COMMUNITIES AND TECHNOLOGIES 2005

Communities and Technologies 2005

Proceedings of the Second Communities and Technologies Conference, Milano 2005

Edited by

PETER VAN DEN BESSELAAR
University of Amsterdam The Netherlands

GIORGIO DE MICHELIS
University of Milano Bicocca, Italy

JENNY PREECE
University of Maryland, U.S.A.

and

CARLA SIMONE
University of Milano Bicocca, Italy

Springer

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN-10 1-4020-3590-X (HB) Springer Dordrecht, Berlin, Heidelberg, New York
ISBN-10 1-4020-3591-8 (e-book) Springer Dordrecht, Berlin, Heidelberg, New York
ISBN-13 978-1-4020-3590-6 (HB) Springer Dordrecht, Berlin, Heidelberg, New York
ISBN-13 978-1-4020-3591-3 (e-book) Springer Dordrecht, Berlin, Heidelberg, New York

Published by Springer,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.

Printed on acid-free paper

Printed in the Netherlands.

Table of Contents

From the Conference Chairs

This volume consists of the papers presented at the second international conference on Communities and Technologies (C&T 2005). After a very successful first conference in 2003 in Amsterdam, the second one attracted about the same number of submissions and workshop proposals. This suggests that the scholarly interest in the relationships between communities and technologies is lasting, and that the C&T conference has become a major international forum for presenting and discussing this work.

Researchers have a growing interest in the effects information and communication technologies have on communities, because communities are increasingly recognized as one of the basic forms of social organization and coordination. The needs, interests, and practices of community members and the locality of the community influence how communities evolve and function. Communities provide the foundation for social practices, experience and social integration in the following ways.

Firstly, within a globalizing society, communities play a crucial role. Problems such as new forms of political participation and civic engagement, maintenance of cultural identities, or the integration of various social groups need to be tackled at the community level. Secondly, communities also reshape how we learn and share knowledge, both as individuals and in and between organizations. While earlier research and development focused on storing, classifying and retrieving explicit knowledge represented in documents and data bases, it is now generally accepted that communities are an important forum for sharing implicit (tacit) situated knowledge. Thirdly, knowledge sharing between communities is a prerequisite for innovation and social change. And finally, new types of communities, e.g., on-line communities, change relationships between producers and consumers, doctors and patients, teachers and students, and between citizens and politicians.

Advances in electronic networking technologies embody promise to enable and stimulate inter-community and inter-organizational cooperation and communication if managed appropriately. However, many of the ICT infrastructures and systems that are intended to do this fail because of lack of adequate understanding about the social dynamics of communities. In practice, information technologies may support or hinder community formation, or change the dynamics of existing communities for better or worse depending on how they are employed. A considerable research agenda needs to be addressed if society is to reap the benefits of social information technologies.

Understanding the relationships between communities and technologies requires multidisciplinary research efforts involving researchers from different fields of applied computer science and information science (Computer Supported

Cooperative Work, Computer Supported Collaborative Learning, Artificial Intelligence, Information Retrieval, Human Computer Interaction, Information Systems, Social Informatics) and social sciences (Anthropology, Communication Studies, Economics, Innovation Studies, Management and Organization Science, Psychology, Political Science, Sociology).

In this volume we are pleased to present research papers from a range of disciplines covering a variety of topics. These papers result from a selective reviewing process. We received more than 100 full paper submissions. We undertook an intensive peer review process in which each paper was assessed by at least three reviewers. This resulted in the selection of 23 papers that are included in this volume. Both the number of submissions, and the quality and diversity of accepted papers indicate the development of the research field and we are sure that you will enjoy reading them. The 23 papers have been written by some 60 authors, with an average of almost three authors per paper. And, in five cases the co-authors have different nationalities. This indicates that the C&T research field itself is also a connected community.

The research papers in this volume are only one aspect of the C&T 2005 conference. In addition to the paper sessions, the conference offered thirteen challenging workshops, a panel, a highly demanded tutorial by Larry Prusak (IBM Consulting Group, Boston, USA), and stimulating keynote lectures by Marco Susani (Advanced Concept Group, Motorola, Cambridge, USA) and Noshir Contractor (University of Illinois, Urbana-Champaign, USA).

A conference like this one cannot take place without considerable enthusiasm, support and encouragement as well as hard work. In particular, we gratefully thank:

- All those who submitted a paper or workshop proposal to the conference. The standard was very high, which reflects well on the state of art in the field.
- All of those who contributed to the conference through organizing workshops, and through paper presentations.
- All of those who contributed to the organization of the conference. Setting up a major international conference is a complex endeavor and the efforts of many are needed to make it a success. Special thanks go to the workshops chair Fiorella De Cindio, the local organizing chairs Alessandra Agostini and Marcello Sarini, and to Silvia Calegari who worked hard to develop and maintain the conference www-site. Thanks for that!
- The members Program Committee and the other reviewers who worked diligently to ensure that the conference was of high technical quality.
- The sponsors of C&T 2005 for their contributions to the conference.

Many of these individuals to whom we owe thanks are listed elsewhere in this volume.

These proceedings are a contribution to the academic discourse on communities and technologies. Keep up the good work!

Peter Van den Besselaar
Jenny Preece
Giorgio De Michelis
Carla Simone

C&T 2005 SPONSORS

Convivio, the Network for People-Centred Design of Interactive Systems

University of Milano Bicocca, Italy
- Department of Informatics, Systems and Communication (DISCo)
- Inter-disciplinary Doctorat on Quality of Information Society (QUA-SI)

University of Milano, Italy

CONFERENCE CHAIRS

Giorgio De Michelis	University of Milano Bicocca, Italy
Carla Simone	University of Milano Bicocca, Italy

PROGRAM CHAIRS

Jenny Preece	University of Maryland, USA
Peter Van den Besselaar	University of Amsterdam & Royal Netherlands Academy of Arts and Sciences – The Netherlands

WORKSHOP CHAIR

Fiorella De Cindio	University of Milano, Italy

LOCAL ORGANIZING CHAIRS

Alessandra Agostini	University of Milano, Italy
Marcello Sarini	University of Milano Bicocca, Italy

