

Almost half the population of Blacksburg, Virginia are Internet veterans, having spent the past three years at the core of one of the most advanced community network projects in the U.S.

Developing *the* Blacksburg Electronic Village

John M. Carroll and Mary Beth Rosson

BUILDING COMMUNITY NETWORKS IS, IN SOME RESPECTS, AN ODD IDEA. NETWORKS facilitate interaction among individuals who are physically remote—in distributed work groups and interest groups. Why would anyone want a network connection to their next-door neighbor? In fact, community networks are a big idea. Over the past 20 years, since the Community Memory project in

Berkeley, Calif., the idea has caught on in hundreds of community networks across North America and the world. They provide forums for community discussion and access to government, public health information, economic development, and public education. In most cases, they started as outreach or service projects of universities, as initiatives of local governments, and as public interest projects of energetic citizens. They offer a unique vision of grassroots technology development [1–3, 5, 11].

In January 1994, we became professors at Virginia Tech, residents of Blacksburg, Virginia, and participant-observers in the Blacksburg

Electronic Village. This article is an overview of our observations, discussions, and projects within the local community network.

The Blacksburg Electronic Village (BEV), in operation since October 1993, is a technologically advanced community network. The project was originally constituted as a partnership among the town of Blacksburg, Virginia Tech, and Bell Atlantic to improve community networking service to the level available on the Virginia Tech campus. Bell Atlantic agreed to install a Number 5 ESS digital electronic switch and to run T1 ethernet to the public library as well as to several hundred apartments and some

of the town's public schools. Virginia Tech provided personnel for a core management-development team [10, 12]

The BEV provides access to a huge volume of information and services; including health information from local doctors, local bus schedules, projects by school children, the rugby football club schedule, discussion of regional power line and highway proposals, information on area museums and a string quartet, and access to the Internet. BEV user surveys have consistently found the principal uses of the network are learning and teaching, civic interests, social relations, support for work or business, consumer information, entertainment, and medical services

(<http://www.bev.net/project/research/>).

The BEV has grown and diversified at a remarkable rate, perhaps because it is managed in a highly distributed fashion. The BEV development team supports a top-level information framework (see the BEV homepage structure in Figure 1), but generally, after the first link, the information and services in the BEV belong to the town, to various community groups and businesses, and to individuals. Since April 1994, when the BEV staff began archiving access data, the access rate for BEV material on the Web has increased 1,000-fold (see Figure 2). In January 1995, 880 unique pages were accessed; in January 1996, the corresponding number was 7,300. All 20 local public schools now have a Web presence.

The BEV hosts 14 community newsgroups on a variety of topics, four listservs, and its own chat room. More than 100 community groups and 200 local businesses maintain BEV sites.

A substantial portion of the local community has access to the BEV. The BEV office estimates the network currently serves more than 17,000 community members (<http://www.bev.net/project/stats.html>); more than 45% of the population of Blacksburg has access to the BEV at home or at work. Users are preponderantly affiliated with Virginia Tech: 85% of those with access to the BEV are Tech-affiliated; the town's population is 75% Tech-affiliated. There are approximately 4,000 registered members—people whose specific reason for being connected is to participate in the BEV; 48% of the registered members are Tech-affiliated (see <http://www.bev.net/project/stats.html>).

Participation in the BEV is demographically broad. In a November 1995 survey, 33% of new members were female, a rather high proportion relative to network communities, such as newsgroups and multi-user domains (MUDs), and high even for communi-

ty networks (e.g., Santa Monica PEN [9]). Three of the most active community group sites in the BEV are those of the seniors, the Islamic Center, and the arts council.

