To the Graduate Council:

I am submitting herewith a dissertation written by Pamela Maize Harris entitled "Testing Molitor's Model for Tracking the Information Highway: An Issues Management Study." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree, with a major in Communications.

Susan M. Lucarelli, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor
and Dean of The Graduate School

TESTING MOLITOR'S MODEL FOR TRACKING THE INFORMATION HIGHWAY: AN ISSUES MANAGEMENT STUDY

A Dissertation
Presented for the
Doctor of Philosophy
Degree
University of Tennessee, Knoxville

Pamela Maize Harris
August 1994

DEDICATION

This research is dedicated

to Olivia Lauren Katilyn Maize, who was born twice the same day, July 1, 1994,

when she became the youngest heart transplant recipient;

to Kaitlyn Reneè and her parents, whose loving and generous hearts

have touched ours with hope, and

to my late father, Oliver Loren Maize, who would have enjoyed reading this document

from cover to cover.

This study is also dedicated to Vice-President Albert Gore, Jr., whose broad vision for

network computing has created unimagined opportunities for the future.

ACKNOWLEDGEMENTS

First, I thank my husband, Allen Dortch Harris, without whose enthusiastic support and partnership I could not have accomplished this project. My family, Lonnie and Sherrie Maize, Jerry and Elizabeth Maize, and Naomi Maize kept in weekly contact with me by ham radio or telephone, buoying my spirits and breaking the loneliness of being away from home.

In August 1991, the first month of my doctoral program at the University of Tennessee, Knoxville, I met Jane Row, who introduced me to the NREN, the National Research and Education Network. From that moment on, the High-Performance Computing Act of 1991, which created NREN, and the Internet became the focus of my doctoral research.

Dr. Susan Lucarelli, chair of the dissertation committee, was also an early enthusiast who assisted in the design. She recognized the usefulness of bibliometrics to issues management in public relations and provided outstanding leadership in bringing this research to fruition.

Dr. George Everett's interest and expertise in media economics and new technology helped shape the direction of this study. He is an excellent editor and provided suggestions that have improved this document immeasureably.

Dr. Jose'-Marie Griffiths, director of the University of Tennessee's School of Information Science, who in 1994 added Acting Vice Chancellor of Computing and Telecommunications to her responsibilities, has been involved in early research related to network computing. She encouraged my interest in the Internet and helped to shape the research design. Her expertise in information science contributed to the methodological underpinnings.

Dr. Herbert Howard, dean of the graduate school in the College of

Communications, was also an early proponent of the need for research about the Information Superhighway. As a broadcasting scholar, he saw early parallels to other introductions of new technology in our society.

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My dissertation committee was outstanding, and I shall always owe them for the contributions they made to my research and to my educational and professional career.

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Rodney Schwark entered raw data and created the first graphs and tables for each database on Excel. Stacy Spaulding DeLay's learned Excel and manipulated several DOS- and Macintosh-based programs to help create this document on a Power Macintosh. She and I spent many hours manipulating data, creating and reformatting charts, photocopying, faxing, and other myriad details related to the preparation of this document. Thank you, Stacy, for many long hours.

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ABSTRACT

This study tested Graham Molitor's Precursor Monitoring Model and extended work done by Lancaster and Lee, who tested online databases for growth, spread, and movement of an issue as it diffuses over timethrough various types of printed literature. Using bibliometric methodology, the Internet, representing the Information Highway as a public policy issue, was tracked retrospectively from its earliest point of origin in scientific and research literature through trade and industry literature, the general press and legislative literature.

This study supports Lancaster and Lee's finding that a public policy issue appears first in scientific and research literature. It does not support Molitor's prediction that a public policy issue gains the attention of the public through general press coverage, creating a public outcry and resulting in legislative action. The High-Performance Computing Act of 1991 created the National Research and Education Network (NREN) connecting industry, government, and university databases. The study found that general press coverage of the Information Highway did not begin in earnest until 1993. A revised model is offered reflecting diffusion of the Internet through printed literature.

One of the purposes of this study was to determine at what point the Internet became a "hot" issue. Earliest identification of this point has implications for issues managers and public relations professionals who track and monitor issues on behalf of their organizations.

This study found that the press neglected coverage of this issue until major corporations began merging in anticipation of commercialization of the Information Highway. The study found that trade and industry press provided broadest coverage and that the issue emerged as one to be tracked in the early 1980s. In this research, an issue reached the point of being a significant issue to be tracked when coverage in trade and

industry literature tripled within one year. The research also introduced and demonstrated a technique, the Intensity Index, for measuring the value of some articles over others.

This study confirmed Bradford's Law of Scatter for identifying core journals, showing that a small number of high-yield trade and industry journals provided broad coverage of the Information Highway.

The study supported the value of qualitative judgments in identifying issues to be tracked and introduced Precursor Pointers, qualitative tracking techniques to help an issues manager identify important players, industries, corporations, politicians, legislation, publications and advertisements in a precursor environment.

Besides introducing Precursor Pointers, this study suggests applications for public relations practitioners in the areas of online issues identification and tracking, creating an issues gopher, key databases to monitor, and use of DIALINDEX, a commercial product produced by DIALOG, for efficient and economic monitoring of issue growth and spread.

Through in-depth interviews with database publishers and producers, this study addresses the limitations and advantages of online databases for retrospective research.

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CHAPTER I

INTRODUCTION

When then-President George Bush signed the High-Performance Computing Act of 1991, he predicted the legislation would bring about long-lasting changes in American society. In his remarks at the signing, Bush said, "The development of high-performance computing and communications technology offers the potential to transform radically the way in which all Americans will work, learn, and communicate in the future." Mr. Bush said the legislation would change society as much as other revolutionary inventions of this century, "including telephone, air travel, and radio and TV."[1]

Clearly, the High-Performance Computing Act of 1991 will change the way in which society communicates. By creating a mega-network connecting existing scientific research networks, universities, corporations and government agencies, this legislation's centerpiece, the National Research and Education Network (NREN), introduced a "supercomputer information highway" to society through advanced state-of-the-art technology.

The bill, introduced by then-Senator Albert Gore, Jr. and backed by a bipartisan coalition of congressmen and the Executive Office of the President, was designed to bolster U.S. competitive advantage in the global marketplace and to spark a synergy between the corporate marketplace, research community and government. One of the purposes of the legislation is to provide American schools and organizations access to electronic information. The time element makes information a valuable quantity; indeed, information is power in this information age.

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[1] George Bush, "Remarks on Signing the High-Performance Computing Act of 1991," Weekly Compilation of Presidential Documents 27:1794-1795, December 9, 1991.

By September 1993, President Bill Clinton had issued an executive order authorizing the Commerce Department to establish the United States Advisory Council of the National Information Infrastructure (NII).[2] The NII has replaced the term NREN designated in the High-Performance Computing Act of 1991 as the term for Gore's "information highway."

One implication of supercomputing and the NII for public relations is the role public relations plays managing information for an organization. The ability to respond to changing environments and societal attitudes is at the core of issues management. Examples include legislative or regulatory actions affecting a company's services, products, or operations. Emerging issues may create conditions by which an organization would benefit from strategic changes. In other cases, organizations may face a crisis situation, particularly if steps are not taken to minimize the negative impact. Clearly, issues management is most successful if public relations practitioners identify and isolate emerging issues at the **earliest possible time**.

Issues scanning and monitoring allows sustained issue communication with key publics. Issues management also can assist in determining long-term comparative performance of companies (competitive intelligence) and absolute performance of industries and economies.

SIGNIFICANCE AND PURPOSE OF STUDY

The information explosion and resulting information-rich environment has created the necessity of providing exact information to policy makers, at the precise time needed, in a manageable format.

With government as the largest producer of information, and corporations in need

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[2] Federal Register, Presidential Documents, **Executive Order 12864: United States Advisory Council on the National Information Infrastructure**, Washington, DC, September 17, 1993.

of information resources management, American businesses face a period in human history when "information and knowledge directly shape the fabric of society," according to Richard A.V. Diener, director of the Information Management Group for Macro Systems, Inc. "Those with knowledge, expertise, skills, and abilities have more control over their lives and the lives of others than those without information and knowledge."[3]

Indeed, the American competitive challenge is epitomized by the so-called "technology-intensive" manufacturing sectors, including computers, telecommunications, electrical machinery, instruments, chemicals and transportation.[4] The U.S. will see tough competition from the European Economic Community. It has already geared up to sponsor projects combining data, images, digital maps, graphics on agriculture and environment on compact optical disk. The Western European database services market will double by 1995 to more than $7 billion, with the online portion of the budget increasing from 60 to 70 percent.[5]

To avoid pitfalls such as flawed secondary sources, unconfirmed data, and unsubstantiated propaganda, corporations require savvy and information-literate professionals to sift accurate information from contradictory and light-quality data. In the 1990s electronic information use among professional marketers continues to grow with $1.4 billion spent on electronic research and $400 million devoted to online databases in 1990; those figures are expected to double by 1995.[6]

Information has emerged as one of the most valuable industrial commodities in the 1990s.

Hawk said it well: "Now knowledge, not minerals or agricultural products or

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[3] Diener, Richard A.V. "Information Management: An Application of Information Science." **Bulletin of the American Society for Information Science**, Vol. 77, August/September 1989, p. 17.

[4] Federal Scientific and Technical Information and the U.S. Competitive Edge. **Information Hotline**, September 1990, p. 4.

[5] Ibid., p. 7

[6] Hawk, Keith, "More Marketers Are Going Online for Decision Support." **Marketing News** 24(23), November 12, 1990, p. 14.

manufactured goods, is the country's most precious commodity, and people who are information literate—who know how to acquire knowledge and use it—are America's most valuable resource."[7]

The environment of electronic information retrieval produces a set of conditions ripe for testing growth and diffusion of issues related to The Electronic Information Highway. High-performance computing, once the domain of scientific and governmental researchers, has become available to corporations and to the general public. The new Electronic Information Superhighway, integrating voice, text, video, digital data, and high-resolution images, will provide a revolutionary communications medium eventually linking every American home and business. Early adopters have an opportunity to shape the direction of this new medium.

This study will address the specific issue of how public relations professionals may take advantage of the opportunities afforded by new telecommunications technology to practice proactively[8]. Issues scanning and tracking provide an entre into effectively utilizing technology in the public relations management function. This study is confined to an examination of print media because print lends itself to examination by bibliometrics[9], while electronic media do not at this time. This study will examine the issue of the Electronic Information Highway to test the Precursor Monitoring Model's prediction of how issues diffuse into society.

SPECIFIC RESEARCH OBJECTIVE

This study will develop a procedure for the earliest possible detection and identification of key issues and will utilize characteristics of published literature captured in

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[7] Ibid., p. 5.

[8] Proactive is a public relations term that denotes a management leadership role and control of a situation rather than being placed by circumstances in a crisis or reactive role in addressing public policy issues.

[9] Bibliometrics is a class of research methods using mathematical and statistical methodology to quantify the processes of written communication, according to Alan Pritchard who coined the term in 1969. Several of its uses include retrospective citation trend identification to determine patterns and offer predictions of growth.

various databases to track the diffusion of an issue through various kinds of media. The study will sample from databases to track:

1. The growth of literature on the Electronic Information Network;
2. The spread of interest as reflected in increasing numbers of databases;
3. The movement of the concept of the Electronic Information Network through databases reflecting various types of literature.

According to a construct developed by Graham Molitor (see Chapter III, p. 34), the Precursor Monitoring Model,[10] an issue begins in documents of visionaries, scientists, or academics and moves into applied sciences and technical and specialty journals. From there the general press picks up the issue and informs the general public through magazines and newspapers. From that point, the issue moves into the legislative realm through regulatory measures and Congressional testimony.

A method developed by Lancaster[11], will be used to search online databases. The technique is based on Bradford's Law of Scatter and Goffman's concept of information diffusion as an epidemic process. Key legal issues related to the Electronic Information Highway (database security, privacy, copyright, etc.) will not be specifically addressed in this study.

Given the technical nature of this material, a brief glossary of terms is provided at this point in the study.

DEFINITION OF TERMS

ARPANET: The Internet's first component network was originated by the Defense Advanced Research Projects Agency (DARPA) as ARPANET in 1969 to allow researchers in geographically distant areas to share data and computing resources and to provide them access to otherwise incompatible networks.[12]

BIBLIOGRAPHIC RETRIEVAL SERVICE (BIBLIOGRAPHIC UTILITY): An on-line information service specializing in maintaining huge computerized indexes and

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[10] F. W. Lancaster, Ja-Lih Lee, "Bibliometric Techniques Applied to Issues Management: A Case Study," **Journal of the American Society for Information Science** 36(6):389-397.

[11] Lancaster and Lee used online databases and bibliometrics in a case study of the issue of acid rain for issues management.

[12] High-Speed Computer Networking For Research and Education (Milford, Connecticut: International Business Machines Corporation, and Washington, DC: MCI Communications Corporation, 1992), p.6.

full-text databases of scholarly, scientific, medical, technical, financial, trade and newspaper literature.[13] Bibliographic databases, as they are sometimes called, offer reference information retrievable by title, author, subject and date of an article. In addition, abstracts, citation lists, summaries, and other formats are available in some cases. In essence, a bibliographic retrieval service is an electronic **Reader's Guide to Periodical Literature**.

BIBLIOMETRICS: This is a class of research methods using mathematical and statistical methodology to investigate the processes of written communication. For example, quantifying citations through retrospective audits, prediction of cycles and trends is possible.

BITNET (Because It's Time NETwork): Begun as a single leased telephone line between The City University of New York (CUNY) and Yale University's computer centers in 1981, this network developed into an international network of computer systems serving more than 800 educational institutions.

BRADFORD'S LAW OF SCATTER: This Law of Scatter groups journals and articles to identify the number of periodicals relevant to a particular issue. Its computation is based on the total number of articles published by the journals in a particular genre. A constant is computed for that subject area, which is used to determine the percentage of total coverage by various numbers of journals in a field.

CURRENT ISSUE: An issue being debated or acted upon in local, state, or federal government.

DIALOG INFORMATION RETRIEVAL SERVICE: With more than 400 computerized databases in excess of 329 million records (units of information), DIALOG provides a broad range of information from directory-type listings, citations with bibliographic information, and abstracts to full text of journal articles. More than 1600 journal titles are available.[14]

ELECTRONIC INFORMATION HIGHWAY: Name given to the network of networks connecting computers globally. The term is a metaphor derived from the interstate highway system that links cities and towns.

ENVIRONMENTAL SCANNING: The first step in identifying issues that may affect an organization; this information-gathering step is broad in scope and scanning social, political, scientific, ecological, economic, technological, biological, international, and other "environments" for emerging issues. The goal is to scan these environments early enough so that an organization has "room to maneuver, to frame and explore a range of response."[15]

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[13] Bryan Pfaffenberger, **Que's Computer User's Dictionary**, 4th ed. (Indianapolis: Que Corporation, 1993), p. 73.

[14] Database Catalog 1992, DIALOG Information Services, Inc (Palo Alto, California: Knight-Ridder, 1992), p. 1.

An Examination of Models of Issue Development: Environmental Scanning Using On-Line Databases (Palo Alto, California: Electric Power Research Institute, 1987), p. A-2.

[15] **Issues Identification and Management: The State of the Art of Methods and Techniques** (Palo Alto, California: Electric Power Research Institute, 1985), p. 2-12 to 2-13.

EMERGING ISSUE: A public policy issue with three characteristics: 1) although still in the process of evolving, it is beginning to cause conflict and affect economic, social or political interests; 2) it will be subject to government action within 3-5 years; 3) it can be affected and acted upon by organizations.

FORECASTING: Attempting to predict future events or conditions as a result of deliberate study and data analysis pertinent to the event.

FULL-TEXT DATABASES: Databases offering the entire text of journal, newspaper or magazine articles, or other documents.

GOFFMAN'S EPIDEMIOLOGY MODEL: Medical epidemic theory applied by William Goffman to the spread of ideas.

GOPHER: A distributed information service that makes available hierarchial collections of information across the Internet. Gopher uses a simple protocol that allows a single gopher client to access information from any accessible gopher server, providing the user with a single "gopher space" of information.[16]

GROWTH: The interest in a topic as exhibited by a rapid increase in the number of online databases that include literature on the issue.

HIGH-PERFORMANCE COMPUTING ACT OF 1991: Signed into law Dec. 9, 1991, the legislation established the National Research and Education Network (NREN) to link government, industry and university computer systems. The legislation was introduced by then-Senator Albert Gore, Jr., who articulated his dream of a national Information Highway that would enable school children in geographically far-flung regions to tap into government sources such as the Library of Congress and the Smithsonian Institution.

HIT: In this study, the number of "hits" is the number of articles containing the search term ARPANET or Information Highway or Internet. If a database had 43 hits for Data Highway, 43 articles contained at least one mention of the term Data Highway.

INTERNET: A global network of interconnected computer networks.

ISSUES ASSESSMENT: Making judgments about the critical implications of an issue for an organization.

ISSUES FORECASTING: Projecting future patterns and events.

ISSUES MANAGEMENT: Organized and systematic efforts by an organization to respond to issues of public concern. A process of strategy development regarding the organization's involvement, responsibility, and response enables the organization to take a proactive management approach rather than a reactive approach to changes in the external environment.

ISSUES MONITORING: Tracking specific trends and events to confirm patterns.

ISSUES SCANNING: Open-ended viewing of environments to detect changes already

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16 WAIS Internet-user-glossary.src

underway.

LATENT ISSUE: An issue that has not caught the attention of the media or public interest groups and is not being widely discussed. Organizations can diffuse the issue at this point and prevent it from developing into an emerging or current issue.

MOVEMENT: In online database tabulation, tracking an issue from its first appearance in research reports through other databases representing various categories of publications.

NATIONAL INFORMATION INFRASTRUCTURE (NII): A seamless web of communications networks, computers, databases, and consumer electronics services that will put vast amounts of information at users' fingertips, unleashing an information revolution that will change forever the way people live, work, and interact with one another.[17]

NATIONAL RESEARCH AND EDUCATION NETWORK (NREN): The High-Performance Computing Act of 1991 established NREN. The law specified that the National Science Foundation, the Department of Defense, the Department of Energy, the Department of Commerce, the National Aeronautics and Space Administration, and other agencies participating in the National High-Performance Computing Program will establish NREN, portions of which would be capable of transmitting data at one gigabit per second or greater by 1996. The NREN would link research institutions, government, educational institutions, and industry in every state.[18]

NSFNET (NATIONAL SCIENCE FOUNDATION NETWORK): Originated at a meeting of higher education representatives and networking specialists from the National Science Foundation, NSFNET was designed to function as a national data backbone connecting six supercomputing centers. It was based on 56-kilobit-per-second (Kbps) lines leased from telecommunications vendors. Funded in 1986, it put a "virtual supercomputer" on researchers' desktops.

ONLINE DATABASE: A computerized database usually available through a commercial vendor via a telephone modem to which users log in to access machine-readable collections of documents that are in digital form in memory. These documents have been tape loaded, key stroked, or received on diskette.

PRECURSOR MONITORING MODEL: Graham Molitor devised this model of how issues diffuse through various categories of publications to become public policy issues acted on by Congress.

SPREAD: The place and date when an issue first appeared and the number of citations for succeeding years.

RESEARCH QUESTIONS

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[17] Information Infrastructure Taskforce, **The National Information Infrastructure: Agenda for Action**, Washington, DC, September 15, 1993.

[18] U.S. Congress, Public Law 102-94—**High Performance Computing Act of 1991**, Washington, DC, December 9, 1991.

The research questions addressed in this study are the following:

1. Will the issue of the new Electronic Information Superhighway and its common synonyms (known in its earlier terms as ARPANET, NSFNET, BITNET, Internet, NREN, and now NII) first appear in conference papers and research in the scientific community?

2. Was coverage of the new Electronic Information Superhighway skimpy in the general press, bypassing this critical phase in the Molitor Precursor Monitoring Model (see Appendix A)? According to Molitor, an issue moves from pure science literature to applied science literature to the general press, then into legislative literature. This question has evolved as a result of a research study on press coverage of the Electronic Information Highway in newspapers of U.S. research communities[19]

3. Will a small nucleus of journals yield a high percentage of the total literature on the new Electronic Information Highway?

4. At what point does the coverage of an issue within an online electronic database become significant? At what point can one determine that a topic will become an emerging issue?

5. Is Bradford's Law of Scatter reliable for identifying a small nucleus of journals likely to yield a high percentage of the total literature? This will be tested by fitting the curve created by data relating to the Information Highway to Bradford's curve. This has implications for search economics.

6. Given that early detection allows managers to take proactive[20] measures to shape the issue environment, how can public relations practitioners effectively and economically take advantage of online databases for tracking emerging issues that may precipitate significant changes the organization must react to?

7. How can quantitative (bibliometrics) and qualitative techniques be combined for optimal issues tracking in the electronic database environment?

8. Could an "issues Gopher" be created online to provide organizational advantage in tracking issues in the competitive marketplace?

9. How do technological concerns evolve into public issues?

10. How does the level of issues significance vary from one media genre to another?

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19 Pamela Maize Harris, "An Historical Examination and Legislative History of the High-Performance Computing Act of 1991 and A Retroactive Audit of Newspaper Coverage of High-Performance Computing in U.S. Research Communities from 1986 to 1991." Unpublished paper, 1992.

20 A proactive approach is one in which the organization takes the initiative, taking measures to modify the environment, to lessen the impact of an issue and to shape change. The proactive approach is opposite of a reactive situation in which an organization must make accommodations in crisis situations, which are often adversarial.

LIMITATIONS AND DELIMITATIONS

The primary goal of this study is to audit retrospectively the emerging issue of the Electronic Information Superhighway by using bibliometric techniques to identify and track its entrance into recorded knowledge from the point of earliest mention on throughout the legislative process. Graham Molitor's Precursor Monitoring Model of issue development will be tested in this study. Because online databases are relatively new, comprehensive historical analysis of the issue prior to 1975 is not possible (except in the case of a few databases).

Lag time between publication of an article or research report and the time it appears in a database will be an issue when calculating citations by publication year. In-depth interviews with database publishers and designers should provide insight into how and to what extent this occurs. Change of publication coverage over time by database providers by dropping and adding various journals could have an impact on the results. Online database analysis provides a snapshot of the total literature available at a particular time. Although this snapshot may change over time, observing a core literature base can provide meaningful data and is not as critical an issue as with research evaluating citation patterns. Although time lag is not within the control of the researcher, this study should provide insight into the issue of time lag.

In-depth interviews with database publishers and designers also should provide insight into database creation as it relates to publication selection bias. Economics, availability, and online access to a publication may all be factors in database design.

Duplication of sources within various databases is an issue that will be addressed. A goal of this study will be to select databases with minimal duplication of publications. This will be one of the reasons for in-depth interviews with database designers explained in more detail in Chapter IV.