PROGRAM COMMITTEE

Mark Ackerman	University of Michigan, USA
Alessandra Agostini	University of Milano, Italy
Erik Andriessen	Delft Technical University, The Netherlands
Stefania Bandini	University of Milano Bicocca, Italy
Andreas Becks	Fraunhofer FIT, Germany
Ann Blandford	University College London, UK
Amy Bruckman	Gatech, USA
John Carroll	Virginia Tech, USA
Andrew Clement	University of Toronto, Canada
Elisabeth Davenport	Napier University, UK
Peter Day	University of Brighton, UK

Fiorella De Cindio	University of Milano, Italy
Giorgio De Michelis	University of Bicocca, Milano, Italy
Thomas Erickson	IBM Watson Research Center, USA
Shelly Farnham	Microsoft, USA
Marcus Foth	Queensland University of Technology, Australia
Valerie Frissen	TNO and Erasmus University, The Netherlands
Mike Gurstein	New Jersey Institute of Technology, USA
Christine Halverston	IBM Research, USA
Manual Heitor	University of Lisbon, Portugal
Susan Herring	Indiana University, USA
Thomas Herrmann	University of Dortmund, Dortmund, Germany
Marleen Huysman	Free University, the Netherlands
Toru Ishida	Kyoto University, Japan
Yasmin Kafai	University of California, Los Angeles, USA
Simon Kaplan	University of Queensland, Australia
Ralf Klamma	RWTH Aachen, Germany
Helmut Krcmar	Technical University of Munich, Germany
Brian Loader	Teeside University, UK
Peter Mambrey	Fraunhofer-FIT, Germany
Mark Maybury	MITRE, USA
David Millen	IBM Watson Research Center, USA
Anders Morch	University of Oslo, Norway
Kumiyo Nakakoji	University of Tokyo, Japan
Keiichi Nakata	International University, Germany
Bernhard Nett	University of Freiburg & Fraunhofer-FIT, Germany
Davide Nicolini	University of Trento, Italy
Markus Perkmann	Warwick Business School, UK
Volkmar Pipek	Int. Institute for Socio-Informatics, Germany
Jenny Preece	University of Maryland, USA
Wolfgang Prinz	Fraunhofer-FIT, Germany
Paul Resnick	University of Michigan, USA
Markus Rohde	Int. Institute for Socio-Informatics, Germany
Harry Scarbrough	Warwick Business School, UK
Doug Schuler	Evergreen State College, USA
Gerhard Schwabe	University of Zurich, Switzerland
Leslie Shade	Concordia University Montreal, Canada
Carla Simone	University of Milano Bicocca, Italy
Marc Smith	Microsoft Research, USA
Charles Steinfield	Michigan State University, USA
Yao Hua Tan	Vrije University, The Netherlands
Larry Stillman	Monash University, Australia
Josie Taylor	Open University, UK

Peter Van Baalen	Erasmus Universiteit, The Netherlands
Peter Van den Besselaar	University of Amsterdam & KNAW, Netherlands
Bart Van den Hooff	University of Amsterdam, The Netherlands
Barry Wellman	University of Toronto, Canada
Etienne Wenger	CPsquare, USA
Volker Wulf	University of Siegen & Fraunhofer-FIT, Germany

OTHER REVIEWERS

Matthias Baume	Technische Universität München, Germany
Miriam Daum	Technische Universität München, Germany
Aldo De Moor	Tilburg University, The Netherlands
Antonio Dini	University of Milano, Italy
Marco Durissini	Fraunhofer FIT, Germany
Magy Seif El-Nasr	Pennsylvania State University
Umer Farooq	Pennsylvania State University
Andrea Forte	Georgia Tech, USA
James M. Hudson	Georgia Tech, USA
David Kensche	RWTH Aachen, Germany
Markus Klann	Fraunhofer FIT, Germany
Ivan Longhi	University of Milano, Italy
Marco Loregian	University of Milano Bicocca, Italy
Sara Manzoni	University of Milano Bicocca, Italy
Selmar Meents	Free University, The Netherlands
Marco Prestipino	University of Zurich
Daniela Redolfi	University of Milano, Italy
Tim Reichling	University of Siegen, Germany
Laura Ripamonti	University of Milano, Italy
Mary Beth Rosson	Pennsylvania State University
Uwe Sandner	Technische Universität München, Germany
Wendy Schafer	Pennsylvania State University
Christian Seeling	Fraunhofer-FIT, Germany
Leonardo Sonnante	University of Milano, Italy
Gunnar Stevens	University of Siegen, Germany
Liisa Syrjänen	University of Oulu
Yuriy Taranovych	Technische Universität München, Germany
Michele Telaro	University of Milano Bicocca, Italy
Walter Thoen	Free University, The Netherlands
Eleftheria Vaseiliadou	University of Amsterdam, The Netherlands
Michael Veith	University of Siegen, Germany
Sven Walter	Technische Universität München, Germany
Lu Xiao	Pennsylvania State University

Does the Internet Enhance the Capacity of Community Associations?

Christopher Weare[+], William E. Loges*, Nail Oztas[#]

[+]University of Southern California, USA *Oregon State University, USA [#]Gazi University, Turkey
weare@usc.edu, bill.loges@oregonstate.edu, noztas@gazi.edu.tr

Abstract. We employ a social network approach to explore the Internet's impact on the capacity of community associations. We focus on how increased e-mail use affects the cohesion and democratic character of associations, and operationalize these concepts employing the standard social network measures of density and centralization. The analysis employs network data from 41 community associations that are comparable on a variety of factors, but which vary in their use of the Internet. It finds that the technological nature of e-mail as well as the background and interests of its users matter. Members of community associations do consider e-mail to be a distinctive communication mode and employ it differently from other modes such as phone and face-to-face communication. Increased use of e-mail is found to be associated with increased network density, a critical support for collective action. In contrast, increased e-mail use can either lead to increased or decreased network centralization, an indicator of the degree to which associational activities provide opportunities for the development of civic skills. In associations with relatively similar levels of e-mail use among members, the technology leads to more decentralized communication patterns, but in associations with disparate reliance on e-mail, e-mail use is associated with increased centralization.

