

Starr Roxanne Hiltz: Pioneer Digital Sociologist

Ramesh Subramanian
Quinnipiac University

Editor: Thomas Haigh



In 1978, an intriguing new book appeared, *The Network Nation: Human Communication Via Computer*,¹ the brainchild of a sociologist named Starr Roxanne Hiltz and Murray Turoff, the “father” of the first computer conferencing system EMISARI (Emergency Management

Information System and Reference Index). It was a technical work on computer networks and computer conferencing. *The Network Nation* was also the earliest work describing the sociology of a new type of community—a networked community of people spread around the globe, connected only through a computer network, who met, worked, discussed, argued, and collaborated entirely on the networked platform. The book was a crystal ball of sorts, offering interesting, bold predictions about the future development of virtual communities and their effects on society, politics, and law. Written in an almost playful style, it was astonishingly prescient, introducing ideas issues such as flaming, privacy, anonymity, telecommuting, and online political action that feature prominently in today’s online social behavior.

As one of the earliest sociologists studying online and virtual communities, Hiltz has carved for herself an important place in the history of computing. She was then, and still is one of the few sociologists to

gain appointment as a tenured full professor in an academic computer science department, considered a male bastion at the time. Now retired, Hiltz is modest about her brainchild, pointing out that her pioneering work would not have been possible without Turoff’s work on computer conferencing.

Early Years

Starr Roxanne Hiltz was born on a US Army base in Little Rock, Arkansas, on 7 September 1942 to parents of German ancestry. Roxanne’s father John Donald Smyers and mother Mildred Violet Koons were conservative Protestants from western Pennsylvania who got married during the Great Depression shortly after her father graduated from the Wharton School. John was serving his “six months of active duty” in the military when Pearl Harbor occurred. He was in the Army for all of World War II, finishing with the rank of Major. Roxanne’s parents named her “Starr” in hopes of a bright future for the world during that dark period and “Roxanne” after the heroine of *Cyrano de Bergerac* who appreciated inner character over looks.

Hiltz recollected having lived in 26 places in her younger days—something that had a lasting influence on her. She saw rural, urban, religious, and social classes and became acutely aware of the differences. This got her interested in thinking about what makes people

Background of Roxanne Hiltz

Born: 7 September 1942, Little Rock, Arkansas

Education: AB (magna cum laude, sociology and economics), Vassar College, 1963; MA (sociology), Columbia University, 1964; PhD (sociology), Columbia University, 1969.

Professional Experience: US Army Human Engineering Laboratories Systems Research Laboratory, Aberdeen Proving Ground, sociologist, 1967; Prudential Insurance Company of America, Operations Analysis and Research Department, research analyst, 1967–69, and special consultant, 1969–1973; Princeton University, Department of Sociology, visiting fellow, 1976–1977; Upsala College, assistant professor, 1969–1973, and associate professor, 1973–1981; Upsala College,

chairperson of sociology, anthropology, and social work, 1973–1984, and, professor of sociology, 1981–1985; New Jersey Institute of Technology (NJIT), Department of Computer and Information Science, professor, 1985–1993, distinguished professor, 1993–2000, and director of PhDs in information systems, 2000–2003 and 2005–2007; NJIT, Information Systems Department, distinguished professor, 2000–2007; Distinguished Professor Emerita, 2007–present.

Honors and Awards: NSF Faculty Fellowship in Science, 1976/1977; Electronic Networking Association’s Rodale Award for Creative Achievement, 1990; Electronic Frontier Foundation’s Pioneer Award, 1994; Sloan-C Award, 2004.

into what they were. She explained, it was “probably one of the things that made me a sociologist.”¹

She spent much of her early days at Army posts. After the war, her father returned to his western Pennsylvania roots, where he bought a small farm. However, because they could not make much money by farming, he took up a traveling salesman’s job selling hunting goods. During the week, Mildred and her children lived on the farm by themselves. Roxanne acquired a lifelong love of gardening, but eventually her father realized that he was not really a rural person and moved his family to Camden while he attended law school at the University of Pennsylvania, on the GI Bill. This was a big shock for Hiltz after rural Pennsylvania. Racial strife was rising, and she was one of the few Protestant white kids in the area’s large African American and Jewish communities. Later, they moved to a Jewish neighborhood in Philadelphia. She recalled that on Jewish holidays, she would be one of only a half dozen students in school!