Caution also will be exercised in evaluating the first appearance in online literature

of the issue/topic. However, this is not expected to create as much a research problem for this study since the National Science Foundation has provided leadership in exchanging reports and data via computers. This issue lends itself well to online research because the network has been used for exchange and release of research and data from the beginning.

Since comprehensive examination of databases is neither practical nor feasible in the realm of the study, the research design is limited to sampling of databases.

CHAPTER II

HISTORICAL BACKGROUND OF THE ELECTRONIC INFORMATION HIGHWAY

As Ithiel de Sola Pool predicted in 1983, "Networked computers will be the printing presses of the twenty-first century. If they are not free of public control, the continued application of constitutional immunities to the nonelectronic [press] . . . may become no more than a quaint archaism, a sort of Hyde Park Corner where a few eccentrics can gather while the major policy debates take place elsewhere."[21]

An explosion of digital technology fueled by integrated circuits, semiconductor electronics, and fiber optics has made possible vast communication capacity in a highly networked environment. In the coming years, this technology may vastly change the information gathering and dissemination resources and methods of the media. The result is a blurring of the distinction between gathering information and publishing. New electronic information tools already are being used for publishing. **Building Information Infrastructure** by Brian Kahin was released early in 1992 as the first title of the Primis label by McGraw-Hill, Inc. The Primis line allows professors to create custom textbooks by downloading chapters individually or in tandem with any other material in the Primis database.[22]

The physics community is in the midst of a professional discussion regarding doing away with journals and peer review and placing all articles on an electronic bulletin board to which major original research reports would be posted. A proposal by N. David Mermin in

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21 Ithiel de Sola Pool. **Technologies of Freedom** (Cambridge, Mass.: Belknap Press 1983).

22 Brian Kahin, ed. **Building Information Infrastructure: Issues in the Development of the National Research and Education Network**. McGraw-Hill Premis, 1992. The chapters of this book were presented as papers at a symposium at Harvard University's John F. Kennedy School of Government in December 1990. The symposium was a joint venture of the Program on Strategic Computing and Telecommunications in the Public Sector and the Program on Science, Technology, and Public Policy. Financial support was provided by IBM, Digital Equipment Corporation, Northern Telecom, Electronic Data systems, Ohio Bell, and Mitre Corporation.

the May 1991 issue of **Physics Today**, "Publishing in Computopia," triggered an overwhelming response, both pro and con, from academics around the world.[23]

Aside from the questions of copyright, individual privacy rights, national security, and expungement of records, the legal issues to be discussed in electronic journalism abound, including:

- Balancing governmental interests against the rights of individuals when the two are in conflict;
- Whether First Amendment rights extend to non-Americans in the U.S. or to speakers in foreign countries when they are heard and read in the U.S.; and
- The power of government to regulate access to and ownership of the new

An electronic blurring between print publishers, electronic broadcasters, and common carriers will make First Amendment rights of distinction increasingly difficult to justify.[24]

In 1988 the Committee on the Judiciary of the U.S. House of Representatives and its Subcommittee on Courts, Civil Liberties, and the Administration of Justice, requested the U.S. Office of Technology Assessment examine the impact of electronic media, satellites, computers, electronic bulletin boards, teletex, videotext and other technologies on constitutional rights. The report was released in honor of the Bicentennial of the U.S. Constitution and also addressed freedoms of speech and of the press and their application to scientific information and communications.[25]

"Limitations on the liberty of the press may come from a failure to reconcile private ownership interests in the physical media with public interest in the message carried over these media," the report predicted. It will be possible for media satellites, "mediasats," to

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23 "The Rocky Road to 'Computopia.'" **Physics Today**, January 1992, pp. 13, 15, 94, 96, 98-99.
24 U.S. Congress, Office of Technology Assessment. **Science, Technology, and the First Amendment**, OTA-CIT-369 (Washington, DC: U.S. Government Printing Office, January 1988), p. 2.
25 Ibid.

convey a stream of timely information "peering where repressive governments or dangerous natural environments had formerly kept the press at bay."[26] The report suggested that satellite and database technologies may change the very meaning of "public" and "private."[27] Already reporters have used documents available in databases to retrieve information on arrests, credit applications, property records, previous appearances in newspapers, and self-volunteered information to create investigative reports. The power of aggregate information was illustrated in 1987 when two businessmen appeared to be publicly competing to purchase a major U.S. newspaper company. When a reporter ran a routine check using both their names in the NEXIS database, he discovered one was married to the sister of the investment banker representing the target newspaper's interests, and that the couple had recently returned from a weekend visit to Mexico City where the competitor lived. A few days later the two announced they were partners rather than competitors.[28]

The High-Performance Computing Act of 1991 has deep roots in scientific research initiatives. However, implications for the media and communications professions are staggering in light of the capabilities for electronic information gathering, retrieval, restructuring and delivery.

THE EVOLUTION OF NETWORK TECHNOLOGY

In the early 1960s, computers began to proliferate. By the mid-1960s a greater need for time-sharing and connectivity between computer-and-terminal and computer-and-computer became necessary. An electronic network experiment was launched when the U.S. Defense Department Advanced Research Projects Agency (DARPA) funded the first

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26 Ibid., p. 9.
27 Ibid., p. 12.
28 Christopher Burns, **Freedom of the Press in the Information Age**, OTA contract report, April 21, 1987, p. 20.

academic research network in 1969, ARPANET. UCLA became the first node on the network, which grew quickly to include hundreds of thousands of nodes.[29] Expansive bandwidth of high-speed lines made possible high-speed connectivity across the nation. This dynamic sharing was the pioneering use of Transmission Control Protocol/Internet Protocol (TCP/IP).[30]

> This dynamic sharing is accomplished by introducing intelligent switches at the ends of these lines . . . The intelligent switch collects a sequence of bytes from an incoming device's byte stream to form a data block, adds a header to this block containing, for example, the destination and source address for this block, adds a tail to this block (containing, for example, error control information), and calls the whole thing a packet. These packets are then launched into the network of intelligent switches whose further job it is to route these packets through the network in an adaptive, dynamic fashion so as to deliver them expeditiously to the appropriate destination.[31]

Wide-area networks (WANs) began appearing in the 1970s. Merit, Michigan's state-wide higher education network, appeared in 1972. The OCLC, On-line Computer Library Center, was established in 1971 to meet the needs of librarians; today it functions internationally. When personal computers hit the market in a unprecedented way in the 1980s, a rising demand for connectivity resulted. Within local offices, LANs (local-area networks) developed at corporations such as Xerox (Ethernet), IBM (token ring), and Bell Laboratories (Datakit).[32] In 1981 BITNET (Because It's Time Network) became operational as an academic network as well as CSNET, a network devoted to computer science research and engineering.[33]

In 1983 as a result of lobbying by the physics community, the U.S. Congress became involved in the supercomputing issue. Concerned about competitiveness with the

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[29] Leonard Kleinrock, "Technology Issues in the Design of the NREN." Paper delivered at the December 1990 Symposium at Harvard University. Published in Kahin, **Building Information Infrastructure**, 1992.
[30] **NSF—The National Science Foundation Computer Network for Research and Education**, (Milford, Conn.: International Business Machines Corporation, January 1990).
[31] Kleinrock, p. 175.
[32] Ibid.
[33] NSFNET, p. 3.

Japanese, Congress authorized the National Science Foundation (NSF) to fund construction and operation of U.S. supercomputing centers "in order to stay abreast of the Japanese. In 1984 the NSF issued a solicitation for the establishment of these centers, and by the end of 1985 funds for the establishment of five new computer centers were awarded by the NSF."[34]

Shortly afterward at a meeting of the NSF, university representatives and networking specialists established a network, NSFNET, which would use TCP/IP packet-switching protocols and become the communications backbone connecting the six supercomputers. The idea was to put a supercomputer on researchers' desktops.[35] The sixth supercomputer system was the National Center for Atmospheric Research (NCAR) in Boulder, Colorado. By 1987 the network became saturated with use, resulting in slow response time because of bandwidth congestion. Other management issues surrounding the large Internet-protocol-based networks were routing, "robust connections to mid-level networks," and "efficient, friendly, user interfaces."[36] The network needed an overhaul and as a result, NSF requested input in revising and re-engineering the existing NSFNET backbone.

In November 1987 Merit, Inc., in partnership with IBM and MCI Telecommunications Corp. entered into a $14 million, five-year agreement with NSF to expand NSFNET. The State of Michigan Fund contributed $5 million. With MCI's extensive fiber optic and digital radio network, IBM's hardware and software development, and Merit's operational and management experience, the strengths of the three organizations combined to create an architecture capable of meeting existing requirements as well as creating a future 'data highway,' a switching and routing system for a national

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[34] Richard Mandelbaum, & Paulette A. Mandelbaum. "The Strategic Future of the Mid-Level Networks." **Building Information Infrastructure**. Primis McGraw-Hill, 1992.
[35] Ibid., p.4.
[36] NSFNET, p. 4.

research network.[37]

The partnership's goals were to deliver a network with the following characteristics:

- Very high bandwidth and very low error rates.
- The ability to dynamically modify topology[38] and bandwidth.[39]
- Multiple-link redundancy.[40]
- Strong and proven network management.
- Comprehensive information and technical support services.[41]

By 1988 the partnership was successful in creating an operational NSFNET backbone upgrade; by July 1988, "NSFNET had 13 nodes and 14 physical links connecting mid-level networks and supercomputer sites."[42] The network was expanded in 1990 to 19 physical links. A fiber-optic line connects Europe across the Atlantic Ocean as well as Canada, Mexico, Scandinavia, Japan and Australia. Mid-level networks connect every state in the union, including Alaska, Hawaii and Canada. Since the new backbone was instituted in August 1988, traffic has increased nearly 20 percent per month. In June 1989, a billion packets were transmitted over the network for the first time.

According to the IBM publication **NSFNET—The National Science Foundation Computer Network for Research,** change has occurred rapidly:

> NSFNET has proceeded rapidly through several evolutionary stages—from a limited-use, bandwidth-constrained network linking the supercomputer centers, to a more robust, high-speed "network of networks" linking potentially hundreds of thousands of users. And these are proposals for a far grander information superhighway linking millions of users—the National Research and Education Network (NREN)—that may be built on today's NSFNET.[43]

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37 NSFNET, p. 4-5.

38 The geometric arrangement of nodes and cable links in a local area network.

39 Bandwidth is a measurement in cycles per second (hertz) or bits per second (BPS)of the amount of information that can flow through a channel.

40 Rather than a single path, this allows for a multiple-path delivery for packet delivery within a network system.

41 Ibid., p. 6.

42 Ibid.

43 Ibid., p. 20.

The next big challenge is to upgrade the gigabit level to make possible high-quality, full-color graphics, including animation and sound. The Corporation for National Research Initiatives (CNRI), a non-profit organization, is working with DARPA and NSF in funding a high-speed network initiative for experimental testing nationwide by 1995.[44]

Not only will researchers and students benefit from high-performance computing tools, organizations—large and small—without regard to geographic location will have access to specialized research facilities, supercomputers, databanks, and digital libraries that heretofore have only been available to large, well-funded universities and laboratories.[45]

A LEGISLATIVE HISTORY OF THE HIGH-PERFORMANCE COMPUTING ACT OF 1991

Senator Albert Gore, Jr. (D-TN) introduced the Supercomputer Network Study Act of 1986, a provision of which would require the White House Office of Science and Technology Policy to report to Congress on how the U.S. Government could promote supercomputing and high-speed networking.[46] In compliance with the Act, which became law August 21, 1986, the Office of Science and Technology Policy (OSTP) issued a report, **A Research and Development Strategy for High-Performance Computing**, which recommended that U.S. government, industry and universities coordinate research to develop a research network linking government, industry and higher education.[47]

In August 1988, Senator Gore chaired a hearing of the Subcommittee on Science, Technology, and Space of the Senate Commerce Committee on Computer Networks and

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[44] Ibid., p. 21.

[45] **NREN: The National Research and Education Network**, (Washington: Coalition for the National Research and Education Network, 1989).

[46] Chronology of Congressional Action on Supercomputing. Compiled by Sen. Albert Gore's office, September, 1991.

[47] Carol C. Henderson. **Library Perspectives on NREN: The National Research and Education Network**, edited by Carol Parkhurst (Chicago: American Library Association, 1990), pp. 7-12.

High-Performance Computing. Two months later he introduced the National High-Performance Computer Technology Act of 1988.

Legislative Action in 1989

About a year later in May 1989, Gore introduced the National High-Performance Computer Technology Act of 1989, an updated version of the previous year's bill. In his remarks, Gore said, "Libraries, rural schools, minority institutions, and vocational education programs will have access to the same national resources—databases, supercomputer, accelerators—as more affluent and better known institutions."[48]

Several subcommittees began holding hearings:

- Subcommittee on Science Research and Technology of the House Science, Space and Technology Committee—June 20, 1989
- Senate Commerce, Science, and Transportation Subcommittee on Science, Technology, and Space—June 21, 1989, July 26, 1989.

By August 3, 1989, Rep. Doug Walgren (D-PA) introduced a companion bill into the House, the National High-Performance Computer Technology Act of 1989. This bill was referred to the House Committee on Science, Space, and Technology's Subcommittee on Science, Research, and Technology.

On September 8, 1989, Allan D. Bromley, President Bush's Science Adviser and Director of the White House Office of Science and Technology Policy, issued a report which endorsed creation of a Federal High-Performance Computing Program and NREN. **The Federal High Performance Computing Program** was written cooperatively by more than a dozen federal agencies with OSTP. At this point, the Bush administration's view was that the initiative should be addressed through administrative action by the President rather than through the legislative process. New funding was not called for.[49]

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[48] **Congressional Record**, May 18, 1989, p. S5689.
[49] Parkhurst, p 2.

A few days later, September 15, 1989, the Senate Commerce, Science, and Transportation Subcommittee on Science, Technology, and Space held hearings on Sen. Gore's bill. It was at this hearing that Dr. James Billington, Librarian of Congress, introduced the concept of the "library without walls" that would provide scholars nationwide access to its materials, a revolutionary concept of expanded service.[50] Shortly thereafter, Rep. Walgren chaired a hearing of the House Subcommittee on Science, Research, and Technology on high-performance computing and NREN (National Research and Education Network).[51] The next day Rep. Edwin Markey (D-MA) chaired a hearing of the House Energy and Commerce Subcommittee on Telecommunications and Finance to discuss the nation's telecommunications infrastructure and the "Network of the future."[52]

By November 21, Sen. J. Bennett Johnston (D-LA) and Sen. James McClure (R-ID), chairman and ranking minority member of the Energy and National Resources Committee, and then-Sen. Gore introduced the Department of Energy High-Performance Computing Act of 1989, which defined and authorized the DOE portion proposed in Sen. Gore's High-Performance Computing Act.[53]

1990 Legislative History

In January 1990 the President's budget for fiscal year 1991 allocated $469 million for the High Performance Computing Program.[54] More committee and subcommittee hearings took place:

- March 6, 1990—Senate Subcommittee on Energy, Research and Development
- March 14, 1990—House Subcommittee on Science, Research, and Technology
- April 3, 1990—Senate Committee on Commerce, Science, and Technology ordered an amended version of Sen. Gore's bill

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50 Ibid., p. 3
51 Gore Chronology, p. 2.
52 Ibid.
53 Parkhurst, p. 3.
54 Ibid.

- June 27, 1990—Committee on Energy and Natural Resources ordered an amended version of the DOE High-Performance Computing Act
- July 10, 1990—Subcommittee on Defense Industry and Technology of the Senate Armed Services Committee approved the Defense Department authorization bill with an additional $30 million for a high-performance computing initiative at DARPA
- July 19, 1990—Senate Energy and Natural Resources issued its Report on the Department of Energy High-Performance Computing Act of 1990
- July 23, 1990—Senate Commerce, Science, and Transportation Committee issued its report in which distribution of library information resources was tied to NREN.

The U.S. Congress passed the Defense Department Appropriations bill, which included $20 million in additional funding for supercomputing and high-speed networking at DARPA.[55] Although the Senate passed Sen. Gore's High Performance Computing Act unanimously October 23, 1990, the House ran out of time.

1991 Legislative History

Because the House did not address the High Performance Computing Act, Gore reintroduced the bill as the High Performance Computing Act of 1991 on January 24, 1991. Rep. George Brown introduced a similar bill in the House simultaneously.[56]

The Department of Energy's High Performance Computing Act of 1991 was introduced February 5, 1991, while the same month the Bush Administration proposed $638 million in high-performance computing systems, advanced software technology and the National Research and Education Network (NREN). Authored by the Committee on Physical, Mathematical and Engineering Sciences, **Grand Challenges: High**

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55 Gore chronology, p. 2-3.
56 Parkhurst, p. 7.

Performance Computing and Communications outlined the President's program.[57]

Subcommittees again held hearings on the legislation:

- March 5, 1991—The Science, Technology, and Space Subcommittee of the Senate Commerce Committee
- March 7, 1991—The Senate Science Committee's Subcommittee on Science and its Subcommittee on Technology and Competitiveness held a joint hearing
- March 19, 1991—The Senate Committee on Commerce, Science, and Transportation unanimously approved the High-Performance Computing Act of 1991
- April 10, 1991—The House Science Committee's Subcommittee on Technology and Competitiveness approved an amended version of the House bill
- April 11, 1991—Senate Energy Committee held a hearing on the DOE HPCA
- April 17, 1991—The House Science Committee's Subcommittee on Science approved an amended version of the House bill
- May 8, 1991—The House Committee on Science, Space, and Technology amended and approved the House bill
- May 9, 1991—The Senate Energy Committee unanimously approved an amended version of the HPCA
- May 16, 1991—The House Education and Labor Committee amended and approved the House HPCA

By June 6, 1991, the House approved the VA, HUD, and Independent Appropriations Bill, which included nearly full funding for the NSF's research programs ($213 million for high-performance computing and the NSFNET computer network).[58]

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[57] Parkhurst, p. 7.
[58] Gore Chronology, p. 4.

On July 11, 1991, the House approved by voice vote an amended version of the High-Performance Computing Act, which included a "Buy American" provision. This provision specified that hardware and software should be purchased from American manufacturers. A week later the Senate approved the VA, HUD and Independent Agencies Appropriations Bill. On September 11, the Senate amended and passed both the Senate and House versions of the HPCA and sent both back to the House. On November 20, 1991 the House passed a House-Senate compromise version of the High-Performance Computing Act. The next day, November 22, 1991, the Senate unanimously approved the compromised version.[59] The President had thirty days in which to sign the bill and he did so, December 9, 1991. Public Law 102-194 established a program to accelerate research and development in high performance computers, software, and networks; it established an interagency supercomputer program coordinated by the Office of Science and Technology; it directed OSTP to establish jointly with the computer, telecommunication, and information industries a national network connecting computers at research and educational institutions and other government and industry facilities.[60]

Developments from 1992 to 1994

In a Report to Congress, Allan D. Bromley presented a model for the evolution and funding of NREN, specifying the status of NREN, the government's role in its development, and detailing concerns and constituencies. Bromley addressed ownership, operation, acceptable use, fair competition, interoperability, copyright protection and user base.[61]

After Bill Clinton took office as President in January 1993, the new administration committed itself to accelerated technological advances. In a February 22, 1993, statement,

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59 Ibid. p. 4.

60 Public Law 102-194: High-Performance Computing Act of 1991. **CIS Annual 1991: Legislative Histories of U.S. Public Laws** (Washington, D.C.: Congressional Information Service, 1992), pp. 227-233.

61 Allan D. Bromley, **The National Research and Education Network Program: A Report to Congress**, OSTP, Washington, DC, December, 1992.

Clinton-Gore vowed to focus on acceleration of technological development and articulated as one of their technology goals, "support for a national telecommunications infrastructure and other information infrastructures critical for economic expansion." As a management priority, Vice President Gore was appointed to "reinvigorate" the Office of Science and Technology Policy to lead in creating policy with the Federal Coordinating Council on Science, Engineering, and Technology "and other means" to coordinate regulatory, trade, tax, and economic policies.[62]

On September 15, 1993, President Clinton issued an executive order establishing the Commerce Department as the official United States Advisory Council on the National Information Infrastructure (NII), setting up 25 members to be appointed by the Secretary of Commerce. Issues the Council were directed to address include:

1. universal access;
2. privacy, security, copyright;
3. national security, emergency preparedness;
4. interconnection and interoperability of communication networks;
5. role of public and private sectors in the developing NII;
6. regulatory issues related to NII;
7. job creation, economic growth, productivity, and
8. health care implications.[63]

The same day, **The National Information Infrastructure: Agenda for Action** was released by the Information Infrastructure Task Force headed by Secretary of Commerce Ron Brown. In addition to listing the appointees and agenda, the document included accomplishments already addressed during the first seven months of the Clinton-Gore Administration. The President's Fiscal Year 1994 Budget allocated $1.1 billion for high-performance computing, including a new program to focus on education, manufacturing, health, and digital libraries totaling $100 million. Grants were allocated to demonstrate applications of NII for non-profit institutions (schools, libraries, hospitals),

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62 William J. Clinton, & Albert Gore, Jr., **Technology for America's Economic Growth, A New Direction to Build Economic Strength**, White House, Washington, DC, February 22, 1993, pp. 1-6.

63 Federal Register, Presidential Documents, **Executive Order 12864: United States Advisory Council on the National Information Infrastructure**, Washington, DC, September 17, 1993.

and $40 million was earmarked for research by the Department of Energy's National Labs for the NII. Nearly 3,000 proposals totaling $8.5 billion were received from the private sector in 1993. The President endorsed funding for the Technology Reinvestment Project (TRP) at $600 million in 1994.[64]

In a December 21, 1993, speech to the National Press Club, the Vice President announced plans to present a legislative package concerning telecommunications and information policy. He outlined the following principles as fundamental to Administration policy:

1. Encouragement of private investment in the NII;
2. Promotion and protection of competition;
3. Provision for open access to the NII by consumers and service providers alike;
4. Preservation and advancement of universal services to avoid the creation of a society of "haves" and "have nots", and
5. Insurance of regulatory flexibility to keep pace with massive market changes in the telecommunications and information industries.[65]

On January 11, 1994, Vice President Gore made a major policy speech to the Academy of Television Arts and Sciences at the UCLA regarding regulations for the cable and telephone industries. Gore promised to prevent states from imposing barriers on new companies entering the local phone business. The Administration supports new legislation that would allow telephone companies to get into the cable business, and allow cable and other companies to enter the telephone business. The Vice President said he supported legislation offered by John Dingell (D-MI) and Jack Brooks (D-TX) and would work to help enact a bill this year.[66] That bill left restrictions prohibiting regional Bell operating companies (RBOCs) from delivering long-distance phone service out of their region after five years. Among other provisions, the bill would allow RBOCs to petition the Justice

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[64] Information Infrastructure Task Force, **The National Information Infrastructure: Agenda for Action**, Washington, DC, September 15, 1993, p. 24.