Introduction

Small volunteer associations are an integral building block of robust communities. They provide venues for collective action, cultivate social capital, act as channels of information, and mediate between communities and state power (Chaskin, Brown, Venkatesh, and Vidal 2001; Granovetter 1973; Putnam 2000; Warren 2001). Voluntary associations, however, encounter imposing barriers to success. While the work of associations often yields substantial community benefits, the

P. van den Besselaar et al. (eds.), Communities and Technologies 2005, 1-18.

specific benefits for individual volunteers are limited, giving rise to incentives to "free ride" off of the efforts of others. In addition associations face substantial coordination costs in organizing the efforts of several busy and geographically dispersed volunteers.

The means of communication available to community associations influences their success in overcoming these barriers. Recent research into the role of communication technology and community building has shown that the communication infrastructure in the communities in which people live influences their ability to use available technology effectively for purposes of enhancing the quality of community life (Ball-Rokeach, Kim, and Matei 2001). As the Internet becomes ubiquitous, its impact on the communication infrastructure available to communities is important to understand. DiMaggio, Hargittai, Neuman, and Robinson (2001) note, however, that there has been little systematic study of how community-level voluntary associations use the Internet and whether the Internet affects their structure and enhances their effectiveness. This gap in the literature is unfortunate because the communication capabilities offered by the Internet should be particularly useful to community associations (Weare 2002). Association members are geographically dispersed, do not share a common place of work, and must balance associational activities with other commitments. In this situation, the asynchronous character of e-mail and its ability to broadcast messages are especially useful for keeping members in contact. Given that there is significant evidence that communication between organizational members is a critical factor facilitating successful collective action, such structural changes are likely to have significant effects on associational performance (Heckathorn 1993; Macy 1991; Sell and Wilson 1991).

This research focuses on the cohesion and democratic character of small, voluntary associations. Cohesion (the relative frequency of contacts between the members of a group) is of interest because of its relation to the development of common norms and bonds of trust that promote associational capacity (Coleman 1990; Wasserman and Faust 1994). An organization's democratic character (the degree to which it enables members to participate in core decision-making functions) is important because more decentralized and democratic structures and processes are linked to the development of civic skills and civic virtues among associational members (Parsons 1971; Putnam 1993; Verba, Schlozman, and Brady 1995; Warren 2001). This paper focuses on the effects of increased use of e-mail on the cohesion and democratic character of voluntary associations, holding other variables constant. It employs a social network approach to define and operationalize measures of cohesion and democratic character. It then analyzes network data collected from 41 community-based associations that are comparable on a variety of factors known to influence network structure, but which vary in their use of the Internet.

Social Networks

Cohesion and democratic character are concepts that can be operationalized through network analysis. This analysis employs two frequently utilized concepts: *density* and *centralization*.

Density is the ratio of existing ties among group members to all possible ties in their network. Density is closely linked to the concept of cohesion because an increase in the number of ties increases the probability that people interact directly. Density, also, has been shown to affect the flow of information in networks (Burt 2000; Monge and Contractor 2003; Rogers 2003; Scott 2000). In a high-density network, actors are tied directly to most others in the network. Because information-sharing is key to the coordination of group behavior, the density of a network has much to do with the capacity of an association to function. Specifically, research has shown that it is possible to affect the degree of "free-riding" in voluntary associations by effectively communicating the contributions and expectations of others (Cason and Khan 1999; Heckathorn 1993; Sell and Wilson 1991).

The homophily of group members (i.e., their similarity to one another) is an important contingent factor. Because more homophilous groups tend to support denser networks of communication, homophily is in general associated with greater cohesion (Brass 1995; Monge and Contractor 2003; Rogers 2003). Nevertheless, heterogeneity has advantages too. Heckathorn (1993) has shown that early in the stages of group formation, heterogeneity can facilitate collective action because highly motivated actors, or those with high capacity to make material contributions, may voluntarily offer those resources without polarizing the group or demanding complete reciprocity from the other members. Over time, Heckathorn notes, these conditions change. If cliques of homophilous members form, for example, within-clique communications may increase the apparent density of communications for the group as a whole, but reduce valuable contacts and willingness to compromise between dissimilar members (Huckfeldt and Sprague 1987). These contingencies are important in the study of voluntary associations because a central argument concerning the importance of engagement in civil society is the beneficial effect of exposure to people with different backgrounds, interests, and goals (Lipset 1981; Mutz 2002; Weatherford 1982). Moreover, if it can be shown that communication technology facilitates certain kinds of communication and discourages others, associations can choose available technologies that enhance their ability to work together productively.

Centralization is the extent to which a group's communication tends to flow through a specific person or persons rather than being more evenly distributed throughout all of its members (Freeman 1979; Scott 2000; Wasserman and Faust 1994). At the individual level, an actor's centrality indicates the importance or prominence of an individual within a network. Networks with higher levels of

group centralization are those in which there is a higher degree of variation in the centrality of individuals.

Among the many specific measures of centrality that have been identified, we focus on betweeness centrality because it (or more precisely its inverse) best captures the democratic character of associations. Betweeness centrality measures the extent to which a person serves as a link between two others seeking to communicate in a network. Specificially, person j's betweeness centrality is the proportion of all existing paths that connect all others in the network that include j. The group-level measure of centralization is derived from the sum of squared differences of each actor's centrality in comparison to the most central actor in that group. The analysis presented here focuses on the normalized centralization index, which expresses a group's centralization as a proportion of the maximum centralization of a group of that size.

The centrality of individuals in a network is related to power. Research has demonstrated that "actors who are the most important or the most prominent are usually located in strategic locations within the network" (Wasserman and Faust 1994, p. 169). These strategic locations were found to be central locations in a network, which provide extensive opportunities for involvement with others, more visibility, accessibility, control over resources, and brokerage of information (Ibarra 1993; Krackhardt and Brass 1994; Wasserman and Faust 1994). Organizations with low levels of centralization have a more democratic structure that distributes control over resources, maintenance of relationships, and information more evenly among their members. Verba, Schotzman, and Brady (1995) connect such decentralized structures with the acquisition of civic skills by their members. Also, Ajuha and Carley (1999) argue that decentralized organizations generally have more satisfied members, and that in "virtual organizations" (i.e., those that rely on electronic communication to accomplish their goals) "absence of prior structure allows the members to develop new structures through informal interaction in response to particular tasks" (1999, p. 745).