The most important lesson from the BEV project to date is that an advanced network infrastructure provides the only opportunity for a community network. Human resources are the critical element. The *raison d'être* of the BEV is increasing access to and participation in community life. This goal is being realized in the BEV through three principal mecha-

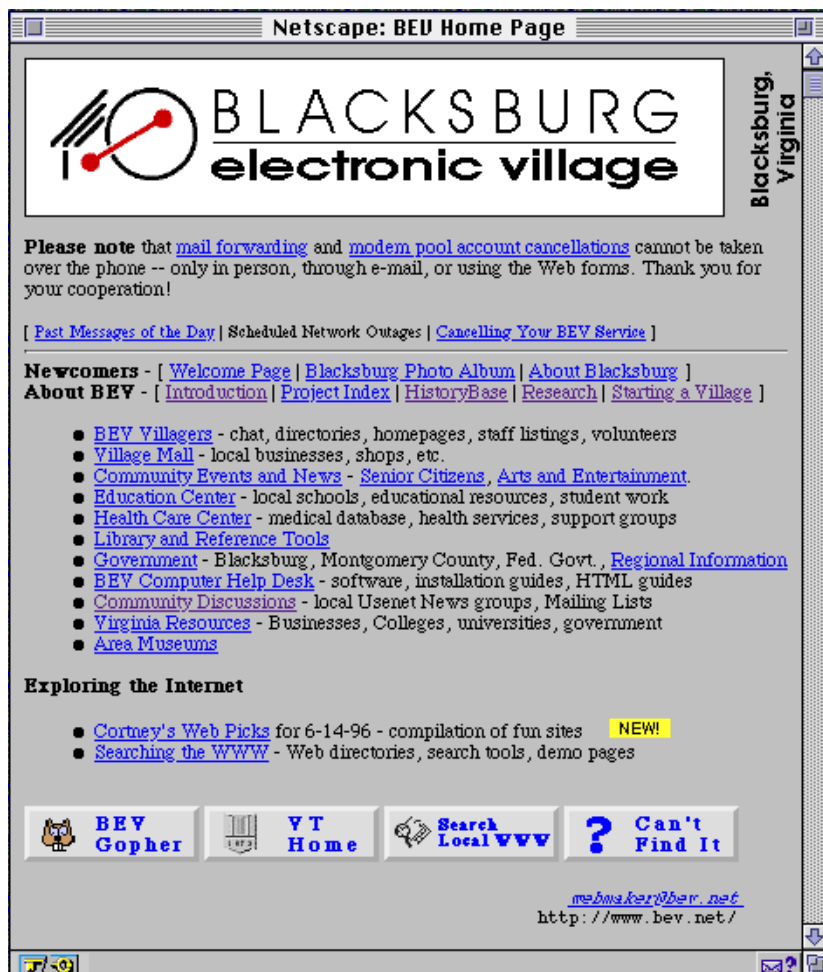


Figure 1. Homepage of the Blacksburg Electronic Village (<http://www.bev.net>). The links on this page provide a broad overall framework for information and services within the BEV. Note references at the top to the shift to private network access providers currently under way in the BEV (see text for discussion).

nisms of grassroots technology development. Some groups have begun managing their own communication and activities through the BEV, becoming models for others [8]. Other groups have made entrepreneurial use of the BEV, reaching out to and inspiring the larger community through advertising and recruiting. Still others have extended the BEV itself, creating new online services and applications, and new activities for the community.

Increasing Access and Participation

Perhaps the most obvious human impact of the BEV on the Blacksburg community has been increased access to information and easier participation in community life. The town of Blacksburg routinely posts information of community interest that would otherwise require special effort to obtain (e.g., all the maps, descriptions, and background documents pertaining to a rezoning proposal). The town has also used the BEV to facilitate communication from residents; citizens can fill out the county survey online, send email to officials and departments with a single mouse click (<http://www.bnt.com:80/~bburg/post.html>), and fill out an online form to request a vacation house check, or apply for municipal permits. In 1995, the town provided \$15,000 in seed grants to assist 47 local businesses in developing Web pages for the BEV.

The public library is another focus for access and participation. The library provides a bank of eight public terminals for access to the BEV; from January 1994 to January 1996, these terminals hosted more than 75,000 sessions (<http://www.bev.net/project/stats.html>). The library provides staff time for technical support and offers a series of short courses on using computer networks. The library maintains a listing of 150 nonprofit community organizations on its BEV site, with active links to 90 organizations (<http://www.montgomery-floyd.lib.va.us/pub/libpages/orgs.html>). It also assists community groups that wish to develop homepages, offering workshops and fielding email queries.