After law school, her father started working for the Atomic Energy Commission (AEC) in Washington, D.C., but he soon shifted to corporate law in New York. He found prosperity as a partner in a large Wall Street law firm. The family finally settled on Long Island in the town of Baldwin.

Early Influences

Hiltz remembered attending middle school in Baldwin, New York, where she was recognized as a bright student. She became interested in the sciences, and in high school, she initially wanted to become a physicist or chemist. As a young woman, however, she did not feel welcome in science class. The physics honors teacher would pick on her, tell off-color jokes, and say “women have no place in physics.” Her uncle who was a chemist also discouraged her. Despite that, Hiltz took many advanced placement sciences courses. In one of the chemistry labs in high school, she met her future husband, George Stephen Hiltz, “a bright, athletic and gentle person.”¹ She fell in love with George and decided right then that she would marry him.

While Hiltz was still at school, she had many opportunities to meet her father’s well-known clients, which at the time included Alfred McClung Lee, president of the American Sociological Association, and his equally famous wife and collaborator,

Elizabeth Briant Lee. A particularly strong influence on Hiltz, the Lees encouraged her to consider sociology as a career. By the time Roxanne graduated from high school, she had decided to focus on sociology. She recalled,

[I]t was a combination of a lot of curiosity about what makes people behave the way they behave, and also the feeling that there was no real place for women in the natural sciences. There were clearly more opportunities for women in the social sciences. I was already aware of Margaret Mead, and the Lees were a nice influence.¹

Hiltz was admitted to Vassar College in Poughkeepsie, New York, in 1960. Vassar was a highly selective women’s only college at the time. She chose to major in sociology and minor in economics. Anthropology and English were her other major interests at Vassar. Because her fiancé George was a year ahead of her in college, attending an engineering program at Rensselaer Polytechnic Institute (RPI) in Troy, New York, Hiltz pursued an accelerated schedule to catch up with him.

Hiltz loved the country atmosphere at Vassar and that almost half of its faculty were women. She had “very nice, strong, female instructors” who told the female students that they could be anything they wanted. Hiltz excelled there, made the dean’s list every semester, and became a star student in the sociology department. One of her mentors at the time was Suzanne Keller, who eventually joined Princeton University as its first female faculty member.

Graduate School

Hiltz had opportunities to meet luminaries in the field of sociology. When the distinguished Professor Robert K. Merton from Columbia University who came to Vassar for a visit, Hiltz was fortunate to spend some time talking with him. He encouraged her to apply to Columbia University for a PhD program in sociology. In her third year at Vassar, Hiltz married George. Since Columbia also had a graduate program in engineering, they both decided to apply to Columbia for graduate studies.

Hiltz was raised in a religious household. She had to attend church and Sunday school every Sunday, starting from about four years old. Once she became a teenager, she also had to attend a church group at night. At Vassar she charted a different course away

from her conservative upbringing. She joined the Congress of Racial Equality (CORE), the Vassar chapter of the Students for a Democratic Society (SDS), and the National Organization for Women (NOW). She remembered participating in the first parade that NOW organized in New York led by Betty Friedan and Gloria Steinem. During that parade, some people were booing and spitting. Hiltz later went door to door trying to collect signatures for the Equal Rights Amendment but could not generate much interest. Even the women would not sign it, saying “we have a lot of advantages now, if we sign for equal rights, we won’t enjoy those benefits. We will have to pay alimony to our husbands.”¹

Hiltz’s graduate study plans were rendered a rude shock when she realized that she had gotten pregnant by accident. She remembered feeling trapped by the prospect of becoming a mother at age 21 and having “to shelve plans for graduate studies.”¹ Shortly thereafter, she miscarried and thus, as she put it, “got lucky.” After graduating from Vassar in 1963, she entered Columbia University for a doctoral program in sociology.