The Internet and Network Structure

The present study takes the approach de Sola Pool (1983) termed *soft technological determinism*—a concept that describes Castells' (2000) analysis as well. Castells highlights the Internet's ability to affect social networks by allowing people to search for and connect to individuals and organizations that otherwise would be impossible to find off-line, i.e. establishing more "weak ties" (Castells 2000; Granovetter 1973). Internet communication can reduce the costs of communication and change the character of mediated communication (e.g., Internet communication is asynchronous and low in social valence), and thus can change the structure and character of relationships.

In particular, the broadcast capabilities of electronic mail are significant. When children play "telephone" by whispering a message to one another, the fun of the game is the artificial constraints they place on their communication (e.g., artificially constraining centralization by forcing people in the same room to speak softly, and only directly to one other) and the consequences that ensue as the message deteriorates as it makes its way through the network. In fact, the Internet allows people to overcome that game's problem (and the limitations of organizational hierarchies) by "broadcasting" the same message to multiple recipients, usually with no extra marginal cost. While the term broadcasting accurately describes this ability, the Internet provides an additional capability that radio and television broadcasting do not: the ability for recipients of the message to respond quickly and to the entire network. One broadcast e-mail message can generate additional communication throughout the network, further increasing density, and perhaps decreasing centralization as the whole network is activated.

The Internet's technical characteristics are not, however, the only factor influencing individuals' communication patterns. Their goals, skills, and social context are co-determinants. People differ in terms of their ability and inclination to use the Internet (Jung, Qiu, and Kim 2001; Loges and Jung 2001; Wood and Smith 2001). People already connected to the Internet differ in their skill levels, their access from different places, and the importance they place on the Internet, a combination of objective and subjective dimensions that Jung, Qiu, & Kim (2000) call *Internet connectedness*.

The Internet and Group Cohesion

No matter how fond a person is of his or her colleagues in a voluntary association, practical obstacles to communicating with them can discourage communication that might otherwise build strong relationships between members (Burt 2000). The introduction of the Internet to an existing social network should increase that network's density by mitigating these constraints. For example, Internet communications enable individuals to establish "weak ties" with others with whom they might not otherwise connect (Castells 2000; Granovetter 1973; Sproull and Kiesler 1986; Sproull and Kiesler 1991). In addition, Sproull and Kiesler (1986, 1991) observe that e-mail increases network contacts by reducing communication inhibitions based on status. Sceptics have argued that Internet use may have the opposite effects, reducing social contacts by taking away from time previously employed for personal contacts (Nie, Hillygus, and Erbring 2002). Nevertheless, the preponderance of empirical work on the Internet's effects on sociability has found positive, if small effects (Shklovski In Press).

The effects of an e-mail broadcast on group density are particularly strong for small, low-density networks, which are common characteristics of informal, community-based associations. The overall impact of any observed increase in density, however, is mitigated by the manner in which the technology is

employed. Mediating factors include the importance of the message, the status of the message sender, the information processing capabilities of individuals, and the presence of alternative media (Ahuja and Carley 1999; Sproull and Kiesler 1991). Homophily is another factor to consider as an intermediate cause of higher density and when interpreting the effects of changes in density, because people who are similar to one another are more inclined to communicate in any medium.

The Internet and Network Centralization

The Internet is also likely to affect patterns of centralization within networks, but in contrast to density, the direction of change is not clear *a priori*. The use of e-mail might increase centralization if one or a few members use e-mail to broadcast to most other members of the network. To the degree that Internet use correlates with attributes that make an actor central to networks, such as high status and strong technical and communication skills, previously central members would become more central to a network when the Internet becomes available (Rethemeyer 2002). Nevertheless, the Internet may decrease network centralization if decreased costs generate more widespread communication throughout the network. Bikson and Eveland (1990) note that when groups with otherwise-similar tasks differ in their access to e-mail, those with access share leadership roles more than those without. Overall, existing empirical results support both causal directions, finding cases in which Internet use has both increased and decreased centralization (Ahuja and Carley 1999; O'Mahony and Barley 1999).

As with the discussion of density above, however, changes in centralization are mediated by characteristics of the network's members, not merely the technical attributes of the Internet. Real power in associations is redistributed more slowly than communication patterns. For example, O'Mahony and Barley conclude that the literature shows an "equalizing effect" among e-mail users, but "there is little evidence that computer mediated communication broadens democratic participation in organizational life" (1999, p. 135). In addition to the mediating effects of power differentials, different levels of Internet connectedness (Jung, Qiu, and Kim 2001) affect the likelihood of network members engaging in broadcasting and responses to broadcast messages. An association populated by members who desire more decentralized communication structures may nonetheless show evidence of high centralization if a few members high in Internet connectedness generate most messages.

Since the research into the effects of the Internet on the structure of social networks has not produced consistent findings that allow for firm predictions about the relationship between Internet use and density and centralization, our analysis is guided by the following basic research questions:

RQ1: Does use of electronic mail produce new patterns of communication in intra-association networks, or does e-mail simply replace previous modes of communication?
RQ2: Does use of electronic mail increase the density of intra-association networks?
RQ3: Does use of electronic mail increase the centralization of intra-association networks?

Methods

Participants

We explore these research questions employing a unique data set that includes social network indicators for a group of board members of neighborhood councils (NCs). In 1999, Los Angeles voters ratified a new charter that included provisions to create a system of neighborhood councils. Although officially considered organs of Los Angeles city government, neighborhood councils share many of the characteristics of informal associations. Other than requirements that neighborhood councils represent all segments of their neighborhood and that they have an elected board, the charter ceded great discretion to the neighborhoods in the design and makeup of their councils. In particular, each neighborhood was free to define its boundaries and develop its bylaws.