The local schools have initiated a variety of projects that increase community access to and participation in school activities. For example, middle school students worked with community members to gather materials for a multimedia history of Blacksburg, high school physics students posted positions and discussions about social issues in science, and

high school chemistry students answered email science questions submitted by other students [7]. These projects galvanized the county school system's commitment to networking. Using its own resources, the school system networked all secondary school libraries and contracted to install a fiber backbone in every school, along with fiber and copper drops to every classroom and work area by the end of 1996 (<http://www.bev.net/education/schools/>).

Access and participation have become community goals beyond the public sector. A local physician created a gopher site of medical journal summaries ([gopher://crusher.bev.net:70/11s/Health/Hendricks](http://crusher.bev.net:70/11s/Health/Hendricks)). A restaurant installed a networked PC at the bar. The owner believed it would be "a useful and unique experiment" to facilitate informal peer learning through

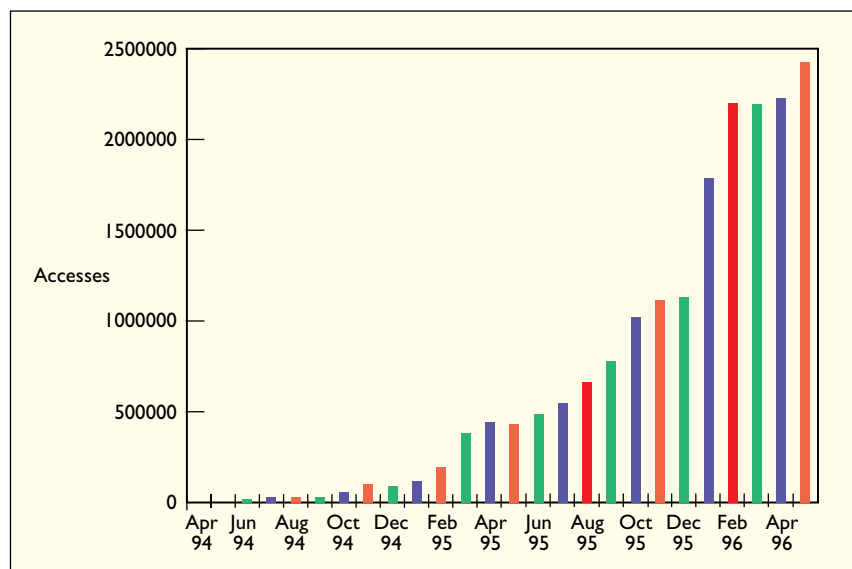


Figure 2. Accesses to BEV pages over a 30-month period, ranging from 2,490 to 2,374,222 accesses per month. Monthly averages are 38,503 for 1994 (9 months); 597,625 for 1995 (12 months); and 2,157,839 for 1996 (9 months). See <http://www.bev.net:80/wwwstat/> for additional information.

show-and-tell discussion. Indeed, the BEV management-development team found that the most significant community need has been education and help programs. For example, from October 1994 to January 1996, the volunteer group organized by the BEV team responded to approximately 44,000 calls from BEV users (<http://www.bev.net/project/stats.html>).

Flourishing Subcommunities

Much of the activity in the BEV occurs within particular subcommunities, providing services and communication for their own members. For example, a very active seniors group meets regularly (approximately

once a month) and maintains a list of local programs for seniors as well as links to the calendar of seniors events provided by the local newspaper (e.g., walks, lunches, and lectures) and to other relevant sites around the world (e.g., SeniorNet and SeniorCom). The seniors also have their own listserv discussion group, currently 81 subscribers.

Several churches are among the community groups comprising well-defined pockets of BEV subcommunity activity. They have developed homepages displaying the church's mission statement, schedule of events, monthly bulletin, email list and directory, links to the congregation's community projects and to its sister congregations, reports from missionaries, and translations of scriptural passages. One informant estimated that 50%–80% of his congregation's weekly communication is now conducted by email (e.g., the choir's music selection, agreement on keys and chords, exchanging of lyrics, and scheduling of practices). He articulated the belief that these new channels have increased communication among church members.