At the time, the sociology department at Columbia was home to several top sociologists. Terrence Hopkins, an authority on world-systems analysis became her mentor and eventually her thesis advisor. She also admired the other big shots in the sociology department, including Robert K. Merton and Paul F. Lazarsfeld. Merton was most famous for his contributions to structural functionalism. Hiltz would eventually adopt structural functionalism in much of her work on virtual communities.

Soon after joining Columbia, Hiltz’s husband joined the Reserve Officers’ Training Corps (ROTC) and, six months after graduation, was sent to Vietnam, where American involvement in the war was escalating. As in her childhood, Roxanne had to relocate to various Army camps. She even worked at the Aberdeen Proving Ground as a sociologist for a few months when her husband was stationed there.

For several years, Hiltz could not work on her PhD at all, but she got a big break through her friend from Vassar, Elaine Kerr. Kerr had finished her PhD (also in sociology) from Columbia and was employed as a researcher at Prudential. Through Kerr, Hiltz also got a job as researcher at Prudential. This job was her first formal introduction to large computers and computer programming. Prudential had some of the biggest

datasets in existence at that point, all on punched cards. The company did national surveys of their policy holders about their financial planning, assets, and goals. Hiltz worked with Prudential on their surveys and with a group on operations analysis and research, using their large computers for data analysis. This also enabled her to learn about the programs used for data analysis. As a result of this work, her doctoral dissertation at Columbia, titled “The Consumer Financial System: A Mechanism of Inequality,” was a sociological analysis of the changes that were taking place in the country’s consumer finance sector.

Hiltz’s doctoral work required a great deal of data analysis, and Columbia University charged \$3,000 per hour for computer time. She had an understanding boss at Prudential, however, who allowed her to spend one day each week on her dissertation as well as use their computers. He also bought for her all the volumes of the *Survey of Consumer Finances*. Thus, Hiltz did her thesis on secondary analyses of one of the world’s largest datasets.

Hiltz completed her PhD in 1969 and realized that although Prudential was a nice place to work, it really had no place for women. Even her supportive boss said to her: “Honestly, I do not know what your chances are here, given that you are a woman.”² Her husband, having returned from Vietnam, worked at Mobil in New York City. She wanted to have children, but maternity leave was not available at that time. Finally, she decided to join academia until her kids were all in school. She took a substantial pay cut to join Upsala College, a small, private liberal arts college in East Orange, New Jersey, close to her home. After a while, though, she got used to the month off at Christmas and summers off. Hiltz’s two children were born in 1971 and 1972, and she also appreciated the correspondence with the children’s school year, so she decided to stay.

Introduction to Murray Turoff and Virtual Communities

Hiltz enjoyed working at Upsala, but the race riots that had occurred in Newark in 1967 had a detrimental effect on the college in 1969 and 1970. East Orange was turning from a mainly white to a black population due to “white flight.” This affected enrollments at Upsala, whose student body was primarily Lutheran and white. Meanwhile, Hiltz’s relationship with her husband began

to deteriorate. She recalled, "Vietnam changed my first husband. He was not the gentle sweet person anymore. He had had bad experiences."⁷ She was busy with two young children, four course preparations each semester, and a lot of teaching and grading. She was also consulting for Prudential, conducting research at Prudential's "widows' consultation center" and evaluating the effectiveness of a counseling agency for widows she been involved in starting.

All this left Hiltz vaguely dissatisfied. She also did not want to go back to studying consumer finance systems because she no longer had access to the data. Hiltz became the chair of the sociology, anthropology, and social work department at Upsala in 1973, but the workload remained heavy.