[65] Albert Gore, Jr., "Background on Telecommunications Policy Reform Initiative," Washington, DC, The White House, December 21, 1993 speech to the National Press Club.

[66] Albert Gore, Jr., "Bring the Information Revolution to Every Classroom, Hospital, and Library in the Nation by the End of the Century," Washington, DC, The White House, speech given January 11, 1994, to the Academy of Television Arts and Sciences.

Department and the FCC to use their own networks to provide in-region long-distance service and to permit RBOC manufacture of telecommunications equipment (in the U.S.).[67]

The Vice President emphasized the need for universal access:

> Accordingly, our legislative package will contain provisions designed to ensure that each telephone carrier's networks will be readily accessible to other users. We will create an affirmative obligation to interconnect and to afford nondiscriminatory access to network facilities, services, functions and information. We must also explore the future of non-commercial broadcasting; there must be public access to the information superhighway.

Gore also challenged the major corporate telecommunications players to connect the nation's schools to the information highway free of charge. "We cannot tolerate—nor in the long run can this nation afford—a society in which some children become fully educated and others do not," the Vice President said. "Nor can we permit geographic location to determine whether the information highway passes by your door."[68]

The Clinton-Gore Administration, concerned about universal access, obviously has the knowledge-gap concern in mind. Access to new technology in our society costs money. Because of this, those without means to connect to the information highway could be in danger of being "curbed" or without access lanes onto the superhighway. As information scientists E.B. Parker and D.A. Dunn prophesied in 1972:

> If access to these information services is not universally available throughout the society, then those already "information-rich" may reap the benefits while the "information poor" get relatively poorer. A widening of this "information gap" may lead to increased social tension.[69]

Open discussion of accessibility, training, funding, privacy, security, copyright, and other issues is imperative if Americans are to be knowledgeable about the complexities

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67 Kim McAvoy, "Full Speed Ahead on Superhighway," **Broadcasting & Cable**, Jan. 3, 1994, pp. 51-52.
68 Ibid.
69 E.B. Parker and D.A. Dunn, "Information Technologuy: Its Social Potential," **Science**, Vol. 176, 1972, p. 1396.

involved. The press has an important role to play in clearly articulating the issues to the public. The communications industry faces immense challenges in getting the public's attention and keeping it long enough to address complex issues in the marketplace of ideas. It is the purpose of this study to trace the diffusion of the information highway concept through the printed press. If ever the information revolution were an issue, it is now.

CHAPTER III

LITERATURE REVIEW

Because of the complexity of this study, several strands of research are applicable to its understanding. Macro subject areas include:

1. Forecasting;
2. Trend Analysis;
3. Environmental Scanning;
4. Monitoring;
5. Issues management;
6. Precursor monitoring;
7. Database management, and
8. Bibliometric analysis

Although these research areas are generally related to this study, the specific theoretical underpinnings for it are in issues management and related models. The most well-known model for public issue management is that of W. Howard Chase, who pioneered the marriage of public relations with issues management in about 1977.[70] With business under attack in the 1970s, a new form of counterattack was coined to respond to critics of business activity. Chase coined the term "issue management" in the midst of a trend from information-based to advocacy-based corporate communication.[71] Chase offered an Issues Management Process Model for predicting the effect of organizational change on the company's overall performance.[72] Raymond Ewing introduced the uses of "futurist techniques in issues management" in a Public Relations Quarterly article in

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70 Robert L. Heath, Kenneth R. Cousino. "Issues Management: End of First Decade Progress Report," in **Public Relations Review**, Vol. 16, No. 1, pp. 6-18, Spring, 1990.
71 Ibid.
72 Ibid.

1979.[73] From 150 forecasting techniques, Ewing delineated nine as widely used in the practice of public relations:

1. Trend extrapolation;
2. Trend impact analysis;
3. Scanning;
4. Monitoring;
5. The Delphi technique
   (based on the assumption that two heads are better than one);
6. Cross-impact analysis;
7. Computer simulations;
8. Scenario writing, and
9. Technology assessment.[74]

In the face of potentially hostile regulations or public policy, planning was seen as necessary for organizations to protect their interests during the 1970s. Known by various names (public affairs, corporate planning, corporate communication, government affairs, policy analysis), issues management required strategic planning, monitoring, communicating and responsibility to assist an organization in coping with change and meeting its mission.[75]

Discussion of issues management blossomed in public relations literature in the early 1980s. The literature has explored the realm of establishing a definition;[76] discussing First Amendment implications;[77] mapping;[78] case studies;[79] international implications;[80]

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[73] Raymond P. Ewing. "The Uses of Futurist Techniques in Issues Management," **Public Relations Quarterly**, Vol. 24, No. 4, pp. 15-19, winter, 1979.
[74] Ibid.
[75] Robert L. Heath, "Corporate Issues Management: Theoretical Underpinnings and Research Foundations," in **Public Relations Research Annual**, Vol. 2, Larissa A. Grunig and James E. Grunig, eds.
[76] W. Howard Chase. "Public Issue Management: The New Science," in **Public Relations Journal**, Vol. 33, No. 10, pp. 25-26.
[77] Richard Alan Nelson, "Bias Versus Fairness: The Social Utility of Issues Management," in **Public Relations Review**, Vol. 16, No. 1, pp. 25-33.
[78] Joseph F. Coates, Jennifer Jarratt, "Mapping the Issues of an Industry: An Exercise in Issues Identification," **Futures Research Quarterly**, pp. 53-63.
[79] Lauren Cook, "The State Scanning Network: An Issue Identification System for State Policy Managers," **Futures Research Quarterly**, pp. 65-77. W. Timothy Coombs, "The Failure of the Task Force on Food

and clarification of an issue life cycle.[81]

Within private industry, Graham T. T. Molitor developed a method for issues management. He published a public-policy prediction model in 1977, which later evolved into a more polished model.[82] Molitor was a pioneer in developing systematic techniques for predicting public policy change. An attorney, author, educator, corporate lobbyist, speechwriter for presidential candidates, and president of Public Policy Forecasting, Inc., Molitor developed an issue emergence concept for strategic public policy issues.[83] The "proactiveness" of this approach is attractive to public relations practitioners who prefer proactive practice of public relations rather than reactive practice, particularly in crisis situations.

Coates defined "foresight" as including both qualitative and quantitative means for "monitoring clues and indicators of evolving trends and developments."[84] He defined the foresight elements as:

1. Issues alert;
2. Issues definition;
3. Trends identification;
4. Definition of data needs;
5. Data gathering;
6. Resource allocation;
7. Foresight study plan;
8. Coordination;

Assistance: A Case Study of the Role of Legitimacy in Issue Management," **Journal of Public Relations Research**, Vol. 4, No. 2, pp. 101-122.

80 Laurie J. Wilson, "Corporate Issues Management: An International View," **Public Relations Review**, Vol. 16, No. 1, pp. 40-51.

81 Max Meng. "Issue Life cycle Has Five Stages," **Public Relations Journal**, Vol. 48, No. 3, pp. 23-24.

82 Graham T. T. Molitor, "How to Anticipate Public-Policy Changes," in **S.A.M. Advanced Management Journal**, Summer 1977, p. 7-9. Alice Chambers Wygant, and O.W. Markley, **Information and the Future: A Handbook of Sources and Strategies** (New York: Greenwood Press, 1988), pp. 121-123.

83 Graham T. T. Molitor, "Plotting the Patterns of Change," **Enterprise**, March 1984, pp. 4-9.

84 Joseph F. Coates, "Foresight in Federal Government Policymaking," **Futures Research Quarterly**, Summer 1985, pp. 29-53.

9. Definition of assumptions;
10. Forecasts of relevant variables;
11. Identification of affected parties/stake-holders;
12. Identification of outcomes;
13. Definition of policy options;
14. Analysis of policy alternatives;
15. Framing the results;
16. Delivering the results, and
17. Quality control of the process.[85]

Futures research, forecasting techniques, and environmental scanning were addressed in the mid-1980s by Neufeld, VanSlyke Turk, and Becker.[86]

The marketing and management disciplines have recognized the strategic value of issues management in meeting professional objectives. The addition of public relations in the marketing mix includes issues management. Northwestern University's leadership in this area is reflected in an article in its Journal of Corporate Public Relations,[87] and Preble introduces the concept of issues management as "strategic formulation" or "strategic control" in the Journal of Management Studies.[88]

The next section will outline how the quantitative methodology of bibliometrics has been used in trend analysis research.

USING BIBLIOMETRICS AND COMPUTER ONLINE DATABASES FOR TREND ANALYSIS RESEARCH

Alan Pritchard coined the term "bibliometrics" in 1969 to describe a statistical

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85 Ibid.

86 William P. Neufeld, "Environmental Scanning: Its Use in Forecasting Emerging Trends and Issues in Organizations," **Futures Research Quarterly**, Fall 1985, pp. 39-52. Harold S. Becker, "Making Futures Research Useful: The Practitioner's Opportunity, **Futures Research Quarterly**, Summer 1985, pp. 15-28. Judy VanSlyke Turk, "Forecasting Tomorrow's Public Relations," **Public Relations Review**, Vol. 12 No. 3, pp. 12-21.

87 Brant W. Long, "The Wisdom of Foresight: Trend Prediction for the PR Practitioner," **Journal of Corporate Public Relations**, Vol. III 1992-1993, pp. 11-15.

88 John F. Preble, "Towards a Comprehensive System of Strategic Control," **Journal of Management Studies**, Vol. 29 No. 4, pp. 391-411.

methodology using mathematics and statistics to quantify the processes of written communication.[89] Retrospective by necessity, bibliometrics can utilize longitudinal methods to determine the citation trends of a group of articles over time. This is helpful in determining patterns and to offer predictions of growth. In Miranda Lee Pao's terminology, bibliometrics makes possible study of subject coverage of specific journals, author output, issues evolution, through quantification, description, and prediction of the process of print communication.[90]

Of particular use in this study is S.C. Bradford's work in the distribution of literature of a particular subject among various journals. Bradford studied applied geophysics and lubrication and noted a relationship between the number of journals and the scatter of articles published across a number of journals. In 1934 Bradford published an article in **Engineering** hypothesizing that articles in a particular discipline are scattered in a very regular manner over a broad range of journals.[91]

Bradford called the core articles, "a nucleus of periodicals more particularly devoted to the subject."[92] According to Pao, the law has been tested in many disciplines, resulting in a consistent 20/80 percent rule: A concentration of 80 percent yield is found in the 20 percent nucleus of sources. If a distribution conforms to Bradford's Law of Scatter, three distinct regions will emerge:

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89 Alan Prichard, "Statistical Bibliography or Bibliometrics?" in **Journal of Documentation**, Vol. 25, No. 4, pp. 348-349.

90 Miranda Lee Pao, "Literature" in **Concepts of Information Retrieval**, Englewood, Colorado: Libraries Unlimited, 1989, p. 13.

91 Abe Bookstein, "Explanations of the Bibliometric Laws," in **Collection Management**, Vol. 3, Nos. 2/3, Summer/Fall, 1979, pp. 151-152.

92 S.C. Bradford, **Documentation** (London: Crosby Lockwood, 1948).

1. a rapid rise;
2. a major portion of linear relationship between the two variables, and
3. a droop at the tail end of the distribution indicating incompleteness.[93]

According to Brooks, three conditions must be met to test Bradford's Law of Scatter:

1. The number of articles in each zone must remain constant.
2. The Bradford multiplier must be greater than one.
3. The Bradford multiplier must remain approximately constant.[94]

Many bibliometric studies have confirmed Bradford's Law of Scatter. Of particular interest to this study is the use of online resources to create bibliometric studies. Use of online bibliometric utilities for this research extends previous studies using bibliometrics, Bradford's Law of Scatter, and online resources.

Donald Hawkins of Bell Telephone Laboratories introduced the idea of using bibliometrics online in an article titled "Unconventional Uses of On-line Information Retrieval Systems: On-line Bibliometric Studies."[95] He pointed out the usefulness of on-line databases for performing quantitative analysis in journal comparison studies, corporate affiliation studies, and statistical studies. In 1978 he published a bibliometric study of online information retrieval literature, unsuccessfully applying Bradford's Law of Scatter to the literature. Because there were no journals exclusively devoted to online retrieval, literature was dispersed in other journals. Hawkins has written that this accounted for the unsuccessful Bradford curve. Hawkins expected two new online journals to consolidate widely dispersed literature and to bring the curve into conformity with the Bradford distribution.

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93 Pao, p. 32.
94 Ibid.
95 Donald T. Hawkins, "Unconventional Uses of On-line Information Retrieval Systems: On-line Bibliometric Studies," **Journal of the American Society for Information Science**, pp. 13-18.

In 1984 Hibbs et al. published a piece on using online databases to perform trend analysis, delineating limitations and strengths of online databases, but emphasizing that economically, this technique provided an inexpensive way to focus on developments within a specific time frame. In addition, the authors suggested that the combination of inductive and deductive methodologies is complementary. For example, while bibliometrics supplies statistical trends via citation analysis, the impact of each article cannot be ascertained through bibliometrics alone.[96] It is possible that public reaction to an article with negative information about an issue early in an issue's cycle could impact the direction the issue takes. Statistical analysis helps researchers determine whether fluctuations reflected in bibliometric data are due to something other than chance. If fluctuations are determined to be statistically significant, the researcher can utilize qualitative methodology to examine data to determine more specifically causes and effects not reflected in the bibliometric data. Hibbs has asserted that quantitative methods have the potential of confirming trends and revealing unsuspected relationships. Qualitative analysis might reveal significance in a subtopic heretofore unrecognized as important.[97]

The same year, Hawkins published another study about online retrieval literature, an update of his 1978 study, which again examined the distribution of publications and Bradford's Law. With this study, Hawkins had more success in applying Bradford's Law.[98]

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96 Jack Hibbs, Ronald T. Bobner, Isadore Newman, Charles Dye, and Carolyn Benz, "How to Use Online Databases to Perform Trend Analysis in Research," in **ONLINE**, Vol. 8 No. 2, pp. 59-64.
97 Ibid., p. 59.
98 Donald T. Hawkins, "The Literature of Online Information Retrieval: An Update," in **Online Review**, Vol. 8 No. 2, pp. 153-164.

In 1985, Lancaster and Lee published their "Bibliometric Techniques Applied to Issues Management: A Case Study," in the **Journal of the American Society for Information Science**.[99] With unstated allusions to both Molitor's model and Goffman's theory of epidemiology, Lancaster and Lee used online database bibliometrics to study growth of literature, spread of interest, and movement from one type of database to another using the term "acid rain." The authors' results supported Bradford's Law of Scatter; the authors recommended that issues managers use a combination of journal monitoring and online database tracking.

A 1987 study in **Library and Information Science Research** used online database bibliometrics to examine the rate of publication studies on cognitive development. Their interest was in plotting the evolution of areas of research within an academic discipline.[100] They concluded that bibliometric methods were successful in breaking down a discipline into major research categories (i.e., learning, language development, perception, memory, problem solving, etc.). They suggested that future bibliometric studies could determine the impact of particular individuals and their research upon a field. They concluded that bibliometrics provides a clear overall picture of research trends.

The Electric Power Board Research Institute funded a $17,000 issues management study in 1986 to examine the Molitor and Lawless models of issue development through online database environmental scanning.[101] Using six environmental issues over a ten-year

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99 F.W. Lancaster, and Ja-Lih Lee, "Bibliometric Techniques Applied to Issues Management: A Case Study," in **Journal of the American Society for Information Science**, Vol. 36 No. 6, pp. 389-397.

100 Paul E. McGhee, Peggy R. Skinner, Karen Roberto, Nancy J. Ridenour, and Susan M. Larson, "Using Online Databases to Study Current Research Trends: An Online Bibliometric Study," in **Library & Information Science Research**, Vol. 9 No. 4, pp. 285-291.

101 **An Examination of Models of Issue Development: Environmental Scanning Using On-**

period, the study tracked the issues through scientific, popular, legislative and national press, then compared the results with the two models. The results of this study supported the applicability of bibliometric techniques in the tracking of issues through online databases. According to the study, testing of an "issues management curve" was successful, and the issues examined did follow the model[102] of issue evolution although there was some variation found. Their preliminary conclusion was that activity in the general press is **the** determining factor in catapulting an issue into the legislative arena. The question left unanswered by this study was: Can bibliometric techniques be used for the early identification of emerging issues? The study showed that bibliometric methods can track an issue once it has been identified, but discovering the first mention of that issue is the problem.

Wolfram et al. conducted research for measuring growth of knowledge among various disciplines over a 20-year period (1968-1987). The study attempted to model growth of the literature using a linear model, an exponential model, and a proposed power model.[103]

Other bibliometrics studies include citation analysis of the journal submission process[104]; bibliometric analysis of public relations research[105]; a bibliometric analysis of

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Line Databases (Alexandria, Virginia: Electric Power Research Institute, 1987).

102 This study also examined a model by Lawless, which uses content analysis in predicting development of issues related to technology.

103 Dietmar Wolfram, Clara M. Chu, and Xin Lu, "Growth of Knowledge: Bibliometric Analysis Using Online Databases," in **Infometrics** (Amsterdam: Elsevier, 1990).

104 Michael D. Robinson, "Applied Bibliometrics: Using Citation Analysis in the Journal Submission Process," in **Journal of the American Society for Information Science**, Vol. 42 No. 4, pp. 308-310.

105 Yorgo Pasadeos, and Bruce Renfro, "A Bibliometric Analysis of Public Relations Research," in **Journal of Public Relations Research**, Vol. 4 No. 3, pp. 167-187.

the 1988 presidential campaign for press coverage of candidates, campaign managers, chairmen and staffers, opinion leaders and campaign quotations[106]; and a bibliometric analysis of literature growth in microcomputers in library and information services from 1973 to 1986.[107]

BRADFORD'S LAW OF SCATTER and GOFFMAN'S EPIDEMIOLOGY MODEL

In 1964 William Goffman introduced his theory on the transmission and spread of ideas in **Nature** magazine as a process analogical to the spread of a medical epidemic.[108] He introduced a mathematical model and showed that transmitting ideas is not a single process within a population but a collection of interacting processes within sub-populations. He wrote that "the notion of an all-encompassing information retrieval system spanning the totality of knowledge should be replaced by the notion of small dynamic interrelated systems that appear when needed and disappear when not needed."[109]

In 1966 Goffman again offered mathematical equations for the epidemic processes model using the Kermack-McKendrick theorem to confirm the applicability of Russian mathematician A.M. Lyapunov's theory of differential equations. According to the Kermack-McKendrick theorem, for a population susceptible to an epidemic, the initial number of susceptibles will drop over the course of the epidemic in a value equally below

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106 Tim Miller, and David Stebenne, "The Bibliometrics of Politics," in **Gannett Center Journal**, Vol. 2 No. 4, pp. 24-30.
107 Changren Hu, "Microcomputers in Library and Information Services (1973-1986): A Bibliometric Analysis of Literature Growth," in **Microcomputers for Information Management**, Vol. 4 No. 3, pp. 183-208.
108 William Goffman, and Vaun A. Newill, "Generalization of Epidemic Theory: An Application to the Transmission of Ideas," in **Nature**, Vol. 204, pp. 225-228.
109 Ibid., p. 228.

the threshold as was originally above it. Goffman mathematically established the stability of his model for these epidemic states after exposure to some phenomenon (infectious material): increasing state, decreasing state, and stable state (change in number of infectives over time is zero).[110]

In 1969 Goffman and Warren published a study which affirmed Bradford's Law in relation to two diverse medical literatures: 1) mast cells and 2) schistosomiasis .[111] Goffman used a comprehensive bibliography of literature on mast cells from 1877, when Ehrlich discovered the cell, to early 1964.[112] For the schistosomiasis literature, Goffman used a bibliography prepared by Warren and Newill, which covers literature on the subject from 1852 (when Bilharz discovered the parasite causing the disease) until 1962.[113] Goffman's data confirmed Bradford's law of dispersion even though the two literatures "differ in almost every respect."[114] Goffman's 1970 study explored Bradford's Law and library acquisitions,[115] and in 1971 he published a mathematical approach to the prediction of scientific discovery, noting that "in symbolic logic, fundamental discoveries seem to follow patterns suggesting that future discoveries may in some sense be predictable."[116]

In 1973 Worthen examined Goffman's epidemic theory and Menzel's contagion theory to compare the two models and to examine their similarities and differences. He

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110 William Goffman, "Stability of Epidemic Processes," in **Nature**, Vol. 210, pp. 786-787.
111 William Goffman, and Kenneth S. Warren, "Dispersion of Papers among Journals Based on a Mathematical Analysis of Two Diverse Medical Literatures," in **Nature**, Vol. 221, pp. 1205-1207.
112 H. Selye, **The Mast Cells** (London: Butterworth, 1968).
113 K.S. Warren, and V.A. Newill, **Schistosomiasis, a Bibliography of the World's Literature from 1852-1952** (Cleveland, Ohio: Western Reserve University Press, 1967).
114 Ibid., p. 1207.
115 William Goffman, "Bradford's Law and Library Acquisitions," in **Nature**, Vol. 226, pp. 922-923.
116 William Goffman, and Glynn Harmon, "Mathematical Approach to the Prediction of Scientific Discovery," in **Nature**, Vol. 229, pp. 103-104.

concluded the two models are very similar, with the major difference being the scope of methodology rather than the construction of models. Goffman used the analogy between the spread of a disease and the diffusion of an idea. By using a mathematical model composed of the population of an infection divided into three sections (infectives who have the disease, susceptibles who can acquire the disease, and removals who cannot become infective), Goffman was able to make predictions about the state of the literature in any given field. Research could confirm growth, decline, or stability by using definable periods and using the model constructed with a series of differential equations.[117]

Menzel, a sociologist, examined the sociometric process surrounding the introduction of a new pharmaceutical product to a definable population, in a definable geographic region. Menzel's "contagion theory" examined the medical community to determine how a new innovation diffused. Menzel examined journal articles, advertising, advisor-advisee relationships, discussion partners, age, education, and other factors in the spread of a product. He concluded that two channels of communication were necessary for a physician to try a new product: information from commercial channels, and legitimatization from professional channels and colleagues.[118]

In 1975, Worthen published a study on the application of Bradford's Law to monographs and found support for the law. The law's validity extends to diverse disciplines, Worthen said, and is not confined by political or economic boundaries.[119]

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117 Dennis B. Worthen, "The Epidemic Process and The Contagion Model," in **Journal of the American Society for Information Science**, Vol. 24, pp. 343-346.
118 Ibid. p. 344.
119 Dennis B. Worthen, "The Application of Bradford's Law to Monographs," in **Journal of Documentation**, Vol. 31 No. 1, pp. 19-25.