A particularly interesting subcommunity is the

subcommunities, mutual help and education was a prominent activity. One of the main activities in the BEV is for people to help their neighbors learn about the BEV and about general network technology. This focus is understandable in that participation in the BEV has expanded rapidly, including a high proportion of new users at any time. But the extent to which helping and education come up in these accounts led us to wonder how helping interactions are used to initiate broader mutual cooperation.

Entrepreneurial Activities

The BEV is fueled to a great extent by energy that is simultaneously entrepreneurial and community-oriented. Many of the leading pockets of subcommunity activity can be traced to a single person who showed initiative. In many cases, we found that curiosity about network technology was an important factor. People who are now BEV community leaders acknowledged that they had originally become involved to learn about HTML and CGI-forms; some were home-computer hobbyists (as one put it: "modeming since the late 1970s") who saw the BEV as

User surveys consistently find the principal uses of the network are learning and teaching, civic interests, social relations, support for work or business, consumer information, entertainment, and medical services.

BEV-news listserv. The original purpose of BEV-news was online community discussion of BEV policies. The BEV management-development team members participate, and there are about 350 community list members. Policy discussions occur through this listserv (BEV users are currently concerned with how the BEV will work when commercial providers replace Virginia Tech as the principal source of network access; see Figure 1). However, during a 20-month period when we archived BEV-news email, we observed a much broader range of discussion topics, including help, announcements of current events, town issues (such as parking tickets and restaurant critiques), personal matters (such as birth announcements), and pointers to and discussions of network resources. Most of the email came from community residents; input from the BEV management team was about 13%. Starting in 1995, the group began organizing social gatherings for itself, becoming a community group in its own right, not just a listserv.

An interesting fact about BEV news is that 35% of all the traffic pertains to help and education (with less than 10% of this support coming from the BEV management team). We found that among all of the BEV

the logical next horizon for their interests.

The BEV has provided a channel for various entrepreneurial endeavors. For example, the mountain biking club has used it to broaden its membership pool (originally only Virginia Tech students). Similarly, the community theater group uses the BEV to inform people of plays it is producing and performing, and the hunting club uses it to recruit new members and to inform the community about training and other services the club provides. Church groups reported that their information is often accessed by people moving to the Blacksburg area or are considering a move and looking for a church. Some of the non-Christian denominations emphasized the role of the BEV in enhancing, as one member put it: "the diversity, richness, and quality of life in Blacksburg," by making their groups more visible to everyone.

Economic development was always a strong theme in the BEV and was a central element in the BEV vision [10, 12]. More than 200 local businesses (approximately 25% of all Blacksburg businesses) have some sort of presence in the BEV—a Web page in many cases. Most view their participation as both supportive of community initiative and as a means of

advertising. Some mentioned worldwide exposure for their groups or businesses as a motivation. Yet, so far, the specific business rewards are uncertain; none of the businesses we interviewed has documented commercial advantages to date. We interviewed several businesses that chose to not participate in the BEV for reasons that included concerns about depersonalizing relations with clients, lack of relevant knowledge and skills, and fear of exposing their information to competitors.

A good example of entrepreneurial leadership is the Web-based ordering service developed by a local grocery store. Forms-capable Web browsers can be used to order flowers and customizable “care packages” of foods (<http://www.bnt.com/~wades/index.html/>). A Blacksburg travel agency accepts itineraries and requests for accommodations, car rentals, and other services through Web forms (<http://www.bnt.com/utc/request.html>). At several restaurants, one can order ahead or reserve a table through the BEV. We were impressed that even commercial entrepreneurial activities manifest strong community-oriented goals and motives. As a local garden store owner told us, his ambition is to be “the leading horticulture/plant info center in BEV.” It is interesting that the community here is referenced as the community network.

New Applications

Community networks are typically constructed by the community in the sense that their content is created by the community's members. In the BEV, we have seen an extension of this paradigm in the building of new services and applications by members of the Blacksburg community. The forms-based ordering services are an example. About three dozen small local companies have emerged to assist with development of network services and applications; at least two local Web-page builders have gone into business.