At this point, Hiltz's colleague at Upsala Robert Johansen introduced her to Murray Turoff. Turoff was working at the New Jersey Institute of Technology (NJIT), not far from Upsala College, and building a new version of his computer conferencing system. His first version, EMISARI, had come under some criticism because he had not included any sociological studies in his reports. He was therefore looking for a sociologist who could design experiments and study the sociology of communities that met and collaborated in a completely virtual, computer conferencing platform. His first choice had been Robert Johansen, who as a doctoral student at Northwestern University had done sociological studies of a computer-based education system. However, by the time Turoff met him, Johansen was on his way out of NJIT, having taken up a job at the Institute for the Future (IFTF) to work on its fledgling conferencing system called Planet.

Turoff talked to Hiltz about the new conferencing system he was planning. Initially, Hiltz was noncommittal, saying that she would like to learn more about the system, but she could not look at EMISARI because it was proprietary. She eventually got on Planet. As she recollected, she planned to be on it for a half hour and started a real-time chat with global participants in California and France. Before she knew it, three hours had passed and she had even missed a department meeting without realizing it! She recalled that she got into "the flow." She realized that this had some interesting application possibilities in science and other areas, so she agreed to work with Turoff.

Thus began Hiltz's work on studying virtual communities. At that time, only a

Hiltz helped Turoff to identify what EIES would do, dream up a social application for the system, and evaluate the pros and cons.

handful of sociologists had done any type of study on computers. Hiltz's work on virtual communities was arguably the first of its kind.

Working on EIES

Beginning in 1974, Hiltz worked with Turoff on his new conferencing system. She helped him to identify what the system would do, dream up a social application for the system, and evaluate the pros and cons. She recalled, "It was all speculative theory-building ... if the system did this, and the people used it this way, then this might occur."² The first application that they thought of was a collaborative platform for researchers working on scientific applications. Hiltz even helped name the system. Initially, it was to be called EIO (Electronic Information Organizer), although neither Hiltz nor Turoff could fully remember what the "O" stood for. Hiltz felt that sounded like the "Old MacDonald" song, however, so she suggested EIES (Electronic Information Exchange System), pronounced "eyes" for a new way of seeing and perceiving the world.

In the beginning, Hiltz helped Turoff write grant proposals for EIES. She helped write the request for proposal (RFP) funded by the NSF to request that research communities come and work on EIES. The research communities would all have free access and get thermal printing terminals. They all had to have an internal evaluation plan to study the impact of the system on their scientific research community.

Hiltz also obtained a separate grant to study all the scientific research communities using similar tools, and she began to look at how online environments would change small group communication and decision making. She wrote an early research report on how small group communications

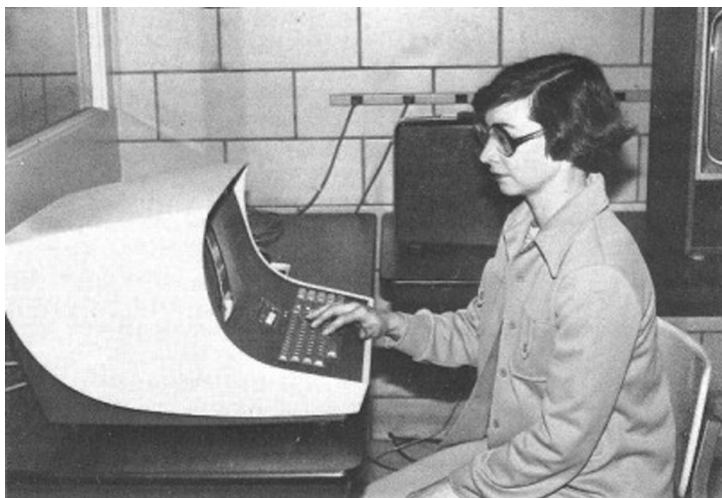


Figure 1. Roxanne Hiltz on an EIES terminal.³

would change if the participants were first put in synchronous and then asynchronous systems. She wanted to find out “what kinds of tools and structures could you build that would engineer their decision making to be smarter, to reach ‘collective intelligence’” by making better decisions than its members could have done as individuals. She was interested in measuring what they knew and what they would have done before the discussion and then measuring what the group did and what they thought afterward.