Worthen's sample population was drawn from titles published between 1965 and 1970 located in the U.S. National Library of Medicine on cardiovascular diseases, heart diseases, cerebrovascular disorders, vascular diseases, and arrhythmia.

Drott (1981) and Brookes (1984) have published more detailed mathematical examinations of Bradford's Law and comparisons to others' laws. For example, Lotka's Law addresses productivity of publication by a population of authors. Zipf's Law supports a theory of linguistics by addressing word occurrence in search of patterns by frequency of occurrence. These are the most prominent in library literature although examples of pattern distributions have been discovered in a variety of subject content (distribution of income in society; distribution of species of biological entities over genera; population within a city to its rank by size among other cities; sizes of islands in an archipelago; and distribution of minerals over land masses.)[120] Bradford's Law of Scatter was found to cover other bibliometric laws adequately and comprehensively.

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120 Bookstein, p. 154.

CHAPTER IV

METHODS OF RESEARCH

DATA GATHERING TECHNIQUES

The sample was be drawn from approximately 24 online DIALOG databases representative of the four literature genres specified by Molitor's Precursor Monitoring Model. The databases will be chosen for their appropriateness to the categories on the Precursor Monitoring Model and their availability on the DIALOG Information Retrieval System. Further, they will be chosen for their comprehensive representation of journals and research most consistently covering the time period 1974-1993. (Comprehensive historical analysis prior to 1975 is not possible since online databases are relatively new.)

1. Scientific reports
2. Trade and industry journals
3. National/general press
4. Federal/government/legislative (combining Government Awareness and Enacting of New Policy categories)

DIALINDEX, a low-cost database selection aid, will be used to decide which databases to sample based on a preliminary search indicating the number of hits in the entire 360 database DIALOG service.

In the next session I will detail the methodology, which includes content analysis, bibliometrics, the in-depth interview.

METHODOLOGY

CONTENT ANALYSIS. The following basic coding categories were used in the

bibliometric online database search where the abstract/article/citation was the basic unit of analysis. Coding was by publication year and category of database.

Coding Categories

Synonyms for government-funded electronic network:

ARPANET (Advanced Research Projects Agency Network)
NSFNET (National Science Foundation Network)
INTERNET (International Network)
BITNET (Because It's Time Network)
NREN (National Research and Education Network)
NII (National Information Infrastructure)

Synonyms for the electronic network:

Smart Highway
Data Superhighway
Data Highway
Electronic Highway
Information Superhighway
Electronic Information Highway
Information Highway
Super Datahighway
Computer Superhighway

THE CASE STUDY—The High-Performance Computing Act of 1991 triggered initial general press coverage of a new electronic information highway. This research will focus on research, press coverage, and legislation related to the electronic highway and the policy and legal issues it creates.[121]

BIBLIOMETRICS—The application of mathematics and statistical methods to books and other media of communications. Bibliometrics uses citation analysis to shed light on the processes of communication and the nature and course of development of an issue or discipline by means of quantitative analysis. Further, it facilitates the detection of historical

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121 Robert K. Yin, **Case Study Research: Design and Methods** (Beverly Hills: Sage, 1984).

movements and the spread of ideas.

THE INTERVIEW—In-depth interviews with database publishers and producers represented in this study were conducted to determine how the databases are created and the practicality of regular examinations of the lexicons used by designers to discover new terms that have never occurred before. Information from interviews with database publishers and producers helped determine differences in underlying philosophies and standards for inclusion of articles in databases.

After the database sample was chosen through DIALINDEX, searches were tailored to use full-text, key-word searches. Occurrences of the selected word or phrase anywhere within the database cause that record to be counted. Once the searches were designed and tested, each term was run through the selected databases to determine issue frequency count, total frequency count, first mentions, and yearly additions of items in the database. The information, captured on computer diskette, tracks issues across the approximately 20-year period and builds a comprehensive picture of their spread, movement, and growth. Graphs and tables using frequency counts and percentages facilitate monitoring primary literature for a fundamental bibliometric phenomenon, Bradford's Law of Scatter.

DATA TABULATION AND ANALYSIS

Data was tabulated to determine the following:

GROWTH: interest in a topic (rapid increase in the number of databases that include literature on the search term/issue).

SPREAD: where/when issues first appeared and the number of citations for

succeeding years.

MOVEMENT: tracking an issue from its first appearance in research reports through various types of databases.

Graphing the results provides direct evidence on variance of literature from year to year. In addition, tables and graphs illustrate issue evolution by database group, issue development within database groups, total issue coverage, issues by date of first mention, issue chronologies, and Bradford's Law of Scatter,

CHAPTER V

PRESENTATION OF RESULTS

This research used retrospective content analysis of 25 online databases through DIALOG, the online bibliographic utility. More than 36 million articles were scanned covering more than 60,000 sources. The 25 databases were chosen for their appropriateness for the model, comprehensive coverage, number of hits, and dates of coverage.

The purpose of this research was to locate the database(s) in which the concept of the Information Highway originated, locate the take-off point at which it became a public issue, and to monitor the growth, spread, and movement of the concept. These were designed to test Molitor's Precursor Monitoring Model for issues management. Data will be organized and presented as they pertain to the research questions:

1. Will the issue of the new Electronic Information Highway and its common synonyms—also known in its earlier terms as ARPANET, NSFNET, BITNET, Internet, NREN, and now NII (National Information Infrastructure)—first appear in conference papers and research in the scientific community?

2. Was coverage of the Electronic Information Highway skimpy in the general press, bypassing this critical phase in Molitor's Precursor Monitoring Model (see Appendix A)? Molitor predicts a public policy issue moves from pure science literature to applied science literature to the general press, then into legislative literature.

3. Will a small nucleus of journals yield a high percentage of the total literature on the new Electronic Information Highway?

4. Is Bradford's Law of Scatter reliable for identifying a small nucleus of journals likely to yield a high percentage of the total literature?

5. At what point does the coverage of an issue within an online electronic database become significant? At what point can one determine that a topic will become an emerging issue?

Discussion of research questions 6-10 involves policy questions and will be discussed in the second half of the results section.

The initial research began using DIALINDEX, a directory of index terms, keywords, and other terms directly searchable in the DIALOG databases. A DIALINDEX search indicates the number of term occurrences within each database. Lancaster and Lee suggested that multiple DIALINDEX searches over time could allow monitoring and growth of a concept as an inexpensive and relatively simple procedure.

In addition to revealing how many databases include coverage of a particular term, a DIALINDEX search can indicate how fertile particular databases are in terms of volume of material on an issue. For example, DIALINDEX searches for the term Info Highway were conducted in June 1993 and June 1994. Table 1 and Table 2 show how term usage increased dramatically in one year. The number of articles with the term Info Highway increased from 18 to 97 between 1993 and 1994. Three fertile databases for this term had emerged by 1994: PTS Prompt, Trade & Industry ASAP, and PTS Newsletter.

Tables 1 and 2 show the number of articles within a database containing the term Info Highway. With the database name are dates of coverage for that particular database. Notice the dramatic increase of term use within newspapers by 1994.

Table 1: Dialindex Search for the term Info Highway June 13, 1993

No. of Hits	Database
1	ABI/INFORM(R)_1971-1993/Jun W2
4	PTS PROMT_- 72-93/June 14
1	PTS F&S INDEX(R)_1980-1993/MayW5
Examined 50 databases	
2	ACADEMIC INDEX_1976-93/JUN
2	TRADE AND INDUSTRY INDEX_81-93/JUN W
Examined 100 databases	
1	NEWSEARCH_, 06/11/93
Examined 150 databases	
Examined 200 databases	
3	Newspaper & Periodical Abs_88-10 Jun 1993
3	DETROIT FREE PRESS_1987 - 10 Jun 1993
Examined 250 databases	
1	PTS MARS_- 84-93/Jun.14
1	KNIGHT-RIDDER/TRIBUNE BUS.NEWS_1989-1993
1	BOSTON GLOBE_ 1980 - 11 Jun 1993
5	PTS NEWSLETTER DATABASE_87-93/Jun. 14
Examined 300 databases	
1	MAGAZINE ASAP_83-93/JUN W1
2	TRADE AND INDUSTRY ASAP_83-93/JUN W1
1	ORLANDO SENTINEL_ 1988 - 11 Jun 1993
1	ATLANTA JOURNAL/CONST._1989 - 31 May 1993
1	SF EXAMINER_1990 - 09 Jun 1993
Examined 350 databases	
1	TIME PUBLICATIONS_1985 - 31 May 1993

18 databases have one or more items; database list includes 358 files.

Table 2: Dialindex Search for info highway June 27, 1994

No. of Hits	Database
1	INSPEC_1969-1994/Jun W4
1	Social SciSearch(R)_1972-1994/Jun W1
52	ABI/INFORM(R)_1971-1994/Jun W2
110	PTS PROMT(TM)_1972-1994/Jun 27
32	PTS F&S INDEX(R)_1980-1994/JunW3
29	Magazine Index(TM)_1959-1994/Jun W3
Examined 50 databases	
1	Management Contents(R)_1974-1994/Jun
1	PTS Aero./Def.Mkts.(R)_1986-1994/JUN 27
49	Academic Index(TM)_1976-94/Jun W2
12	Natl.Newspaper Index(TM)_1979-1994/Jun
6	Washington Post Online_May 1983-1994/Jun 22
112	Trade & Industry Index(TM)_1981-1994/Jun W2
3	Resource Index(TM)_1980-1994/Jun
Examined 100 databases	
18	Newsearch(TM)_1994/Jun 24
2	Microcomputer Abstracts(TM)_1981-1994/Jun
2	PIRA_1975-1994/Aug B1
1	Business Software Database(TM)_1994/May
9	AP News_Jul 1984-1994/Jun 25
33	Canadian Bus. & Current Affairs_1982-1994/Apr
Examined 150 databases	
68	Computer Database(TM)_1983-1994/Jun W3
2	Scisearch(R)_1974-1994/Jun W1
5	Current Contents Search(R)_1990-1994/Jun W1
Examined 200 databases	
93	Newspaper & Periodical Abstr._1988-1994/Jun 23
1	Accounting and Tax Database_1971-1994/Jun W2
9	Arizona Repub/Phoenix Gaz_1986-1994/Jun 22
1	St.LouisPost-Dispatch_1988-1994/Jun 26
1	The Columbus Dispatch_1988-1994/Jun 26
8	The Sacramento Bee_1988-1994/Jun 26
4	(Ft.Lauderdale)Sun-Sentinel_1988-1994/Jun 26
6	Detroit Free Press_1987-1994/Jun 23
6	Investext(R)_1982-1994/Jun 21
1	ICC British Co. Dir_1994/May 27
Examined 250 databases	
15	PTS MARS(R)_1984-1994/Jun 27
4	Globalbase(TM)_1986-1994/Jun W1
26	KR/T Bus.News_1989-1994/Jun 27
12	Business Wire_1986-1994/Jun 27
13	Reuters_1987-1994/Jun 27
2	PR Newswire_1987-1994/Jun 27
1	PTS New Prod.Annou.(R)_1985-1994/Jun W3
28	McGraw-Hill Publications Online_1985-1994/Jun 23
14	Los Angeles Times_1985-1994/Jun 27
5	Boston Globe_1980-1994/Jun 25
2	Chicago Tribune_1985-1994/Jun 27
1	Phil.Inquirer_1983-1994/Jun 24
20	San Jose Mercury_Jun 1985-1994/Jun 24
37	Business Dateline(R)_1985-1994/Jun W3

Table 2: Dialindex Search for info highway June 27, 1994 —Continued

No. of Hits	Database
94	PTS Newsletter DB(TM)_1987-1994/Jun 27
1	Journal of Commerce_1986-1994/Jun 24
13	Newsday/New York Newsday_1987-1994/Jun 25
5	The Houston Post_1988-1994/Jun 24
6	San Francisco Chronicle_1988-1994/Jun 25
19	Rocky Mtn News_Jun 1989-1994/Jun 24
10	The Charlotte Observer_1988-1994/Jun 26
49	Magazine ASAP(TM)_1983-1994/Jun W3
99	648: Trade & Industry ASAP(TM)_1983-1994/Jun W2
21	Newswire ASAP(TM)_1994/Jun 24
1	Tax Notes Today_ 1986-1994/Jun 24
5	BNA Daily News_Jun 1990-1994/Jun 27
3	Federal News Service_1991-1994/Jun 26
Examined 300 databases	
11	Computer News Fulltxt_AUG 1989-1994/Jun W2
63	Computer ASAP(TM)_1983-1994/Jun W3
6	Saint Paul Pioneer_Apr 1988-1994/Jun 25
30	USA Today_1989-1994/Jun 24
4	(Portland)The Oregonian_1989-1994/Jun 25
7	The Orlando Sentinel_1988-1994/Jun 25
4	(New Orleans)Times Picayune_1989-1994/Jun 25
18	The Seattle Times_1989-1994/Jun 25
2	(Akron)Beacon Journal_1988-1994/Jun 26
3	Richmond Times-Disp._1989-1994/Jun 24
1	Independent(London)_Sep 1988-1994/Jun 26
3	Palm Beach Post_1989-1994/Jun 24
5	Atlanta J/Const._1989-1994/Jun 16
1	(Baltimore) The Sun_ Sep 1990-1994/Jun 24
4	Christian Sci.Mon._1989-1994/Jun 16
2	The Washington Times_1989-1994/Jun 26
3	Pittsburgh Post-Gazette_Jun 1990-1994/Jun 23
2	(Albany) The Times Union_Mar 1986-1994/Apr 20
5	(Columbia) The State_Dec 1987-1994/Jun 25
3	Lexington Hrld.-Ldr._1990-1994/Jun 25
3	Cincinnati/Kentucky Post_1990-1994/Jun 24
3	The Wichita Eagle_1990-1994/Jun 24
3	(Minneapolis)Star Tribune_1989-1994/Jun 25
3	(Cleveland)Plain Dealer_Aug 1991-1994/Jun 26
10	Philad.Dly.News_1983-1994/Jun 24
15	San Francisco Exam._1990-1994/Jun 24
7	The Buffalo News_1990-1994/Jun 26
6	Dayton Daily News_Oct 1990-1994/Jun 22
5	Seattle Post-Int._1990-1994/Jun 24
2	Anchorage Daily News_1989-1994/Jun 24
2	(Allentown) The Morning Call_1990-1994/Jun 26
2	739: The Fresno Bee_1990-1994/Jun 25
2	740: (Memphis)Comm.Appeal_1990-1994/Jun 25
5	741: (Norfolk)Led./Pil._1990-1994/Jun 24
21	742: (Madison)Cap.Tim/Wi.St.J_1990-1994/Jun 25
5	743: (New Jersey)The Record_1989-1994/Jun 24

Table 2: Dialindex Search for info highway June 27, 1994 —Continued

No. of Hits	Database
23	746: Time Publications_1985-1994/Jun 13
1	764: BCC Market Research_1989-1994/Jun

97 databases have one or more items; database list includes 348 files.

DATABASE SELECTION

Originally, 16 databases were selected for this study based on the DIALINDEX search. However, because one of the research questions for this study involves newspaper coverage of the issue, five additional databases were added to test in more detail newspaper coverage of the Information Highway. **The Boston Globe, Miami Herald, Philadelphia Inquirer, San Jose Mercury News,** and **Los Angeles Times** were early adoptors of the electronic format and are the earliest online newspapers available. In addition, the **Washington Post's** online availability since 1985 and its role as an elite newspaper placed it on the database list for examination of its coverage of this issue.

Furthermore, DIALOG offers availability to 53 online newspapers through its database "PAPERS." Additional work was done using this database to further explore coverage by newspapers and to create an intensity index of significance. (See p. 119)

The database Compendex Plus was added at the suggestion of information scientist and University of Illinois Professor Martha Williams. University of Tennessee Information Science Professor Carol Tenopir suggested adding the Medline database since the medical profession will be a key user and benefactor of the Information Highway. DIALOG's information specialist Dale Smidt indicated in an interview that the databases selected would be her choice of files with the addition of Compendex Plus.[122]

Table 3 shows the databases chosen for this study, their assignment to a print genre on Molitor's Precursor Monitoring Model, year of online publication, and the name of the corporation owning the database.

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[122]June 6, 1994 telephone interview with Dale Smidt, senior information specialist, DIALOG.

Table 3: Databases Sampled			
	Databases	**Began Publishing**	**Database Publisher/Producer**
Science & Research			
	NTIS	1964	National Technical Information Service
	INSPEC	1969	Invest/Net Inc.
	Energy, Science, Technology	1974	U.S. Dept of Energy
	AEROSPACE	1962	Am. Institute of Aeronautics & Aviation
	Conf Papers	1973	Cambridge Scientific Abstracts
	Dissertation Abstracts	1861	UMI/ Data Courier
	Compendex Plus	1970	Engineering Info. Inc.
Trade & Industry			
	Trade & Industry Index	1981	Information Access Company*
	PTS Newsletter	1988	Predicasts*
	ABI Inform	1971	UMI/Data Courier
	PTS Prompt	1972	Predicasts*
	Medline	1966	U.S. National Library of Medicine
	LISA	1969	Bowker-Saur Ltd.
General Press			
	National Newspaper Index	1979	Information Access Co.*
	Magazine ASAP	1983	Information Access Co.*
	Boston Globe	1980	Boston Globe
	Miami Herald	1983	Miami Herald Inc.
	Philadelphia Inquirer	1981	Philadelphia Newspapers Inc.
	San Jose Mercury News	1985	San Jose Mercury News
	The Washington Post	1985	The Washington post co.
	Newspaper & Periodical Abstracts	1988	UMI/Data Courier
	Los Angeles Times	1985	Los Angeles Times
Govern-ment			
	Federal News Service	1991	Federal Information Systems Copr.
	Federal Register	1988	U.S. Government Printing Office
	CIS	1970	Congressional Information Service

*Owned by Ziff

DATABASE DESCRIPTIONS

A brief description of databases selected to represent Molitor's Precursor Monitoring Model is listed here. An in-depth description of each database is located in Appendix B.

Pure Science And Research:

NTIS

Government-sponsored research and reports from more than 600 agencies.

INSPEC

Physics, electronics and computing.

Energy, Science, Technology

One of the world's largest sources of journals, reports, and research from the U.S. Department of Energy.

Aerospace

Scientific and technical documents on space science and technology development.

Conference Papers

Scientific and technical papers presented at regional, national, and international meetings.

Dissertation Abstracts

More than 1.2 million doctoral dissertations and masters theses.

Compendex Plus

Engineering and technology.

Trade And Industry

Trade & Industry Index

Business journals relating to trade, industry, and commerce.

PTS Newsletter

Covers business and trade newsletters for nearly 50 industries.

PTS Prompt

Multi-industry database providing coverage of companies, products, markets, and applied technologies for all industries.

ABI Inform

Business information.

Medline

Biomedical literature.

LISA

Library and information science.

General Press

National Newspaper Index

Cover-to-cover indexing of the **Christian Science Monitor,** the **New York Times**, and **The Wall Street Journal**.

Newspaper & Periodical Abstracts

Coverage of general interest publications and 26 newspapers.

Magazine ASAP

Coverage of 500 popular magazines.

Federal/Legislative

CIS

Congressional hearings, reports, documents, prints, statistical data, and articles.

Federal News Service

Hearings, briefings, speeches, backgrounders, conferences, witness testimony.

Federal Register

Full text of the daily Federal Register, including presidential documents, rules and

regulations, proposed rules, notices, and Sunshine Act meetings.

A table comparing the database composition and coverage was created for the purpose of selecting even fewer databases to represent each genre of Molitor's Precursor Monitoring Model. Again, breadth of coverage through numbers of records and coverage dates were considerations. Table 4 provides an overview of database size, coverage dates, multiple ownership, and number of journals covered.

Table 4: Comparison of Databases by Record Number and Type						
	Coverage Date	Records*	First Hit: ARPANET	First Hit: Internet	Records per year	# of Journals
NTIS	1964	11751172	1979	1971	79200	240
INSPEC	1969	4696129	1971	1974	264000	750
Energy, Science, Technology	1974	3094409	1975	1975		4100
Aerospace Research	1962	1951563	1972	1975	140400	1600
Conference Papers	1973	1656599	1974	1982	48000	20000
Dissertation Abstracts	1980	1290164	1980	1982	42000	
Compendex Plus	1970	3271748				
ABI Inform	1971	852889	1974	1981	62400	800
PTS Prompt	1972	N/A	1972	1979		
Trade & Industry Index	1981	5115284	1981	1981	624000	1300
PTS Newsletter	1988	N/A	1987	1987	52000	100
LISA	1969	138260	1975	1977	1300	
Medline	1966	7898306	0	1992	364000	3600
National Newspaper Index	1979	3276290	1983	1991	360000	10
Newspaper & Periodical Index	1988	3000000	1987	1988	728000	250
Magazine ASAP	1983	541698	1983	1983	12000	100
CIS	1970	279412	1975	1989	12000	300
Federal News Service	1991	1338701	0	1991	14600	
Federal Register	1988	210577	1988	1988	35100	1

*6/19/94

This table provided information used to select databases representative of each of Molitor's literature areas for a manageable sample. The sample databases were chosen on the basis of their comprehensiveness, parallel dates of coverage (as much as possible), and number of hits. Furthermore, the sample was selected to eliminate repetition of coverage. For example, databases PTS Prompt and Trade & Industry have a 40 percent duplication of coverage.[123] After analyzing this table and reviewing DIALINDEX preliminary data, the following databases were selected as the representative sample: INSPEC, PTS Prompt, National News Index, Magazine ASAP, CIS, and Federal News Service.

INSPEC houses the science and research literature; PTS Prompt, the trade and industry area; National News Index and Magazine ASAP represent coverage of the general press; and CIS and Federal News Service represent legislative and government coverage.

DATA RETRIEVAL

Measures of growth and spread were accomplished by placing the following terms in DIALINDEX. These terms were selected through preliminary DIALINDEX searches in June 1993 and in collaboration with Dr. Jose Marie Griffiths, acting vice chancellor for computing and telecommunications at the University of Tennessee, Knoxville:

ARPANET
NSFnet
Internet
BITNET
NREN
National Information Infrastructure
Smart Highway[124]
Data Superhighway
Data Highway
Electronic Highway
Information Superhighway

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123 June 7, 1994 interview with Cheryl Penick, information specialist, Information Access Co.

124 Upon initial examination of the data, the term "smart highway" produced a number of false hits related to traffic and automobile research. The term was dropped as a result.

Electronic Information Highway
Information Highway
Super Data Highway
Computer Superhighway
Electronic Superhighway
Computer Highway

This strategy allowed for comprehensive searches through free-text searching. Any occurrence of each phrase anywhere within the database was counted, whether the term was in the title, abstract, listing of descriptors/index terms, or text.

