study in online public fora when the researchers do not identify themselves? Must researchers identify themselves if they are only participating in the electronic equivalent of hanging-out on street corners or doughnut shops

4. How do ties and relations maintained by CMC change over time?
5. How do interpersonal relations such as friendship, work role and organizational position affect CMC?
6. How do computer-mediated communications differ from face-to-face communications in terms of (a) who uses them and (b) what people communicate about?
7. Do computer-mediated communications describe different social networks than face-to-face communications?

Several microcomputer programs have been especially designed to analyze social network structure: *UCINET*, *Multinet*, *Negopy*, *Krackplot*, and *Gradap*, with the combination of *UCINET* and *Krackplot* being the mostly widely used. To use these applications, data often must be transformed into a matrix with rows and columns representing the units of analysis. These units can be people, events, groups or other entities that are related to one another. In a person-by-person whole network study, the columns and rows represent the respondents. In a directed matrix, rows represent the initiators and columns the receivers of specific relations. For example, Person B gives advice to Person D but Person D may not reciprocate.

Each relation is represented by one matrix. For example, in our whole network study of members of a distributed work group, we constructed one matrix for frequency of “overall work interaction” by totaling their communication by each medium (see [Figure 3](#)). Individual matrices are constructed for separate media. In a longitudinal study there are matrices for each time period as well as for each relation. Managing data in matrix format can be a challenge if there are many different relations or, as in the case of communication media studies, several types of media for each relation.

President, worked from headquarters. The Vice President and his office coordinator operated from a satellite office 100 km away. The following sociograms were generated by Krackplot and depict the organizational communication structure at different times over the twenty month study. In these visual representations people are displayed as points and arranged in relation to the relative frequency of their interaction. People who communicated more with each other are placed closer together. The connecting lines indicate communication direction and frequency level (above average).

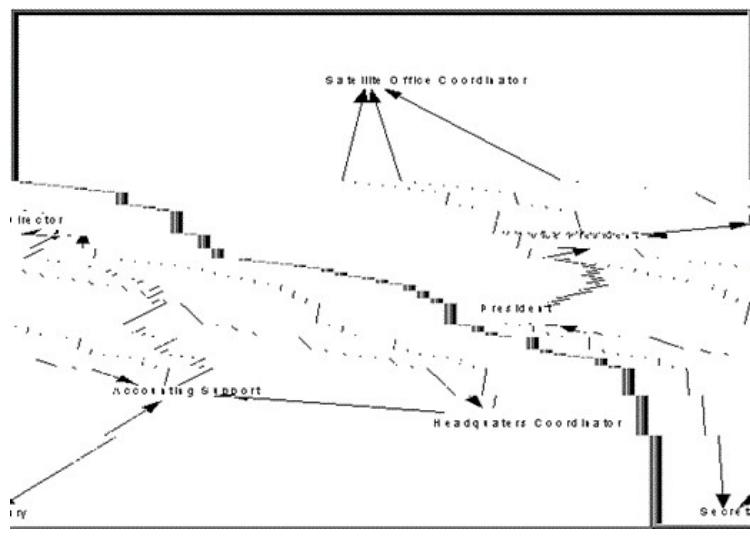
The sociograms of work interaction (by all media) before and after the introduction of CMS ([Figures 4 and 5](#)) indicate few changes took place in the overall structure of communication patterns. The Headquarters Office Coordinator remained a central communication star despite changes in staff and job descriptions. Furthermore, the Satellite Office Coordinator remained a relative isolate, connected to the others primarily through a link with the Vice President. This interpretation of the sociograms is reinforced by statements made in interviews with individual organizational members. They reported a continued preference to organize their work activities with others who were physically proximate despite the addition of CMS. The exception was the Vice President who reported increased connectivity with all members of the organization and in particular with the President.

Figure 4



Figures 6 and 7 are sociograms showing the work related communication networks that operated via CMS. The data is drawn from an electronic log of all interactions on CMS by all members of the organization over eighteen months.