The boards differ in many respects. They represent neighborhoods encompassing between about 11,000 to more than 85,000 residents with an average population of about 40,000. These neighborhoods vary significantly in terms of socio-economic and ethnic makeup, from very rich enclaves of primarily white homeowners to diverse mixes of poorer, less educated recent immigrants. The neighborhood council boards are composed of between 9 and 41 members, with an average of 20. The boards that had organized earliest had been certified by the city for 20 months at the time of our survey, while other boards had been certified for as little as seven months. In all cases, however, ad hoc committees had been working to organize neighborhood councils for many months prior to certification. Some bylaws have created highly formal decision-making structures while others are less structured, allowing more fluid and spontaneous participation by stakeholders. Most importantly, these boards contend with many of the prototypical problems of informal, community organizations: (1) they rely on a small cadre of highly committed volunteers to keep the board together, (2) all members need to balance their NC activities with other responsibilities, and (3) the involvement levels of other members are fluid. The survey focused on elected board members, though there were notable cases in which highly active NC members did not hold board positions.

At the time of our survey, 45 NC boards had been certified by the city of Los Angeles and had sitting elected boards. Because we were unable to get complete lists of board members for four boards, they are excluded from a number of analyses, though we use the individual level data from those boards when appropriate.

Members of this research team personally visited board meetings and invited members to take the survey either online or by telephone in the summer of 2003. The survey was available in Spanish and English. Out of 894 total board members, 587 respondents began the survey, for a response rate of 66%. Five hundred and eighty-two surveys yielded usable network data, and of these 541 respondents had initiated contact with at least one other board member. In total, there are 3,141 communication dyads, including responses from the four incomplete boards. While this survey was designed to gather responses from all members of each eligible board, the response rate may be sufficient to estimate network characteristics with some confidence. Costenbader and Valente (2003) have shown that the measures of centrality employed here are fairly robust when response rates are higher than 60% within a network.

Measures

The questionnaire item of most importance in this paper presented board members with a list of all other members of their NC board. They were then asked, "Thinking about the two weeks just before your most recent Neighborhood Council meeting, which board members were you in touch with during that time to discuss matters concerning politics, government, or neighborhood issues?" For those members with whom they had been in contact, respondents were asked whether they had been in contact by e-mail, face-to-face, or by telephone. Multiple communication modes were accepted. Finally, the respondents rated the importance of contact with the other board member for their work on the NC. In a small network (as most of the NCs are), density is most accurately measured when respondents are able to select others from a complete roster with no limit on their nominations, and to employ loose criteria for nominating someone (Costenbader and Valente 2003; Scott 2000).

Respondents also were asked which of the stakeholder groups the city wanted the NCs to represent they felt closest to (these included such groups as residents, employers, property owners and those with children in the neighborhood's schools). Other items in the questionnaire provided indicators of Internet connectedness. These included measures of the respondents' confidence that they could perform a variety of tasks online, use of the Internet to gather information, and questions regarding the places from which they regularly have Internet access (e.g., home, school, their workplace, and libraries). These indicators were combined into a single scale measuring overall Internet connectedness. Respondents also were asked to rate their political conservatism or liberalism on a

five-point scale. Demographic variables included age, education, household income, ethnicity, and length of residence in their community.

Results

NC board members are not typical of the average resident in the neighborhoods they represent. Consistent with earlier findings about political participation, NC board members are more commonly white, wealthy, older, well educated, home owners, and long-time residents of their community (Verba, Schlozman, and Brady 1995) (Table 1). They expressed a much higher than average interest in politics, averaging 3.5 on a 4-point scale ranging from not at all interested to very interested. Their political ideology, however, did mirror the range of views of the entire city population, with most respondents expressing moderate views on a 5-point scale between very conservative and very liberal.

	N	Mean	Mode	Std. Dev.	Minimum	Maximum
Income in dollars	500	74,320	110,000	32,856	10,000	110,000
Education (years)	565	15.8	18.0	2.1	10	18
age (years)	558	51.1	49.5	12.6	16	68
Years lived in community	587	16.3	23.0	7.6	0.5	23
Interest in local politics	570	3.5	4	0.6	1	4
Political ideology	562	2.7	3	1.1	1	5
Uses Internet	563	93.1%				
Home Internet access	531	87.8%				

Table 1: Demographic Characteristics of Neighborhood Council Board Members

Board members operate in an environment in which e-mail is strongly promoted. The General Manager of the Department of Neighborhood Empowerment, the city department that manages the neighborhood council system, openly states that he is only able to communicate to individuals by e-mail due to the time pressures under which he works. Similarly, many intra- and inter-organizational conversations, activities, and notices are communicated over the Internet. Thus, NC members face pressures to adopt e-mail, and many of them have. Ninety-three percent accessed the Internet, and almost 88% had an Internet connection at home. Even on the least well connected board, 71% of its members were online and 67% had access at home. These results indicate a level of Internet connectedness higher than is usual in Los Angeles (Jung, Qiu, and Kim 2001; Loges and Jung 2001).

As is expected with informal organizations, the degree of individual involvement and group cohesion vary markedly. The average NC board member was in contact with about 38% of the other board members. The number of contacts, however, was skewed to the right by the small number of board

members who were most heavily involved. Less than 5% of board members contacted more than 85% of their colleagues, and this group accounted for over 19% of all contacts. Normalized network centrality varied accordingly, with an average of 4.9, but a maximum of 80.36. Only about 10% of board members had a normalized centrality above 10. At the board level, the average density was 37.4% with a high of 64.9% and a low of 13.9%. Normalized centralization averaged 27.8% and ranged between 3.6% and 79.7%.

E-mail and Patterns of Communication

Our findings show that e-mail plays a central role in intra-group communication for these organizations. As seen in Table 2, 21.3% of contacts between board members are mediated solely by e-mail, and in over 58% of all dyads, e-mail is at least one of the communication modes employed. There is a distinct bimodal distribution in the degree to which individuals rely on e-mail. Over 14% of board members have no contacts with others by e-mail, while 16.3% have employed e-mail communication with everyone with whom they have been in contact. The remaining 69% are uniformly distributed between these two extremes.