From this data surfaced the four metaphors most used in all the databases: Data Highway, Information Superhighway, Information Highway, and Electronic Superhighway. These four metaphors for the concept of the Internet were used for additional searches for first mentions. Table 5 shows the number of times highway metaphors were found in all the databases.

Table 6 shows how the term Internet developed from 1974 through 1993. Table 7 is expanded to include additional newspapers[125] to reflect news coverage by major newspapers of the Internet.

Figures 1 and 2 illustrate nearly identical patterns with spurts of coverage from 1989-1990 and 1992-1993. Clearly, "take-off" points occurred in 1989 when coverage nearly tripled and in 1992 when coverage nearly tripled again from 1990.

In the next section, results from research questions 1-5 will be presented.

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[125] **The Boston Globe, Miami Herald, Philadelphia Inquirer**, and **San Jose Mercury**.

TABLE 5: Internet Metaphor Hits by Database

Science & Technology:	Compendex Plus	NTTS	Inspec	Dissertation Papers	Conf. Papers	Energy, Science Technology	Aerospace
Data Highway	3	23	239	1	9	43	13
Electronic Highway	6	2	15	0	1	0	0
Info Superhighway	0	0	3	0	0	0	0
Electronic	0						
Information Highway	7	0	0	0	0	0	0
Information Highway	0	1	11	0	0	2	0
Super Data Highway	0	0	0	0	0	0	0
Computer Superhighway	0	0	0	0	0	0	0
Electronic Superhighway	2	1	1	0	2	0	0
Computer Highway	0	1	1	0	0	0	0
Data Superhighway	0	0	0	0	0	0	0
Total	18	28	270	1	12	45	13
Trade & Industry:	ABI	PTS Prompt	LISA	Trade & Industry	Medline	PTS Newsletter	
Data Highway	104	309	0	69	1	104	
Electronic Highway	73	109	3	33	2	85	
Info Superhighway	136	379	2	150	0	500	
Electronic							
Information Highway	7	6	1	3	0	8	
Information Highway	149	269	4	139	0	345	
Super Data Highway	4	0	0	0	0	5	
Computer Superhighway	2	4	0	2	0	3	
Electronic Superhighway	46	193	0	42	0	125	
Computer Highway	0	20	0		0	8	
Data Superhighway	46	111	1	47	0	95	
Total	567	1400	11	485	3	1278	

TABLE 5: Internet Metaphor Hits by Database—Continued

General Press:	National Newspaper	Mag. ASAP	News & Periodical
Data Highway	11	76	47
Electronic Highway	1	53	27
Info Superhighway	19	101	180
Electronic Information Highway	1	3	3
Information Highway	28	117	127
Super Data Highway	10	0	7
Computer Superhighway	1	0	7
Electronic Superhighway	8	34	40
Computer Highway	1	0	0
Data Superhighway	11	35	37
Total	81	420	468
Government:	CIS	Federal Register	Federal News Service
Data Highway	0	5	3
Electronic Highway	0	5	3
Info Superhighway	0	1	5
Electronic Information Highway	0	0	17
Information Highway	0	2	15
Super Data Highway	0	0	15
Computer Superhighway	0	0	0
Electronic Superhighway	0	0	3
Computer Highway	0	1	0
Data Superhighway	0	0	4
Total	0	14	65

TABLE 6: Diffusion of Internet 1974-1993 in Selected Databases

	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
INSPEC	1	2	2	2	1	3	5	10	14	13	14	27	44	34	74	71	112	131	192	248
PTS Prompt						1	1	4	7	4	15	18	50	82	136	144	713	843	1090	1526
National News Index																		3	12	83
Magazine ASAP										2	1	2	8	20	95	119	121	163	290	570
CIS																2	1	1	1	1
Federal News Service																		2	5	28
TOTAL	1	2	2	2	1	4	6	14	21	19	30	47	102	136	305	336	947	1143	1590	2456

TABLE 7: Coverage of Internet in Selected Databases with Selected Newspapers 1974-1993

	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
INSPEC	1	2	2	2	1	3	5	10	14	13	14	27	44	34	74	71	112	131	192	248
PTS Prompt						1	1	4	7	4	15	18	50	82	136	144	713	843	1090	1526
National News Index																		3	12	83
Magazine ASAP										2	1	2	8	20	95	119	121	163	290	570
Boston Globe														1	4	5	6	2	2	81
Miami Herald												1	1	0	2	3	4	1	3	26
Philadelphia Inquirer															5	4	6	2	4	31
San Jose Mercury															9	20	27	19	13	122
CIS																2	1	1	1	1
Federal News Service																		2	5	28
TOTAL	1	2	2	2	1	4	6	14	21	19	30	48	103	137	325	368	990	1167	1612	2716

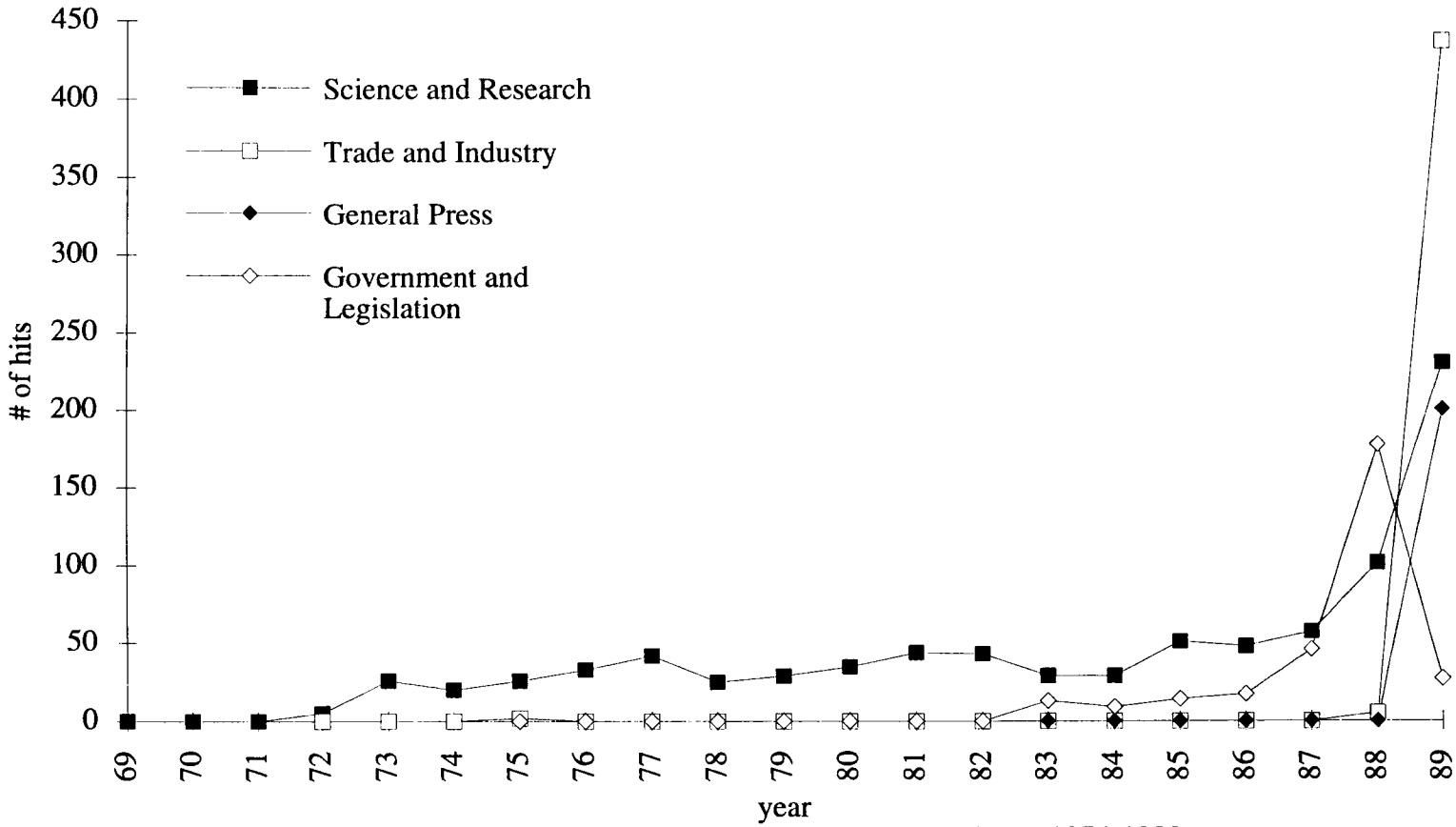

Figure 1: Coverage of Internet in Selected Databases 1974-1989

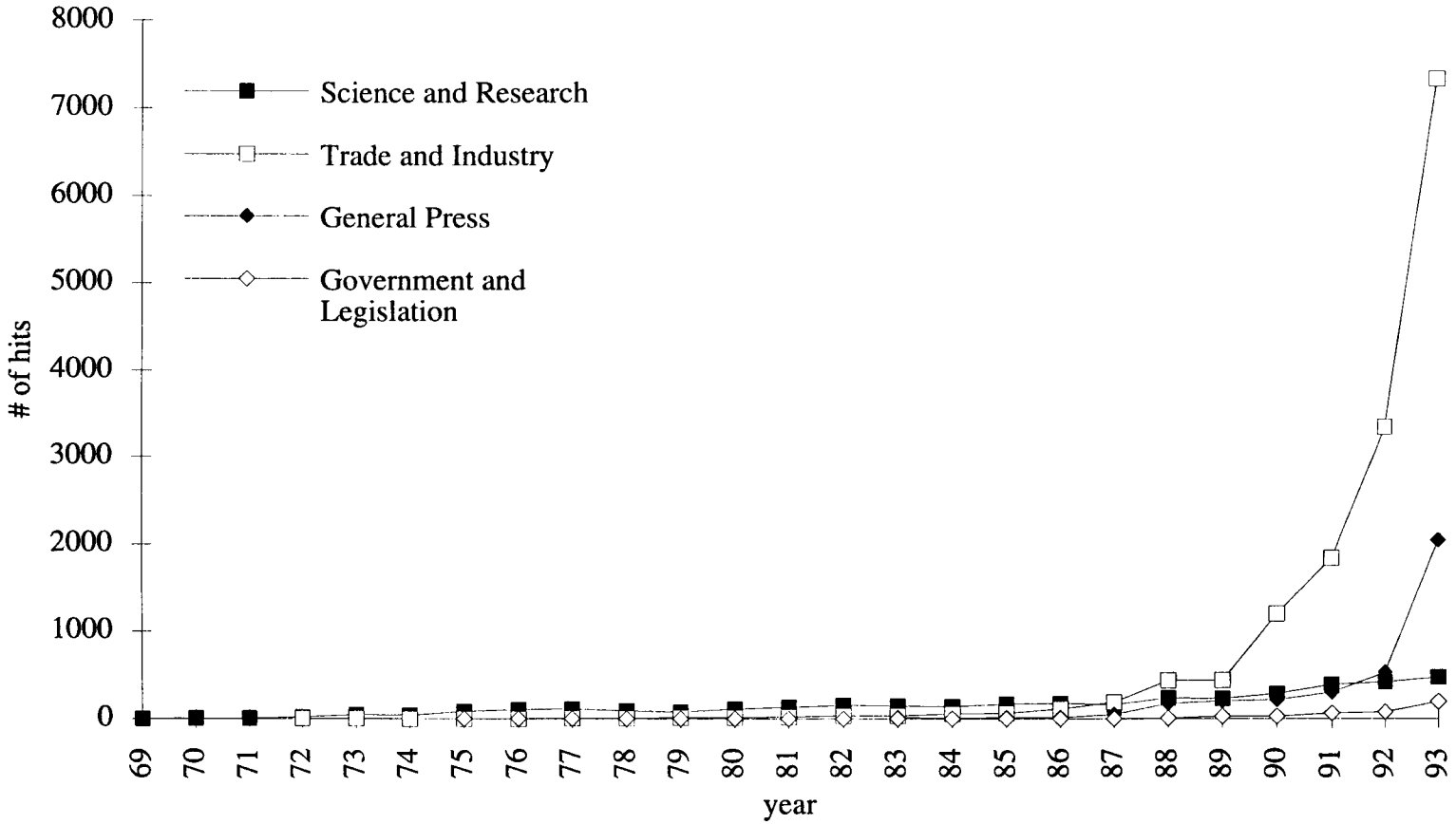

Figure 2: Coverage of Internet in Selected Databases 1974-1993

ORIGINATION OF ISSUE AND TERMS IN PRINT

RESEARCH QUESTION #1: Will the issue of the new Electronic Information Superhighway and its common synonyms (known in its earlier terms as ARPANET, NSFNET, BITNET, Internet, NREN, and now the National Information Infrastructure) first appear in conference papers and research in the scientific community?

This section shows that the origination of the technical terms ARPANET, NSFNET, BITNET, Internet, NREN and NII within printed literature occurred in proceedings from computer conventions, seminars, university research projects, and scientific journals.

ARPANET

The first mention of ARPANET appeared at a computer convention.

In 1969 the Advanced Research Projects Agency (ARPA) undertook development of a computer network data communications system to permit resource sharing and responsiveness reliably and economically. In 1971 L.G. Roberts discussed the cost and projection of the resulting network, ARPANET, at the 5th annual EIII International Computer Society Conference on hardware, software, firmware and trade-offs.[126] Other early research included reports on packet switching for communication network design,[127] polling modifications for data communication,[128] a description of image processing facilities accessible over the ARPANET,[129] speech data compression and local user interaction with ARPANET,[130] and a description of the ALOHA SYSTEM, a system using message switching techniques similar to the ARPANET.[131]

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126 L.G. Roberts, "The ARPA Network: Cost and Projections," presented Sept, 22-24, 1971, IEEE International Computer Society Conference, Boston, MA.

127 Howard Frank, "Research in Store and Forward Computer Networks," Network Analysis Corporation, Dec. 1972.

128 Henry Liano, "A Polling Modification for Burst Random Access Channels," Systems Research Corp., 1972.

129 William K. Pratt, "Semiannual Technical Report 1 March 1972 through 31 August 1972, University of Southern California Los Angeles Department of Electrical Engineering, 1972.

130 David O. Harris, James A. Howard, and Roger C. Wood, "Research in On-Line Computation," California University Santa Barbara Computer Systems Lab, June 1972.

131 Norman Abramson, "The ALOHA SYSTEM," technical report from Hawaii University, January 1972.

In 1972 a team of researchers headed by Vinton G. Cerf presented research on the store-and-forward characteristics of the message-switching network ARPANET.[132] A new prototype network similar to ARPANET, CYCLADES was developed under French government sponsorship to link 20 computers located in universities, research centers and other information processing centers.[133]

Internet

The first mention of Internet occurred in the proceedings of a seminar. It was a vague reference to "project Internet," a joint research project on social systems and man-machine systems with ramifications for the military. A "Simulation Seminar" for all-computer and man-computer simulation of human organizations as they relate to the military decision-making processes was the object of the study. Two results of the seminar were "a project on simulated international processes (ARPA) and project internet (ONR)."[134]

A program supporting Internet experiments between Stanford University and University College London is the subject of a report in 1974-1975. Work by Kahn and Cerf reported in May 1974 on implementing the Internetwork Transmission Control Program was completed. This is the first reference to "Internet experiments" in which Internet is capitalized.[135]

INTERNET in all caps was introduced as a series of interactive network codes used by the French Post Office. Described as "distributive administrative data processing," the postal service used INTERNET to optimize scheduling and routing with a "linear

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132 Vinton G. Cerf, Eric F. Harslem, John F. Heafner, Robert M. Metcalfe, James E. White, "Experimental Service for Adaptable Data Reconfiguration," in **IEEE Transactions on Communications**, Vol. COM-20, No. 3, June 1972, pp. 557-564.

133 Louis Pouzin, "Presentation and Major Design Aspects of the CYCLADES Computer Network," presented at the Data Communications Symposium, St. Petersburg, Fla., Nov. 13-15, 1973.

134 Harold Guetzkow. "Seminar on Simulation of Human Social Systems," Conference Proceeding, March 16, 1971, Northwestern University, Evanston, Ill.

135 "Distributed Computation and Tenex-related Activities," in **Quarterly Progress Report**, Nov. 1, 1974-Jan. 31, 1975.

programming scheme."[136]

In 1979 the Internet Protocol specification (version 4) for use in interconnected packet-switched networks (called "catenets") was published. The research mentions network delivery of packages of bits called "Internet datagrams," blocks of data with source and destination addresses. The Internet Protocol provides directions for fragmenting and reassembly of long datagrams.[137]

A year later Postel published the "DoD Standard Internet Protocol" in which he described a "catenet" as an interconnected system of packet-switched computer communications networks.[138] Catenet didn't catch on; Internet did.

National Information Infrastructure

The first mention of "national information infrastructure" turned up in a United Nations journal reporting on an Eastern European country. It was used in 1983 in relation to the People's Republic of Bulgaria and its development of "telematics." Using information technology, Bulgaria's National System for Scientific and Technical Information has connected its scientific and technical information centers, libraries, and archives.[139] This hit appeared in INSPEC along with a second paper in 1984 on the Bulgarian national information infrastructure.[140]

The term was used generically to describe an electronic computer telecommunications network for an entire nation.

Data Highway And Other Metaphors

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136 J. P. Netter, "INTERNET: An Interactive Network Code for Mail Transportation," in **Bulletin of the Operations Research Society of America**, Vol. 23, Supplement 2, Fall 1975.

137 Jon Postel, "Internet Datagram protocol Specification." University of Southern California Marina Del Rey Information Sciences Institute, Feb. 1979.

138 Jon Postel, "DoD Standard Internet Protocol," University of Southern California, Marina del Rey, Information Sciences Institute, Jan. 1980.

139 P Kiratsov, "Development of a Centralized Automated Scientific and Technical Information Service in the People's Republic of Bulgaria," in **UNESCO Journal of Information Science, Libarianship and Archives Administration**, Vol. 5, No. 3, pp. 153-139, July-Sept. 1983.

140 B. Fotev, T. Todorov, and V. Trichkov, "Bulgarian Information Policy-Oriented to Users," in **Use of Information in a Changing World: Proceedings of the Forty-Second FID Congress**, The Hague, Netherlands, Sept. 24-27, 1984, pp. 131-135.

The first mention of a data highway occurred at a San Francisco computer conference in 1968. Information highway and electronic highway soon followed.

Ralph Lee Smith has been credited with publishing the term Information Highway[141] in 1970; however, the electronic highway as a metaphor for the telecommunications highway did not gain popularity until 1977 when then Sen. Albert Gore, Jr., introduced the concept and began forming legislation for the national information infrastructure.

The first hit for "electronic highway" in this study occurred in the French journal **L'Onde Electrique** in December 1971. An article titled "Very high speed data transmission channels: the west electronic highway and Paris-Orleans-La Source,"[142] indicated that digital communications systems, or electronic highways, one between Breton and Paris and the other between Paris and Orleans-LaSource, connected users with two and 6.4 mbits/s experimental channels.

However, the very first hit in this study for the concept of the information highway occurred in 1968 as research on the "data highway." Produced by I.N. Hooton and R.C.M. Barnes at the Atomic Energy Research lab in Harrwell, England, and presented December 9-11 at the AFIPS Conference in San Francisco, California, the paper's title was "Standardized Data Highway for On-line Computer Applications." In it the authors discussed a data transfer highway with a modular instrumentation system linking devices with computers to convey digital data.[143]

Using a telemetry system, a single telephone pair acting as a "data highway" for telecontrol of rail traffic, was the subject of a 1969 article published in **WSW Technische**

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141 Ralph Lee Smith. "The Wired Nation," **The Nation**, Vol. 210, No. 19, May 18, 1970.

142 A. Jousset and J. Lachaise, "Very High Speed Data Transmission Channels: The West Electronic Highway and Paris-Orleans-LaSource," **L'Onde Electrique**, Vol. 51 No. 11, pp. 905-919, December, 1971.

143 I. N. Hooton and R.C.M. Barnes, "Standardized Data Highway for On-line Computer Applications," in **AFIPS Conference Proceedings**, Vol. 33, pt. 2, Fall Joint computer Conference, San Francisco, Calif., Dec. 9-11, 1968, pp. 1077-1087.

Berichte.[144]

In 1969, Gere, Lie, Miller and Senator of Bell Telephone Labs presented "The Bell-Rutgers Data Highway System" at the October 29-31, 1969 Nuclear Science Symposium and Nuclear Power Systems Engineering Symposium in San Francisco. The paper discussed a framework of online hardware and 16 bit parallel "data path" to be shared by up to 150 modules. The initial study implemented a computer-based nuclear physics data acquisition and analysis system.[145]

Researchers at Hitachi Ltd. in Tokyo published a journal paper in January 1971, "A Data Highway System," in which they discussed advanced wiring techniques for cutting wiring costs for a data highway.[146]

The first hit for "computer highway" appeared in July 1972 with research on switching for digital data networks.[147]

Data highway appears to be the earliest metaphor evolving from research. In December 1973, Andrews, Milton, and Giallorenzi of the U.S. Naval Research Laboratory presented a paper, "Military Applications of Fiber Optics and Integrated Optics." This introduced applications for a multiplexed data highway for aircraft and shipboard use using "optical fibers as tethers."

The term "dataway" (data highway) was introduced in 1976 by Louis Costrell in research on the Computer Automated Measurement and Control (CAMAC) system in which he standardizes the instrumentation system. The terms "standardized parallel and serial highways," in the same study, are used in relation to compatibility with the basic

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144 W. Landstetter and E. Moser, "Remote Control of Traction Power Switches in Electric Railway System" in **WSW Technische Berichte**, Vol 21, No. 1., April, 1969, pp. 48.

145 E.A. Gere, H. P. Lie, G.L. Miller, and A. Senator, "The Bell-Rutgers Data Highway System" in **IEEE Transactions on Nuclear Science**, Vol. NS-17, No. 1, Pt. 1, pp. 436-444, Feb. 1970.

146 F. Inoise, K. Takasugi, and M. Hiroshima, "A Data Highway System," in **Instrumentation Technology**, Vol. 18, No. 1, pp. 63-67, January 1971.

147 K.J. Dean, "Nonarithmetical Cellular Arrays: Investigation of Arrays for Control Functions," in **Proceedings of the Institution of Electrical Engineers**, Vol. 119, No. 7, pp. 785-789, July 1972.

CAMAC system.[148]

Information Superhighway appeared first in the **San Jose Mercury News** in 1985 then in Trade and Industry and Magazine ASAP databases in 1988. The **San Jose Mercury News** article, "Japan Firm, AT&T to Lay Pacific Cable," appeared October 18, 1990. The term appears in the 24th paragraph in the section subtitled Telephones, Computers Converge: "The communications network thus becomes an information superhighway, able to handle voice and computer data and, in some cases, video as well." It is the last sentence of the entire six-paragraph section.

