The International and Scientific Origins of the Internet and the Emergence of the Netizens

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Netizens are Net Citizens …. These people … makes [the Net] a resource of human beings. These Netizens participate to help make the Net both an intellectual and a social resource.
Michael Hauben, "Further Thoughts about Netizens"

Forms grow out of principles and operate to continue the principles they grow from.
Thomas Paine, "The Rights of Man"

I. Controversies over the Origins of the Internet

There is a controversy about the Internet and its origins that is widespread. This is connected to the misconception that the Internet is the result of the desire of the U.S. department of defense to create a network that would survive a nuclear war.[1] A significant aspect of the controversy is over the origin of the idea of packet switching for the building of the ARPANET. Many credit Paul Baran, a researcher at Rand Corporation.[2]

Larry Roberts, who headed the research project to create the ARPANET as the head of the Information Processing Techniques Office (IPTO) in 1967-1972, explains that Donald Davies, a researcher at the National Physical Laboratory (NPL) in the UK, did significant work in the early development of packet switching, while Paul Baran's work came to be known as the project developed. Describing some of the relevant events, Roberts writes:[3]

> (I)n 1965, a … meeting took place at MIT. Donald Davies, from the National Physical Laboratory in the UK was at MIT to give a seminar on time-sharing. Licklider, Davies and I discussed networking and the inadequacy of data communication facilities for both time-sharing and networking. Davies reports that shortly after this meeting he was struck with the concept that a store and forward system for very short messages (now called packet switching) was the ideal communication system for interactive systems.

Davies subsequently invited IPTO researchers to come to Great Britain to present the research they were doing on time-sharing. In November 1965, ten U.S. researchers gave a set of presentations in Great Britain at a meeting sponsored by the British Computer Society. Describing these presentations, Davies "reports that though most of the discussions were about operating systems aspects of time-sharing, the research done to show the mismatch between time-sharing and the telephone network was described."[4]

Davies writes:[5]

> It was that which sort of triggered off my thoughts and it was in the evenings during that meeting that I first began to think about packet switching.

"The basic ideas," Davies continues, "were produced really just in a few evenings of thought, during or after the seminar." Roberts describes how Davies "wrote about his ideas in a document entitled 'Proposal for Development of a National Communication Service for On-Line Data processing' which envisioned a communication network using trunk lines from 100K bits/sec in speed to 1.5 megabits/sec (T1), message sizes of 128 bytes and a switch which could handle up to 10,000 messages/sec." (Historical note by Roberts: this took 20 years to accomplish). Then in June

1966, Davies wrote a second internal paper, ‘Proposal for a Digital Communication Network’ in which he coined the word “packet,” – a small sub-part of the message the user wants to send, and also introduced the concept of an ‘interface computer’ to sit between the user’s equipment and the packet network. His design also included the concept of a Packet Assembler and Disassembler (PAD) to interface character terminals, today a common element of most packet networks.

It was only after Davies did this pioneering work developing the concept of packet switching that he learned of related work previously done by Baran. “As a result of distributing his 1965 paper,” Roberts reports, “Donald Davies was given a copy of an internal Rand report ‘On Distributed Communications,’ by Baran, which had been written in August 1964. Baran’s historical paper also described a short message switching network using T1 trunks and a 128-byte message size ….” Roberts states the influence of Baran’s work was “mainly supportive, not sparking its development.”

Along with the controversy over the invention of packet switching, there is a related controversy, as to what is the defining nature of the Internet.[6] Is the creation of packet switching and the development of the ARPANET the actual beginning of the Internet, or is the defining characteristic of the Internet something different? I want to propose that the defining characteristic of the Internet is not packet switching, but the design and development of the protocol that makes it possible to interconnect dissimilar computer networks. A protocol in computer networking vocabulary is a set of agreements to make communication possible among entities that are different, as, for example, entities who speak different languages.[7] TCP/IP is a protocol that makes it possible to interconnect dissimilar computer networks.

Robert Kahn, one of the co-inventors of the TCP/IP protocol, explains that the ARPANET was “a single network that linked heterogeneous computer systems into a resource sharing network, first within the U.S., and eventually it had tentacles to computer systems in other countries. What the ARPANET didn’t address,” Kahn clarifies, “was the issue of interconnecting multiple networks and all the attendant issues that raised.” (Kahn, E-mail, September 15, 2002)

To understand the nature of the Internet, it is necessary to understand what could be called the Multiple Network Problem and how it was solved. The difficulties were not only technical.[8]

II. The Internet as the Network of Networks

By 1973 there were various packet switching computer networks either being developed or in the planning stages in countries around the world. To illustrate, there is a memo which shows three of the early packet switching research networks. The memo is from a U.S. researcher. It is dated 1973. It shows three different packet switching networks being developed in 1973.[9] They were:

ARPANET - USA
NPL - UK
CYCLADES - France

Each of these networks was under the ownership and control of different political and administrative entities.

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Consequently, each of these networks would differ technically in order to meet the needs of the organization or administration that controlled it. The question being raised in this period of the early 1970s is how to interconnect dissimilar packet switching networks.

Considering how to solve the Multiple Network Problem, Davies presented a paper in 1974 on "The Future of Computer Networks." In the paper, he writes:

> To achieve … the interconnection of packet switching systems … a group including ARPA, NPL, and CYCLADES is trying out a scheme of interconnection based on a packet transport network with an agreed protocol for message transport …. (Davies, "The Future of Computer Networks," *IIASA Conference on Computer Communications Networks*, October 21-25, 1974, page 36)

Davies was explaining the research effort to make communication possible among these diverse networks. The conference where Davies presented this paper was held at a detente era research institution. It was called the International Institute for Applied Systems Analysis or IIASA. IIASA was situated in Laxenburg, Austria.

In October 2001, I attended a conference in Berlin where I was fortunate to meet Klaus Fuchs-Kittowski. He was one of the researchers who participated in IIASA in the early 1970s. Fuchs-Kittowski was then a Professor at Humboldt University in the then German Democratic Republic (G.D.R.). When I met Fuchs-Kittowski in 2001, he brought me a copy of a publication put out by the IIASA. It is the proceedings of a workshop held in 1975. He had presented one of the papers at the "Workshop on Data Communications," held on September 15-19, 1975. Others at the workshop included researchers from Austria, Belgium, France, the Federal Republic of Germany, and the German Democratic Republic.

In this 1975 workshop proceedings, was an article by British researchers describing the early development of a British, Norwegian, U.S. research collaboration to make it possible to have the Internet. A diagram, created just one year after the Davies paper considering how to interconnect CYCLADES, NPL, and the ARPANET, shows something quite differently.[10]

The graphic shows international collaboration to create an implementation of the TCP/IP protocol. Involved in this research, however, were Norwegian researchers at NORSAR in Norway, British researchers at the University College of London, in the UK, and American researchers developing the ARPANET.

UCL
NORSAR

ARPANET

The collaborative research on the development of the TCP/IP protocol done by researchers from the UK, U.S. and Norway later included research developing a satellite packet switching network called SATNET. Also, involved in this networking research for shorter periods of time were German and Italian researchers.

There is an interesting graphic of SATNET.[11] In it you can see the German, Italian, U.S., UK, and Norwegian sites. There was also collaborative research creating a packet radio network.

The reason I refer to this history is that it was an international collaboration of researchers working on developing network technology and more particularly in developing the protocol that would make the Internet a reality.

A key to understanding the Internet and its origins, however, is that there is a vision that inspired and provided the glue for such international collaborative research efforts. To explore the nature and origin of this vision helps to understand the research processes creating the TCP/IP protocol and the Internet's subsequent development.

Through studies of the history of the Internet, there is much evidence that the vision for its development had been pioneered by JCR Licklider, an experimental psychologist interested in human communication. Licklider introduced this vision when he gave talks for the ARPA program inspiring people with the idea of the importance of a new form of computing and of the potential for a network that would make it possible to communicate utilizing computers.

III. The Historical Origins of the Vision for the Net and of the Science Guiding the Development

Describing the dynamic nature of communication, Licklider in a paper written with Robert Taylor explains:

> We believe that communicators have to do something nontrivial with the information they send and receive. And … to interact with the richness of living information – not merely in the passive way that we have become accustomed to using books and libraries, but as active participants in an ongoing process, bringing something to it through our interaction with it, and not simply receiving from it by our connection to it …. We want to emphasize something beyond its one-way transfer: the increasing significance of the part that transcends 'now we both know a fact that only one of us knew before.' When minds interact, new ideas emerge. We want to talk about the creative aspect of communication. (Quoted from The Computer as a Communication Device, in *Netizens*, page 5.)

To understand the influences on Licklider and his insight into the dynamic nature of communication, it is helpful to look at the scientific research community he was part of in the late 1940s and early 1950s.

In the early post World War II period, there was much interest in the research and advances in the science of communication and in what was referred to as self-organizing systems. Among those with such interest were Julian Bigelow, an engineer interested in communication technologies, Norbert Wiener, a mathematician interested in the development of automatic systems and about how learning about the functions of the nervous system would provide insight into the creation of such machine systems, Arturo Rosenblueth a researcher and medical doctor who worked with Wiener on similar developments, anthropologists Margaret Mead and Gregory Bateson who studied the social systems of primitive people, and Karl Deutsch who was interested in how looking at political systems through a communication framework would help to understand the nature of such systems.

When considering questions related to communication, the idea of an interdisciplinary research group was considered to be desirable. That is why in the late 1940s and early 1950s there were a number of meetings of an interdisciplinary research group sponsored by a medical foundation, the Josiah Macy Jr. Foundation. This foundation was headed by Frank Fremont-Smith. This group, one of the interdisciplinary research groups established by the Macy Foundation, was to study feedback systems, systems which modified their behavior based on the information gained from previous behavior.

Among the names for such systems were ‘self-organizing systems’, ‘cybernetic systems’, ‘feedback systems,’ ‘purposive systems.’ A group of 20 researchers from different fields formed the core of the set of scholars who would meet two times a year and discuss their research, hoping that the content and process of their interdisciplinary work would provide stimulating ideas to each other.

JCR Licklider was invited to attend one session of this interdisciplinary research group, in 1950, and to present a paper on his research. (See “The manner in which and extent to which speech can be distorted and remain intelligible.” In H. Von Foerster, (Ed), *Cybernetics - circular, causal and feedback mechanisms in biological and social systems. Transactions of the seventh conference*. New York: Josiah Macy, Jr. Foundation.)

Thus Licklider had first hand knowledge of the methodology and practice of the Macy Foundation group, which was to prove helpful to him in a meeting he set up in 1954 and subsequently in his role as the head of the computer research organization he created in 1962 at ARPA, the Information Processing Techniques Office. The processes of the Macy-sponsored meetings were unusual, at least by the standards of present conferences 50 years later, so I want to briefly explain the process and rationale of the conferences.

The conference meeting would take place over a weekend, and there would be two or three papers presented. Participants in the conference were urged to ask questions of the researchers presenting papers, if there were points they didn’t understand, during the course of the presentations. Afterwards there would be a more general discussion, and a tape recording would be made of the discussion which would be published as the proceedings of the meeting.

The goal of this process was to encourage the participants to think and explore areas that were new to them, to think over what was being presented and to have a discussion on the presentation. The discussion process was considered as important as the paper presentation. The process of the meetings was intended to help to do research in how to encourage communication across the boundaries of the different disciplines and different methodologies used by these different disciplines.

The last of the ten Macy Foundation Conferences was held in 1953. Licklider and others received support from the National Science Foundation (NSF) in the U.S. to fund a similar interdisciplinary conference at MIT in November 1954.

Licklider and the others who organized the 1954 conference invited researchers in various scientific and technical fields. The topics for the conference were information theory, control theory and communication theory. Several of the researchers made presentations on their recent research, rather than limiting the discussion to only two papers. But discussion among the participants was encouraged. The proceedings were tape recorded and a transcript published in a bound volume by the NSF. (*Problems in Human Communication and Control*; MIT Press, Cambridge, MA, 1954)

IV. The Science of Information Processing

Licklider had begun his scientific career not as a computer scientist but as a psychologist. He finished his PhD thesis in 1942 before the working computer was a reality. The subject of his thesis was path-breaking in its time as he devised and carried out an experiment to "place" the "frequency of neural impulse theories" so as "to understand the perception of pitch and loudness." His particular experiment was to measure the loci of cortical electro-neural activity in the brain of cats to understand their response to hearing different tones of sound.

After receiving his PhD from the University of Rochester, Licklider got an appointment at Harvard University as a research associate and an appointment in the Psycho-Acoustic Laboratory there. This was during WWII and one of the projects the laboratory was investigating was how to enhance radio communication for aircraft to overcome the influence from signal distortion and other noise.

Other research work Licklider did include his creation of clipped speech. He explained how one could alter speech using electronic equipment. He discovered that the information necessary to understand speech could be obtained from focusing on the zero crossings of the speech wave form (where it switches from negative to positive or positive to negative values). This made it possible to create equipment alterations to improve the audibility of speech for pilots.

When the war ended, Licklider became interested in weekly gatherings held by Norbert Wiener to discuss Wiener's concept of cybernetics, of control and communication in biological and machine systems. An interdisciplinary community of researchers developed of which Licklider became part. The notion that one could learn about information processing by studying how it would be carried out in living or machine systems was a source of inspiration to researchers like Licklider and others in this interdisciplinary community.

In the process of his studies of the brain and the nervous system, Licklider became eager to realize the promise of the significant tools that the development of the computer was bringing into existence. An example of such a tool was Sketchpad created by Ivan Sutherland for the TX-2 at Lincoln Labs. In a demonstration that Sutherland gave of Sketchpad, a Project MAC graduate student, Warren Teitelman reports:[12]

> In one impressive demonstration, Dr. Sutherland sketched the girder of a bridge, and indicated the points at which members were connected together by rivets. He then drew a support at each end of the girder and a load at its center. The sketch of the girder then sagged under the load, and a number appeared on each member indicating the amount of tension or compression to which the member was being subjected.

Sutherland was able to use the modeling program he had created to add to the support the computer simulation showed was needed. Then the bridge was, according to the computer program, able to maintain its shape. This is the kind of potential that Licklider envisioned for the research community if they could acquire adequate modeling programs. They would be able to rely on the computer to process data and to demonstrate how the change in one parameter would affect changes in others. But to make such a potential advance possible, a new form of computing would first be necessary. This would be interactive online computing. Licklider not only had a vision for how scientists might find significant support for their research in partnership with computers, he also had an understanding of the kinds of research that would be needed to achieve the technical goals he had identified as desirable.

Along with Licklider's interest to create a computer modeling tool for researchers, he had another objective which was to prove even more inspiring. He recognized the need for a community of researchers to work together if they were to make progress in the hard challenges they faced. He also envisioned how the computer would help to facilitate such collaborative activity. Licklider describes this goal in a memo written in 1963 encouraging the researchers being supported by the Information Processing Techniques Office (IPTO) at centers of excellence around the U.S. to collaborate with each other. He describes how he hopes the researchers working on diverse research will benefit from determining how they can work together. This early support for "Members and Affiliates of the Intergalactic Computer Network" demonstrates the inspiration and conceptual foundation for creating first the ARPANET and then the Internet.[13]

In the memo, Licklider wrote:

> But I do think that we should see the main parts of several projected efforts, all on one blackboard, so that it will be more evident than it would otherwise be, where network-wide convention would be helpful and where individual concessions to group advantage would be most important.

Licklider's interest in explaining how computer modeling would serve researchers helped in another important way. It helped to set the foundation for the ARPANET. A graduate student at one of the centers of excellence that Licklider set up, at Project MAC at MIT, Warren Teitelman, wrote his thesis on creating a computer programming language that would encourage interactivity between the scientist and the programmer. His thesis was titled "Pilot: A Step Toward Man-Computer Symbiosis." In his thesis Teitelman set out to contribute to solving the problem of using computers more effectively for solving very hard problems. The kinds of problems he was concerned with were those which "are extremely difficult to think through in advance, that is, away from the computer. In some cases, the programmer cannot foresee the implications of certain decisions he must make in the design of the program."[14] He wrote:

> In such a situation the means of making programs often involved a trial and error process 'write some code, run the program, make some changes, write some more code, run program again'.

Thus there was a need to be able to have the person designing the program continually interact with the computer to make the needed changes.

Licklider believed that thinking is intimately bound up with modeling, and that the human mind is an unmatched and superb environment for demonstrating the power and dynamism of modeling. Licklider and Taylor write:[15]

> By far the most numerous, most sophisticated and most important models are those that reside in men's minds. In richness, plasticity, facility and economy, the mental model has no peer, but in other respects it has shortcomings. It will not stand still for careful study. It cannot be made to repeat a run. No one knows just how it works. It serves its owner's hopes more faithfully than it serves reason. It has access only to the information stored in one man's head. It can be observed and manipulated only by one person.

As Licklider and Taylor note, however, "society rightly distrusts the modeling done by a single mind." Thus, there is a need to transform the individual modeling process into a collaborative modeling process. Licklider and Taylor explain, "society demands … [what] amounts to the requirement that individual models be compared and brought into some degree of accord. The requirement for communicating which we now define concisely 'cooperative' modeling – cooperation in the construction, maintenance and use of a model."[16]

To make cooperative modeling possible, Licklider and Taylor propose that there is the need for "a plastic or moldable medium that can be modeled, a dynamic medium in which processes will flow into consequences …." But most important, they emphasize the need for a common medium "that can be contributed to and experimented with by all."

> The prospect is that, when several or many people work together within the context of an on-line interactive, community computer network, the superior facilities of the network for expressing ideas, preserving facts, modeling processes, and bringing two or more people together in close interaction with the same information and the same behavior – those superior facilities will so foster the growth and integration of knowledge that the incidence of major achievements will be markedly increased.[17]

At the foundation of this relationship between the human and the computer that Licklider recognized as so important is his understanding of the importance of combining the heuristic capability of the human with the algorithmic capability of the computer. Heuristic activity, according to Licklider, is "that which tends toward or facilitates invention or discoveries, that charts courses, formulates problems, guides solutions. The heuristic part is the creative part of information power."[18]

For Licklider, the goal of the research he was doing was to help catalyze the development of a new science, a science of information processing in biological and machine systems. A helpful definition of information science was created by the Committee on Information Sciences for the University of Chicago program established in 1965.

They explained:[19]

> The information sciences deal with the body of knowledge that relates to the structure, origination, transmission and transformation of information in both naturally existing and artificial systems. This includes the investigation of information representation, as in the genetic code or in codes for efficient message transmission, and the study of information processing devices and techniques, such as computers and their programming systems.

This new science included biological and machine systems as part of its scientific study. Licklider was hopeful that the computer would "help us understand the structure of ideas, the nature of intellectual processes."

"Although one cannot see clearly and deeply into this region of the future from the present point of view," Licklider believed, "he can be convinced that information processing," which now connotes to many "a technology devoted to reducing data and increasing costs," will one day be the field of a basic and important science, which will be an in interdisciplinary science.[20]

This new interdisciplinary science, would include, "Planning, management communication, mathematics and logic, and perhaps even psychology and philosophy will draw heavily from and contribute to that science."

"One of the most important present functions," Licklider writes for the "the digital computer in the university should be to catalyze the development of that science." A first step for this new science was to determine what was the most appropriate role of the computer and the human in the relationship between them, and what was the desirable interaction leading to the most advanced mutually beneficial development of each.

Licklider's research into what would be the role of the human and the role of the computer, i.e., a symbiotic relationship, helped to set a foundation for the research program he instituted when he was chosen by ARPA to head the IPTO in 1962.

As computer networking developed and spread, Licklider observed that creative users emerged.[21] Licklider recognized that the creative users developed uses of the network which became catalysts for the development of new and desirable forms and processes that other users would benefit from. Licklider called these creative users 'socio-technical pioneers' and he encouraged the support of their explorations and online activity. Licklider recommended putting off as long as possible the general use of the developing network by other users who would not be exploring its potential. He felt that it was important not to kill the goose who laid the golden eggs of the network and that it was crucial to protect the access of creative users to an exploratory and creative online environment. Licklider defined these 'socio-technical pioneers' as not only the creative users who explored how new online forms and processes could be developed and utilized, but he also recognized the importance of the programmers who were creating the software and the forms of making the software public and something to which many could contribute.

V. The Role of Scientists and Decision Makers in New Technology Decisions

After the Macy conferences and the NSF conference modeled on it, Licklider participated in other similar experiences. Another conference Licklider participated in which has been transcribed into a book version was held at MIT on the occasion of the 100th anniversary of MIT. A series of talks was held and the talks, along with the discussion, were transcribed and published in an edited volume by Martin Greenberger, then a young faculty member at MIT.[22]

While there were a number of talks included in this volume about the vision for the future development of the computer and for the science that would develop alongside the computer development and the science of information processing, the keynote talk was particularly significant. This keynote was by Sir Charles Percy Snow (C.P. Snow), a scientist and civil servant from Great Britain. The topic of Snow's talk was "Scientists and Decision Making."[23]

Snow spoke about the important public policy issues that would accompany the development of new computer technology, and about the difficulty government officials would have determining how to make decisions about the technology which took into account the public interest. In his talk, Snow described why there would be a need for many people to be involved in the decision making process. He proposed the need for broad based public discussion on the issues relating to new computer development. Snow explains:

> I believe that the healthiest decisions of society occur by something more like a Brownian movement. All kinds of people all over the place suddenly get smitten with the same sort of desire, with the same sort of interest, at the same time. This forms concentrations of pressure and of direction. These concentrations of pressure gradually filter their way through to the people whose nominal responsibility it is to put the legislation into a written form.

"I am pretty sure," Snow continues, "that this Brownian movement is probably the most important way in which ordinary social imperatives of society get initiated." (Greenberger, pages 6-7) Snow referred to this broad based public discussion as a political form of the physical phenomenon known as Brownian motion. He proposes that, based on such discussion, better decision making processes would result than if the issues were restricted to secret behind-the-scenes government processes. In his talk, Snow characterizes the limited process of decision-making of government in the U.S.:

> We all know that even in non secret decisions, there is a great deal of intimate closed politics …. In (the U.S.) you elect a President; he initiates legislation (that is, he takes a decision as to which legislation to produce), and then the Congress takes the decision as to whether this legislation is to go into action. (Greenberger, page 6)

Snow explained how government decisions were made in Great Britain, involving a similarly limited number of people as in the U.S. Such a narrow set of people being involved in making decisions was for Snow a sign of a serious problem.

If we follow the explosive development in computer technology that followed C. P. Snow's talk in 1960, we will see that not only was there foresight about the magnitude of change in computer development that would occur in the next 40 years, but also about the technical changes that would result in significant changes in society in general and in the economy in particular. Similarly, the nature of the new technical and scientific developments would require greater social understanding. The social ferment that comes from involving some broader strata of the people in the discussion about the policy issues that are needed to encourage technical development was identified as the process to develop this social understanding.

Shortly after the MIT anniversary programs on the "Future of the Computer," Licklider was invited to create an office for research in computer science and another office for research in behavioral science, within the U.S. Department of Defense (DOD). He formed the Information Processing Techniques Office in ARPA which was under the U.S. Department of Defense. Licklider was not a computer scientist. He was invited to ARPA to focus on the needs of the user and to create a computer that would serve the user.

At ARPA Licklider began a research program that would fundamentally change not only the architecture of computers but the architecture of how computers were used. Not only did the research done under his leadership make a great impact on the type of computing available in the world, but also he identified the need for computer networking and put forward the vision that would inspire computer scientists to develop time-sharing, packet switching and the ARPANET.[24]

Licklider's first term as director of IPTO put the office on a firm foundation that served to fundamentally influence the nature and direction of computer science. He created an intergalactic network of researchers who were supported in their work.

VI. The Politics of Science and Technology

Licklider returned to IPTO in 1974-1975. He found, however, that a significant change had occurred. The kind of basic research he had pioneered was no longer welcome. Instead there was pressure to do research that would meet prescribed outcomes and would be oriented to produce defense specific products.

Licklider challenged these changes both in his second term at IPTO and in talks and articles published after he left. These articles help to provide a guidepost for how the computer and networking development that Licklider envisioned can be practically achieved.[25]

The problem Licklider discovered was the same problem that C. P. Snow had anticipated. The problem was that there were government officials who needed to make decisions about the new technology, but were not able to understand the depth of the issues involved. The difficulty of this problem led Licklider to propose the need to have citizens participate in the process of determining how government would support new technology.

Licklider advocated that the networks themselves be used by those online to influence government policy regarding the continuing development of the networks. Licklider was not proposing that citizens rely on voting as the way to influence government. To the contrary, Licklider writes:

That does not mean simply that everyone must vote on every question for voting in the

> absence of understanding defines only the public attitude, not the public interest. It means that many public-spirited individuals must study, model, discuss, analyze, argue, write, criticize, and work out each issue and each problem until they reach a consensus or determine that none can be reached – at which point there may be occasion for voting. (Licklider, 1979, page 126)

Licklider also felt that "many public-spirited individuals must serve government – indeed must be the government." (Licklider, 1979, page 126) This is because, whether or not all citizens would have networking access, was a problem which would require government initiatives to solve. And the active involvement of public-spirited individuals was needed. Licklider saw that people in the U.S. were frustrated with the government. To change this situation, Licklider advocated making it possible for citizens to participate in government decision-making via the developing computer networks. Licklider writes:

> Computer power to the people is essential to the realization of a future in which most citizens are informed about, and interested and involved in, the process of government. (Licklider, 1979, page 124)

Licklider saw the problem that the current "decision makers and opinion leaders see computers in terms of conventional data processing and are not able to envision or assess their many capabilities and applications."

He maintained that not only must the decisions about the development and exploitation of computer networks be made "in the public interest," but also in "the interest of giving the public itself the means to enter into the decision-making processes that will shape their future." (Licklider, 1979, page 126) Here Licklider expresses the goal that citizens communicate with each other and with the officials and designers of a social policy or plan. The importance of such online developments identified in the 1960s and 1970s by Licklider and others, was demonstrated in the 1990s.

VII. The Emergence of the Netizen

In 1992-1993, Michael Hauben, was in his second year as a college student at Columbia University in New York City. Describing the research that he did which revealed the emergence of Netizens, of the online net.citizens that Licklider identified as needed for the continuing development of computer technology, Hauben relates how he first got online in 1985 using what were known as local hobbyist computer bulletin board systems. At the time he was living in Michigan, where research for the development of the Internet was being carried out.[26]

Describing the experience he had online, Hauben writes:

> I started using local bulletin board systems (called BBS's) in Michigan in 1985. After several years of participation on both local hobbyist-run computer bulletin board systems and the global Usenet, I began to research Usenet and the Internet.
>
> This was a new environment for me. Little thoughtful conversation was encouraged in my high school. Since my daily life did not provide places and people to talk with about real issues and real world topics, I wondered why the online experience encouraged such discussion and consideration of others. Where did such a culture spring from? And how did it arise? During my sophomore year of college in 1992, I was curious to explore and better understand this new online world. (*Netizens*, "Preface," page ix[27])

Hauben explains how, "As part of course-work at Columbia University I explored these questions. One professor encouraged me to use Usenet and the Internet as places to conduct research. My research was real participation in the online community, exploring how and why these communication forums functioned." He continues, "I posted questions on Usenet, mailing lists and Freenets.[28] Along with my questions I would attach some worthwhile preliminary research. People respected my questions and found the preliminary research helpful. The entire process was one of mutual respect and sharing of research and ideas, fostering a sense of community and participation." (*Netizens*, page ix)

Through this research process, he "found that on the Net people willingly help each other and work together to define and address issues important to them." This was the experience people had on Internet mailing lists and Usenet newsgroups in the early 1990s, before the web culture had developed and spread. What one found was a great deal of discussion and interactive communication online. This was like the computer bulletin board culture that flourished in the 1980s and early 1990s. While the computer bulletin boards put users in contact with local computer users, Usenet newsgroups and Internet mailing lists put users in contact with other computer users from around the world. When Hauben posted his early research questions on Usenet and the Internet, he received about 60 responses from around the globe. A number of these responses were detailed descriptions of how people online had found the Net an exciting and important contribution to their lives. Not only did the Internet make a difference in the range of experiences and in contacts people could reach, but also, and sometimes more important, it made possible a more satisfying, broader experience of communication.

Elaborating on the progression of his research, Hauben writes:

> My initial research concerned the origins and development of the global discussion forum Usenet. For my second paper, I wanted to explore the larger Net, what it was, and its significance. This is when my research uncovered the remaining details that helped me recognize the emergence of Netizens. (*Netizens*, page x)

While people answering his questions were describing how the Internet and Usenet were helpful in their lives, many wrote about their efforts to contribute to the Net, and to help spread access to those not yet online. It is this second aspect of the responses that Hauben received which he recognized as an especially significant aspect of his research.

Describing the characteristics of those he came to call Netizens, Hauben writes:

> The world of the Netizen was envisioned more than twenty-five years ago by JCR Licklider. Licklider brought to his leadership of the U.S. Department of Defense's ARPA program a vision of the 'intergalactic computer network'.
>
> There are people online who actively contribute to the development of the Net. These are people who understand the value of collective work and the communal aspects of public communications. These are the people who discuss and debate topics in a constructive manner, who e-mail answers to people and provide help to newcomers, who maintain FAQ's, files and other public information repositories. These are the people who discuss the nature and role of this new communications medium. These are the people who as citizens of the Net I realized were Netizens. (*Netizens*, pages ix-x)

Later Hauben elaborates:

> Net.citizen was used in Usenet … and this really represented what people were telling me – they were really net citizens – which Netizen captures. To be a 'Netizen' is different from being a 'citizen'. This is because to be on the Net is to be part of a global community. To be a citizen restricts someone to a more local or geographical orientation. (From "Webchat with Michael Hauben," Jan. 25, 1996)

Hauben was not referring to all users who get online. He differentiates between Netizens and others online:

> Netizens are not just anyone who comes online. Netizens are especially not people who come online for individual gain or profit. They are not people who come to the Net thinking it is a service. Rather, they are people who understand that it takes effort and action on each and everyone's part to make the Net a regenerative and vibrant community and resource. (*Netizens*, page x)

Several of the articles Hauben wrote about the history and impact of the Net were posted online and then collected into a book. In January 1994 the book was put online at an FTP site documenting the origins of the online network and culture it gave birth to. In his preface to the book Hauben wrote:

> As more and more people join the online community and contribute toward the nurturing of the Net and toward the development of a great shared social wealth, the ideas and values of netizenship spread.

By 1995, Hauben's research was recognized internationally, and he was invited to Japan to speak at a conference about the subject of Netizens. In his talk, he describes his early investigation of Usenet and the Internet and what he learned from his research and experience online. He writes:[29]

> The virtual space created on noncommercial computer networks is accessible universally. This space is accessible from the connections that exist; whereas social networks in the physical world generally are connected only by limited gateways. So the capability of networking on computer nets overcomes limitations inherent in non computer social networks. Access to the Net, however, needs to be universal for the Net to fully utilize the contribution each person can represent. Once access is limited, the Net and those on the Net lose the full advantage the Net can offer. Lastly the people on the Net need to be active in order to bring about the best possible use of the Network.

VIII. The Online Community

It is interesting to see how closely the conceptual vision Hauben developed matched that of the vision of JCR Licklider. Hauben's views were influenced by his experience online, his study and the comments he received in response to his research questions from people around the world.[30] Licklider had recognized the need for an online community that would encourage users to contribute to be able to develop computer and network science and technology. This collaborative environment is what people found online on Usenet and the Internet even into the early 1990s.

Licklider and later Hauben advocated support and protection of the creative users online who were eager to explore how to utilize the Internet in interesting and novel new ways. Both staunchly maintained that users had to be participants in making the decisions that would develop and spread the Internet to all. Both warned that commercial entities could not develop a network that would spread access to all or that would encourage user participation in its development.

The conscious netizen, the net.citizen that Hauben identified online in the 1992-1993 period when he was doing his initial research about the history and social impact of the Internet coincided with Licklider's ideas that there was a need to have creative users online to help the Internet to develop and to care for its continuing development.[31]

The concept and consciousness of oneself as a netizen has since spread around the world. By the mid 1990s, people online had begun to refer to themselves as netizen, in the fashion of how 'citizen' was used during the French Revolution.

There have been significant achievements of netizens in countries around the world. The netizens of South Korea, however, deserve particular mention. They are helping to shape the democratic practices that extend what is understood as democracy and citizenship. Their experience provides an important body of practice to consider when trying to understand what will be the future form of political participation.[32]

IX. Methodology

What are the implications of Licklider's ideas about models and about the brain and modeling, for the study of the Internet and the creation of a research agenda for this study? Recent articles in the "Annals of the History of Computing" and other engineering publications provide a perspective toward what methodology and framework are needed for such study.

One article is an editorial by Hunter Crowther-Heyck titled "Mind and Network."[33] The author proposes that the Internet is attractive as a 'new model.' He recognizes that this is not an accident, but the result of the interest in models and modeling by those in the cybernetic community that Licklider was a member of in the 1940s and 1950s. This community was also interested in how the human mind worked. They wondered what they could learn about the human brain from learning about the computer, and what they could learn about the computer, from learning about the brain.

Licklider and Taylor's article "The Computer as a Communication Device," however, takes this relationship one step further. By focusing on the human-computer system as a network, they are able to consider the implications for the augmentation of the human capability that being part of a collaborative communication network would make possible.

The article, "Engineering Disclosing Models," by the British historian of science, Michael Duffy makes the argument why a new methodology is needed for the history of engineering to support the new advances made possible by information technology.[34] Duffy maintains that modern engineering developments are a change in a conceptual paradigm as fundamental as the change described in the *Elizabethan World Picture*.[35] In his book, Tillyard describes a paradigm change that took place in science in the 16th and 17th centuries. This was a change from the metaphysics that took as its fundamental basis the four elements of fire, air, earth and water, to a science that would focus on the nature of the phenomenon being observed in order to determine the scientific laws and underlying principles.

The changed paradigm led to the discovery of thermodynamics and mechanics and other scientific explanations that made possible the industrial revolution. Duffy proposes that there is a need to create a new conceptual framework by which to understand the history of engineering and by which to help inspire support for its future development.

He explains how the new technologies of our time "are very different from the machines and systems which built and powered the former phases of industrialization, and their raw material is more likely to be a living organization, the nervous system or information …." Because new kinds of industry are being created as consequences of this development, he argues, the new technologies require a conceptual apparatus adequate for interpreting the physical and biological phenomenon.

Duffy is calling for a change from looking at engineering as artifacts as has been common in the past. The "history of technology is too often focused on industrial [artifacts]," he writes. He points out that there is a need for a new history of engineering and a new methodology to develop that history. The history he is proposing is one that will focus on the concepts and models of engineering activities. Duffy defines engineering as, "The science which includes technology."

(page 22) He is proposing the need to identify the model that engineers use, the 'conceptual apparatus,' (page 29) that helps to understand a technological process and to explore how to develop it. Duffy argues that there is a need to create "imaginary models or analogies of the phenomenon" being developed. Then "these models can be abstracted, generalized and idealized." (page 27)

"All design," he writes, "must of course be subjected to practical tests." Duffy identifies what he calls "disclosing models," as a means to provide this new conceptual framework to reinterpret and deepen understanding of engineering in the past and to provide a new conceptual apparatus for the future. (pages 22-23, see page 29) "Even the simplest model can effect a revolution," he observes. An example he offers is the advance that came from borrowing the model of the "semipermeable membrane" from chemistry to describe "the actions of the model of the heart by the 'diastolic and systolic action'." (page 28)

X. Research Questions

In his article, "How Did Computing Go Global: the Need for an Answer and a Research Agenda," James W. Cortada raises a series of questions about how computer developments have occurred and spread so rapidly in just the past 50 years. "How this class of technology dispersed so quickly … remains little understood," he observes.[36] Considering "why this is a useful question," he concludes that, "In short this story is too big and too important to ignore." Cortada then asks "what is it critical to examine" and "how to do so." (page 53)

While Cordata is making a set of observations about the rapid spread of computer technology, similar observations about the rapid spread of the Internet could be made which would be even more striking. Cortada proposes that the question of "what to examine" is a question to ask about how to study the rapid development and spread of computer technology, "what to examine" is similarly an important question to help to formulate a research agenda on the history and development of the Internet.[37]

XI Conclusion

This paper began with a reference to the mythology that surrounds the origins and development of the Internet. A problem that results from the widespread dissemination of this mythology is that it stands in the way of the researchers and the public recognizing the significant scientific and social advance represented by the creation and the development of the Internet.

It is not that the Internet has grown and spread as an accidental side effect of some obscure U.S. military project, as the mythology would lead one to believe. To the contrary, the Internet is the result of a significant scientific collaboration among an international group of researchers to solve the problems, technical and political, of making communication possible across technical and political boundaries.

Not only was there international collaboration to create the TCP/IP protocol, but this technical research had a scientific foundation in the ferment among an interdisciplinary community of researchers in the 1940s and 1950s who were interested in the science of information processing, of communication, and of control systems.

Along with the scientific interactions of these researchers, there was a concern about the social problem that the new technology would encounter. A primary concern was how to deal with the problem of government officials who would not understand the depths of the issues involved, but who would have to make decisions about the future of the new technology.

To help solve this problem, Licklider recognized that there was a need for increased citizen participation in the decisions that would be made with respect to the new technology. He also recognized that the new computer networking technology would help to make a new form of participatory citizenship possible.

The creation of mailing lists and online discussion groups like Usenet newsgroups have provided support for grassroots participation in networking development. This in turn has helped to create and define the broad ranging social and technical vision that has helped the online community create and develop a significant new social institution, often referred to as 'the Net'.[38]

Even more profoundly, in the early 1990s, just when a number of networks around the world were becoming part of the Internet, research revealed that a new form of social identity and consciousness had emerged within the online community. The identity of oneself as a 'netizen', i.e., a net.citizen, was embraced as a way to refer to the new social consciousness that participation online made possible.

Reviewing Licklider's interest in the brain and the modeling feature of the brain and his understanding that the individual nature of this modeling was a limitation that needed to be overcome, one is struck by how precious and important is the online collaborative and interactive activity that the Internet makes possible.

While there has been much political and financial attention given to the creation of so called new models for Internet governance, there has been little attention or institutional interest in trying to learn the lessons of how the Internet grew and spread and how the netizen emerged. As Thomas Paine observed, almost three centuries ago, "Forms grow out of principles and operate to continue the principles they grow from." (*The Rights of Man*)

By understanding the principles that made it possible to develop the Internet, it will be possible to understand how to create the forms needed to nourish its continuing development. The Internet and the netizen provide a means to carry on this process. That is why there is a serious need for the formulation of a research agenda to support this much needed study.

Notes:

(1) "Packet Switching," Wikipedia,
http://en.wikipedia.org/wiki/Packet_switching

(2) Baran wrote a 11-volume set of booklets "On Distributed Communication" in 1964. Baran's research was sponsored by the U.S. Air Force and proposed a military communication system for voice and data.

(3) Lawrence G. Roberts, "The Evolution of Packet Switching" http://www.packet.cc/files/ev-packet-sw.html

(4) Ronda Hauben, "The Birth of the Internet: An Architectural Conception for Solving the Multiple Network Problem" http://umcc.ais.org/~ronda/new.papers/birth_internet.txt

(5) "An Interview with Donald W. Davies," conducted by Martin Campbell-Kelly, on 17 March 1986 National Physical Laboratory, "Actually, most of the discussions tended to be about the operating system aspects, but certainly the mis-match between time-sharing and the telephone network was mentioned. It was that which sort of triggered off my thoughts, and it was in the evenings during that meeting that I first began to think about packet-switching." (page 6) See also Thomas Marill and Lawrence G. Roberts, "Toward a Cooperative Network of Time-Shared Computers," *Proceedings-Fall Joint Computer Conference, AFIPS 29,* 425-431, Washington, D.C., Spartan Books, 1966, and Interview with Davies.

(6) Ronda Hauben, "A Closer Look at the Controversy Over the Internet's Birthday!," *CircleID*, January 15, 2003. http://www.CircleID.com/posts/a_closer_look_at_the_controversy_over_the_internets_birthday_you_decide

(7) These networks can differ significantly. To transport packets among dissimilar networks meant a whole set of issues had to be understood and resolved, according to Robert Kahn, one of the co-inventors of the TCP/IP protocol. Among the issues listed are: packets on different networks would be of different sizes, there would be different decisions made regarding timing, flow control, error checking and so forth. There would need to be a means of having all the different networks recognize how to route packets to their destination address. A form of addressing was needed which would be recognized by all the networks of the Internet.

(8) See Ronda Hauben, "The Internet: On its International Origins and Collaborative Vision (A Work in Progress)" http://umcc.ais.org/~ronda/new.papers/birth_tcp.txt
(9) Vinton Cerf. See:
http://umcc.ais.org/~ronda/new.papers/1.pdf
(10) Sylvia B. Kenney and Peter Kirstein, "The Uses of the ARPA Network via the University College London Node," *Workshop on Data Communications Sep 15-19, 1975, CP-76-9*, IIASA Laxenburg, Austria, 1975, page 54, http://www.ais.org/~ronda/new.papers/2.pdf
(11) See graphic of SATNET at:
http://umcc.ais.org/~ronda/new.papers/4.pdf from an E-mail between the author and Horst Claussen and Hans Dodel.
(12) Warren Teitelman, "Pilot: A Step Toward Man-Computer Symbiosis," September 1966, Project MAC, MIT, MAC-TR-32 (Thesis), page 11.
(13) JCR Licklider, "MEMORANDUM FOR: Members and Affiliates of the Intergalactic Computer Network, Subject: Topics for Discussion at the Forthcoming Meeting, April 23, 1963," ADVANCED RESEARCH PROJECTS AGENCY Washington 25, D.C.
http://www.olografix.org/gubi/estate/libri/wizards/memo.html
(14) *Ibid.*, Teitelman, abstract, p. I.
(15) JCR Licklider and Robert Taylor, "The Computer As a Communication Device," *In Memoriam: JCR Licklider, 1915-1990*, Digital Systems Research Center Palo Alto, CA, 1957, page 21 http://memex.org/licklider.pdf
(16) *Ibid.*
(17) *Ibid.*
(18) "The On-Line Intellectual Transfer System at MIT in 1975." Carl F. J. Overhage and R. Joyce Harman, *The On-Line Intellectual Community and the Information Transfer System at MIT in 1975*, page 25
(19) See for example Licklider, JCR "Computers: Thinking Machines or Thinking Aids?" *Mgmt. Rev. 54* (July 1965) 40- 43.
(20) "In order to understand the wonder that the Internet and various other components of the Net represent, we need to understand why the ARPANET Completion Report ends with the suggestion that the ARPANET is fundamentally connected to and born of computer science rather than of the military." Chapter 7, Behind the Net: The Untold Story of the ARPANET and Computer Science, by Michael Hauben, in *Netizens*, page 96. See also "The developers of the ARPANET viewed the computer as a communication device rather than only as an arithmetic device. Such a shift in understanding the role of the computer was fundamental in advancing computer science." *Ibid.*, page 109.
(21) Ronda Hauben, "Computer Science and the Role of Government in Creating the Internet: ARPA/IPTO (1962-1986) Creating the Needed Interface,"
http://www.columbia.edu/~rh120/other/arpa_ipto.txt
(22) Greenberger, Martin ed, *Computers and the World of the Future,* MIT Press, Cambridge, 1962.
(23) *Ibid*., C. P. Snow, "Scientists and Decision Making," pages 3-13 (Talk given at MIT, March 1961)
(24) Ronda Hauben, "Computer Science and the Role of Government in Creating the Internet,"
http://ais.org/~ronda/new.papers/arpa_ipto.txt
(25) JCR Licklider, "Computers in Government," in Michael Dertouzos and Joel Moses, *The Computer Age: A Twenty-Year View*, Cambridge, MIT Press, 1979, pages 87 - 126.
(26) This was under a contract between ANS, the Univ of Michigan and IBM
(27) Michael Hauben and Ronda Hauben, *Netizens: On the History and Impact of Usenet and the Internet*, IEEE Computer Society, Los Alamitos, CA, 1997.
(28) In the 1990s, community networks called Freenets were just springing up which provided local users with free access to the Internet.
(29) From "The Netizens and Community Networks," presented at the Hypernetwork '95 Beppu Bay Conference on November 24, 1995
http://www.columbia.edu/~hauben/text/bbc95spch.txt
(30) It is remarkable how the ideas about democracy and communication that Hauben recognized from his research and the ideas that Licklider had about citizens being involved in the decisions that would influence the future of the net coincide with the ideas that Jurgen Habermas had conceptually described as a public sphere. In an article describing Habermas's theory, Mark Warren explains the aspects of discursive democracy that Habermas has identified. The importance of Habermas's work is that he focus on communication and the procreative quality of communication (the transformative quality), in a way that is similar to that of Licklider and Hauben. On the other hand, the difference is that Hauben and Licklider consider the importance of an actual technological support for this human communicative activity, while Habermas speaks more abstractly and focuses on the human activity in a more philosophical (or normative)

framework.

(31) Ronda Hauben, "The Information Processing Techniques Office and the Birth of the Internet: A Study in Governance,"
http://www.columbia.edu/~rh120/other/misc/lick101.doc

(32) Ronda Hauben, "The Rise of Netizen Democracy: A case study of the impact of netizens on democracy in South Korea," in manuscript.

(33) Hunter Crowther-Heyck, "Mind and Network," Vol. 27, Issue: 3 *IEEE Annals of the History of Computing*, July-Sept. 2005, page 104.

(34) Michael C. Duffy, "Engineering Disclosing Models," *Helvelius Book 2*, edited by Oktawian Nawrot, University of Gdansk, 2004, pages 22-64.

(35) *Ibid.*, page 56.

(36) James W. Cortada, "How Did Computing Go Global? The Need for an Answer and a Research Agenda," *IEEE Annals of the History of Computing,* January 2004, pages 53-58.

(37) In this context I want to point to the Asian networking association online Internet history museum as one project with has been created to document how networking has developed in the countries in Asia.
http://www.internethistory.or.kr/

(38) This reflects the fact that the pre-Internet forms like Usenet, BITNet, mailing lists, and a number of other net-working developments in the 1970s and 1980s prepared the ground for the Internet which enveloped all these other networks by the mid 1990s.

Appendix

Examples included Steve Alexander who compiled and distributed a list of gas prices at particular gas stations in California to which many people contributed and kept up to date. (He started this in a newsgroup ca.driving). His effort was to work with others to counteract the collusive price-gouging behavior of the oil companies. (page 11 *Netizens*)

Another response was from Declan Mc Creesh who wrote about how the most up-to-date sports information was available online. It had been contributed to by different people about the Grand Prix.

Godfrey Nolan wrote about how a newspaper about Ireland distributed online by Lian Ferrie who worked in Galway helped Godfrey to keep up with what was happening in his home country.

Malcolm Humes wrote how the kind of conversation online was about substantial issues rather than "how's the weather" type of small talk.

There are numerous other descriptions in the paper Hauben wrote which he titled, "The Net and Netizens: the Impact the Net is having on People's Lives."

Hauben's paper is online as chapter 1 of *Netizens: On the History and Impact of Usenet and the Internet* The URL is: http://www.columbia.edu/~hauben/netbook/

Specific examples of netizen activity to help spread the consciousness of the netizen:

A netizen from Ireland, Cal Woods put the online book into html to help it to spread more widely.

A review of the book was done by a Rumanian researcher, Boldur Barbat. He recognized that netizenship is an important new democratic development and acts as a catalyst for the development of ever more advanced Information Technology.

In his review of *Netizens*, the Rumanian researcher summed up Chapter 13, the chapter about the effect of the Net on the news media. He wrote: "Chapter 13 investigates the effect of the Net on the professional news media, under the metaphor of 'Will this kill that?'; its conclusion is rather optimistic: the user masses becoming 'netizen reporters' will force the acknowledged news media – to avoid being increasingly marginalized – to evolve a new role, challenging the premise that authoritative professional reporters (almost always biased, consciously or not) are the only possible ones." From Boldur Barbat, "Book Review: Netizens: On the History and Impact of Usenet and the Internet," *Studies in Informatics and Control*, Vol. 7, No 4 (December 1998).
www.ici.ro/ici/revista/sic1998_4/art06.html

A Japanese sociologist, Shumpei Kumon, gathered a series of articles into a book in Japanese titled 'The Age of Netizens'. The book begins with a chapter on the birth of the netizen.

Also in the mid 1990s, a Polish researcher, Leszek Jesien, was doing research about what form of citizenship would be appropriate for the European Union (EU). Looking for a model that might be helpful to understand how to develop a European-wide form of citizenship, he found the work about netizens online. He recommended that EU officials would do well to view the phenomenon of netizenship with sympathy and attention as a model of a broader than national, but also a participatory form of citizenship.

The Polish researcher's paper: "The 1996 IGC: European Citizenship Reconsidered," by Leszek Jesien, Instituets fur den Donauraum und Mitteleuropa, March 1997.
http://www.columbia.edu/~hauben/netizens/list-archive/Related-Articles/Jesien.rtf See also:
http://www.columbia.edu/~rh120/other/misc/citizenpap.html

Notable events showing the impact of netizens around the world include:

A Netizen art contest seeking online art that helps to build the online community was sponsored by a gallery in Rome.

A Netizens Association to keep the price of the Net affordable was organized in Iceland.

A lexicographer in Israel composing a dictionary definition for a Hebrew dictionary wanted to be certain that she described a netizen as one who contributes to the Net, not only as anyone online.

A Congressman in the U.S. introduced a bill into the U.S. House of Representatives called the Netizen Protection Act to penalize anyone who sent spam on the Internet.

Along with individual efforts to develop and spread the consciousness of netizenship, there have been online discussions which have demonstrated the power of the Net and Netizen to impact society. One such example is a discussion about an editorial in an Indian newspaper about whether or not India should help the U.S. to invade Iraq. The discussion had more than a thousand entries.