Communication Mode	Frequency	Percent
E-mail Only	657	21.3%
Offline Only	1288	41.7%
Both E-mail and Offline	1145	37.1%
Total	3090	100%

Table 2: Mode of Communication for All Dyads

As expected, discussion pairs composed of social and economic elites tend to rely more on e-mail either exclusively or in addition to offline modes of communication. Of more interest, time appears to play a role in the choice of communication modes. Individuals that have been involved with the board for a longer time tend to rely proportionally less on communications solely by e-mail and have more frequent face-to-face contact (Figure 1). Similar results were obtained for boards that have been certified for a longer period of time, but these results do not reach standard levels of statistical significance.

For dyads homophily is strongly associated with the choice of communication media, in that similar individuals are more likely to communicate by e-mail. Respondents were asked which stakeholder group they represented on the board; consequently, they can be divided into dyads between individuals from the same stakeholder group and those from differing stakeholder groups. Of the discussion pairs composed of members of the same group, over 70% employed e-mail, while

only 61% of discussion pairs composed of differing stakeholders did so. Similar results are obtained when one examines differences in political ideologies. Over 70% of the discussion pairs of individuals with identical ideological leanings are mediated by e-mail. In contrast, 68.4% of the discussions between individuals with the most extreme ideological differences occur solely offline.

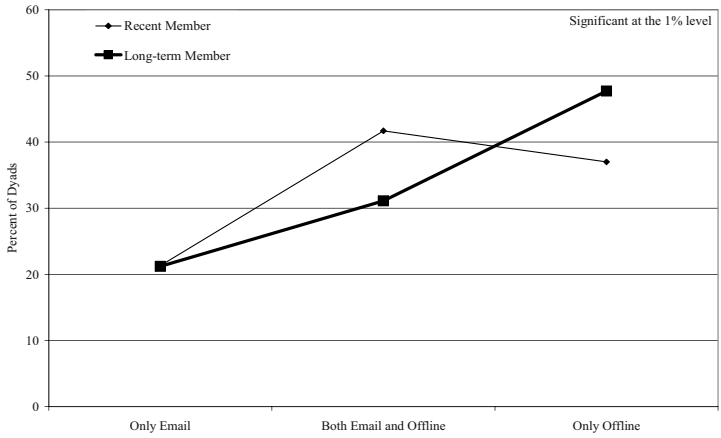

Figure 1. Choice of Communication Mode by Associational Tenure.

E-mail and Associational Density

Research question 2 involved the relationship between e-mail use and the network density of associations. Given that almost 22% of all contacts in our sample employ only e-mail communications, it is not surprising that e-mail appears to increase the density of NC board networks. If we assume that all e-mail-based communications constitute new contacts that would not have occurred in the absence of the availability of e-mail, the addition of e-mail to offline forms of communication increases the density for almost all boards. Of the 41 boards, 32 boards experience statistically significant (at the 5% level) increases in density ranging between .025 and .3. Another 4 boards experience smaller increases in density that are only statistically significant at the 10% level. The average increase is substantial. The average board in our sample has 20 members and an offline density of .3, indicating that 57 of the 190 possible pairs of organizational members are in contact with one another. When added, the e-mail network, on average, creates 13 new ties connecting a pair of board members.

To examine the extent to which e-mail communication really represents contact between members that would not have occurred in the absence of e-mail, we estimate a model of organizational density. For explanatory factors, we include

characteristics of organizational members, the age of the organization, and the number of members with high levels of Internet connectedness. This particular model is supported by the notion that due to the broadcast capability of e-mail, only a few Internet savvy members are needed to tie the group together through e-mail. Table 3 presents two versions of the model, one of the basic model and a second that includes organizational size because density is known to be sensitive to organizational size. The two models generally support the notion that having a larger number of Internet savvy members on a board increases group density, though in the second model the coefficient is only marginally statistically significant.

Variable	Model 1	Model 2
Average age	-.055 (.730)	-.175 (.212)
Average education (years)	.254* (.066)	.119 (.323)
Months since NC officially recognized by city	.247* (.065)	.204* (.072)
Average number of organizational memberships	-.059 .(696)	-.023 (.859)
Average hours of volunteer work	.508*** (.001)	.431*** (.002)
# of board members with high Internet connectedness (top quintile)	.414*** (.008)	.225* (.100)
Board size		.472*** (.000)
Adjusted R^2	.479	.642

Dependent variable is mean degree
N = 41 *** Sig. at .01 Level * Sig. at .10 Level
Reported coefficients are standardized betas. T-scores are reported in parentheses.

Table 3: Board Network Density as a Function of Internet Use

Moreover, the importance of the broadcast capability of e-mail to increasing organizational density is borne out by the pattern of e-mail communications. Among the council board members examined here, wide use of e-mail is relatively rare. Only 18 out of 522 board members (3.4%) contact 85% or more of their board through e-mail. E-mail, though, is clearly preferred when one wishes to communicate broadly. Only two members contacted 85% or more of their board by phone, and only six did so face-to-face. These individuals who employ e-mail broadly, moreover, are associated with those boards for which e-mail increased their density most. For the ten boards that had the largest increases in density associated with e-mail, eight had at least one member that contacted at least 85% percent of the board by e-mail. In contrast, of the other 31 boards only six included such an e-mail broadcaster.

Organizational Network Centralization and Actor Centrality

Research question 3 concerned the relationship between e-mail use and network centralization. As the empirical literature has found, the relationship between the use of Internet communications and group centralization is ambiguous. An important contingency factor is the distribution of Internet use. A single or only a few users who employ e-mail lists to broadcast messages can increase centralization. This effect is countered by the degree to which the lower communication costs associated with e-mail decrease the burden of maintaining redundant ties, leading to more dynamic communication exchanges between a larger proportion of organization members.

The importance of the distribution of Internet use and other intermediary factors is evident in these organizations. We calculated a measure of the change of centralization due to e-mail communications, equaling the betweeness centralization index for each board including all contacts minus the same index for only offline communications. The results vary widely. Forty-six percent of the boards saw centralization decrease with the addition of e-mail links, 46.3% saw centralization increase, and 7.3% saw no change.