The Trade & Industry database hit appears in **PC Week** July 18, 1988, in the story "Kapor's On: Writing Software for 'Information superhighway.'" Not only did the term appear in the headline, it was also in the first paragraph.

Information Highway first appeared in 1981 in INSPEC and ABI databases. INSPEC database holds an article by C.K. Kao, "Fiber Optics" published October 14, 1981 in the journal **EDN**. It predicts that "optical waveguides will form the building blocks of the information-highway system . . . help manage energy resources, transportation and communication; deliver health care . . . strengthen military defense; develop business; and provide materials for entertainment and education."[149]

In the ABI/INFORM database, an April 1981 **Administrative Management** article discusses broadband computer systems, suggesting that uniting local distributed systems, PABX (Private Area Branch Exchange—integrating voice and data), broadband, and baseband systems will create a "hybrid concept of the true 'information highway.'"

Electronic Superhighway came into use in 1990 in Trade & Industry and Magazine ASAP databases. The Trade & Industry database housed a **Business Week** article using

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148 Louis Costrell, "Evolution, Definition, and Status of IEEE Standard 583: Standard Modular Instrumentation and Digital Interface System (CAMAC)," in **Proceedings of the Electronics 1976 Professional Program**, Boston, Mass., No. 29, Paper No. 4, pp. 1-8, May 11-14, 1976.
149 C.K. Kao, "Fiber Optics" in **EDN**, Vol. 26, No. 20, pp. 200-202, October 14, 1981.

"electronic superhighway" within the title: "Is the Electronic Superhighway of Tomorrow on Schedule? ISDN, the Supercomputer Network." Published March 26, 1990, author Celia McAllister made predictions on the telecommunications industry.

Six months later, Sept. 17, 1990, **Forbes** published Joshua Levine's "The Last Gasp of Mass Media?" The term appeared in the last, or paragraph 33, of the article with a prediction by James Ogilvy, president of Holden North America research firm, that when fiber optics arrives, "it will completely destroy the very idea of mass media."

Table 8 summarizes first hits for selected technical and highway terms. It shows the years in which articles first appeared with the respective terms.

In summary, first occurrences do occur within the scientific and research literature. Table 8 shows that for first hits, trade and industry literature is not far behind, while the general press lags considerably, as does government and legislative literature.

Table 8: First Hits

	Arpanet	Internet	NII	Data Highway	Information Superhighway	Information Highway	Electronic Superhighway
Inspec	1971	1974	1983	1969	1990	1981	1993
NTTS	1972	1971	1987	1973	0	1982	1992
Compendex	1972	1977	1985	1968	0	1982	0
Dissertation	1980	1982	0	1991	0	0	0
Conf. Paper	1974	1982	1992	1974	0	0	1991
Energy, Science	1975	1975	1993	1977	0	1982	0
Aerospace	1972	1975	1991	1973	0	0	0
PTS Prompt	1972	1979	1991	1977	1990	1989	1990
ABI	1974	1981	1987	1980	1992	1981	1993
LISA	1975	1977	1990	0	1990	1991	0
Trade/Ind	1981	1981	1991	1983	1988	1984	1990
Medline	0	1992	1992	1993	0	0	0
PTS Newsletter	1987	1988	1988	1987	1990	1988	1991
National Newspaper Index	1983	1991	1990	1993	1993	1984	1993
News Periodicals	1987	1988	1991	1989	1991	1991	1993
Magazine ASAP	1983	1983	1989	1983	1988	1984	1990
Los Angelas Times	1985	1986	1992	1989	1991	1989	1993
Boston Globe	1980	1987	1989	1983	1992	1992	1993
Philadelphia Inquirer	1985	1988	1993	1990	1993	1991	1993
San Jose Mercury News	1986	1988	1992	1987	1985	1990	1993
Washington Post	1983	1983	1992	1992	1990	1985	1993
Miami Herald	1983	1985	1993	1993	1993	1983	1993
CIS	1975	1989	1993	0	0	0	0
Federal News Service	0	1991	1993	1993	1991	1992	1993
Federal Register	1988	1988		1988	1993	1993	0

GENERAL PRESS COVERAGE OF THE INFORMATION HIGHWAY

RESEARCH QUESTION #2: Was coverage of the Electronic Information Superhighway skimpy in the general press, bypassing this critical phase in Molitor's Precursor Monitoring Model?

Molitor predicts that issues have their origin in scientific research literature, then move into the trade and industry press. This study supports that prediction with coverage of the issue nearly tripling between 1985 and 1986, then jumping 495 percent between 1989 and 1990.

Coverage in the trade journals doubled between 1990 and 1993. Although Molitor indicates that newspaper coverage grows significantly after an issue gains momentum in the trade press, newspaper coverage by the elite press did not begin much before 1992. While magazines gave the Internet earlier coverage than the elite press, coverage in magazines doubled in 1993 over 1992, indicating a trigger point 3 to 4 years after the trade press began coverage. Although high-performance computing hearings have taken place in Congress for many years, the CIS, whose coverage goes back to 1970, did not include that testimony and hearing transcripts in its coverage. The Federal News Service's coverage increased in 1993 to more than five times its 1992 coverage, nearly the same percentage of increase as the National News Index.

The **San Jose Mercury News** more than doubled its coverage of Internet between 1988 and 1989, printing nine articles in 1988 and 20 in 1989 (see figure 13).

Most newspapers did not provide coverage of any quantity until 1993. The **Boston Globe**'s coverage went from two articles in 1992 to 81 hits in 1993, no hits on data superhighway in 1992 to 13 hits in 1993; three articles on the Information Superhighway in 1992 to 31 in 1993; one mention of the Information Highway in 1992 and 30 in 1993. This is the trend for **The Washington Post,** the **Miami Herald**, the **Los Angeles Times,** the **Philadelphia Inquirer**, and the **San Jose Mercury News** as well. However, the

San Jose Mercury News did provide earlier coverage of the Internet and ARPANET (see Appendix G).

The **Miami Herald**'s first article on the Internet appeared in 1985; the first article on the Information Highway appeared in 1983, when three articles appeared on ARPANET.

The **San Jose Mercury News** published an article on the Information Superhighway in 1985; in 1986 it published two articles on ARPANET. By 1988, the Internet was mentioned in 9 articles and jumped to 20 articles in 1989.

The **Boston Globe**'s first articles on ARPANET appeared in 1980 and 1983; the first hits for "computer highway" and "electronic highway" appeared in 1983 and 1982, respectively. The Internet first appeared in 1987, then four times in 1988. Information Superhighway appeared with three hits in 1992 and 31 hits in 1993.

Early coverage of the Information Highway by newspapers involved a specific story of a computer virus and hacking. These stories apparently fit into the news values of conflict, timeliness, the bazarre and unusual.

The data indicate that press coverage was skimpy, especially in elite newspapers such as the **Washington Post, The New York Times**, the **Los Angeles Times** and the **San Jose Mercury News**. While issues such as privacy, security, access, and ubiquity were pertinent public policy issues deserving of discourse in the marketplace of ideas, these were poorly discussed—or ignored—in the American mainstream print media prior to 1992. Figures 3 through 14 show press coverage of all search terms.

This is a major change from Molitor's prediction that press coverage reflects the public's increasing knowledge of the issue and its eventual demand for government action. See Appendix A for Molitor's model and a revised model resulting from this study.