Hiltz recollected that much of her work on EIES had the sociology of science as the basis (which reflected her Columbia University background, where Robert Merton, Harriet Zuckerman, and James Coleman were all primarily working on the sociology of science.) Hiltz was influenced by Merton’s structural-functional sense that “if a structure has persisted for a long time in a culture, then it has function—so find it.”² She started thinking that a new communications structure with some new functions was going to change the social structure.

From the beginning, Hiltz and Turoff saw that computer conferencing and information exchange would build broader social networks. Roxanne stated,

In the early days of EIES I could see that—we had an international community of scientists. First they got to know each other online. After they got to know each other online, they went out of the way to meet each other in person—the online relationships became deeper personal relationships. So we could see social structures that came out of this communication that were more heterogeneous, and more different, networks than before.²

An important milestone in Hiltz’s career took place soon after she started working with Turoff. She applied to the National Science Foundation for a faculty fellowship in science, which would provide funding for her to visit any institute that would sponsor her for one year of postdoctoral work. Roxanne chose Princeton University because one of her favorite teachers at Vassar, Suzanne Keller, was at Princeton then. Keller sponsored Hiltz, so she got the grant for 1976–1977.

Hiltz recalled that the year at Princeton changed her life. She “hung out” in the sociology department, building many important connections. She took Keller’s “Sociology of Architecture” seminar, and she discovered that the Institute for Advanced Studies offered a year-long seminar on the sociology of science. There she met many leading figures in the sociology of science and got them involved in planning her studies of on-line scientific communities.

Birth of The Network Nation

During that year, Hiltz started writing *The Network Nation*. Turoff had also wanted to write a book. Realizing that Hiltz was more of a writer than he was, he let her take the lead. An early version of EIES was already working and scientific communities were experimenting with it. In this early online community setting, she met other important researchers such as Ron Rice (University of California, Santa Barbara), Linton Freeman (UC Irvine), and Barry Wellman (University of Toronto). Roxanne started her studies on virtual communities and initially submitted a paper to the *American Sociological Review*. To her surprise, she received a rejection letter explaining that “sociologists do not study computers.”⁴

She continued working on the book, however, and credits Wellman for giving her the idea for the book’s title, modeled on his seminal 1973 book *The Network City*.⁵ She approached *The Network Nation* as a book that would talk mostly about emerging virtual communities, while also focusing on the technology aspects with input from Turoff.

They also decided to make the book fun by adding some interesting predictions about how the networked world would look 15 years hence. To do that, they came up with the idea of an imaginary newspaper, the *BosWash Times*, from which they added headlines at the beginning of each chapter. The issues they covered remain current and

relevant to this day, such as telecommuting, online behavior, censorship and surveillance, email and the death of the US Postal Service, addiction, IP and copyright violations, and changes to work, politics, and law.

Published by Addison-Wesley in 1978, *The Network Nation* won a prize as the best technical publication of the year from the Association of American Publishers and attracted a cult-like following from a disparate group of people ranging from computer scientists to management scientists, politicians to sociologists, and medical doctors to lay computer enthusiasts. It has been dubbed “the bible” of computer conferencing. Describing the early days of the virtual community in his book *The Virtual Community*, the digital sociologist Howard Rheingold says this about the year 1978:

Starr Roxanne Hiltz and Turoff published a book that year, *Network Nation*—about a revolution that took more than another decade to break out beyond the small circles of enthusiasts—in which they predicted that the medium wouldn’t be limited to a few laboratories and think tanks. They noted some of the well-known advantages and disadvantages of the medium. They forecast that people would use the medium to find others who shared their interests and values. They began the first systematic research of how different kinds of organizations use and fail to use CMC technology.⁶

The Network Nation was revised and reprinted in 1993 by MIT Press. In the new edition, Hiltz and Turoff revisited their predictions made 15 years earlier. Together, the two editions of the book have been cited more than 2,000 times. Over the years, *The Network Nation* and Hiltz’s work on virtual communities have spurred dozens of doctoral dissertations in computer-mediated communication (CMC), virtual communities, group decision making, and online education and have shaped the careers of numerous sociologists, business academics, and computer scientists interested in human-computer interaction.