Figure 6



boundaries between the two office sites which made it more difficult for the Vice President to unobtrusively control frequency and timing of interruptions by others. Since work between sites could be handled without visual synchronicity, CMS had become less useful as a tool for collaboration. However, CMS was used among members of the support staff. This group did not distribute work to each other and consequently did not report CMS interaction as disruptive or problematic. Media use in this case study was dependent upon the nature of the relation between the users as well as the features of the technology and the distribution of tasks.

Sociograms provide snapshots of organizational interaction structures which can indicate how static or dynamic these structures are over time. From these types of diagrams we can visually identify emergent positrons and clusters of interaction. The nature and content of relations may be part of the initial construction of the sociogram or determined later through surveys and interviews with members of the network. Visual depictions of whole networks can highlight both linkages and non-linkages, revealing 'structural holes' [Burt, 1992]. By examining these patterns of mediated and unmediated interaction we gain an added perspective on communication structures that underpin explicit work processes as well as those that support affective, less instrumental behaviors.

Conclusions

Because computer networks often are social networks, the social network approach gives important leverage for understanding what goes on in computer-mediated communication: how CMC affects the structure and functioning of social

Bernard, H. R., Killworth, P., Kronenfeld, D., & Sailer, L. (1984). The problem of informant accuracy: the validity of retrospective data.

Bernard, H. R., Killworth, P., & Sailer, L. (1981). Summary of research on informant accuracy in network data and the reverse small world problem. *Connections*, 4(2), 11–25.

Boissevain, J. (1974). *Friends of friends: Networks, manipulators, and coalitions*. Oxford.

Bonacich, P. (1987). Power and centrality: A family of measures. *American Journal of Sociology*, 92, 1170–82.

[Google Scholar](#) [Crossref](#)

Boorman, S., & White, H. (1976). Social structure from multiple networks II: Role structures. *American Journal of Sociology*, 81, 1384–1446.

[Google Scholar](#) [Crossref](#)

Borgatti, E., & Freeman, L. (1996). *UCINET IV 1.64*. Natick, MA: Analytic Technologies.

Breiger, R. (1974). The duality of persons and groups. *Social Forces*, 53, 181–90.

[Google Scholar](#) [Crossref](#)

- Danowski, J. A. (1982). Computer-mediated communication: A network based content analysis using a cbbs conference. *Communication Yearbook*, 6, 905–924.
- Davis, R. H. (1981). Social network analysis—an aid in conspiracy investigations. *FBI Law Enforcement Bulletin*, 50(12), 11–19.
- Espinoza, V. (1997). Social networks among the urban poor: Inequality and integration in a Latin American city. In B. Wellman (Ed.), *Networks in the global village* (in press). Boulder, CO: Westwood.
- Eveland, J. D. (1993). Uses and limitations of communication network analysis in the evaluation of CSCW applications, Third European Conference on Computer-Supported Cooperative Work. Milan, Italy.
- Eveland, J. D., & Bikson, T. (1988). Work group structures and computer support. *ACM Transactions on Office Information Systems*, 6, 354–79.
- [Google Scholar](#) [Crossref](#)
- Feld, S. (1981). The focused organization of social ties. *American Journal of Sociology*, 86, 1015–35.
- [Google Scholar](#) [Crossref](#)
- Feldman, M. S. (1986). Constraints on communication and electronic mail, CSCW'86.

[Google Scholar](#) [Crossref](#)

Haythornthwaite, C. (1996a). Media use in support of communication networks in an academic research environment. Unpublished doctoral dissertation, University of Toronto, Toronto.

Haythornthwaite, C. (1996b). Social network analysis: An approach and technique for the study of information exchange. *Library and Information Science Research*, 18, 323–342.

[Google Scholar](#) [Crossref](#)

Haythornthwaite, C., & Wellman, B. (1996). Which kinds of network members communicate by email or face-to-face for what kinds of work? (pp. 45). University of Toronto: Centre for Urban and Community Studies.

Haythornthwaite, C., Wellman, B., & Mantei, M. (1995). Work relationships and media use: A social network analysis. *Group Decision and Negotiation*, 4(3), 193–211.

[Google Scholar](#) [Crossref](#)

Hesse, B. W., Sproull, L. S., Kiesler, S. B., & Walsh, J. P. (1993). Returns to science: Computer networks in oceanography. *Communications of the ACM*, 36(8), 90–101.