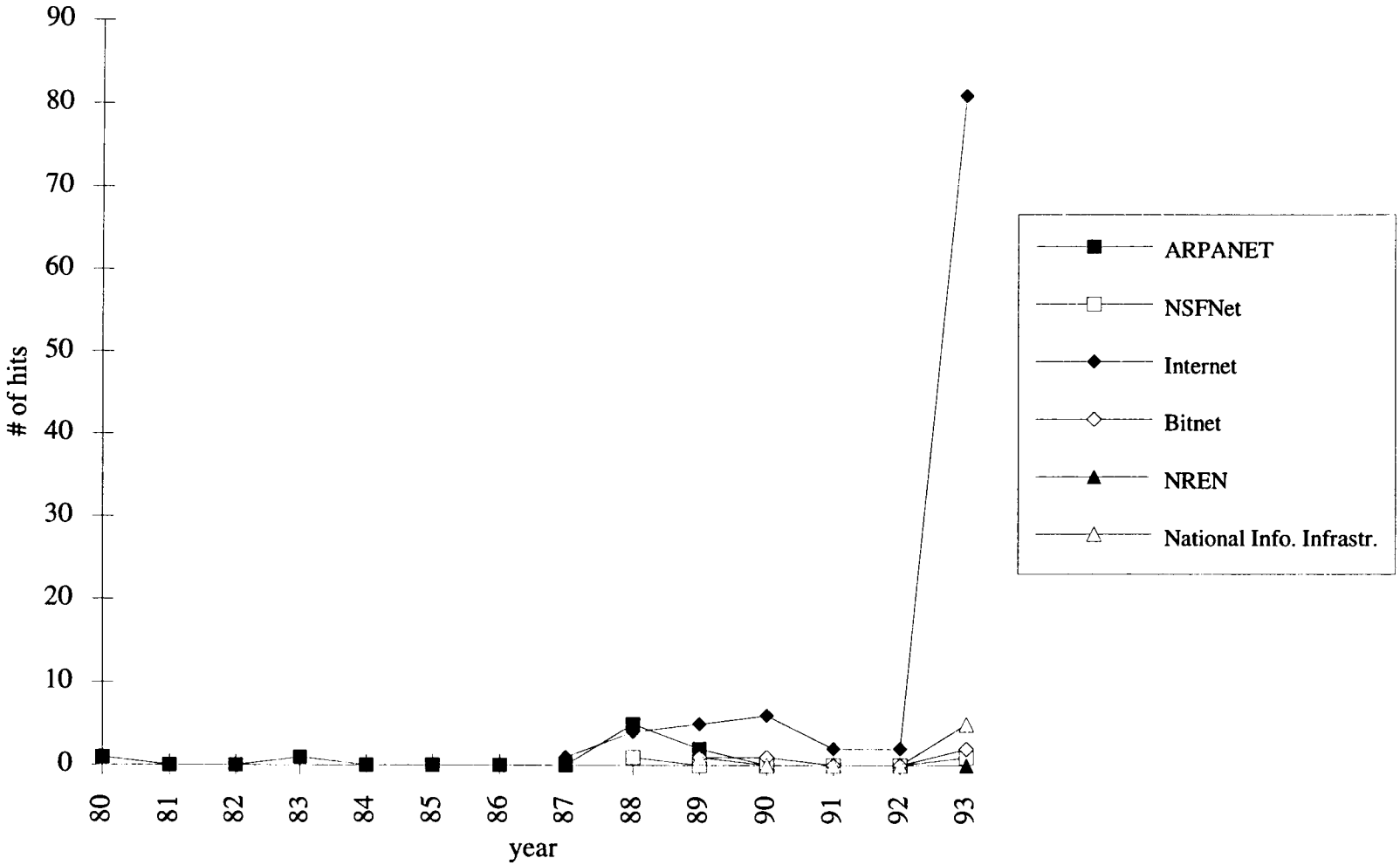

Figure 3: THE BOSTON GLOBE

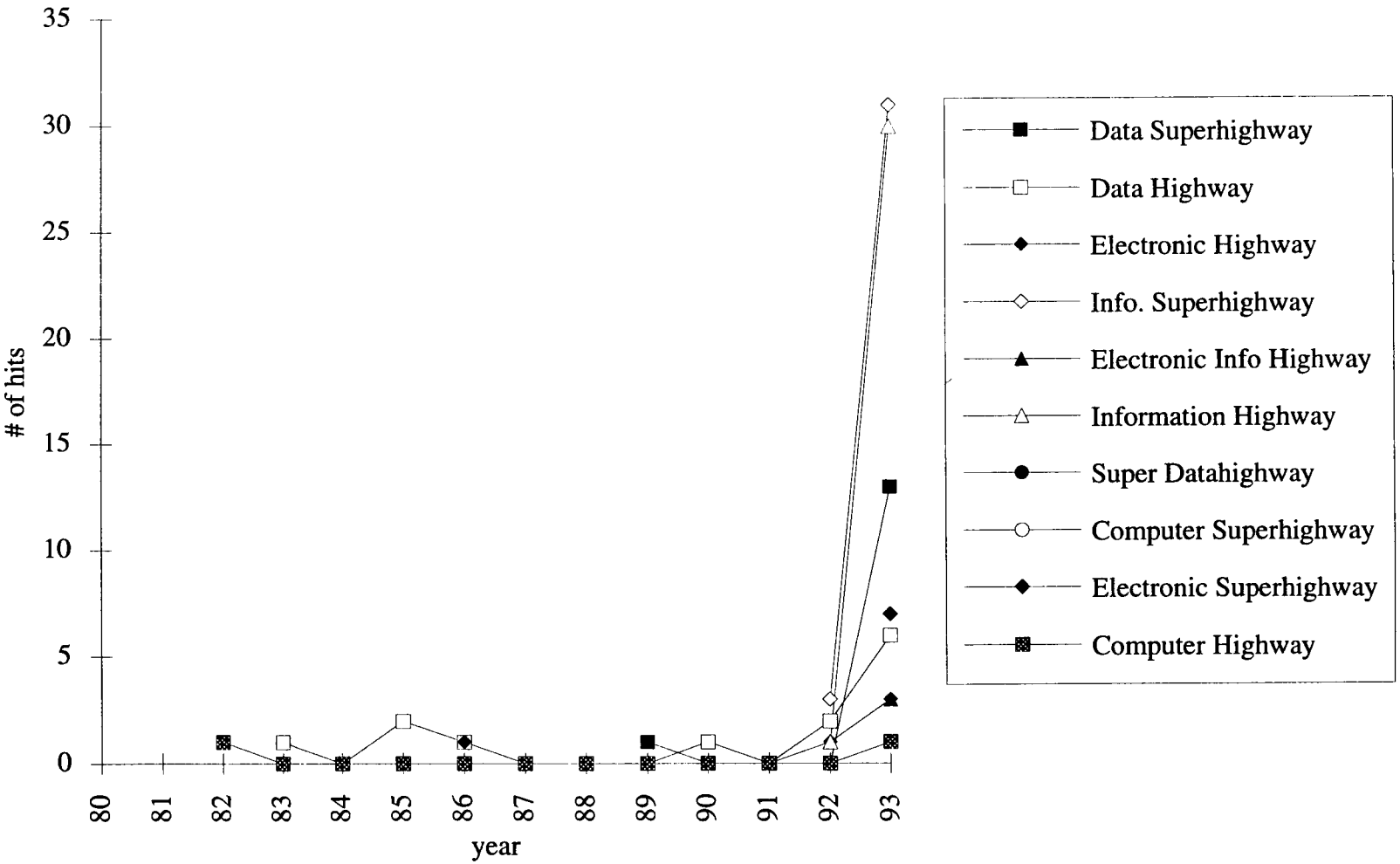

Figure 4: THE BOSTON GLOBE

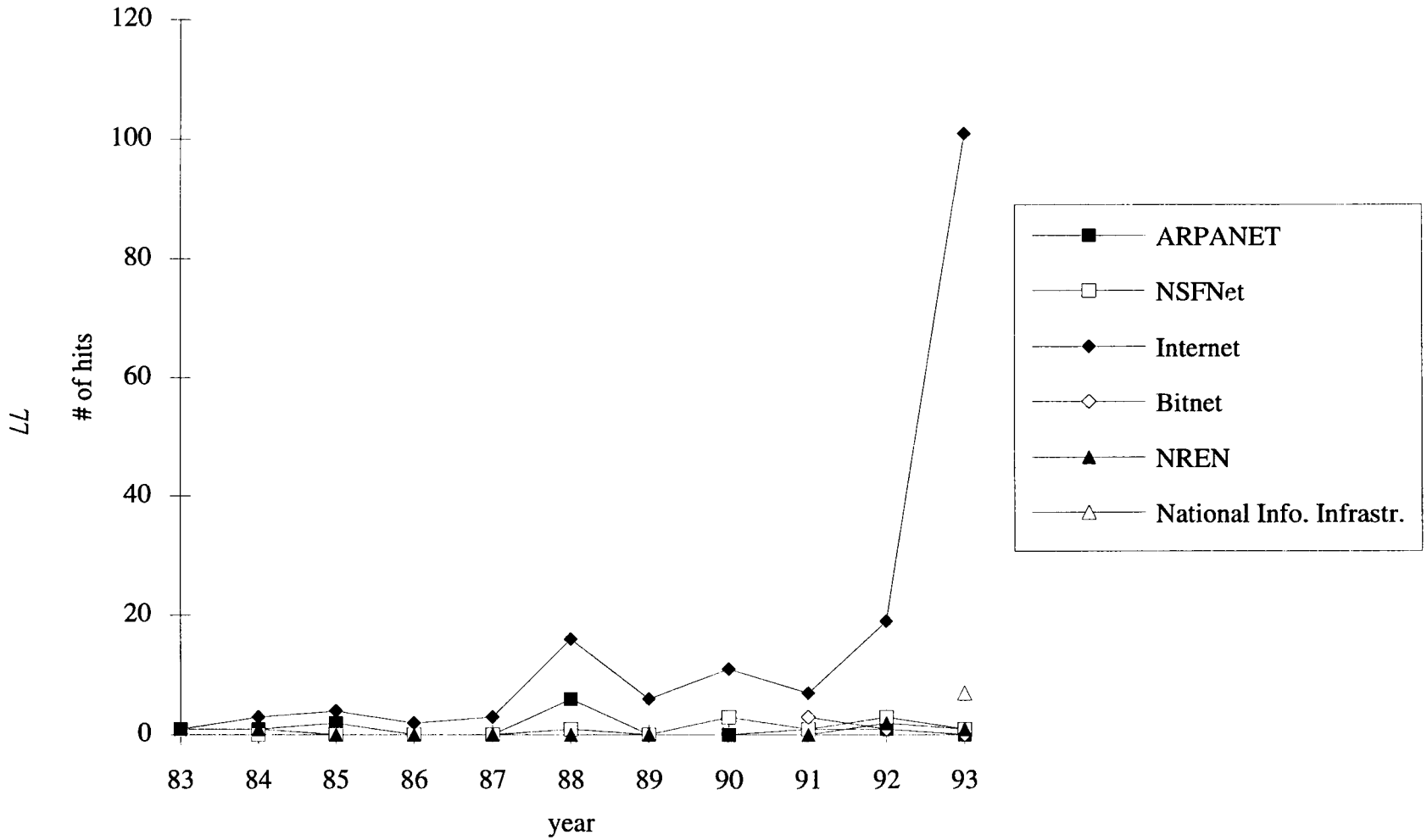

Figure 5: THE WASHINGTON POST

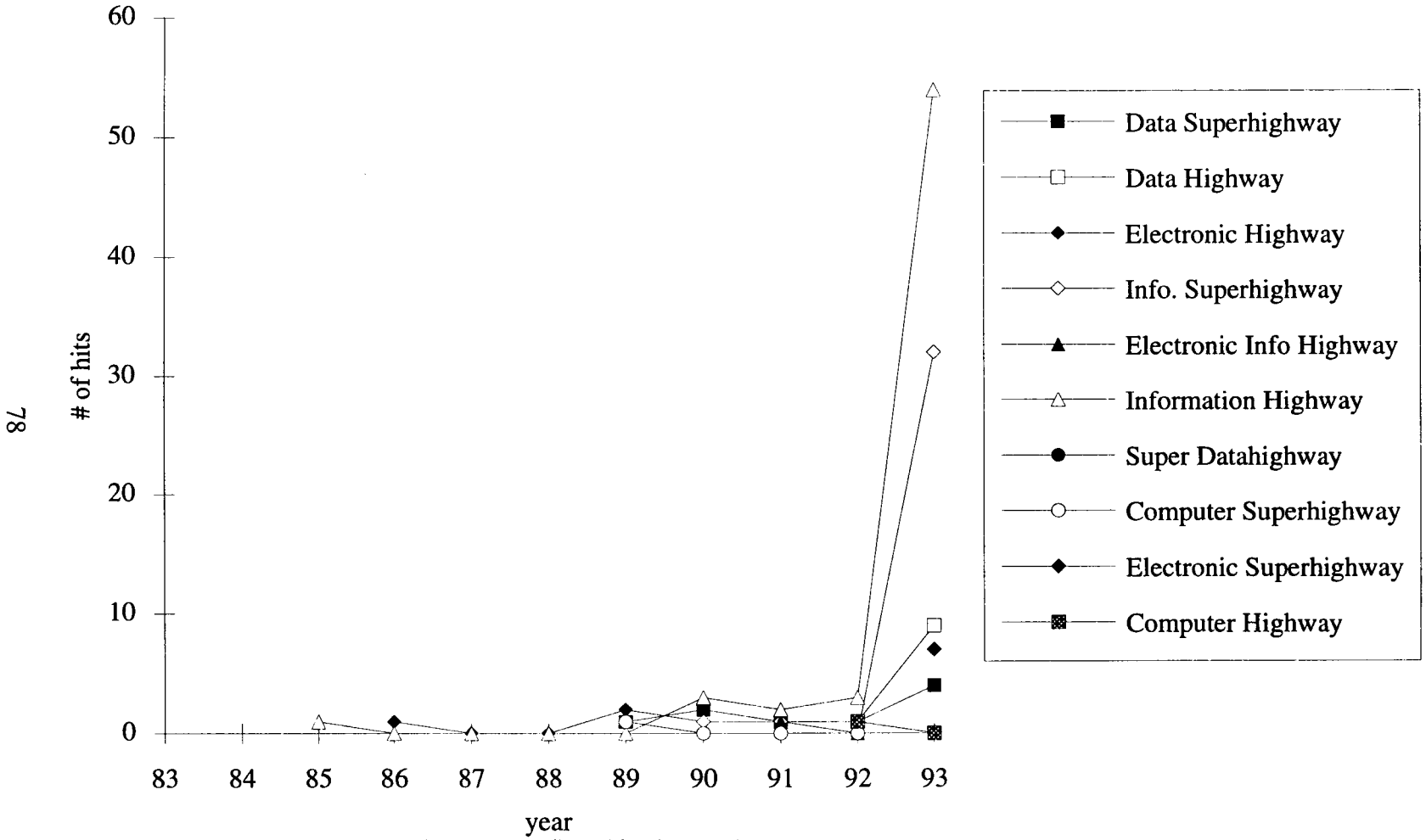

Figure 6: THE WASHINGTON POST

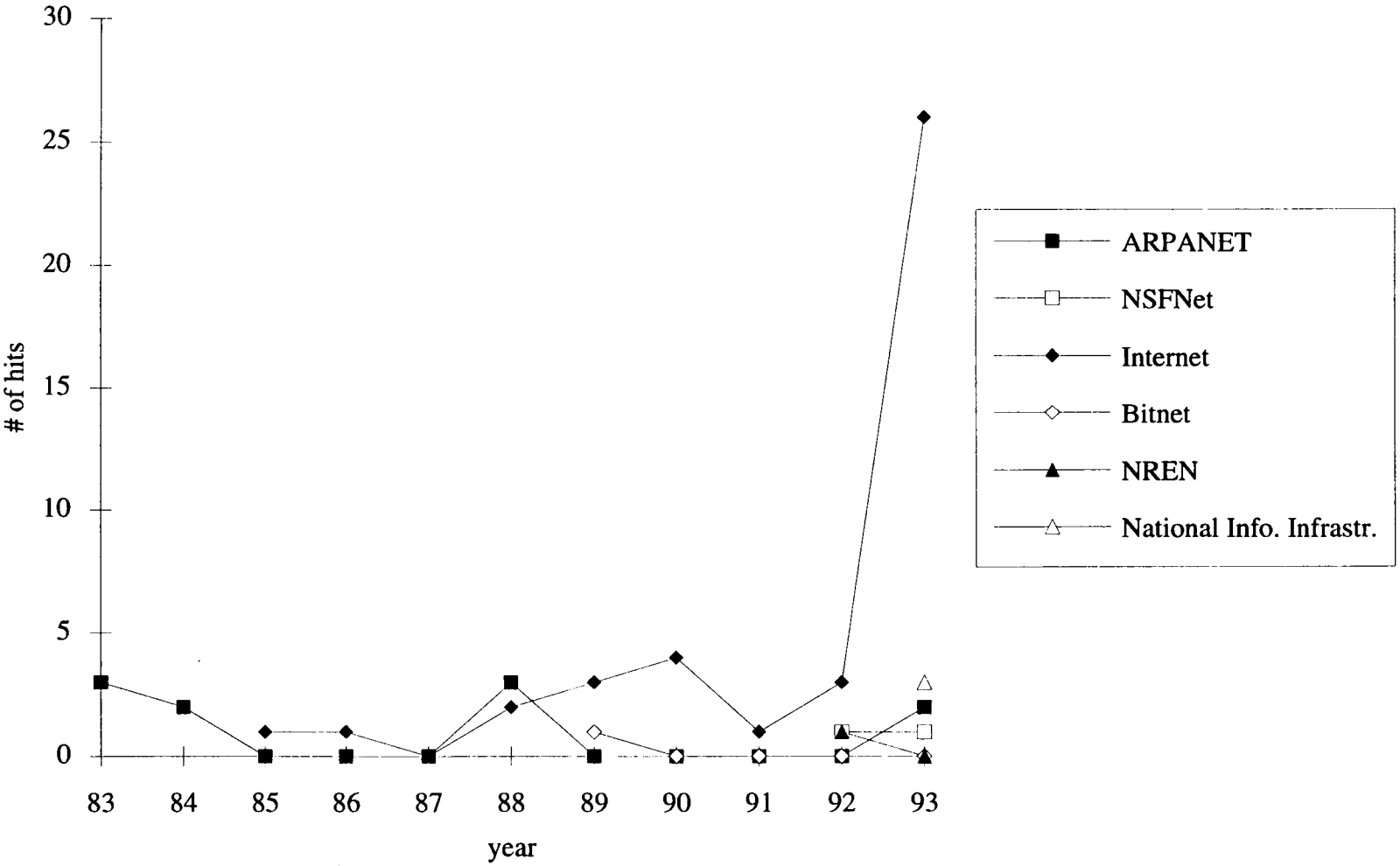

Figure 7: THE MIAMI HERALD

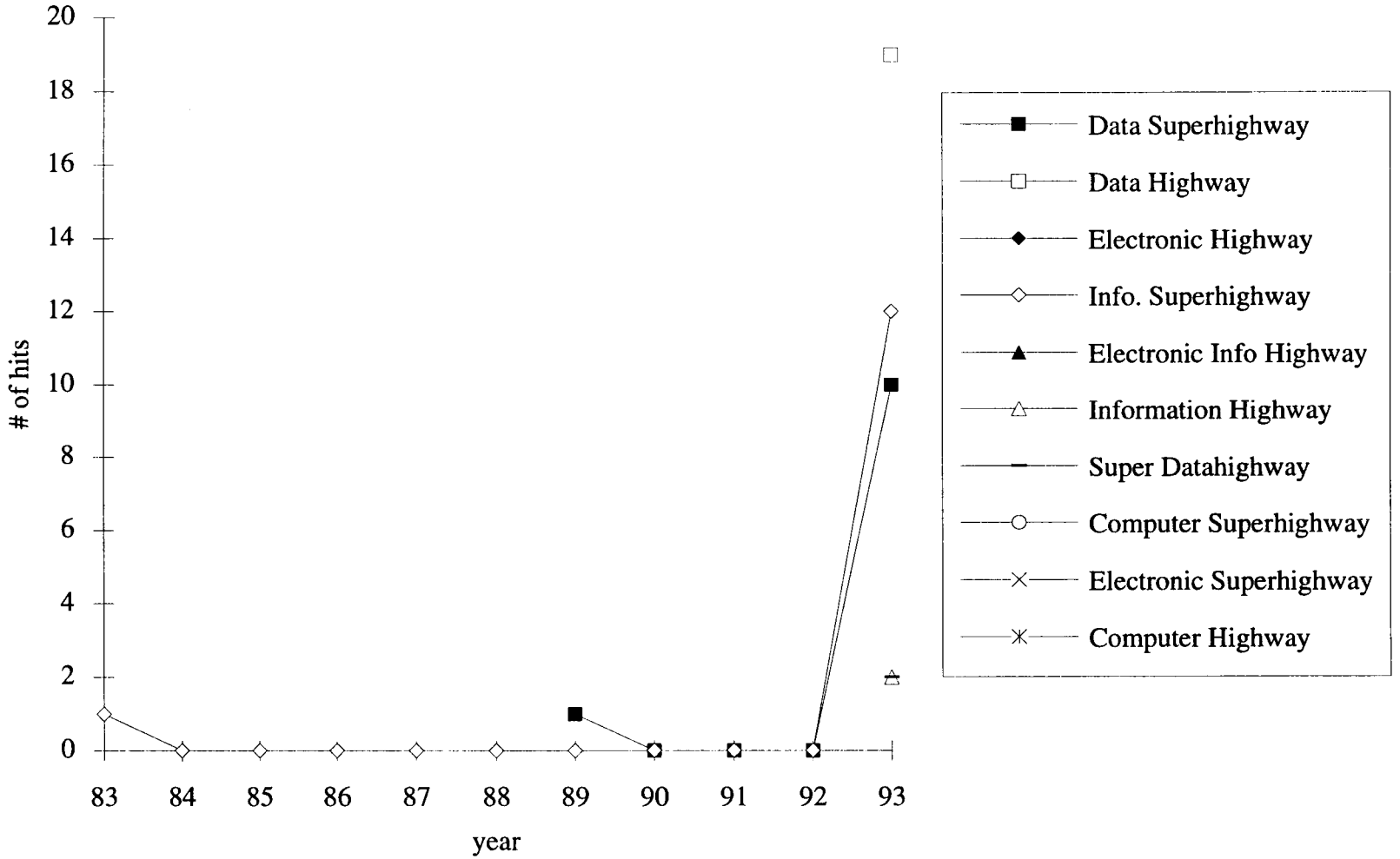

Figure 8: THE MIAMI HERALD

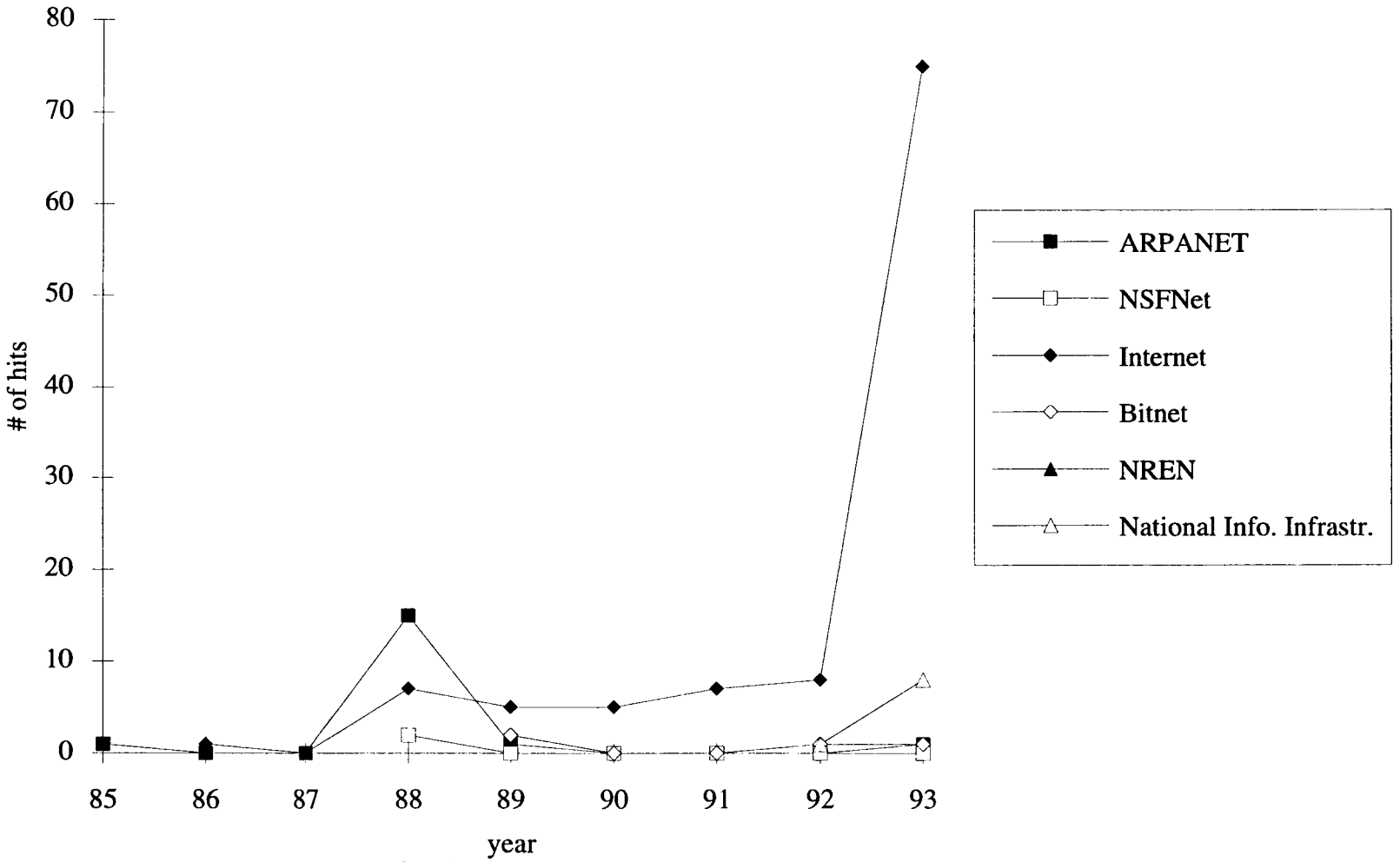

Figure 9: LOS ANGELES TIMES

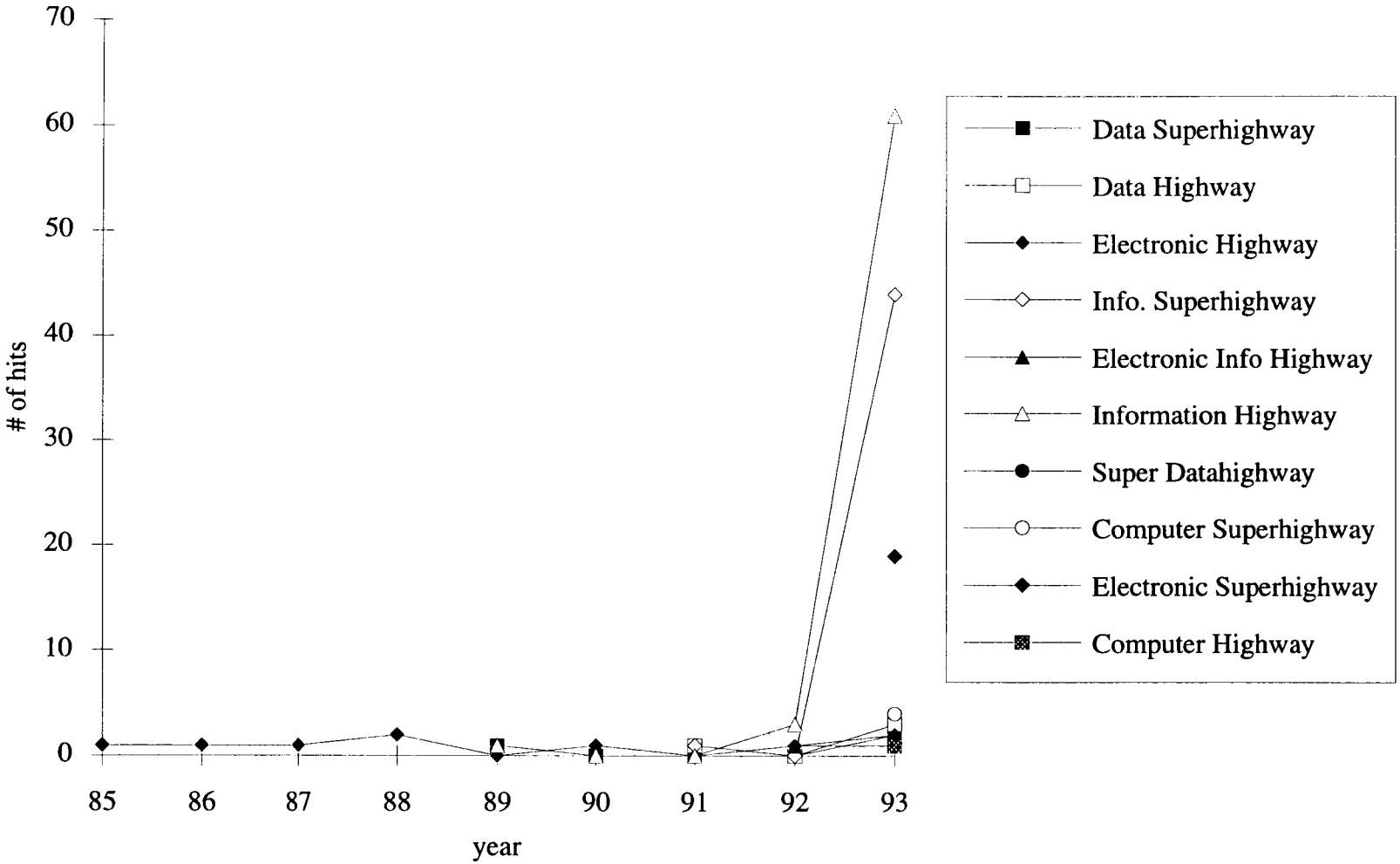

Figure 10: LOS ANGELES TIMES

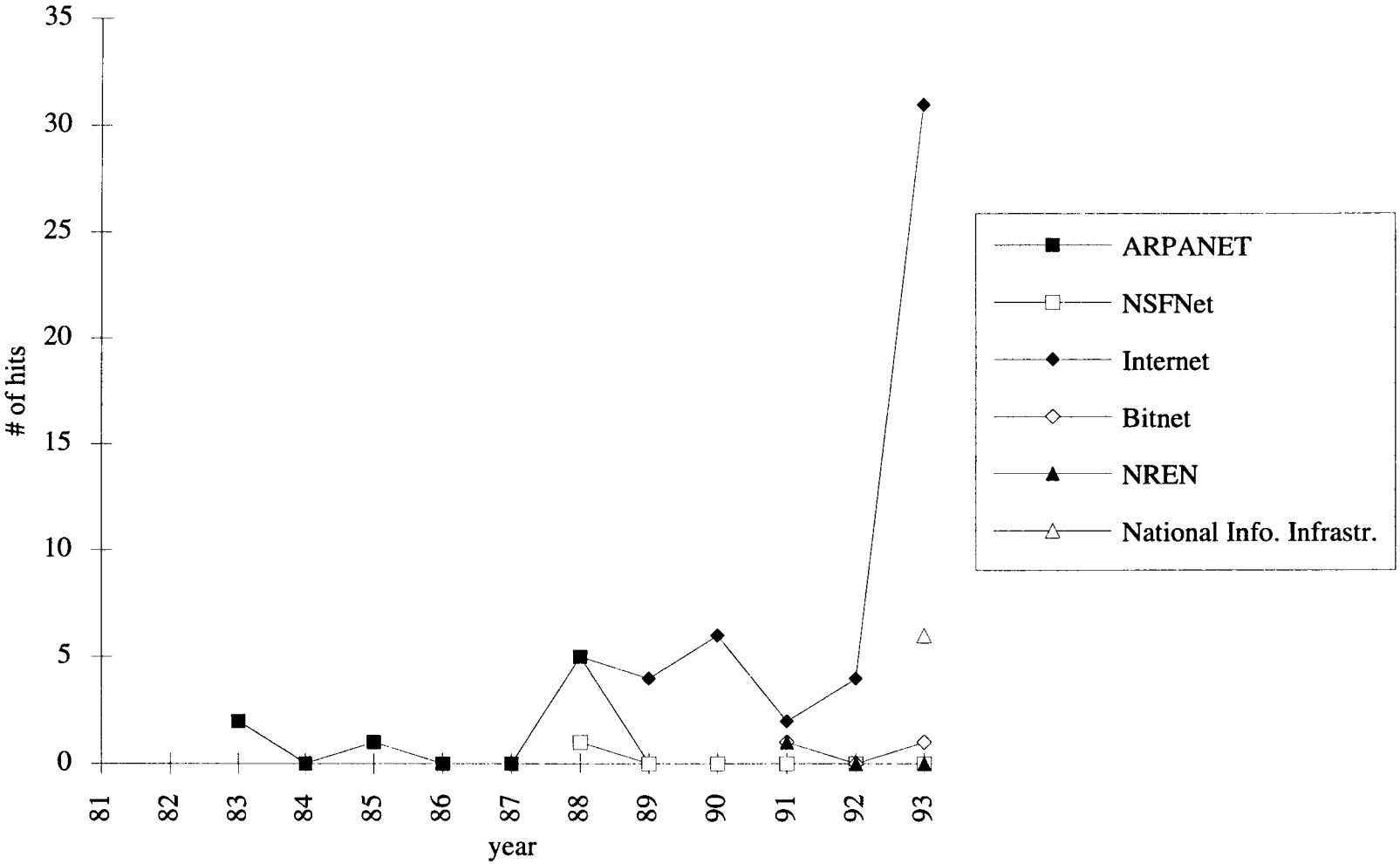

Figure 11: PHILADELPHIA INQUIRER

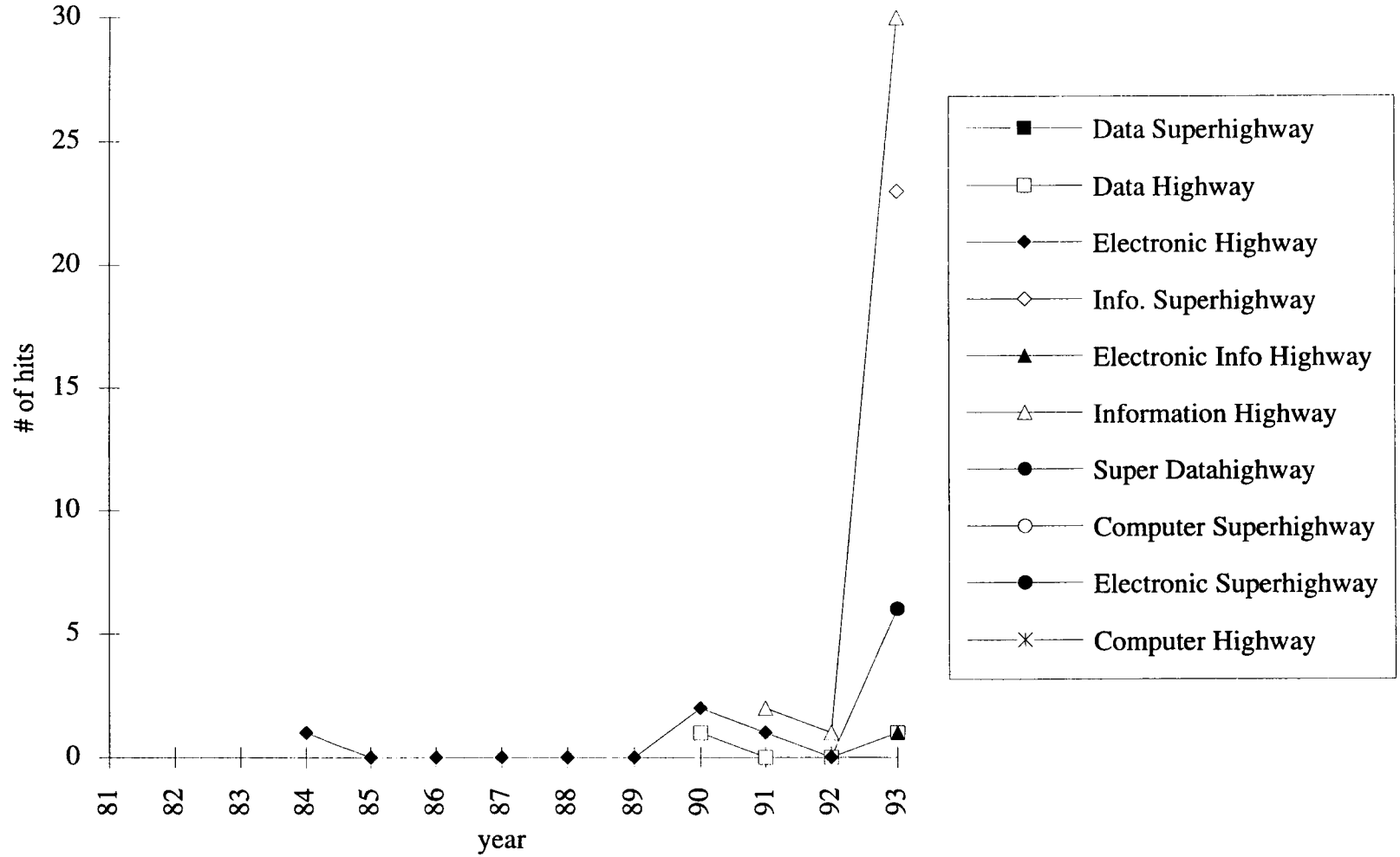

Figure 12: PHILADELPHIA INQUIRER

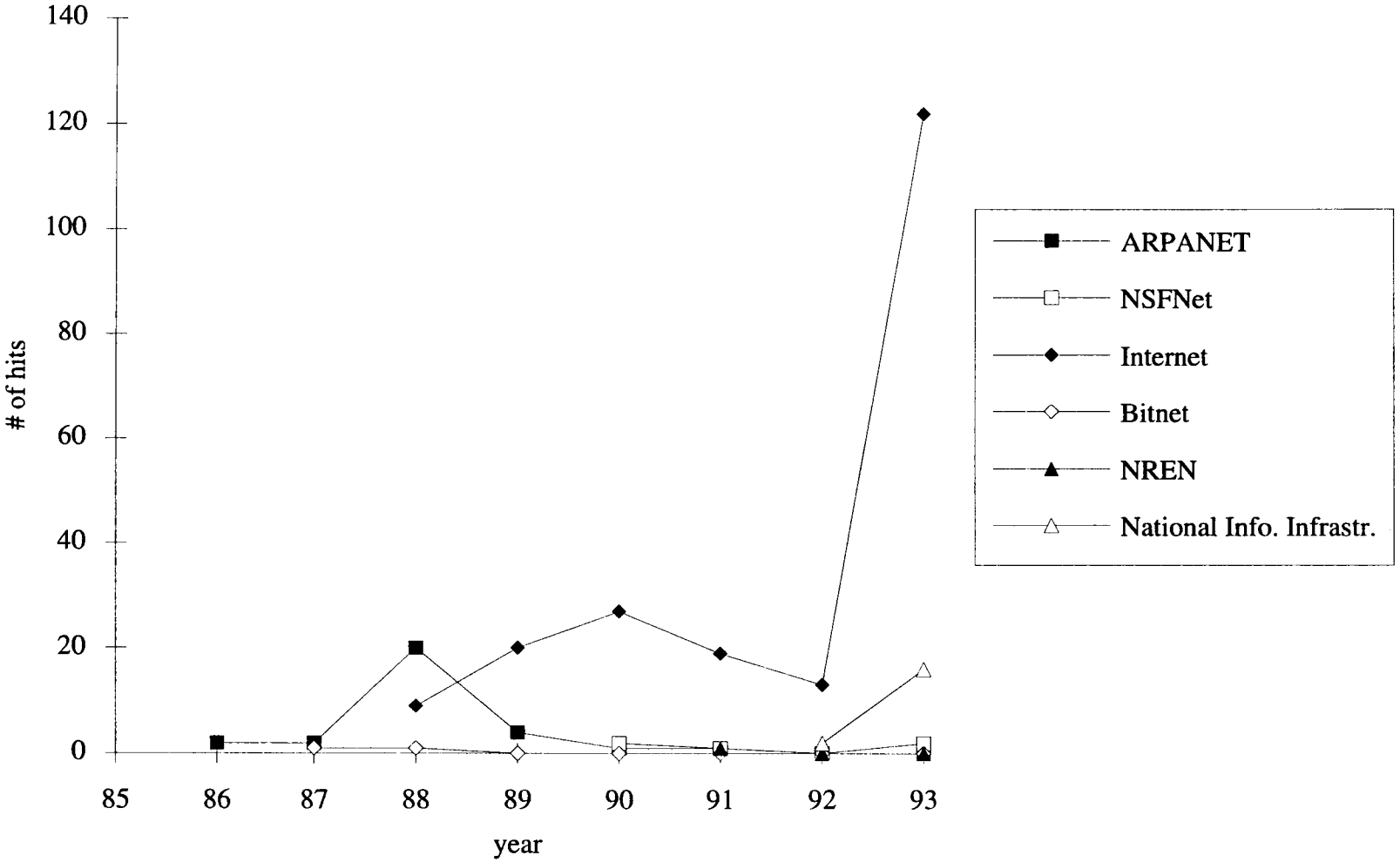

Figure 13: SAN JOSE MERCURY NEWS

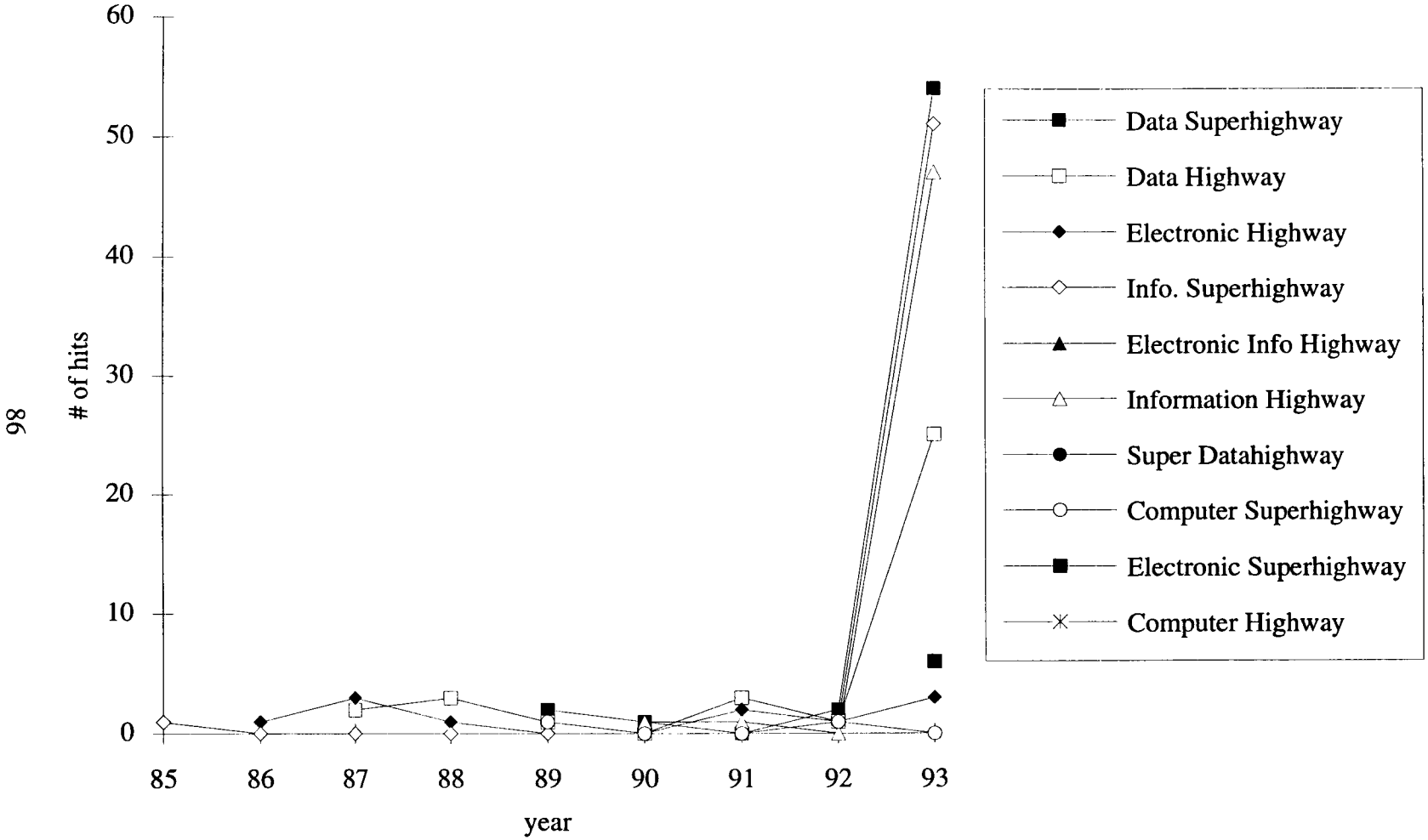

Figure 14: SAN JOSE MERCURY NEWS

HIGH-YIELDING JOURNALS AND BRADFORD'S LAW OF SCATTER

Because Bradford's Law of Scatter was necessary to answering Questions 3 and 4, these two are grouped together.

RESEARCH QUESTION #3: Will a small nucleus of journals yield a high percentage of the total literature on the Information Highway?

RESEARCH QUESTION #4: Is Bradford's Law of Scatter reliable for identifying a small nucleus of journals likely to yield a high percentage of the total literature?

Lancaster and Lee's study supported Bradford's prediction that over a period of time, journal articles are scattered over a number of different journal titles. Clearly, it is impossible for an issues manager to regularly scan hundreds of journal titles. In addition, such a strategy would be fiscally impractical. Lancaster and Lee indicate that six journals in their study produced fifty percent of the literature. They suggested regular scanning of these six titles would provide exposure to 50 percent of the literature.

For this study, in the trade and industry database PTS Prompt, ARPANET, NSFNET, Internet Bitnet, NREN, National Information Infrastructure, Information Highway, Information Superhighway, Electronic Superhighway, and Data Superhighway were chosen.

Table 9 reveals literature scatter for ARPANET. Column 1, **# of Journals**, places journals in descending order of productivity. Column 2, **# of Articles,** shows the number of articles produced for each level of journal number. Columns 3 and 4 show **cumulative** totals for journals and articles, respectively.

For example, the top journal, **Communications Week,** yielded 12 articles on ARPANET. Two sources yielded 9 articles each about ARPANET (**Network Copywriting** and News Releases). At this point three journals have yielded 30 articles, or 25 percent of the coverage. Eight of the journals provide 49.5 percent of coverage on ARPANET. After this point, a rapid dropoff in journal productivity occurs. At the bottom

of the list, 28 journals each produced one article mentioning ARPANET.

Tables 9 through 27 show journal scatter and identify core journals producing 50 percent of the literature for each of the terms. Figures 15 through 24 depict the scatter curve for journal yield, showing the percent of articles versus percent of journals. Key data have been inserted to display article yield and percentage of articles covered.

Figure 15: ARPANET in PTS Prompt 1988-1993

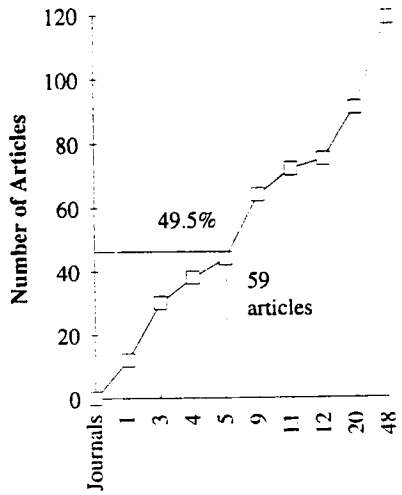

Table 9: ARPANET in PTS Prompt 1988-1993

		Cumulative	
Journals	# of Articles	Journals	Articles
1	12	1	12
2	9	3	30
1	8	4	38
1	6	5	44
4	5	9	64
2	4	11	72
1	3	12	75
8	2	20	91
28	1	48	119

Table 10: ARPANET in PTS Prompt 1988-1993

Top Ranked Journals and Article Yield	
12	Communications Week
9	Network Copywriting
9	News Release
8	Computer World
6	Open Systems Today
5	Computergram International
5	Data Communications
5	Information Week

8 (17%) of 48 journals provide
59 articles (49.5%) of 119 total articles

Figure 16: NSFnet in PTS Prompt 1988-1993

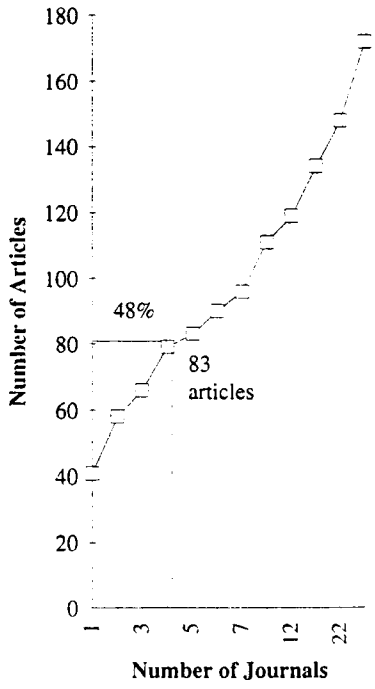

Table 11: NSFnet in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	41	1	41
1	15	2	58
1	1	3	66
1	9	4	79
1	8	5	83
1	7	6	90
1	6	7	96
3	5	10	111
2	4	12	119
5	3	15	134
7	2	22	148
24	1	46	172

Table 12: NSFnet in PTS Prompt 1988-1993
Top Ranked Journals and Article Yield
41 Communications Week
15 Electronic Engineering Times
10 Common Currier Week