EIES as a Research Platform

The first version of EIES was operative in 1975 and was designed to be a research system where one could tailor different communication structures for different groups and different applications. This followed the philosophy of the Delphi Method for dealing with complex problems by tailoring an appropriate knowledge structure to facilitate

the communication process. A great deal of the design effort for EIES focused on tailoring a specific communication process to a given group and/or application while keeping the basic EIES structure general. EIES remained a research system in this regard until the mid-1990s.

The EIES implementation was completed by 1977. Once Hiltz began working on EIES, she saw a lifetime of research. There were so many fascinating things that could be done. Turnoff kept “chunking,” inventing new functionalities that she would look at it and say “that could be used for studying this aspect, (so) let us write a proposal for that.” This led to more collaborative grant writing.

Eventually, Hiltz moved to NJIT, where she worked as a visiting professor in the Computer Science Department for two years. First, she focused on online communities and, almost at the same time, started working on small group decision making. This came partly from her year at Princeton, where one of the assignments in the “Sociology of Architecture” seminar was to design an ideal classroom for the 21st century. She started sketching different physical spaces. There would be a lecture hall with a podium up front, computer labs, and libraries. There would be a “great conversation pit” for seminars and it would be a circle so that everybody could be equal. But she realized that such a circle would become too big with a large number of people. She wanted small groups to be able to work together on research, so she sketched different physical spaces and equipment.

As she started writing *The Network Nation*, however, she realized that her ideal classroom did not need all those physical spaces and that the learning spaces could be virtual. Everything done on a college campus could be done or simulated with software. Thus, she conceived the idea for the virtual classroom and started writing proposals to implement and study it. She obtained a \$1 million grant from the Annenberg Foundation/Corporation for Public Broadcasting to build a virtual classroom on EIES and to run the first virtual class. This, plus her other NSF grants got her into NJIT, where she was appointed a tenured full professor in NJIT’s Computer Science Department starting in 1985. Hiltz was the first female professor in NJIT’s Computer Science Department. She recalls that when she started, there was not even a woman’s bathroom on the floor where the CS department was housed.

**As an academic system
that depended on
subscribers, EIES
could not compete
with commercial
competitors.**

As Hiltz and Turoff performed research and worked on their book together, they also became attracted to each other—"we shared this enthusiasm."² At that time, though, they were both married to others. Hiltz recalled that "it just happened," and both had become dissatisfied with their relationships. So they decided to leave their respective marriages and move in together. They eventually got married in 1986.

All three of Hiltz's projects—virtual communities, group decision support, and the virtual classroom—had to do with what is now called social computing, supporting online communities, small groups, collaborations, decisions, and collaborative education. She realized early on that the way to make asynchronous education engaging was not to avoid lectures (which were videotaped), but to focus online time on discussions. In the virtual classroom, discussion questions could be assigned as well as projects for which small groups of students could work on, discuss, and present to others.

One inherent problem with a virtual classroom is that it was easy for students to put off signing into the classroom. In those days, it was also difficult to sign on using dial-up connections and computer centers. Hiltz decided that the way to get students engaged was to put them in groups and assign various parts to each, with the expectation that each student do his or her part because the others were depending on it. Each small group had an assignment every week, so each group member had to be on the system, participating with the rest of the group.

EIES became popular in the early 1980s, which led to a hardware grant from IBM. IBM wanted Hiltz and Turoff to build a tailor-able EIES (TEIES) that could be customized for use in various companies for different group decision-support applications. To keep

up with developments in hardware and software technology, Turoff started building new versions of EIES—EIES2 on the Unix platform, and TEIES on an IBM platform—using grants and subscriptions. Soon the EIES and virtual classroom projects were employing 20 to 30 people writing code and administering the system. The Annenberg Foundation was willing to give another \$1 million grant for the virtual classroom to run on both EIES2 and TEIES on the condition that it would run for at least three years. A university in Denmark also expressed interest in funding a virtual classroom development for the European environment.