To examine how both the intensity and distribution of e-mail use among organization members affect centralization, we regressed centralization on three variables: 1) the proportion of overall board communications that employ e-mail, 2) a dummy variable equal to 1 for boards with higher than average variance in e-mail use among its members and 0 otherwise, and 3) an interaction term between the first two variables. The results presented in Table 4 show that overall boards that rely more heavily on e-mail are not, on average, more or less centralized. Boards in which members vary more in their use of e-mail are, on average, less centralized, but centralization in these boards increases markedly as they rely more on e-mail communications. In sum, it is the combination of e-mail use and the distribution of its use that matters. Increased use of e-mail in an organization composed of members with similar levels of e-mail use decreases centralization, but in an organization composed of members with disparate e-mail use patterns, e-mail leads to increased centralization.

In contrast to these results on group centralization, e-mail use does not appear to have a significant effect on individuals' centrality within their neighborhood council boards. The correlation between individuals' centrality within networks of offline communications and their centrality within online communications is relatively low, only .31. This suggests that the advent of e-mail could be enabling some individuals to rise in centrality within associations. However, e-mail communication does little to alter the core of individuals who appear to control these neighborhood councils. In 17 of 41 boards, the five most central actors are also the five most central in the offline network, and in another 16 boards only one of the five most central actors was not in the top five in the offline network. In

only one board was it the case that all five of the most central actors were not among the most central members in the offline network.

Variable	Model
Proportion of communication by e-mail in board	-.077 (-.451)
High variation in e-mail use	-1.13** (-2.33)
High Variation * Proportion of e-mail	1.47*** (2.87)
Adjusted R^2	.194

Dependent variable is mean degree
N = 41 ***Sig. At .01 Level ** Sig. at .05 Level
Reported coefficients are standardized betas. T-scores are reported in parentheses.

Table 4: Board Network Density as a Function of Internet Use

Discussion

Voluntary associations that seek to work together to strengthen their communities require conditions that encourage cohesion among their members and a structure that encourages participation. A large number of theorists have linked the development of large-scale organizations and other social structures to developments in information technology (Bell 1974; Beniger 1986; Castells 2000; Innis 1951; Pool 1977; Pool 1983). However, they often have little to say about the micro- or meso-level processes that must accompany the macro-level social changes they describe. Our results on the micro-level organizational impacts of information technology provide qualified support for claims about the social influence of information technology, but we find that the effects of the Internet do not necessarily lead to more democratic structures.

Use of the Internet provides organizations with some specific capabilities that can build cohesion and generate communication that might not otherwise occur. However, we find that e-mail contact is more common between people who are similar to one another in their political outlook and the interests they represent on their neighborhood council. The broadcast capability of the Internet may allow information to be shared throughout a group efficiently, and thus reassure members that they are on an equal footing where information-access is concerned. But the purpose of that equality is to allow people of diverse backgrounds and interests to work together for the common good. If e-mail becomes a medium that allows cliques to form more effectively, the cohesion of the association could be threatened.

We find that Internet use increases the density of associational communications. To the extent that increased density helps associations maintain contact, disseminate information quickly and efficiently, monitor the actions of

members, and forge social bonds that prepare them for the give and take of neighborhood-level politics, new technology has the potential to mitigate a fundamental obstacle to group cohesion and collective action. This shift has the potential to strengthen and expand the role of associational activity in a wide range of social arenas such as urban governance and non-profit service provision.

Associations relying on the Internet do not appear to develop less centralized, more democratic structures than less-Internet connected groups. In fact, if members within an association differ widely in the extent of their Internet connectedness, the association may tend toward greater centralization in the communication within the group as one or two members become conduits through which more and more messages pass. This might encourage members to acquire more Internet skills, but it may also encourage free-riding as the association's members assume that the more highly Internet-connected among them will perform the lion's share of the group's communication work (such as distributing information internally and maintaining contacts outside the association).

Further research is required to identify the specific role that Internet communications play in organizational activity. We find, for example, that the propensity to use the Internet for associational communication decreases as tenure in the association grows longer. This tendency suggests that the Internet is more helpful for forming initial ties within the association than it is for maintaining these ties on an ongoing basis. Associations like neighborhood councils in Los Angeles begin with no routine tasks, no clear role definitions, and no specific times and places at which the group will meet. As the association matures, routines and roles stabilize. The Internet appears most helpful in the early, somewhat chaotic phase of association life –what population ecologists termed as the challenges associated with liability of newness– and less helpful as routines become established.

Our findings support the utility of employing a soft technological determinism perspective given that we find that individuals' goals, skills, and social context do influence the use and impacts of technology. The relationship between Internet use and associational centralization is the most obvious example. It is not the mere presence of the Internet that centralizes an association, but the distribution of people with various levels of skill and inclination to use the Internet that makes a difference in centralization. To the extent that democratization and decentralization are similar and reinforcing concepts, the findings indicate that the Internet will foster democratic associations only if the people in these associations have similar levels of Internet connectedness. In this way, Internet connectedness becomes akin to a civic skill. It also implies a digital divide problem—people with less Internet access (for whatever reasons) may be able to join a NC, but not as able to become a central player in the NC, thereby receiving information later and less reliably. Since Internet access is correlated with socioeconomic status, ethnicity, and age in Los Angeles (Jung, Qiu, and Kim 2001; Loges and Jung

2001), neighborhood councils in places with concentrations of low-connected people may consist of board members who are less representative of their neighbors than other boards.

The addition of the Internet to the toolkits of community organizations does not have totally predictable results. The motives and interests of the members of an association will be influential in determining the difference the Internet makes. Awareness of the potential benefits of the Internet and of the potential pitfalls can prepare an association to take steps to get the most out of this technology. Most of the impacts we report here, positive or negative, can be affected by decisions members of an association make deliberately, such as providing Internet training for less-skilled members. It is important that theories of the way the Internet affects human communication not be understood to make such effects inevitable, leading to blue-sky expectations or needless fears that keep people from realizing the advantages they and their associations might have enjoyed.

Acknowledgments

This research was supported by National Science Foundation Information Technology Research Grant #0112899. The authors would like to thank attendees of the University of California, Irvine Social Network seminar and the USC seminar series on civic enterprise for helpful comments. In addition, we thank Kyu-Nahm Jun, Mark Elliot, and the Los Angeles Department of Neighborhood Empowerment for their assistance. All errors are our own.

References

Ahuja, Manju K. and Kathleen M. Carley. 1999. Network Structure in Virtual Organizations." *Organization Science* 10:741-757.