A more experimental direction is illustrated by MOOsburg, a locally developed multi-user (object-oriented) domain (<http://hci.ise.vt.edu/~jkies/Moosburg.html>). Unlike most MOOs, the domain model was a real and familiar physical place—the town of Blacksburg and the Virginia Tech campus. The concept for MOOsburg emphasized building; every user was granted programming privileges. Initially, only a two-block kernel of downtown Blacksburg was modeled, but it expanded quickly as the user group grew to several hundred over a couple months. Many users adopted the goal of building their own isomorphic spaces; people extended the MOO to add their own place of work or home to the MOO's domain model. For example, the Science Fiction Club began using MOOsburg for its meetings, and several other clubs and some Virginia Tech class-

es soon did the same. This activity instigated a variety of new services within the MOO, including land-use planning and rentals, meeting scheduling, management of programmed objects, and more [6].

A project initiated by the seniors group involves an effort to gather and organize recollections and artifacts of long-time residents. The Nostalgia Project began with discussions on the seniors' listserv, exchange of stories and reflections through email, and a series of organizational meetings. A forms-based Web-application for collecting and annotating stories was announced in June 1996.

Currently, four local schools are working with a group of Virginia Tech faculty and students to develop a virtual science lab within the BEV. This project addresses the lack of teachers, equipment, and sufficient enrollment that are often problems for science courses in rural schools. The virtual lab will support collaborative access to simulation software and real-time chat, allowing students in Blacksburg middle school and high school to work with students from nearby rural schools. Another goal of the project is to conduct a virtual science fair within the BEV; parents and other community members can participate more intensively, more interactively, and over a longer period with students working on science projects.

Reintegrating the Community

Community networks push beyond traditional metaphors for community coherence. They are not merely electronic potbellied stoves. Modern communities, even relatively small ones like Blacksburg, are too large and diverse for everyone to crowd around a single stove. And to some extent, the separate threads we examined earlier conflict. The visions of wide access and participation, well-developed but somewhat insular subcommunities, entrepreneurial initiative, and independently originated new applications and services are not the same vision [12]. Yet this diversity can be a resource to the community if it can be effectively integrated. Unlike a potbellied stove, the BEV can support multiple views of the community, facilitating diversity, and providing various subcommunities their own spaces and activities, but it can also recruit that diversity to enrich the entire community.

One approach to integrating pockets of activity within the larger BEV community is the BEV History-Base [4], one of the BEV's core applications (see Figure 1), which initially sought to make primary sources pertaining to the BEV accessible to all members of the community and to the developers of other community networks wishing to use the BEV as a model. It included original planning documents, advisory committee meeting records, message-of-the-day items, brochures and user guides, interviews with communi-

ty members, issues of the BEV newsletter, reports of visits, demos, community social events, talks and papers describing BEV research, and pointers to media coverage of the BEV project, among others.

Anyone with a BEV user id can contribute a document to the HistoryBase or annotate an extant document; the system is read-only from outside the BEV domain. In addition to text, the HistoryBase includes digital speech (e.g., reflections of a teacher on the role of the BEV in educational reform), images (e.g., photographs of the management-development group), and video (e.g., excerpts from CNN coverage of the BEV project). Currently, the database includes more than 350 documents (<http://history.bev.net/bevhist/>).

The HistoryBase provides a general mechanism for organizing, retrieving, and discussing BEV activities, offering the functionality of a general-purpose community database. Users can search for specific pieces of information, browse the entire document set, or access filtered views of the data. For example, one can view the minutes of the Blacksburg Telecommunications Advisory Committee in a homogeneous list of minutes documents, but one can also browse these documents in the context of all other BEV documents. (The Nostalgia Project is being developed as a subview of the HistoryBase.)

No one yet can assess the long-term effects of community networks. Will this grassroots technology support the revitalization of community life? Are community networks sustainable? At just over three years old, the BEV is one of the oldest community networks, yet its membership and core applications are still expanding and diversifying so rapidly it has remained a perpetual novelty in many respects. Indeed, we identified the creation of new applications and services as an important mode of routine participation in the BEV across the community, and training and help as among the most typical activities.