Hiltz and Murray found themselves juggling too many balls at the same time. Upon reflection, Hiltz now believes that these activities proved detrimental to her writing. Because she could not write and make her findings public quickly enough, her work on the virtual classroom got relegated to the hinterland of academic publishing.

Decline of EIES

By the late 1980s and early 1990s, computer conferencing was no longer novel. CompuServe, a commercial competitor was winning the commercial subscriptions war, later followed by America Online (AOL). The new systems often had many more features and graphics than EIES. Being an academic system that depended on subscribers, EIES could not compete. NJIT did not provide any support for EIES and did not act quickly to obtain grant offers from Annenberg Foundation. Hiltz and Turoff could not convince NJIT that the system they were developing could be licensed and would eventually bring revenue to NJIT. The project survived on existing subscriptions for a while, but it died a slow death over several years.

Initially, Hiltz was extremely dejected at the turn of events. She then decided to treat the situation as an opportunity to write. She wrote journal articles and books based on her research. With several coauthors (including Turoff), she wrote *Learning Networks*, which addressed the worldwide phenomena of the emergence of online learning networks.⁷ With encouragement from Ben Schneiderman, she also wrote and published *The Virtual Classroom* in 1994.⁸

She received several of NSF grants for group decision-support system (GDSS) research that supported PhD students. Eventually, Hiltz obtained another large grant from the Sloan Foundation to build a

virtual classroom on EIES2 and one from the NSF to study multimedia online learning. But EIES was no longer a viable system, and the virtual classroom on EIES2 was past its prime by the end of the 20th century.

She continued her multimedia group systems research by using other commercially available systems. NJIT eventually got a license for the commercial WebCT course management system, which could be used as a conferencing system. Using the Sloan grant, Turoff and Hiltz ran online degree programs (an undergraduate computer science program, master's programs in the school of management, and so forth). Turoff tailored WebCT so that Hiltz could run tools alongside WebCT (on half the screen) to do experiments. Hiltz continued working and writing on virtual communities until she retired from NJIT in 2007. Hiltz still lives with Turoff in Randolph, New Jersey.

2. S.R. Hiltz, interview with R. Subramanian.
3. Photo originally appeared in *IEEE Spectrum*, May 1977, p. 59.
4. S.R. Hiltz, email comm. R. Subramanian, 12 Dec. 2011.
5. P. Craven and B. Wellman, "The Network City," *Sociological Inquiry*, vol. 43, nos. 3–4, 1973, pp. 57–88; <http://onlinelibrary.wiley.com/doi/10.1111/j.1475-682X.1973.tb00003.x/abstract>.
6. H. Rheingold, *The Virtual Community: Homesteading on the Electronic Frontier*, revised ed., MIT Press, 2000.
7. L. Harasim et al., *Learning Networks: A Field Guide to Teaching and Learning Online*, MIT Press, 1995.
8. S.R. Hiltz, *The Virtual Classroom: Learning Without Limits Via Computer Networks*, Intellect Books, 1994.

Ramesh Subramanian is the Gabriel Ferrucci Professor of Computer Information Systems in the Department of Computer Information Systems at Quinnipiac University. Contact him at ramesh.subramanian@quinnipiac.edu.

Reference and Notes

1. S.R. Hiltz and M. Turoff, *The Network Nation: Human Communication via Computer*, Addison-Wesley, 1978.

cn Selected CS articles and columns are also available for free at <http://ComputingNow.computer.org>.



stay connected.

Keep up with the latest
IEEE Computer Society
publications and activities
wherever you are.

IEEE  computer society



[@ComputerSociety](#)
[@ComputingNow](#)



facebook.com/IEEEComputerSociety
facebook.com/ComputingNow



[IEEE Computer Society](#)
[Computing Now](#)



youtube.com/ieeecomersociety