Ball-Rokeach, S. J., Y. K. Kim, and S. Matei. 2001. "A communication infrastructure perspective on communication and society." vol. 2001: Annenberg Center for Communication, University of Southern California.

Bell, D. 1974. *The Coming of Post-Industrial Society: A Venture in Social Forecasting*. London, UK.: Heinemann.

Beniger, J.R. 1986. *The control revolution: Technological and economic origins of the information society*. Cambridge, MA: Harvard University Press.

Brass, D. J. 1995. "A Social Network Perspective on Human Resources Management." Pp. 39-79 in *Research in Personnel and Human Resources Management*, edited by G. Ferris. Greenwich, CT: JAI Press.

Burt, Donald S. 2000. "The Network Structure of Social Capital." in *Research in Organizational Behavior*, vol. 22, edited by R. I. S. a. B. M. Staw. Grenwich: JAI Press.

Cason, T. and F. Khan. 1999. "A laboratory study of voluntary public goods provision with imperfect monitoring and communication." *Journal of Development Economics* 58:533-552.

Castells, M. 2000. *The Rise of the Network Society*. Malden, MA: Blackwell.

Chaskin, Robert J., Prudence Brown, Sudhir Venkatesh, and Avis Vidal. 2001. *Building Community Capacity*. New York: Aldine de Gruyter.

Coleman, James S. 1990. *Foundations of Social Theory*: Harvard University Press.

Costenbader, Elizabeth and Thomas W. Valente. 2003. "The stability of centrality measures when networks are sampled." *Social Networks* 25:283-307.

Freeman, L.C. 1979. "Centrality in social networks: conceptual clarification." *Social Networks* 1:215-239.

Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78:1360-1380.

Heckathorn, Douglas D. 1993. "Collective action and group heterogeneity." *American Sociological Review* 58:329-350.

Huckfeldt, Robert and John Sprague. 1987. "Networks in Context: The Social Flow of Political Information." *American Political Science Review* 81.

Ibarra, H. 1993. "Network centrality, power, and innovation involvement: Determinants of technical and administrative roles." *Academy of Management Journal*:471-501.

Innis, Harold Adam. 1951. *The Bias of Communication*. Toronto: University of Toronto Press.

Jung, Joo-Young, Jack L. Qiu, and Yong-Chan Kim. 2001. "Internet connectedness and inequality: Beyond the "divide"." *Communication Research* 28:507-535.

Krackhardt, David. and D. J. Brass. 1994. "Intraorganizational Networks: The Micro Side." Pp. 207-229 in *Advances in Social Network Analysis: Research in the Social and Behavioral Sciences*, edited by S. Wasserman, Galaskiewicz, J. Thousand Oaks, CA: Sage Publications.

Lipset, Seymour Martin. 1981. *Political Man*. Balimore: Johns Hopkins Press.

Loges, William E. and Joo-Young Jung. 2001. "Exploring the digital divide: Internet connectedness and age." *Communication Research* 28:536-562.

Macy, M. W. 1991. "Chains of cooperation: Threshold effects in collective action." *American Sociological Review* 56:730-747.

Monge, Peter R. and N.S. Contractor. 2003. *Theories of Communication Networks*. New York: Oxford University Press.

Mutz, Diana C. 2002. "Cross-Cutting Social Networks: Testing Democratic Theory in Practice." *American Political Science Review* 96:111-126.

Nie, N., S. Hillygus, and L. Erbring. 2002. "Internet Use, Interpersonal Relations and Sociability: Findings from a Detailed Time Diary Study." in *The Internet in Everyday Life*, edited by B. Wellman and C. Haythornthwaite. Malden, CA: Blackwell.

O'Mahony, S. and S.R. Barley. 1999. "Do digital telecommunications affect work and organization? The state of our knowledge." *Research in Organizational Behavior* 21:125-161.

Parsons, Talcott. 1971. *The System of Modern Societies*. Englewood Cliffs, NJ: Prentice-Hall.

Pool, Ithiel de Sola. 1977. "The Social Impact of the Telephone." Pp. 502. Cambridge, Massachusetts: The MIT Press.

—. 1983. *Technologies of Freedom*. Cambridge, MA: The Belknap Press of Harvard University Press.

Putnam, Robert D. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.

—. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.

Rethemeyer, Randy Karl. 2002. "Centralization or democratization: Assessing the Internet's impact on policy networks. A theoretical and empirical inquiry." Ph.D. Thesis, Public Administration, Harvard University.

Rogers, E.M. 2003. *Diffusion of innovations*. New York: Free Press.

Scott, J. 2000. *Social Network Analysis: A Handbook*. Thousand Oaks, CA: Sage.

Sell, J. and R. Wilson. 1991. "Levels of information and contributions to public goods." *Social Forces* 70:107-124.

Shklovski, I., Kiesler, S., Kraut, R. E.. In Press. "The Internet and Social Interaction: A Meta-analysis and Critique of Studies, 1995-2003." in *Domesticating Information Technology*, edited by R. Kraut, M. Brynin, and S. Kiesler. New York: Oxford University Press.

Sproull, L. and S. Kiesler. 1986. "Reducing social context cues: Electronic mail in organizational communication." *Management Science* 32:1492-1512.

—. 1991. *Connections: New ways of working in the networked organization*. Cambridge, MA: MIT Press.

Verba, Sidney, Kay Lehman Schlozman, and Henry E. Brady. 1995. *Voice and Equality: Civic Voluntarism in American Politics*. Cambridge, MA: Harvard University Press.

Warren, Mark E. 2001. *Democracy and Association*. Princeton, NJ: Princeton University Press.

Wasserman, Stanley and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*, Edited by M. Granovetter. New York: Cambridge University Press.

Weare, Christopher. 2002. "The Internet and Democracy: The Causal Links Between Technology and Politics." *International Journal of Public Administration* 25:659-692.

Weatherford, M.S. 1982. "Interpersonal Networks and Political Behavior." *American Journal of Political Science* 26.

Wood, A.F. and M.J. Smith. 2001. *Online communication: Linking technology, identity, & culture*. Mahwah, NJ: Laurence Erlbaum Associates.