The BEV has evolved into a large-scale, distributed participatory design project in which a range of community constituencies have initiated specific grassroots developments within a broad framework. The conclusion we (and our neighbors) are exploring is that the communitywide objective of broad access and participation can be amplified by more local initiatives—entrepreneurial innovation, subcommunity development, independent building. A key challenge for the BEV is maintaining the balance among these threads of activity to ensure synergy. ■

Acknowledgements

Many Virginia Tech students have worked with us on BEV projects as designers and investigators. The work described here was carried out with Brian Amento, David DeVaux, Mike Duckett, Markus Gröner, Jonathan Kies, Neill Kipp, Stuart Laughton, Olivier

Marchand, Michael Mellott, Mark Missana, Jongwon Park, K. William Schmidt, Jock Schorger, Carmen Sears, and Craig Struble. Many Blacksburg and BEV community members have also worked with us; we are particularly grateful to Connie Anderson, Larry Arrington, Andrew Cohill, Ed Fox, Mark Freeman, Keith Furr, Andrea Kavanaugh, John Kelso, Cortney Martin, Suzan Mauney, Ed Schwab, and Luke Ward.

References

1. Agre, P. and Schuler, D. (Eds.) *Reinventing Technology, Rediscovering Community: Critical Explorations of Computing as a Social Practice*. Ablex, Norwood, N.J., 1996.
2. Anderson, R.H., Bikson, T.K., Law, S.A., and Mitchell, B.M. *Universal Access to E-mail: Feasibility and Societal Implications*. Rand, Santa Monica, Calif., 1995.
3. Beamish, A. Communities On-Line: Community-Based Computer Networks. Masters Thesis, Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, Mass., 1995.
4. Carroll, J.M., Rosson, M.B., Cohill, A.M., and Schorger, J. Building a history of Blacksburg Electronic Village. In *Proceedings of DIS'95: Symposium on Designing Interactive Systems: Processes, Practices, Methods and Techniques*. (Aug. 23–25, 1995, Ann Arbor, Mich.). ACM Press, New York, pp. 1–6.
5. Cisler, S. (Ed.) *Ties That Bind: Converging Communities*. Apple Computer Library. Cupertino, Calif., 1995.
6. Kies, J.K., Amento, B.S., Mellott, M.E., and Struble, C.A. MOOsburg: Experiences with a community-based MOO. Hypermedia Technical Report HCIL-96-03, 1996. Available at: <http://hci.isc.vt.edu/~hcil/HTR/HCIL-96-03.html>
7. Laughton, S. The Design and Use of Internet-Mediated Communication Applications in Education: An Ethnographic Study. Ph.D. Dissertation, Computer Science Department, Virginia Tech, Blacksburg, Va., 1996.
8. Rogers, E.M. *Diffusion of Innovations* (3rd Ed.). The Free Press, New York, 1983.
9. Rogers, E.M., Collins-Jarvis, L., and Schmitz, J. The PEN project in Santa Monica: Interactive communication, equality, and political action. *J. Amer. Soc. Info. Sci.* 45, 6 (1995), 401–410.
10. Schorger, J.R. If We Build It, Will They Come? The Blacksburg Electronic Village: Development and Implementation. Ph.D. Dissertation, Curriculum and Instruction Department, Virginia Tech, Blacksburg, Va., 1995.
11. Schuler, D. *New Community Networks: Wired for Change*. Addison-Wesley, Reading, Mass., 1996.
12. Sears, C. (Re)visions of the Village: Building and Participating in the Blacksburg Electronic Village. Masters Thesis, Center for Science and Technology Studies, Virginia Tech, Blacksburg, Va., 1996.

JOHN M. CARROLL (carroll@cs.vt.edu) is a professor of computer science and psychology, director of the Center for Human-Computer Interaction, and head of the Department of Computer Science at Virginia Tech in Blacksburg, Va.

MARY BETH ROSSON (rosson@cs.vt.edu) is an associate professor in the Department of Computer Science at Virginia Tech.

This work was supported by NSF CDA-9424506 to J. Carroll, A. Cohill, G. Downey, E. Fox, and M.B. Rosson, and by NSF REC-9554206 to J. Carroll, C. Shaffer, M.B. Rosson, J. Burton, and L. Arrington.

Permission to make digital/hard copy of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage, the copyright notice, the title of the publication and its date appear, and notice is given that copying is by permission of ACM, Inc. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or a fee.