[Google Scholar](#) [Crossref](#)

Lin, N., & Westcott, J. (1991). Marital engagement/disengagement, social networks, and mental health. In J. Eckenrode (Ed.), *The social context of coping* (pp. 213–37). New York: Plenum Press.

[Google Scholar](#) [Crossref](#)

Markus, M. L. (1990). Toward a “critical mass” theory of interactive media. In J. Fulk & C. W. Steinfield (Ed.), *Organizations and communication technology* (pp. 194–218). Newbury Park, CA: Sage.

Markus, M. L. (1994a). Electronic mail as the medium of managerial choice. *Organization Science*, 5(4), 502–527.

[Google Scholar](#) [Crossref](#)

Markus, M. L. (1994b). Finding a happy medium: Explaining the negative impacts of electronic communication on social life at work. *ACM Transactions on Information Systems*, 12(2), 119–149.

[Google Scholar](#) [Crossref](#)

Markus, M. L., Bikson, T., El-Shinnawy, M., & Soe, L. (1992). Fragments of your communication: E-mail, v-mail, and fax. *The Information Society*, 8, 207–226.

[Google Scholar](#) [Crossref](#)

Marsden, P., & Campbell, K. E. (1984). Measuring tie strength. *Social Forces*, 63, 482–501.

Rice, R. (1994). Network analysis and computer-mediated communication systems. In S. Wasserman & J. Galaskiewicz (Ed.), *Advances in social network analysis* (pp. 167–203). Thousand Oaks, CA: Sage.

[Google Scholar](#) [Crossref](#)

Rice, R., & Associates (1984). *The new media: Communication, research and technology*. Beverly Hills, CA: Sage.

Rice, R., Grant, A., Schmitz, J., & Torobin, J. (1990). Individual and network influences on the adoption and perceived outcomes of electronic messaging. *Social Networks*, 12, 27–55.

[Google Scholar](#) [Crossref](#)

Rice, R., & Love, G. (1987). Electronic emotion: Socioemotional content in a computer-mediated communication network. *Communication Research*, 14(1), 85–108.

[Google Scholar](#) [Crossref](#)

Rice, R. E., & Danowski, J. A. (1993). Is it really just like a fancy answering machine? Comparing semantic networks of different types of voice mail users. *Journal of Business Communication*, 30(4), 369–397.

[Google Scholar](#) [Crossref](#)

Rice, R., & Rogers, E. (1984). New methods and data for the study of new media. In R. Rice & Associates (Ed.), *The new media*:

193–209.

[Google Scholar](#) [Crossref](#)

Trevino, L. K., Daft, R. L., & Lengel, R. H. (1990). Understanding managers' media choices: A symbolic interactionist perspective. In J. Fulk & C. W. Steinfield (Ed.), *Organizations and communication technology* (pp. 71–94). Newbury Park, CA: Sage.

[Google Scholar](#) [Crossref](#)

Valente, T. W. (1995). *Network models of the diffusion of innovation*. Cresskill, NJ: Hampton.

[Van de Ven](#), A., Walker, G., & Liston, J. (1979). Coordination patterns within an interorganizational network. *Human Relations*, 32, 19–36.

[Google Scholar](#) [Crossref](#)

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. Cambridge: Cambridge University Press.

[Google Scholar](#) [Crossref](#)

Wellman, B. (1979). The community question. *American Journal of Sociology*, 84, 1201–31.

[Google Scholar](#) [Crossref](#)

White, H., Boorman, S., & Breiger, R. (1976). Social structure from multiple networks: I. Blockmodels of roles and positions.

© 1997 International Communication Association



organizations in the Republic of Bashkortostan].

[The medical ethical aspects of organization of medical rehabilitation].

[The motivation of participants of the "Zemstvo doctor" program in the Tyumen oblast and evaluation of their satisfaction with conditions of work and life in rural territory].

[The transformation of Buryat families as a factor determining population health].

Citing articles via

[Google Scholar](#)

[CrossRef](#)

[Latest](#) | [Most Read](#) | [Most Cited](#)

Ethnic Minorities' Social Media Political Use: