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Forward

This issue of the *Amateur Computerist*, Vol. 34 No. 6, is the seventh issue in a series, each containing articles that are the basis for possible chapters for a second netizen book. The articles in this issue provide some models for the study of the Internet and insights into the scientific origin of the Internet and netizens.

The first article, "The Internet Model of Socio-Economic Development and the Emergence of the Netizen," explores a paradigm different from that of the market as the motivator of economic development. This model is based on the practices developed in technical and scientific research: open, collaborative, and directed toward an evolving vision or goal.

The second article, "Citizen Model for the Study of the Internet," proposes that at its essence, the Internet is about communication – communication across borders. A model emerges from the study of the technology of the Internet. The breakthrough was the design and creation of gateways to perform the functions needed to support communication across the boundaries of dissimilar networks. Similarly, the netizen provides a model for a social phenomenon that has made it possible to solve the problem of citizenship across borders or boundaries. The article argues that the models of gateways and the netizen are significant new models to help open up the study of communication.

The next article asks the question of what kinds of policy decisions need to be made about the Internet and by what process? It argues that the Internet's international origins and early vision and development can provide a useful perspective for looking at the contest about whether the development and management of the Internet and its infrastructure should be left to the market to determine or set by the policies of governments.

The fourth article "The International and Scientific Origins of the Internet and the Emergence of the Netizens," begins with a reference to the mythology that surrounds the origins. A problem results from the widespread dissemination of the myth of a military origin. That myth 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. The article concludes that 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 next article "Commodifying Usenet and the Usenet Archive or Continuing the Online Cooperative Usenet Culture," tells some of the collaborative history of Usenet, the world-wide distributed discussion system that dominated early networking. It also tells the story of the sale to Google, Inc. of the archive of Usenet posts collected and archived by the company Deja.com. The sale is seen as part of a commodification of voluntarily contributed Usenet posts. The article explores this as a culture clash and considers possible consequences.

The final article in this issue is a review of Norbert Wiener's 1950 book, *The Human use of Human Beings: Cybernetics and Society*. Much of the book under review consists of examples of communication theory applied to human existence, biology and

thought, along with application to automata, machinery and animal life as well. Wiener's introduction of the concept of cybernetics, for example the importance of feedback that works on actual performance and not just on intended performance, had a strong influence on the development of modern communication technology. The prevalence of the prefix cyber is a tribute to Norbert Wiener's pioneering work on cybernetics.

We hope the articles in this issue will draw attention to the importance of understanding the scientific origin of the Internet.

[Editor's Note: The following paper was presented in July 2010 at the Association for Heterodox Economics (AHE) Conference in Bordeaux, France. It is a look at the lessons for economics that can be learned from the building of the Internet.]

The Internet Model of Socio-Economic Development and the Emergence of the Netizen

by Ronda Hauben

Part I. – Preface

In this paper I want to explore a paradigm different from that of the market, as the motivator of economic development. This model is a model that is scientifically oriented and based on the practices developed in technical and scientific research. It is a model that is open, collaborative and directed toward an evolving vision or goal.

I will call this model the Internet socio-economic development model. It is a model very different from the neo-liberal capitalist oriented socio-economic development model. It is a model based on grassroots participation and feedback. Its theoretical foundation is cybernetic feedback theory and communication theory.

It is a model that recognizes socio-economic development as the development of a system, where a change in one part of the system affects other parts of the system. Critical to this model is the goal or vision that provides the orientation for the processes or practices of development. Also critical to this model is the dynamic nature of the goal or vision as a collaborative process.

This paper will explore how this model evolved from the experience of the development of the Internet. It is a model building on the processes of development of the systems and technologies that we now call the Internet.

Also this paper will explore the adaptive and generative nature of this model which, among other contributions, has led to the development of the netizen and netizenship as a means of participatory empowerment of the users toward a socially oriented public policy objective.

While this model describes how it was possible to develop the Internet, developing nations which also want Internet development are being told they need to follow a neoliberal model of development. Instead of the lessons of the Internet development model being shared with developing nations, developing nations are encouraged to adopt a neoliberal economic model, requiring them to liberalize their laws to be attractive to foreign investment and loans.

But commercial or investment sectors were not capable of developing the Internet. Describing the Internet development process, Robert Kahn, one of the pioneers who provided leadership for Internet development, described how the Internet grew and flourished under government stewardship [before the privatization process] because 1) the U.S. government funded the necessary research, and 2) it made sure the networking community had the responsibility for its operation. Also the U.S. government insulated the early Internet community from bureaucratic obstacles and commercial matters so the Internet could evolve dynamically. Such a role for government in Internet development is very different from relegating development to the private sector.

Another critical aspect of Internet development was the welcoming of grassroots feedback and taking into account the feedback to make the needed changes in the processes. The netizen and netizenship emerged as an embodiment of this feedback process.

Part II. – Introduction

In January 1992, I was fortunate to be able to get a connection from my computer in Dearborn, Michigan to a computer in Cleveland, Ohio, known as the Cleveland Freenet. This was a free connection making it possible to access the Unix-based computer network known as Usenet. I had heard Usenet was filled with interesting and substantial posts and was eager to get access to it.

At the time I was following the economic

developments in the U.S. economy and was interested in understanding the problems which appeared serious. When I managed to get a connection to a discussion group on Usenet, which was called the misc.books.technical newsgroup, I sent a post about my interest in economic discussion.

> From: au329@cleveland.Freenet.Edu
> Newsgroups: misc.books.technical
> Date: 10 Jan 92 07:48:58 GMT
> Organization: Case Western Reserve University, Cleveland, Ohio, (USA)
> Nntp-Posting-Host: cwns9.ins.cwru.edu
> I am interested in discussing the history of economics — i.e. mercantilists, physiocrats, adam smith, ricardo, marx, marshall, keynes etc. With the world in such a turmoil it would seem that the science of economics needs to be reinvigorated.
> Is there anyplace on Usenet News where this kind of discussion is taking place? If not is there anyone else interested in starting a conference.economics and how would I go about doing this. This is my first time on Usenet News.
> au329@cleveland.freenet.edu

I received perhaps 10 e-mails from different people on Usenet telling me in various ways that my post was not appropriate for a newsgroup discussing technical books. Also, however, several who responded told me that my post was interesting and directed me to the newsgroup that was appropriate for the topic I had proposed. The newsgroup they directed me to was the "sci.econ" newsgroup. One of the responses, strikingly representative the culture of Usenet, said: "Start discussing on sci.econ. We're all ears."[1]

The reason this was significant is that it let me know what was wrong with what I had done, but also that there were those on Usenet who were "listening."

This post was done on January 10, 1992. This was during the period that the Internet was beginning to spread and become a worldwide network. It is perhaps difficult for many to understand the experience of being on the Net in this period before widespread access to the Internet was available.

Writing in the Introduction to the Internet Society conference proceedings in 1993 (INET '93), one of the Internet pioneers, Lawrence Landweber writes:[2]

> INET '93 the annual conference of the Internet Society is the first global networking conference to take place since the existence and availability of networks and their services have become known to the general public … . We welcome you to INET'93 and hope you will enjoy the people and the look into the future that you will encounter.

What is significant about this statement and the conference it is introducing is that it helps to mark the time period, 1993, when a significant new economic development had been achieved, primarily outside of and without any significant role being played by the market.

Most of the discussion about the Internet in research and academic circles focuses on the impact of the Internet, or issues about the difficulties of having it spread to all. It is similarly important to focus on the understanding for economics of the significance of the Internet development processes which took place over more than a 20 year period of time involving thousands of researchers, students, and others around the world. By exploring the development model that made it possible to create the Internet and to spread it around the world, one can consider if there are lessons from this process toward not only the continued scaling of the Internet, but also toward solving other problems of economic and technical development.

Part III. – The Role of Government in the Creation of the Internet

In trying to understand the nature of the government role in the creation of the Internet, I came across an anomaly. Indeed there had been a government role, but this role was intimately tied up with the concept of governance. In his book *Nerves of Government*, the political scientist Karl Deutsch reminds the reader, "Let us recall that our word 'government' comes from a Greek root that refers to the art of the steersman."[3]

Deutsch elaborates on the significance of looking at the concept of government as "steersman."

"The same underlying concept," he says, "is reflected in the double meaning of the modern word 'governor' as a person charged with the administrative control of a political event, and as a mechanical device controlling the performance of a steam engine or an automobile."[4]

The institutional structure at the core of the government role in the Internet's development was known as the Information Processing Techniques Office (IPTO). The IPTO was created as a civilian office in the U.S. Department of Defense. This office provided the protective institutional form to nurture the early development of computer science, and then of the Internet.

Describing this office, the authors of a study done by the National Research Council of the National Academy of Science write:[5]

> The entire system displayed something of a self-organizing, self-managing system.

The explanation of the anomaly is that the Information Techniques Processing Office embodied the concepts of governance and communication science that the first director of the Office, J. C. R. Licklider, had encountered in his research and scientific work as part of an international community of scientific researchers.

"The office," writes Robert Fano, one of the researchers who was part of the research community pioneering developments in computer and communication science, "was structured like no other government research program, akin to a single, widely dispersed research laboratory with a clear overall goal."[6]

Fano credits the director, Licklider, for establishing the program so that it was "on the right track with policies from which his successors did not materially depart." Licklider, acted, "as its director and intellectual leader. He fostered close communication and collaboration among all parts of his far-flung laboratory." In this way he created a significant research community.

Fano explains how Licklider:

> Further instilled in that community the sense of adventure, dedication, and camaraderie that he had learned to value in his research career. He also made sure that the availability of computer resources would not be a limiting factor in the research program, And that plenty of funds would be available for the support of graduate students, whom he correctly regarded as a most important and precious resource.

Licklider was part of a community of researchers who studied the conceptual models for feedback, learning and adaptive systems. Licklider, was a psychologist who had done pioneering brain research and had become intrigued with the potential of the computer for the scientific community he was part of.

In a paper he wrote with computer science researcher Wesley Clark, Licklider set as the objective to provide for the coupling of the general purpose human information processing system with the general purpose computer information system. Their object was to "amalgamate the predominantly human capability and predominantly computer capability to create an integrated system for goal oriented online inventive information processing."[7]

Licklider had a broad conception for what the computer was to be able to do and the role for the human in the close human computer partnership he envisioned. He was able to understand the technical and conceptual needs to start a far ranging research program to implement this vision. Critical to the program was the research community he created. He started the Information Processing Techniques Office in the Fall of 1962. He had two years to demonstrate progress in the new form of computing he was proposing.

Part IV. – The Scientific Technical Community

The IPTO funded researchers and encouraged them to develop programs that came to be known as Centers of Excellence. IPTO funded a program at MIT known as Project MAC. It funded a program at Stanford in Artificial Intelligence. At Carnegie Mellon University, Alan Newell and Herb Simon headed the program also in Artificial Intelligence. Other programs were funded at other universities. Part of the research program was for the researchers to use different computer and software systems but to collaborate and share the problems and work they were doing to find the questions they had in common, so as to identify what were the generic issues of computer science.

At the essence of Licklider's quest was to gain an understanding of the computer as a communication device. Along with the effort to form a community of researchers who would collaborate and work together, was the commitment to disseminate widely the results of the research.

Along with support for publication of research in journals, and participation in conferences, researchers were sent abroad when invited. It was during a meeting in Great Britain organized by the British

Computer Society, where 10 IPTO researchers participated, that the British researcher, Donald Davis, first began to think of the ideas for the creation of computer networking technology that came to be known as packet switching.

In a paper Licklider wrote with another researcher Robert Taylor in 1968, Licklider outlined a vision for a network of networks.[8] Licklider's vision was of the creation and development of a human-computer information utility. For this to develop and be beneficial, everyone would have to have access. The network of networks would be global. It wouldn't be just a collection of computers and of information that people could passively utilize. Rather his vision was for the creation of an online community of people, where users would be active participants and contributors to the evolving network and to its development. To Licklider, it was critical that the evolving network be built interactively.

Also Licklider believed that there would be a need for the public to be involved in the considerations and decisions regarding network development. He recognized that there would be problems with pressure put on government from other sectors of society and that active citizen participation would be needed to counter these pressures. Licklider, writes:

> Many public spirited individuals must study, model, discuss, analyze, argue, write, criticize, and work out each issue and each problem until they reach consensus or determine that none can be reached — at which point there may be occasion for voting.

Licklider believed that those interested in the development of the global network he was proposing, would have to be active in considering and determining its future. He also advocated that the future of politics would require that people have access to computers to be involved in the process of government. 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.[9]

Part V. – Internet Research Community International from Its Beginnings

Internet development started in 1973 and involved researchers in a number of different countries. The development of a protocol to make communication possible across the boundaries of diverse national networks required the close collaboration of researchers in an international community.[10]

The resulting computer communication network made it possible to send data across the boundaries of diverse technical and administrative networks. Thousands of researchers, students and others were involved in the development processes from around the world.

At a meeting in Sept. 1973 at the University of Sussex, in Brighton, England, two U.S. researchers, Bob Kahn and Vint Cerf presented a draft of a paper proposing a philosophy and design to make it possible to interconnect different networks. The basic principle was that the changes to make communication possible would not be required of the different networks, but of the packets of information that were traveling through the networks.

To have an idea of the concept they proposed it is helpful to look at a diagram to show what the design would make possible.

Their diagram (http://ais.org/~ronda/new.papers/1.pdf) is from a memo by Vint Cerf, but it is not an actual plan for the Internet.

In the gateways, changes to the packets would be made to make it possible for them to go through the networks. Also the gateways would be used to route the packets.

The philosophy and design for an Internet was officially published in a paper in May 1974. The paper is titled "A Protocol for Packet Network Intercommunication" by Vinton Cerf and Robert Kahn with thanks to others including several from the international network research community for their contributions and discussion.

Describing the process of creating the TCP/IP protocol, Cerf explains that the effort at developing the Internet protocols was international from its very beginnings. Peter Kirstein, a British researcher at the University College London (UCL) presented a paper in Sept. 1975 at a workshop in Laxenburg, Austria, describing the international research process.

This workshop was attended by an international group of researchers, including researchers from Eastern Europe. Kirstein reports on research to create the TCP/IP protocol being done by U.S. researchers, working with British researchers and Norwegian researchers.

There is a diagram (http://ais.org/~ronda/new.papers/2.pdf) that Kirstein presents showing the participation of U.S. researchers via the ARPANET, along with British researchers working at the University College London (UCL) and Norwegian researchers working at NORSAR.

Describing such an international collaboration in building a packet switching satellite network as part of the Internet, Bob Kahn writes:

> SATNET … was a broadcast satellite system. This is if you like an ETHERNET IN THE SKY (http://ais.org/~ronda/new.papers/SatnetPic.jpg) with drops in Norway (actually routed via Sweden) and then the U.K., and later Germany and Italy.

Networking continued to develop in the 1980s. Among the networking efforts were those known as Usenet (uucp), CSnet, NSFnet, FIDONET, BITNET, Internet (TCP/IP), and others.

By the early 1990s TCP/IP became the protocol adopted by networks around the world.

Part VI. – Emergence of the Netizen

It is also in the early 1990s that the co-author of the book *Netizens: On the History and Impact of Usenet and the Internet*, Michael Hauben, did some pioneering online research as part of class projects in his studies at Columbia University. He explored where the networks could reach and what those who were online felt was the potential and the problems of the developing Internet.

In the process he discovered that there were people online who were excited by the fact that they could participate in spreading the evolving network and contributing so that it would be a helpful communication medium for others around the world. Michael saw these users as citizens of the net or what at the time was referred to as net.citizens

Shortening the term to 'netizen,' he identified and documented the emergence of a new form of citizenship, a form of global citizenship that is called netizenship.

Describing these online citizens, the netizens, Michael writes:

> 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 are people who decide to devote time and effort into making the Net, this new part of our world, a better place. (Hauben and Hauben, 1997)

The concept of Netizens has spread around the world. There are many examples of users who have identified the participatory potential of the Internet as a means for them to try to explore how they can contribute to a more democratic and just society. Netizens in South Korea[11] and China[12] are particularly active in exploring the potential of the Internet to give them the ability to monitor those with power in their societies.

Part VII. – Netizens Providing Hope for Future Development

In his article "Social Science and the Social Development Process in Africa" Charly Gabriel Mbock, critiques the structural adjustment model of development that has pauperized Africa. He describes how loans were made by western countries which benefited a small segment of African society and the western nations that made the loans. These left a debt of not only the loan but also continuing interest payments which the people of Africa have to pay back despite the fact they never benefitted from the loans themselves.[13]

In place of the "structural adjustment program" that brought the people of Africa so much trouble, Mbock proposes a "democratic adjustment program."[14] "No one can stop the globalization process," Mbock writes, "But perhaps a world of global netizens could help to mitigate the consequences of the global economy."[15] "Will the situation improve," Mbock asks, "if the future brings 'netizenship' to Africans?"

He writes:

> Michael and Ronda Hauben are of the opinion that the Net and the new communications technologies will encourage people to shift from citizenry to netizenry, away from 'geographical national definition of social membership to the new non-geographically based social membership '(Mbock referring to Hauben and Hauben, 1997, pp. x-xi) (p.165)

"The dream of worldwide 'netizenry,' Mbock writes, "is the creation of a global community devoted to a more equitable sharing of world resources through efficient interactions."

He writes, quoting Netizens :

> A Netizen (Net citizen) exists as a citizen of the world thanks to the global connectivity that the Net makes possible. You consider everyone your compatriot. You physically live in one country but you are in contact with much of the world via the global computer network. Virtually you live next door to every other single Netizen in the world. Geography and time are no longer boundaries (…) A new, more democratic world is becoming possible as a new grassroots connection that allows excluded sections of society to have a voice. (Hauben and Hauben, 1997, pp. 3, 4-5) (p. 165)

"If such a global community were to become reality, then community ways would prevail over market values," writes Mbock. "As an efficient and democratic breakthrough, technological innovation would lead to deep-seated social transformations resulting in global change … ." (p. 165)

"The hypothesis of a new world order," he proposes, "is an opportunity for catch-up of countries in Africa to create," quoting from Michael Hauben, "a forum through which people influence their governments, allowing for the discussion and debate of issues in a mode that facilitates mass participation." (Hauben and Hauben, 1997, p. 56) (p. 165)

"The outcome would be netdemocracy," Mbock writes, "with a three-pronged system of dialogue; dialogue among the citizens of a given country, dialogue among these citizens and their local or national government, and dialogue among 'netizens.' The world as a global community of 'netizens,' would then, 'at last' possess its long-awaited engine for effective and social development in Africa." (p. 165)

"To Sean Connell," Mbock writes, referring to a quote from Connell in Netizens, "the Net is a highway to real democracy, 'a means to create vocal, active, communities that transcend race, geography and wealth,' a mechanism through which everybody can contribute to the governing of his or her country" (Hauben and Hauben, 1997, p. 249) (p. 165).

Mbock argues that:

> (A)s a new paradigm shift from citizenship to genuine 'netizenship' is the worldwide innovation that social scientists should herald, and not only for Africa. This implies looking beyond national citizen passports, to negotiate global, 'netizen' ones.[16]

Mbock's application of the concept of netizenship to help solve the problems created by the structural adjustment policies of the Bretton Woods institutions offers a mechanism to provide a watchdog over the abuse of power in the development processes. The model of Internet development provides a means to base development on a scientific foundation.

Part VIII. – Conclusion

The question being considered in this paper, on the contrary, is how to understand the process of Internet research over a 20 year period of time as a socio-economic phenomena.

There has been much criticism of the neoliberal economic paradigm especially of the structural adjustment policies carried out by the Bretton Woods Institutions.

In his 2001 Nobel Prize speech, Joseph Stiglitz addresses the difficulty of creating a new paradigm in economics. "To develop a new paradigm," he says, "we had to break out from the long established premises, to ask what should be taken as assumptions and what should be derived from analyses."[17]

There is recognition that it is not adequate to critique the neoliberal paradigm, but thought has to be given to the set of assumptions and analyses that have dominated the neoliberal economic paradigm for several decades.

In an article on his comprehensive development paradigm, Stiglitz considers the long standing debate on the relationship between democracy and development. Arguing that it is not necessary to sacrifice democracy to achieve development, Stiglitz notes the need for and potential of a more participatory process in society given new developments like the Internet.[18] But while he is arguing in favor of the benefit to development of more democratic processes, he also notes how difficult it may be to achieve these.

While Stiglitz refers to some examples of participatory processes aiding economic development, the process of the development of the Internet and of the various technologies it helped to bring about, provides a significant source of experience to understand the potential and problems of these new processes. And just as other members of this panel, demonstrate in their papers, the Internet Model of Socio-Economic Development and the Emergence of the Netizen establishes the basis to recognize that the

homo neticus, or the netizen, rather than the egoistic, short-sighted homo economicus, may provide a better theoretical role model for social science and economics.

Notes

1. Michael Hauben and Ronda Hauben, *Netizens: On the History and Impact of Usenet and the Internet*, pp. 61-62.
2. Barry Leiner, (Editor), *Proceedings of INET'93 International Networking Conference,* San Francisco, California, August 17-20, 1993, p. 8.
3. Karl Deutsch, *Nerves of Government: Models of Political Communication and Control*, New York, Free Press, 1963, p. 182.
4. Ibid.
5. National Research Council, *Funding a Revolution*, The National Academies Press, 1999, p. 105, Online at: https://www.nap.edu/cart/download.cgi?record_id=6323&file=85-1 35.
6. Robert Fano, "Joseph Carl Robnett Licklider, March 11, 1915–June 26, 1990," Online at: http://www.ais.org/~jrh/licklider/lick-fano.html.
7. Wesley Clark and J. C. R. Licklider, "Online Man Computer Communication," *AFIPS, Proceedings of May1-3, 1962, Spring Joint Computer Conference*, San Francisco, California, pp. 113-128. Online at: https://ia800807.us.archive.org/29/items/online-man-computer-communication/Image072217150750.pdf
8. J. C. R. Licklider and Robert Taylor, "The Computer As a Communication Device." Online at: https://www.hpl.hp.com /techreports /Compaq-DEC/SRC-RR-61.pdf.
9. Ronda Hauben, "The International Origins of the Internet and the Impact of this Framework on its Future," talk given at Columbia University, November 4, 2004, Online at: http://www.columbia.edu/~rh120/other/misc/wsistalknov2004.doc.
10. Ronda Hauben, "The Internet: On its International Origins and Collaborative Vision, (A Work In Progress)." Online at: http://www.co lumbia.edu/~rh120/other/birth_tcp.txt.
11. Ronda Hauben, "On Grassroots Journalism and Participatory Democracy in South Korea," in *Korea Yearbook 2007: Politics, Economics and Society*, edited by Ruediger Frank et al., Brill, 2007. Online at: http://www.columbia.edu/~rh120/other/netizens_draft.pdf
12. Shaobin Yu, "Interaction in the Information Era: Is Internet Supervision the Panacea?"
13. Charly Gabriel Mbock, "Social Science and the Social Development Process in Africa," *Social Science and Innovation*, OECD, 2001, p. 161. The whole book can be read for free online at: https://www.google.com/books/edition/Social_Sciences_and_Innovation/LncFo1_SDxcC.
14. Ibid, p. 160.
15. Ibid, p. 165.
16. Ibid. p. 166.
17. In his Nobel Prize speech, Joseph Stiglitz addresses the difficulty of creating a new paradigm in economics. "To develop a new paradigm," he says, "we had to break out from the long established premises, to ask what should be taken as assumptions and what should be derived from analyses." Joseph Stiglitz, "Information and the Change in the Paradigm in Economics," Prize Lecture, December 8, 2001, p. 487. Video of this speech can be viewed online at: https://www.nobelprize.org/prizes/economic-.sciences/2001/stiglitz/lecture/
18. Joseph Stiglitz, "Participation and Development: Perspectives from the Comprehensive Development Paradigm," *Review of Development Economics*, 6(2), 2002, p. 169.

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[Editor's note: The Presidency of the European Union (EU) rotates among its member states every six months. In July 2006, Finland was to assume the presidency for the second time. In May of that year, Ronda Hauben was at a conference on "Technology and Rethinking European Borders" in Lappeenranta, Finland.[1] The theme of the conference related to the problem of borders and the role that technology has played in the construction of the European Union. Following is an edited version of her talk presented at the conference.]

Citizen Model for the Study of the Internet

New Technology Demands New Paradigm, Methodology

by Ronda Hauben

My previous visit to Finland was in December 1999, when Finland last had the EU presidency. I was invited to speak at a very interesting conference of NGOs from all over Europe that took place in Tampere, Finland. The title of the conference was "Citizen's Agenda NGO Forum 2000."[2] It was held to herald in the new millennium. Some at the conference had just returned from the 1999 World Trade Organization (WTO) protests in Seattle in the U.S.

The Citizen's Agenda NGO Forum 2000 put on the table the problem that citizens in Europe, as well as citizens in the U.S. (as shown in Seattle), were feeling the problem of a lack of citizen power. The EU conference demonstrated the efforts of citizens to pressure their governments to maintain the social institutions and policies so vital to the fight against the harmful effects of globalization. I presented a talk at the conference exploring the question of whether the Internet could be helpful for citizens. The talk was titled, "Is the Internet a Laboratory for Democracy?"

In July 2006, Finland again assumed the Presidency of the EU. The problem of the citizen was again an issue in the EU, as it was in the U.S. What, if any, is the connection between this conference on the history of technology and European borders and the problem of the citizen in 2006?

The paper I submitted for this conference discusses the history of the Internet and the role that it has played in helping to make it possible for the citizen to communicate across the borders of diverse networks.[3] I want to propose that at its essence, the Internet is about communication – communication across borders. Similarly, communication is vital to those who desire to act as citizens in these times.

The Citizen's Agenda Forum demonstrated that the border that citizens have to be able to cross in their communication is the border posed by their elected representatives, who, all too often, are not interested in hearing the ideas and views of the citizens. This problem – finding a way to have the representative system recognize a means of involving citizens in the decisions that are made – is a problem that was identified and discussed at the workshop, "Civic Participation, Virtual Democracy and the Net" held during the Citizen's Agenda 2000 Forum. Research exploring whether the Internet could help citizens to bridge the borders blocking such communication was discussed.[4]

The problem of involving the citizens in the affairs of the EU, which was the subject of the Citizen Agenda Forum in 1999, had similarly been the focus of research and discussion in the EU in 1995-96. The debate over the ratification of the Maastricht treaty "revealed that there was still a degree of skepticism about European Integration" among the citizens of Europe, explains the EU document "Preparing for the 21st Century." The authors of this document explain that the "Maastricht Treaty makes citizenship an evolving concept."

In a paper published in 1996, after the meeting of the EU's Intergovernmental Conference, "The 1996 IGC: European Citizenship Reconsidered," Leszek Jesien, a researcher and advisor to the Polish government on EU integration, explores the problem of creating a European form of citizenship.[5]

Jesien argues that the bedrock principle of democracy is what legitimizes a government, and that is the "principle that power can be held and governance exercised only with the consent of the governed."

A sign that there is a lack of such legitimacy, he proposes, is when "men and women distrust the institutions of their state." Thus Jesien identifies as a necessary aspect of democratic legitimacy "the need to find modern ways for [the] proper expression of the political will of the citizens."

In the course of his research Jesien identified the ability to participate in the affairs of the state as the essential aspect of citizenship. But he still had a problem of determining how there could be a form of EU citizenship that was different from that of belonging to a nation.

To solve the problem, Jesien proposed as a model, the role of the netizen – Internet users who act as citizens of the Net. Jesien recognized that the netizen was an active participant in the affairs of the Net. Jesien referred to the work of Michael Hauben, co-author of the book *Netizens: On the History and Impact of Usenet and the Internet*. Hauben did pioneering research which provided a conceptual foundation for the social phenomenon of the netizen.

In his paper about European construction, Jesien quotes Hauben's description of the netizen:

> Netizens are Net Citizens … these people are … those who … make [the Net] a resource of human beings. These netizens participate to help make the Net both an intellectual and a social resource.

Jesien recognized that just as the EU was having trouble determining how to develop a concept of citizenship, a related form of citizenship was being developed online. Jesien wrote:

> At the time the European Union struggles to shape the European citizenship with much effort and little success, the other citizenship – Netizenship emerges.

What a rare researcher Jesien is, able to not only identify the significant aspect of the problem he was pursuing, but also to see a model for a solution from

what would seem on the surface to be an unrelated phenomenon. Jesien proposed that European "negotiators and … political leaders should look at this phenomenon with sympathy and attention."

I have taken a significant portion of the time allotted for my talk to focus on one aspect of my paper. I believe that this aspect is worthy of the time for several reasons. One is that it focuses on a serious problem of European construction and of the crisis of democracy worldwide. A second is that once a problem was identified and studied, a solution to it was found in a model which emerged from the new technology, from the technology of the Internet. Third is that there is something new and significant to be learned from paying attention to technology and to the social phenomena which emerge as a result of the technology.

While this example on the surface doesn't refer to the problem of borders or boundaries, the relevance to the theme of this conference becomes clearer when one considers that an essential aspect of the Internet has to do with the problem of making communication possible across the borders or boundaries of dissimilar but interconnected networks.

My paper describes the means found to solve the communication problem facing the Internet pioneers. The breakthrough was the design and creation of gateways to perform the functions needed to support communication across the borders or boundaries of dissimilar networks.

While the design of these gateways is only a part of the design for the Internet, it helps to demonstrate that a significant technical model was developed to help to solve the problem of communication across boundaries or borders of dissimilar networks. (One could add that an aspect of the problem was that these early computer networks were or would be under the political ownership and administration of diverse entities.) Similarly, the netizen provides a model for a social phenomenon that has made it possible to solve the problem of citizenship across borders or boundaries, a problem Jesien identified as relevant to EU construction.

I am proposing that the study of the origin and development of the Internet and of the netizen is a fruitful arena for research, as something new has been created and the research can make it possible to learn about the newly emerging technology and the newly emerging social processes that it brings into being.

Not only is the study of the Internet a means of learning about collaboration across technical and social borders or boundaries, it is also true that the Internet provides a platform to nourish and support such collaborative research.

The significance of this research is highlighted by some observations about the nature and needs of new technology like the Internet that are presented in the work of a British researcher writing about the history of technology and engineering. In his article "Engineering Disclosing Models," Michael Duffy argues that not only is it important to recognize the nature of the new and emerging technical and engineering developments, but also that the research to document these new developments will require new models and methodologies.[6]

Duffy argues that these new engineering and technical developments represent a change in the conceptual paradigm as fundamental as the change described in the book *The Elizabethan World Picture* by Tillyard. This book described the changed paradigm in the Elizabethan period that made it possible to discard the models of the old world of fire, air, earth, and water, and to substitute in their place a science that would focus on the nature of the phenomena being observed in order to determine their underlying principles and scientific laws. This paradigm, Duffy explains, led to the discovery of thermodynamics and mechanics and other scientific explanations that made possible the industrial revolution. Duffy proposes that the new technologies of our time are very different from the machines and systems which built and powered the former phases of industrialization.

Similarly, the new kinds of industry and technology being created require a new conceptual apparatus adequate for interpreting the new physical and biological phenomena. I would add that a new conceptual apparatus is needed to understand and develop the social phenomena that the new technology brings into being.

There is, Duffy argues, a need for a new history of engineering and technology and a new methodology that will focus on concepts and models as the basis for this new history. Essential for this is a need to focus on the actual technology and the new social forms that emerge as part of these developments. I want to propose that the new technologies like the Internet also require a new research agenda to support the study and understanding of the changes that they have introduced into our society.

Even the simplest model can affect a revolution, Duffy observes, referring to the importance of the application of the model of the semi-permeable membrane from chemistry being transferred to describe the model of the heart by diastolic and systolic action.

Similarly, the model of gateways and the netizen are significant new models to help open up the study of communication across boundaries or borders of dissimilar systems. Citizens seeking to find a way to impact the decisions made in their society may well find that they can learn from the experiences and models that have developed on the Internet.

Just as Duffy is arguing for a new methodology appropriate to the study of new engineering developments, so I want to argue for such a new methodology for the study of the Internet that will focus on what is new, on how it was created, and on what its impact has been. As Geoff Long, in a book chapter titled, "Why the Internet Still Matters for Asia's Democracy," argues:

> The Internet is fundamentally different from any previous media communications technology … . The Internet was developed using a participatory model that has its own democratic traditions … . The Internet itself is still evolving … the full story has yet to be written.[7]

Notes:

1. For the program of the conference see "Launch of the Tensions of Europe Research Programme," Lappeenranta, Finland May 24. Online at: http://www3.lut.fi/eki/toe2006/files/23.pdf.
2. The Citizens' Agenda NGO Forum 2000 was held from the 3rd to 5th of December 1999 in Tampere, Finland.
3. See "Communicating Across the Boundaries of Dissimilar Networks: The Creation of the Internet and the Emergence of the Netizen." Online at: http://www.columbia.edu/~rh120/other/misc/finland416.txt.
4. See, for example, see three presentations given at Citizens' Agenda 2000 NGO Forum, 3-5/12/1999, Tampere: Seija Ridell, "Manse Forum: a local experiment with web-mediated civic publicness," online at: https://trepo.tuni.fi/bitstream/handle/10024/65402/951-44-5186-4.pdf, pp.55-89; Lasse Peltonen, "Civic forums, virtual publicness and practices of local democracy"; and Ronda Hauben, "Is the Internet a Laboratory for Democracy?," online at: http://ais.org/~jrh/acn/ACn10-2.pdf, pp. 2-10.
5. Leszek Jesien, "The 1996 IGC: European Citizenship Reconsidered." Online at: http://www.columbia.edu/~hauben/book2005/LJesien.rtf
6. Michael Duffy, "Engineering Disclosing Models," *Helvelieus*, edited by Oktawian Nawrot, University of Gdansk, 2004, pp. 22-64.
7. From *Asian Cyberactivism*, edited by Steven Gan et al, 2004, p. 72.

[Editor's note: The following is a talk given at Columbia University on November 4, 2004. Online at: http://www.columbia.edu/~hauben/nov4talk2.doc.]

The International Origins of the Internet and the Impact of this Framework on its Future

by Ronda Hauben

The research I have been doing for the past 12 years is about the origin, development and social impact of the Internet. I want to propose that knowing something of the nature of the Internet, of its international origins and early vision and development can provide a useful perspective for looking at a process that is currently ongoing at the initiative of the United Nations.

I want to share some of my research about the original vision and the international origins of the Internet and the implications of this heritage on the Internet's future. Just now, over the past two or more years, and continuing through November, 2005, there is a United Nations initiative going on in which the world's governments are participating, along with NGO's and corporate entities. Yet this high level activity, as *Wired* reports, "has been largely ignored by those not participating in it." (Wendy Grossman, "Nations Plan for Net's Future," October 11, 2004)

This process is known as the World Summit on the Information Society (WSIS). After preparatory activities for almost two years, the first of two planned summits was held in Geneva, Switzerland in December 2003. Since that summit, a continuing series of meetings are scheduled to set the foundation for the second Summit which is planned to take place in Tunisia in November of 2005.

Heads of state of many nations, particularly developing nations came to the Geneva summit and spoke about the importance of the Internet to the people in their countries and to their present and future economic and social development and well being. The participants recognized that the Internet is an international network of networks, and that it has been built by a great deal of public and scientific

effort and funding. The disagreement arises over the nature of the present and future management structure and processes for the governance of the Internet.

In 1998 the U.S. government, which had previously overseen the Internet's infrastructure managed as a non-commercial, scientific and educational medium, made a decision to begin to transition it to a private sector entity which is called the Internet Corporation for Assigned Names and Numbers (ICANN).

In the WSIS process there has been a lot of contention over the form and processes of ICANN. The concern is that ICANN was constructed as a business and technical creation and that this process marginalized governments.

Another way of describing this disagreement is that there a contest about whether the development and management of the Internet and its infrastructure should be left to the market to determine or set by the policies of governments.

Concern is being raised about what are the issues pertaining to Internet governance. Stimulating the spread of the Internet and who has access is one such issue. Others include safeguarding the Internet's integrity, oversight of the distribution of Internet addresses and domain names, determining the nature of the public interest and how to protect that interest, etc.

At the core of this dispute is the question of what kinds of policy decisions need to be made about the Internet and determining the process by which they will be made.

The WSIS meetings include those who it is claimed have an interest in questions of Internet governance. These are called the "Stakeholders" and thus far include representatives from:

governments
civil society (NGO's)
private sector

Others are sometimes mentioned, such as the scientific community, or the academic community.

In looking back at the origins of the Internet, I feel it is helpful to start with the vision of JCR Licklider, a psychologist, who was invited to begin a research office within the U.S. Department of Defense in October 1962. Licklider called the office the Information Processing Techniques Office (IPTO).

Licklider was an experimental psychologist who had studied the brain. For his PhD thesis he did pioneering work mapping where sound is perceived in the brain of the cat. Licklider was also excited about the development of the computer and of its potential to further scientific research.

He was particularly interested in the potential of the computer as a communication device. He saw it as a means of helping to create a community of researchers and of making it possible to strengthen the education available to the whole society through access to the ever expanding world of information. He envisioned that increased social contact would become available via the computer and computer networks.

Licklider created a community of researchers that he called the Intergalactic Network. He had in mind a network of networks. Though it was too early to create such a network when he began at IPTO in 1962, he set a foundation that inspired the researchers that followed him. He returned briefly to head the IPTO from 1974-75 just at the time that the research on the Internet was being developed.

In a paper Licklider wrote with another researcher Robert Taylor in 1968, Licklider outlined a vision for a network of networks. Licklider's vision was of the creation and development of a human-computer information utility. For this to develop and be beneficial, everyone would have to have access. The network of networks would be global. It wouldn't be just a collection of computers and of information that people could passively utilize. Rather his vision was of the creation of an online community of people, where users would be active participants and contributors to the evolving network and to its development. To Licklider, it was critical that the evolving network be built interactively.

Also Licklider believed that there would be a need for the public to be involved in the considerations and decisions regarding network development. He recognized that there would be problems with pressure being put on government from other sectors of society and that active citizen participation would be needed to counter these pressures. Licklider, writes:

> … many public spirited individuals must study, model, discuss, analyze, argue, write, criticize, and work out each issue and each problem until they reach consensus or determine that none can be reached – at which point there may be occasion for voting.

Licklider believed that those interested in the development of the global network he was proposing,

would have to be active in considering and determining its future. He also advocated that the future of politics would require that people have access to computers to be involved in the process of government. 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 and other computer pioneers of the 1950s and 1960s were concerned with the public interest and how the computer and networking developments of the future would be maintained in the public interest. Licklider writes that it is important to not only seek to consider the public interest, but also to make it possible for the public to be involved in the decision making process:

> [Decisions] in the 'public interest' but also in the interest of giving the public itself the means to enter into the decision-making process that will shape their future.

Through the 1960s and into the early 1970s the IPTO pioneered new and important computer technology like the time sharing of computers and then the creation of packet switching and the ARPANET computer network. The research was written up in scientific and technical publications and widely distributed.

By the late 1960s and early 1970s it was recognized that there was widespread interest in developing computer networking in countries around the world. A conference was held in 1972 at the Hilton Hotel, in Washington DC from October 24-26. More than a thousand researchers from countries around the world attended and participated in the demonstration by U.S. researchers that packet switching technology was functional. The demonstration excited many of the researchers. Also, however, international participation was recognized as critical to the development of networking technology. "International participation is no mere adornment to the Conference," the organizers wrote. "It is a primary means towards achieving a diversity of interest and viewpoint."

At the conference, a group was formed of those working on networking developments in different countries. It was called the International Network Working Group (INWG).

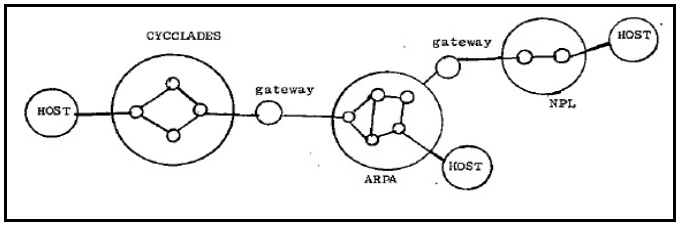
The great interest worldwide in computer networking was stimulating, but also it presented a problem. To understand the nature of this problem, it is helpful to consider the fact that there were packet switching networks being developed in different countries. These included Cyclades in France, NPL in Great Britain, and ARPANET in the U.S. These networks were different technically and were under the ownership and control of different political and administrative entities. Yet networking researchers realized the importance of making it possible for these networks to be able to interconnect, to be able to communicate with each other. This can be articulated as the Multiple Network Problem.

There was the recognition that no one of these different networks could become an international network. There would need to be some means found to make communication possible across the boundaries of different networks.

Collaboration among the researchers continued, with a number of meetings and exchanges about how it would be possible to design and create a means to support communication across the boundaries of these diverse networks.

At a meeting in September 1973 at the University of Sussex, in Brighton, England, two U.S. researchers, Bob Kahn and Vint Cerf presented a draft of a paper proposing a philosophy and design to make it possible to interconnect different networks. The basic principle was that the changes to make communication possible would not be required of the different networks, but of the packets of information that were traveling through the networks.

To have an idea of the concept they proposed it is helpful to look at a diagram to show what the design would make possible.



(This diagram is from a memo by Vint Cerf, but it is not an actual plan for the Internet)

In the gateways, changes to the packets would be made to make it possible for them to go through the networks. Also the gateways would be used to route the packets.

The philosophy and design for an Internet was officially published in a paper over 30 years ago, in

May 1974. The paper is titled "A Protocol for Packet Network Intercommunication" by Vinton Cerf and Robert Kahn with thanks to others including several from the international network research community for their contributions and discussion.

Describing the process of creating the TCP/IP protocol, Cerf explains that the effort at developing the Internet protocols was international from its very beginnings. Peter Kirstein, a British researcher at the University College London (UCL) presented a paper in September 1975 at a workshop in Laxenberg, Austria, describing the international research process. This workshop was attended by an international group of researchers, including researchers from Eastern Europe. Kirstein reports on research to create the TCP/IP protocol being done by U.S. researchers, working with British researchers and Norwegian researchers. Here is the diagram that Kirstein presents showing the participation of U.S. researchers via the ARPANET, along with British researchers working at the University College London (UCL) and Norwegian researchers working at NORSAR.

Collaboration between the Norwegian, British and U.S. researchers continued, demonstrated by the research to create a satellite network, called SATNET. Later researchers from Italy and Germany became part of this work. Describing this international collaboration, Bob Kahn writes:

> SATNET … was a broadcast satellite system. This is if you like, an ETHERNET IN THE SKY with drops in Norway (actually routed via Sweden) and then the U.K., and later Germany and Italy.

Networking continued to develop in the 1980s. Among the networking efforts were those known as Usenet (uucp), CSnet, NSFnet, FIDONET, BITNET, Internet (TCP/IP), and others.

By the early 1990s TCP/IP became the protocol adopted by networks around the world.

It is also in the early 1990s that my co-author of the book *Netizens*, Michael Hauben, did some pioneering online research as part of class projects in his studies at Columbia University. He explored where the networks could reach and what those who were online felt were the potential and the problems of the developing Internet.

In the process he discovered that there were people online who were excited by the fact that they would participate in spreading the evolving network and contributing so that it would be a helpful communication medium for others around the world. Michael saw these users as citizens of the net or what at the time was referred to as net.citizens.

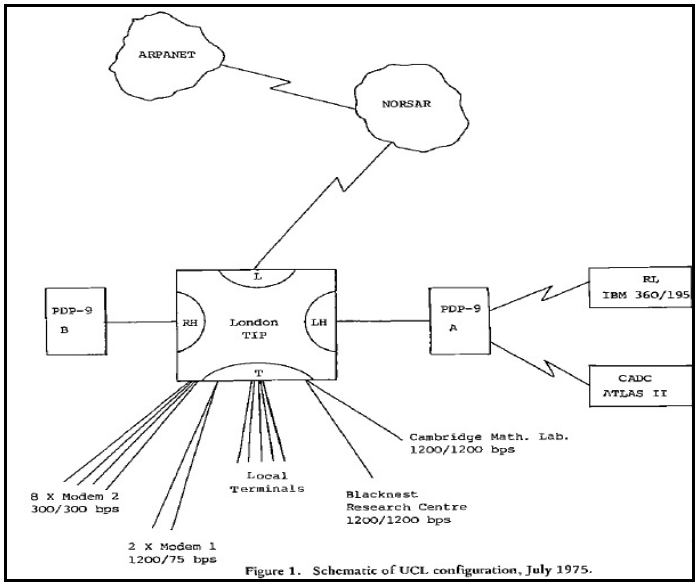


Figure 1. Schematic of UCL configuration, July 1975.

Shortening the term to 'netizen,' he identified and documented the emergence of a new form of citizenship, a form of global citizenship that is called netizenship.

Describing these online citizens, the netizens, Michael writes:

> 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 are people who decide to devote time and effort into making the Net, this new part of our world, a better place.
>
> (Michael Hauben, 1995)

What are the implications of this background to the WSIS process? In October 1998, the U.S. government decided it needed to privatize the Internet's infrastructure. It created ICANN, the Internet Corporation for Assigned Names and Numbers. ICANN provided only minimal input for governments in an official way or for Internet users. There have been many problems with the structure and functioning of ICANN and lots of criticism.

The WSIS process led to holding a Summit in Geneva in December 2003. A number of heads of state attended. Issues raised included: Affordable access available to all, what would be the role for Governments in Internet governance? what would be the role for others in Internet governance?

In February 2004 a workshop was held to try to determine the components of Internet governance. At the workshop there was a proposal for netizens to be involved in Internet governance, recommending that netizen involvement would make it possible to counter the self interest of corporations who were part of the Internet governance process. The following diagram was submitted by Izumi Aizo of Japan. It still shows only a minimal role for governments but it introduces a role for netizens which is in line with Licklider's vision of the crucial nature of citizen participation in the network's development.

Online, there is a forum involved with the WSIS process. But few people who are involved with WSIS seem to pay attention to it. However, a comment on the forum seemed quite relevant to the problems being raised. The contributor to the forum, Safaa Moussa was from Egypt. Moussa, too, echoed Licklider's concerns, writing that the crucial issues of Internet governance involve the issue of public access and the issue of how to widen the scope of public engagement in the decision making process.

In September 2004, a meeting was held in Geneva. Many contributions to that meeting seemed in line with the vision of Licklider expressed to guide computer network development. But there was contention, also. Summarizing the conflict that has developed in the WSIS process, a representative of Egypt, H. E. Dr. Tarek Kamal, explains that there are two conflicting view points. One view is that Internet governance involves primarily technical and operative issues which can be best coordinated by technical groups and business organizations (this is the view of those in favor of ICANN). The other view pointed to by Dr. Kamal is that technical resource management and other policy matters concerning the Internet are social and public questions needing international and government participation.

At the September 2004 meeting, supporting this second viewpoint, a member of the Brazil delegation, Jose Marcos Nogueira Viana, proposed the need to create an inter-governmental forum - a meeting place for governments to discuss Internet related issues. Also putting public interest into the debate, was Hans Falk Hoffman, a representative from the international scientific institution CERN. He described how the scientific community would continue to try to connect universities and therefore major cities to the global network with sufficient bandwidth at affordable prices. A representative from the Chinese delegation Madam Hu Qiheng, explained how "the Internet is a resplendent achievement of human civilization in the 20th century." And that "government has to play the essential role in Internet governance … creating a favorable environment boosting Internet growth while protecting the public interests." (Hu, 2004)

I want to propose that this activity as part of the WSIS process demonstrates the importance of understanding the fact that the Internet is international and that there is a demand for an international management process and structure.

Similarly, and perhaps even more important is the need to understand how to determine the public interest. In connection with this goal, I want to propose the need to seriously consider whether the goal of netizen empowerment is one of the important policy issues to be injected into the WSIS process. This would imply the need to provide means for the online community to be able to be active participants in the WSIS process. In the online forum on September 9, 2004, Safaa Moussa wrote:

> This online forum constitutes an important part of mobilizing efforts for the pursued effective outcome. But, in view of the wide-ranging aspects that Internet Governance covers, I believe it is duly important to make it clearer the inclusion of online contributions into the decision-making process.

Online interaction and feedback need to be seen all along the decision-making and implementation processes.

Another point I would like to underline is the creation of online working groups to help integrate and coordinate initiatives and efforts undertaken at

national regional and international levels.

The Tunis Summit will take place in November 2005. Will it be able to meet the challenges of the continuing development and spread of the Internet? There are promising signs that the public and international essence of the Internet as envisioned by JCR Licklider which were so important in the origin and development of the Internet are being taken up. But will there be a means of welcoming the online community, the community of netizens into the WSIS process? Will there be a convergence of netizen participation and defense of the public essence of the Internet strong enough for the results of the Tunis summit to be significant?

[Editor's Note: The following is a talk given on November 14, 2005 in Tunis at a side event at the World Summit for the Information Society (WSIS 2005).]

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

by Ronda Hauben

> 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*

Part 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 U.K., did significant work in the early development of packet switching, while Paul Baran's work came to be known as the ARPANET 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 U.K. 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)

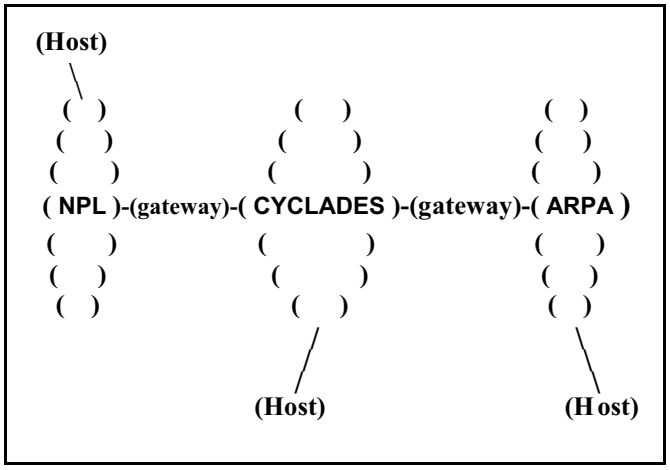
To understand the nature of the Internet, it is necessary to understand what could be called the Multiple Network Problem and how it was solved. The difficulties were not only technical.[8]

Part 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 – U.K.
CYCLADES – France

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



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, 1974, p. 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 back 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 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 U.K., 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 U.K., 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., U.K., 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.

Part 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 in Hauben and Hauben, 1997, p. 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, 1950.)

Thus Licklider had firsthand 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. They 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. (1954.)

Part IV. The Science of Information Processing

Licklider had begun his scientific career not as a computer scientist but as a physio-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."[17]

> The prospect is that, when several or many people work together within the context of an online 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.

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 sys-

tems.

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.

Part 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, 1962, pp. 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, 1962, p. 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.

Part VI. The Politics of Science and Technology

Licklider returned to IPTO more than a decade later, 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, p. 126)

Licklider also felt that "many public-spirited individuals must serve government – indeed must be the government." (Licklider, 1979, p. 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, p. 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, p. 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.

Part VII. The Emergence of the Netizen

In 1992-1993, Michael Hauben, was in his second year as an undergraduate student at Columbia University in New York City. 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 and 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 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. (Hauben and Hauben, 1997, "Preface," p. 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." (Hauben and Hauben, 1997, p. 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.
>
> (Hauben and Hauben, 1997, p. 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. (See Appendix.)

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.
>
> (Hauben and Hauben, 1997, pp. 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. (Hauben, 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.
>
> (Hauben and Hauben, 1997, p. 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.

Part 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]

Part 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] by E. M. W. Tillyard. 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." (Duffy, 2004, p. 22) He is proposing the need to identify the model that engineers use, the 'conceptual apparatus,' (p. 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." (p. 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. (pp. 22-23, see p. 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'." (p. 28)

Part X. Research Questions

In his article, "How Did Computing Go Global: the Need for an Answer and a Research Agenda,"[36] 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. 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." (Cortada, 2004, p. 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]

Part 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 in *The Rights of Man* observed, almost three centuries ago, "Forms grow out of principles and operate to continue the principles they grow from."

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, online at: http://en.wikipedia.org/wiki /Packet_switching.
2. Paul Baran wrote an 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. (Baran, 1964)
3. Lawrence G. Roberts, "The Evolution of Packet Switching," 1978, online at: http://www.ece.ucf.edu/~yuksem/teaching/nae/reading/1978-roberts.pdf. (Roberts, 1978)
4. Ronda Hauben, "The Birth of the Internet: An Architectural Conception for Solving the Multiple Network Problem," online at: 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 mismatch 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." (online at: https://conservancy.umn.edu/bitstream/handle/11299/107241/oh189dwd.pdf, p. 6) See also Thomas Marill and Lawrence G. Roberts, "Toward a Cooperative Network of Time-Shared Computers," Proceedings-Fall Joint Computer Conference, AFIPS 29, pp. 425-431, Washington, D.C., Spartan Books, 1966, online at: https://dl.acm.org/doi/abs/10.1145/1464291.1464336.
6. Ronda Hauben, "A Closer Look at the Controversy Over the Internet's Birthday!," *CircleID*, January 15, 2003. Online at: 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)." Online at: 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, p. 54, online at: 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), p. 11. Online at: https://dspace.mit.edu/bitstream/handle/1721.1/6905/AITR-221.pdf.

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. Online at: http://docplayer.net/4287863-Memorandum-for-members-and-affiliates-of-the-intergalactic-computer-network-subject-topics-for-discussion-at-the-forthcoming-meeting.html.
14. Ibid., Teitelman, p. 1.
15. JCR Licklider and Robert Taylor, "The Computer As a Communication Device," *In Memoriam: JCR Licklider, 1915-1990*, Digital Systems Research Center Palo Alto, California, 1957. Online at: http://memex.org/licklider.pdf, p. 22.
16. Ibid.
17. Ibid.
18. Carl F. J. Overhage and R. Joyce Harman, *The On-Line Intellectual Community and the Information Transfer System at MIT in 1975*, p. 25.
19. See for example Licklider, JCR "Computers: Thinking Machines or Thinking Aids?" *Mgmt. Rev. 54* (July 1965) pp. 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 Hauben & Hauben, 1997, p. 96. … 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., p. 109.
21. Ronda Hauben, "Computer Science and the Role of Government in Creating the Internet: ARPA/IPTO (1962-1986) Creating the Needed Interface," Online at: http://www.columbia.edu/~rh 120/other/arpa_ipto.txt.
22. Greenberger, 1962.
23. Ibid., C. P. Snow, "Scientists and Decision Making," pp. 3-13 (Talk given at MIT, March 1961)
24. Ronda Hauben, "Computer Science and the Role of Government in Creating the Internet," online at: 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, Massachusetts, MIT Press, 1979, pp. 87-126.
26. This was under a contract between ANS, the University of Michigan, and IBM.
27. Hauben and Hauben, 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, online at: 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 focuses 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," online at: 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." Online at: http://www.columbia.edu/~hauben/Era_of_the_Netizen/PDF/Part_II_Netizen_Democracy_in_South_Korea.pdf.
33. Hunter Crowther-Heyck, "Mind and Network," Volume 27, Issue: 3 *IEEE Annals of the History of Computing*, July-September 2005, p. 104.
34. Duffy, 2004.
35. Tillyard, 1943.
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, pp. 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.
38. This reflects the fact that the pre-Internet forms like Usenet, BITNet, mailing lists, and a number of other networking developments in the 1970s and 1980s prepared the ground for the Internet which enveloped all these other networks by the mid 1990s.

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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. (Hauben and Hauben, 1997, p. 11.)

Another response was from Declan McCreesh 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). Online at: http://www.columbia.edu/~hauben/Era_of_the_Netizen/resources/Review_of_Netizens-BBarbat.txt.

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. Online at: http://www.columbia.edu/~hauben/Era_of_the_Netizen/resources/European_Citizenship_Reconsidered-LJesien.doc. 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.

[Editor's Note: The following article appeared in 2002 in *Science Studies*, Vol. 15, No.1, pp. 61–68. It can be seen online at: http://www.columbia.edu/~rh 120/other/usenetstts.pdf.]

Commodifying Usenet and the Usenet Archive or Continuing the Online Cooperative Usenet Culture?

by Ronda Hauben

This article explores the conflict between the cooperative online culture of users who have created Usenet and the corporate commodification of Usenet posts by companies archiving the posts. The clash of decision-making processes is presented through the details of how Usenet users choose to petition a company to provide protection for the public archives it had collected. The company disregarded the petition and the archives were sold to another company. The new company has begun to put its own copyright symbol on the posts in its archives. How will such a commodification affect the cooperative nature of Usenet itself and the continuing vitality of Usenet's cooperative culture? The article explores this culture clash and considers possible consequences.

Keywords: commodification, electronic communication, Usenet

Commodification of knowledge is a trend in modern societies (Suarez-Villa, 2001). A close look at individual cases shows, however, that this process is contentious. The transformation of a public into a private good provokes resistance by those who contributed to the production of that good. If they are now prevented from using it free of charge and from having free access to that good, they may even regard commodification as expropriation. The collaboration that produces a public good in science or technical research is an important process to understand and to protect. Such collaboration has made it possible to create the Internet and Usenet. Researchers creating these important online developments needed the input and contributions from as many people as possible. An example from the Usenet world illustrates the tensions and conflicts which result when corporations become involved and begin to commodify a public good.

Usenet is a worldwide distributed online newsgroup and discussion forum. Contributions to it consist of short or long opinions, comments, articles, questions, or answers typed into the system through computers and then distributed from host site to host site until they have traversed all sites that subscribe to the newsgroup to which they are directed. Each such contribution is called a "post." (Hauben & Hauben, 1997) Contributors are sometime called posters. This article examines the corporate archiving of Usenet posts, which then become subject to commodification. These posts are contributed freely by Usenet users. A corporation doing the archiving put its copyright notice on the posts in this archive. It is unlikely that most contributors have agreed to have their posts archived or to have the copyright of a company appear on the posts.

A Public Good in Corporate Hands

On February 12, 2001, those accessing the archive of Usenet posts collected and archived by the company Deja.com (Deja), learned the archive had been transferred to another company, Google, Inc. (Google). In a press release announcing the acquisition, Google indicated that the archive would be made available to the public in a few months. Google said it "bought" the archive but the price was not indicated. It is likely that Google expected acclaim for acquiring the archive from Deja. The archive had many users and Deja was going bankrupt at the time and either selling or auctioning off its assets.

Among those in the online Internet community, some users welcomed the Google purchase and urged patience to see what would develop. There was also another response. A number of people online were concerned that Google had taken offline the five years of Usenet posts that Deja had collected and substituted a much smaller archive that Google had been collecting on its own. An article appeared in "The Register," a British online publication on February 13, 2001. The article expressed concern that Google had not maintained the Deja interface and the online availability of the archive until they perfected their own interface. Subsequent articles on February 14 and February 15, 2001 included comments by the then chief executive officer (CEO) of Google, Larry Page, promising that some of the archive would be back online in a month and the rest in three months.

There were other concerns expressed both by

users online and in the online press during this period. Among these were references to a petition that eventually contained almost 4000 signatures and many comments. The petition had been initiated a few months earlier to appeal to Deja to safeguard the Usenet archive. After collecting Usenet posts from 1995 to 2000 and making them available online, Deja cut back access from five years of posts to only the past year. Included in the petition were several comments describing the archive as a public good that had somehow fallen into private hands. One comment in the petition urged that the, "USENET archive … should *never* have been in private/corporate hands … give it to an appropriate educational establishment" (comment by Brian McNeil).

To understand the controversy around the corporate archiving and copyrighting of Usenet posts, it is necessary to know something about the origins of Usenet and of archiving Usenet. The collaborative process was crucial for the origins and development of Usenet. A distributed form of archiving was developing as Usenet developed. The open and collaborative process that marked the development of both Usenet and the Google search engine, which was originally developed as a research project, is a process that facilitates the development and implementation of new concepts in technology. Cooperation and collaboration are the processes that generate new knowledge and ways of developing technical processes. The give and take among researchers in the open process where they share knowledge and problems, makes possible ever new developments and improvements.

A proprietary process, is the opposite. It limits the source of input. This tends to narrow the development and change to incremental changes, rather than qualitative leaps. Eventually a proprietary process freezes what is developed for various reasons, amongst which is the need to realize the profit to pay for previous development. When technical pioneers are forging a brand new process or technology, they need the input and support of all who can contribute to the new development. This article will not only explore the collaborative process essential to the development of qualitatively new technologies like Usenet and the Internet, but it will also consider the nature of the efforts to commodify these new developments, such as the archiving of Usenet posts by corporations or the transformation of a publicly funded search engine research project into a private company, like Google.

Unix, Usenet, Internet

Usenet grew up as part of the Unix community. Unix was created in 1969 at Bell Labs, the research arm of the U.S. publicly regulated phone company, AT&T (cf. Holtgrewe & Werle, 2001). Researchers Ken Thompson and Dennis Ritchie, among others at Bell Labs had been part of a broader research project working with Project MAC at the Massachusetts Institute of Technology (MIT). They experienced the close communication that was possible through the new form of programming environment being developed at MIT known as time-sharing. At MIT this was originally the Compatible Time Sharing System (CTSS), and subsequently research was begun to create a more advanced system called MULTICS. AT&T, however, withdrew from the MULTICS collaboration at MIT. Its Bell Labs researchers set out to create their own version of a time-sharing system to be used at AT&T. They called their system Unix (Hauben & Hauben, 1997, pp. 131-134).

Dennis Ritchie, one of the creators of Unix, wrote that Unix was created at Bell Labs by programmers hoping that a "fellowship would form" (Hauben & Hauben, 1997, p. 51). AT&T (the home of Bell Labs) was a government-regulated corporation subject to the 1956 Consent Decree that restricted it to the telephone business. It was therefore not allowed to commercialize software. The researchers at Bell Labs who created Unix were able to make it available to other researchers and academic institutions for a minimal fee for the tape. There was, however, no technical support from AT&T. Unix users were on their own to solve any problems. From this situation a community grew up to support each other. They formed an association of academic and research users of Unix called USENIX.

By 1979, UUCP (Unix to Unix CoPy Program) was being distributed with the Unix code. UUCP allowed computers using Unix to communicate with each other over telephone lines. From this context Usenet evolved. Usenet was conceived in 1979 by Duke University graduate students Tom Truscott and Jim Ellis. They were active in the Unix community and wanted to contribute a means to create an online Usenix newsletter. In collaboration with others, they developed early versions of the Usenet software and explored its capability. In the January 1980 Usenix meeting, the software was made available to those

who were interested.

Usenet was a grassroots network. The users would contribute "posts." Each post would circulate to other users via Usenet software using UUCP. In this way the users created the content and the form of the developing Usenet. It soon spread from the U.S. to Canada, and then to Europe and Australia (Hauben & Hauben, 1997, Chapters 2, 3 and 10).

An important aspect of the contributed posts was that they circulated until their expiration date. Each site could set its own date for the expiration of the posts, but they all expired. Consequently, a user would contribute a post and it would be sent out across the globe, but it would expire and disappear from each node on the network on different but set dates.

On Usenet, the posts would be grouped according to particular topics in "newsgroups." A newsgroup like sci.econ was the place where a user would post about an economics topic. News.misc was a newsgroup about Usenet. By the early 1990s, individual Usenet participants archived the posts of some Usenet newsgroups. An index was maintained online which provided the addresses of the sites for the archived newsgroups. A Canadian Usenet pioneer, Henry Spencer, maintained an archive of most Usenet posts through the 1980s. The earliest two or three years of these posts were made available online on certain occasions.

Increasingly, Usenet was being transported via the Internet rather than predominantly via UUCP and phone lines. For a period in the 1980s and into the early 1990s, the U.S. National Science Foundation (NSF) provided support for an NSF backbone for the U.S. portion of the Internet. Traffic on this backbone was required to adhere to the NSF's Acceptable Use Policy (AUP) until 1995 when the NSF backbone was privatised (Hauben & Hauben, 1997, pp. 219-220). There was an AUP because the NSF backbone was initially founded and for many years financed by public funding. The AUP was the means of protecting the public interest in the network. The AUP explained (NSF, 1992):

> NSFNET Backbone services are provided to support open research and education in and among U.S. research and instructional institutions, plus research arms of for-profit firms when engaged in open scholarly communication and research. Use for other purposes is not acceptable.

The AUP then explained in more concrete terms how this applied in specific situations. For example, with regard to uses by the international research community, the AUP stated that among the "specifically accepted uses were: … . Communication with foreign researchers and educators in connection with research or instruction, as long as any network that the foreign user employs for such communication provides reciprocal access to U.S. researchers and educators." Because the AUP required that the international research community could use the NSFNET backbone as long as networks created in their countries provided reciprocal communication access, the protection provided to the U.S. research community for non-commercial use of the NSFNET extended to other countries. The AUP forbade commercial use of these networks except under certain specified circumstances that would serve the research community.

Privatization and the Clash of Cultures

With the privatisation and commercialization of the U.S. portion of the Internet, companies like Deja were created which began to archive Usenet posts. Several users report discontinuing their own archiving when it appeared that these companies were maintaining a large archive. Some users, however, did not want their posts archived. They were concerned about the effect on the continuing development of Usenet from archiving by private companies. The entities that have done archiving like Alta Vista and Deja and now Google are private companies. The decisions about the nature and goals of their archiving activity have been and are under their control. This differs from the practice on early Usenet, when the online community determined the important aspects to be considered when a policy decision was needed (Hauben, 2001). Private corporate decision-making and cooperative online decision-making represent two different cultures. For example, in the early development of Usenet, new software was being created to transport Usenet. Mark Horton and Matt Glickman were creating the new software and Horton considered changing the name of Usenet. He explained his intentions to the online community of Usenet users, asking them for their consideration of his proposal. There was extensive discussion of the reasons that Horton proposed to justify such a change. As a result of the discussion, the decision was that the name Usenet should remain and that Horton's reasons for a change were not adequate. This was an example of

how decision-making can be enhanced through an online cooperative process.

Corporate decision-making, on the contrary, is often centralized and focused on short-term goals. It is also often difficult to have divergent opinions expressed in an unprotected corporate environment where one can lose one's position or even job if one speaks in a way that is not appreciated by senior management. Often the views of all involved are not heard or even if they are heard, they can only take a secondary place to the more immediate profit orientation or fiduciary requirements of management. In such a situation, as with Deja and the Usenet archives created from the contributed postings of users, the users have little ability to affect the corporate decision making process. On the surface, it may seem an anomaly to have Usenet users write a petition to a corporation. Petitions are most often thought of as being the right of citizens with regard to their government officials. Usenet users, however, accustomed to be participants, acted to express their views, signing and writing comments in a petition to the company Deja. The request of a number of users to have the archive put into a public repository received no response from Deja, the corporate holder of the archive.

What is the effect on the online community and what are the legal implications of the clash of cultures that results from a private company collecting and then maintaining an archive of public and contributed posts? To gain some grasp of the issues, it is helpful to stress the public origins of the private company Google. Graduate student researchers funded by public research funds under the Digital Libraries Initiatives (DLI) developed the Google search engine. In a paper presented in 1998, Sergey Brin and Lawrence Page, who worked in a DLI initiative at Stanford University in the U.S., describe the harmful effects of the commodification of search engine technology and emphasize the need for public technology research and development. They write:

> Up until now most search engine development has gone on at companies with little publication of technical details. This causes search engine technology to remain largely a black art and to be advertising oriented … . With Google we have a strong goal to push more development and understanding into the academic realm.

They continue explaining their strategy to decommodify such research:

> Another goal we have is to set up a Spacelab-like environment where researchers or even students can propose and do interesting experiments on our large-scale web data. (Brin & Page, 1998)

Their plan was to create a public research database as a laboratory for web search engine research. In their article they acknowledge the public funding in the context of the Stanford Integrated Digital Library Project in which industrial partners are also involved.

The plan of Brin and Page was not implemented. Instead of creating the public web search engine laboratory, those working on the Google search engine were encouraged to create a private company, which would become part of the "black art of proprietary search engine technology" that Brin and Page critiqued. The incentives were set by the funding agency, the NSF, which at the time of the creation of Google, testified to the U.S. Congress that the "transfer to the private sector of 'people' – first supported by the NSF at universities – should be viewed as the ultimate success of technology transfer."[1] For the NSF, Google is the company which provides "an excellent example of knowledge transfer from NSF investment in people." As a consequence, the search engine Google, originally created as part of a public research project, was transformed into the product for a private company. The private company's mission "to organize the world's information, making it universally accessible and useful" was generally welcomed. But how does this corporate goal compare with the goal of Usenet users to communicate?

Toward a Commercial Usenet Culture?

Usenet was created to facilitate communication. There is an unwritten agreement that people who post on Usenet are willing to cooperate in effecting that communication (Hauben & Hauben, 1997, 52). Archiving the posts was not explicitly intended. It was seen by some users as a means of dealing with people's contributions to Usenet in a way that differed from their intentions. This may be tolerated as long as the archive can be accessed by the Usenet community free of charge and without any copyright restricting the use of the archive. In the Google archive the posts are initially individually presented separate from the discussions. There is a provision for viewing the discussion, but that is an option not the default. Some

users even welcomed archives because they could help to preserve Usenet's heritage: the cooperative and communicative tradition of the community.

But how long will users tolerate the fact that their contributed posts are copyrighted by a company? Google is moving exactly in this direction. Google is no longer only the private holding company for a public archive but has started to put a © Google 2002 copyright notice after each post in its Usenet archive. Traditionally under the Berne Convention, which the U.S. joined in 1989, users are accorded copyright ownership of their creations, as soon as they are created. Google has not requested that users turn over their copyrights to Google, yet the company is copyrighting the posts. Google's CEO expressed some concern about the copyright of the posts in its archive. Since Google did not ask Usenet users before its decision to put its copyright on users' posts, it did not have a way to take into account users' views. If Google does not create a means for the Usenet community to discuss or to be involved in decisions regarding how the archive is handled who will be responsible for safeguarding the public nature of the archive? (Hauben, 2001) Any company declaring that it has the right to the ownership of these posts, or to buy or sell a compilation of such posts, presents a serious challenge to Usenet's cooperative culture. Such actions can have a chilling effect on users. Usenet, as a cooperative culture, requires a process with provisions for public discussion and decision making to determine and then safeguard the public interest.

Already the archiving of Usenet and the commercialization of the Internet has changed Usenet in subtle ways. In the past diverse views were cherished and discussion between those with differences was welcomed. If there was any harassment of those with a minority point of view, other users would speak up in support of the person being abused. More recently, with the archiving of posts, there is less defense being provided for minority or unpopular views on some newsgroups. Consequently, there is less interest in these newsgroups when the range of discussion is narrowed in this way. Traditionally, Usenet provided an environment that welcomed differences. This is the treasure that Usenet has provided to users. If archiving interferes with this environment, it becomes a serious problem for the continued development of Usenet. In the past posters would add their ideas to a discussion, no matter how brief often saying this was their two cents. With the archiving presenting posts as individual works, there is less of an incentive to make a small contribution.

Usenet has been affected by the archiving of its posts. Some users who know about the archiving have chosen to write "x-no-archive: yes" in the first line of the post, with nothing else on the line to prevent them from being made available to others in the archive. Other users, however, do not know about this possibility, nor about the archiving of their posts in general. Usenet itself can be affected in a serious way if the problems that develop with archiving are not treated cooperatively and sensitively. Google created a place for users to post comments on its web page, but how Google will respond to these comments is not yet known. Various decisions made by Google in the past differ significantly from the way Horton made a proposal to users, and solicited their input before making a decision that would affect them. There are users who stress that Usenet is more important than any archive of Usenet posts and that if the archiving hurts Usenet, it is a serious loss.

In the short term, Google may seem to be providing a valuable service in gathering and making available an extensive Usenet archive. But in the long term – given Google's copyright policy and their method of decision-making – the continued development of Usenet and of the ability of users to communicate is jeopardized. It appears to be essential that public entities provide for the safeguarding of the Usenet archive and of the Usenet decision making process, and that Google learn to understand the importance of responding to the needs of Usenet and the Usenet community in a way that they don't perceive of as in competition with but as complementary to Google. Hopefully, this article will help serve as a catalyst for discussion and research in this vein.[2]

Acknowledgments

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Notes

1. Dr. Rita R. Colwell, Director, National Science Foundation before the Senate Appropriations Subcommittee on VA/HUD and Independent Agencies May 4, 2000, online at: http://www.nsf.gov/od/lpa/congress/106/rc00504sapprop.htm.

2. After writing an earlier article about the commodification of public goods, I was invited to give a talk, both at Stanford University and at Google headquarters about the cooperative culture

which made it possible for Usenet to grow and flourish. While in California, visiting the Internet Archives project, I also inquired about the efforts to make a substantial archive of Usenet posts available which was gathered by Henry Spencer. Several months later, Google announced that they were making this archive available on Google. While visiting Google headquarters, I also inquired about whether Google would make a copy of all the archives it had available to nonprofit or academic or public institutions. The response was that such institutions desiring a copy could contact them, but no information has been provided of any further development in this area.

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[Editor's Note: The following book review was written during an independent study in Theories of Communication at Teachers College in NYC in Spring 1998.]

Norbert Wiener's Cybernetics in *The Human Use of Human Beings*

by Michael Hauben

Norbert Wiener wrote several books about the science of cybernetics, which he introduced. Central to the science, whether discussing people or machines, is the passing of messages between two entities. As such, cybernetics is a theory of communication defining the passing of information between communicators. Wiener was visionary in understanding the importance of applying this engineering theory of messages to society as a whole, the broad field of humanities, and working toward understanding its value to all domains of human knowledge.

His second book about cybernetics first written in 1950, *The Human use of Human Beings: Cybernetics and Society* (Wiener, 1954), consists of Wiener's understanding that society must be studied and understood by looking at the messages exchanged and the modes of communication available to those who comprise society (Wiener, 1954, p. 25). Wiener's definition of society included man and machine and thus it is important to study the development of the passing of messages or communication between man and man, man and machine and all possible combinations thereof. Wiener also relates the theory of control, whether of man or machine, as a part of the theory of messages. Control comes down to be a particular communication mode, and is particularly important in understanding the man/machine dynamic or interaction. In order to affect control, it is necessary to receive a response that the command has been acknowledged and acted on. Communication is also necessary for the intended action to be achieved.

In understanding cybernetics, Wiener devotes time to describing entropy in nature as theorized by physicist Willard Gibbs. Cybernetics develops as part of the struggle against the constant motion toward degeneration or disorder in nature. As such communication is an effort by individuals to find and make order in a disorderly world. Communication of information helps to bring people together as part of a shared world or society. "To live effectively," Wiener writes, "is to live with adequate information." He continues, "Thus, communication and control belong to the essence of man's inner life, even as they belong to his life in society." (Wiener, 1954, p. 27)

Much of *The Human Use of Human Beings* consists of examples of communication theory applied to human existence, biology and thought, along with application to automata, machinery and animal life as well. Examples of exchange of messages in machinery include the automatic photoelectric door openers, where a sensor is activated when a light beam is interrupted by someone passing through its path thus blocking the beam. The door is then opened for a period of time after the light beam is blocked. Another useful application of communication to control of machinery comes in the example of controlling anti-aircraft guns. In order to function, the

artillery device must work in conjunction with both radar which senses the aircraft and its trajectory and some computing machinery which factors in weather conditions, and possible changes in flight path. Such feedback mechanisms are important to the working of such an operation and one which tracks prior firings to see what other changes need to be done to make corrections to calculations because of tracking errors from past shots.

Wiener's most direct commentary on higher level communication comes in chapter four of *The Human Use of Human Beings* discussing the mechanism and history of language. He begins by describing language as another name for communication as well as how we name the codes with which communication occurs. Both humans and animals communicate using their own language, but Wiener defines the complexity of human communication and its greater ambiguity over that of other animals. Wiener also makes a point of saying people communicate with machines in the form of language. Language is just a common shared code that is used in the exchange of information. As such, Wiener defines a machine's reporting of system status in a form that people can understand as language. Usually this requires some translation from the electrical outputs of sensors to a form understood by people. Unfortunately information can be lost in the translation, but that is where feedback plays a role again in further checking of data against real results and changes over the course of time. Wiener even goes as far to describe how the human communication system works as a kind of machine – the ear, the part of the brain which is in connection with the ear, and how this deals with the phonetic aspect of language.

While dwelling on the scientific analysis of language, Wiener also differentiates between man and animal and examining how only man has speech beyond guttural utterances. He continues to examine the scientific basis of language by examining questions such as how language could be a genetically natural aspect of human development versus a socially learned behavior. The history of language is examined from ancient beginnings such as Hebrew, Greek, Latin and Chinese to the development of English, and so on. Wiener continues by exploring how the size of communities have been defined by the ability for communication to occur. The advancement of transportation methods and technologies further expanded by the growth of communication methods and technologies make larger effective communities possible. This was seen in the emergence of communities ruled centrally as in empires and future growth as is yet to be seen. To end the discussion of language, some review of entropy and possible loses or control of meaning is explored. Wiener highlights two varieties of language, one where information is desired to be shared and another where the desire is to force a particular understanding.

In addition to obvious speaking and writing, human communication and feedback occurs at a lower level in the functioning of the human body. Moving arms and legs use muscles to walk or to pick things up by working unconsciously with the body using the sense organs of sight, touch, smell and hearing as feedback to correct actions. The importance of feedback is that it works on actual performance and not just on intended performance. If everything worked perfectly the first time there would not be the need for sensory correction.

Wiener is critical of the overlooking of the role of communications by sociologists and engineers alike at the time of his writing. Cybernetics did much to introduce communication as an important field of study which affected many other disciplines. And while cybernetics might not readily be on the tongue of today's academic community, it did have the profound effect of beginning the study of communication and raising communication issues as important to society. The prevalence of the prefix cyber used when discussing new technologies is a tribute to Norbert Wiener's pioneering work on cybernetics.

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