9 Communications Daily
8 Newsbytes News Network
5 (11%) of 46 journals provide 83 articles (48%) of 172 total articles

Figure 17: Internet in PTS Prompt 1988-1993

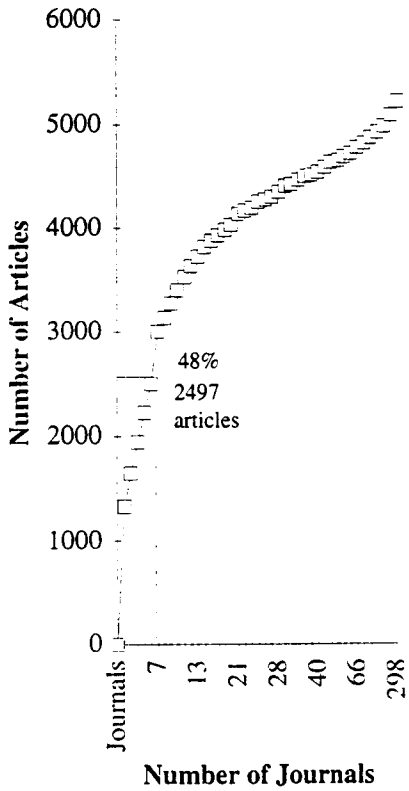

Table 13: Internet in PTS Prompt 1988-1993	
Top Ranked Journals and Article Yield	
1332	Communications Week
318	Newsbytes News Network
297	Network World
278	News Release
272	Open Systems Today
5 (2%) of 298 journals provide	
2497 articles (48%) of 5213 total articles	

Table 14: Internet in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	1332	1	1332
1	318	2	1650
1	297	3	1947
1	278	4	2225
1	272	5	2497
2	253	7	3003
1	137	8	3140
1	135	9	3275
1	128	10	3403
1	122	11	3525
1	106	12	3631
1	96	13	3727
1	89	14	3816
1	58	15	3874
1	56	16	3930
1	55	17	3985
1	39	18	4024
3	36	21	4132
1	34	22	4166
1	31	23	4197
2	27	25	4251
1	24	26	4275
1	23	27	4298
2	22	28	4342
3	19	31	4399
1	18	32	4417
3	16	35	4465
2	15	37	4495
1	14	38	4509
2	13	40	4535
4	12	44	4583
4	11	48	4627
2	10	50	4647
4	9	54	4683
4	8	58	4715
8	7	66	4771
7	6	73	4813
11	5	84	4868
13	4	97	4920
20	3	117	4980
53	2	170	5086
128	1	298	5213

Figure 18: Bitnet in PTS Prompt 1988-1993

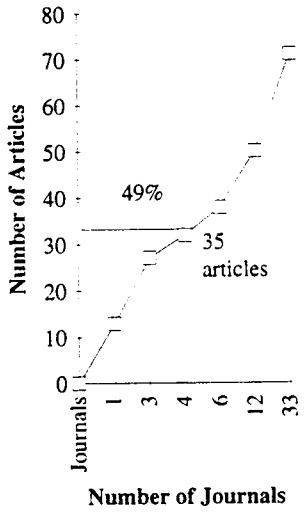

Table 15: Bitnet in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	13	1	13
2	7	3	27
1	5	4	32
2	3	6	38
6	2	12	50
21	1	33	71

Table 16: Bitnet in PTS Prompt 1988-1993

Top Ranked Journals and Article Yield

13	Newsbytes
7	Communications Week
7	Network Computing
5	News Release
3	Eastern European & Soviet Telecom Report

5 (15%) of 33 journals provide
35 articles (49%) of 71 total articles

Figure 19: NREN in PTS Prompt 1988-1993

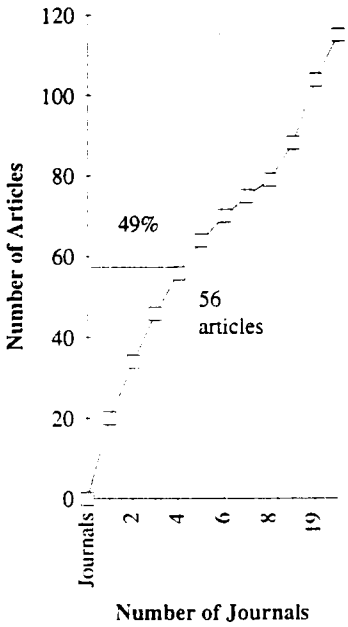

Table 17: NREN in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	20	1	20
1	14	2	34
1	12	3	46
1	10	4	56
1	8	5	64
1	6	6	70
1	5	7	75
1	4	8	79
3	3	11	88
8	2	19	104
11	1	30	115

Table 18: NREN in PTS Prompt 1988-1993

Top Ranked Journals and Article Yield
20 Communications Week
14 Communications Daily
12 Common Currier Week
10 Electronic Engineering Times
4 (13%) of 30 journals provide
56 articles (49%) of 115 total articles

Figure 20: National Info. Infra. in PTS Prompt 1988-1993

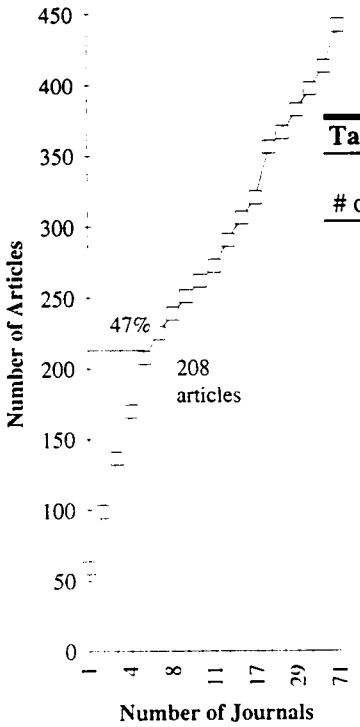

Table 19: National Info. Infra. in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	59	1	59
1	40	2	99
1	37	3	136
1	34	4	170
2	19	6	208
1	17	7	225
1	14	8	239
1	12	9	251
1	11	10	262
1	10	11	272
2	9	13	290
2	8	15	306
2	7	17	320
6	6	23	356
2	5	25	366
4	4	29	382
5	3	34	397
8	2	42	413
29	1	71	442

Table 20: National Info. Infra. in PTS Prompt 1988-1993

Top Ranked Journals and Article Yield
59 Communications Daily
40 Common Carrier Week
37 Electronic Engineering Times
34 Communications Week
19 Multi Channel News
19 Teleunion Digest
6 (8%) of 71 journals provide
208 articles (47%) of 442 total articles

Figure 21: Data Superhighway in PTS Prompt 1988-1993

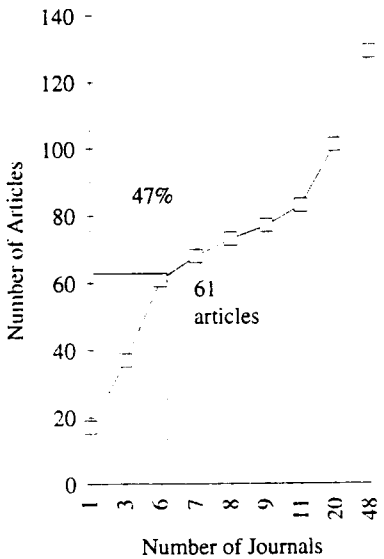

Table 21: Data Superhighway in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	17	1	17
2	10	3	37
3	8	6	61
1	7	7	68
1	5	8	73
1	4	9	77
2	3	11	83
9	2	20	101
28	1	48	129

Table 22: Data Superhighway in PTS Prompt 1988-1993

Top Ranked Journals and Article Yield

17	Communications Week
10	Common Carrier Week
10	Electronic Engineering Times
8	Communications Daily
8	Electronic Buyer's News
8	Newsbytes News Network

6 (13%) of 48 journals provide
61 articles (47%) of 129 total articles

Figure 22: Electronic Superhighway in PTS Prompt 1988-1993

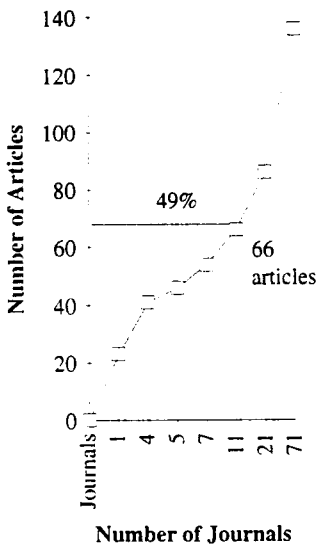

Table 23: Electronic Superhighway in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	23	1	23
3	6	4	41
1	5	5	46
2	4	7	54
4	3	11	66
10	2	21	86
50	1	71	136

Figure 23: Information Superhighway in PTS Prompt 1988-1993

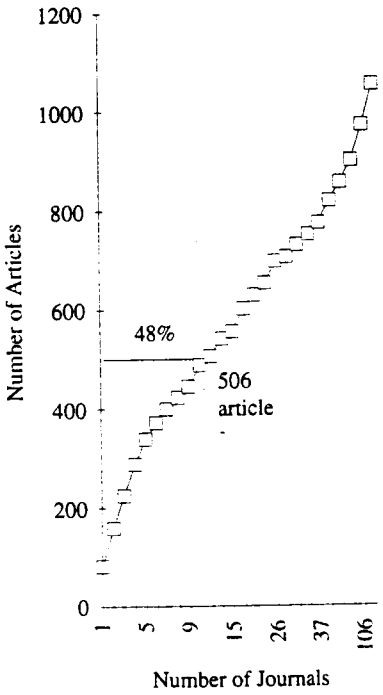

Table 25: Info. Superhighway in PTS Prompt 1988-1993	
Top Ranked Journals and Article Yield	
83	Multichannel News
76	Hollywood Reporter
66	Electronic Media
63	Communications Daily
51	Advertising Age
33	Common Carrier Week
29	Electornic Engineering Times
23	Video Store
22	Coommitergram International
21	PR Newswire
21	Television Digest
18	Billboard
12 (6%) of 1189 journals provide	
506 articles (48%) of 1056 total articles	

Figure 24: Information Highway in PTS Prompt 1988-1993

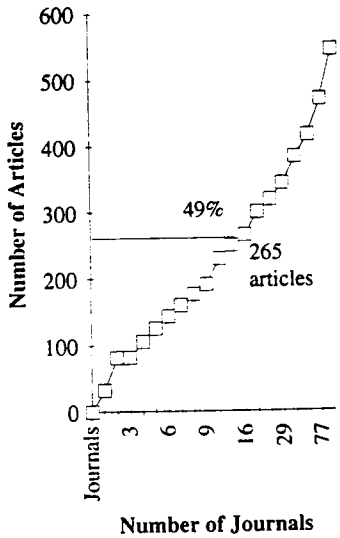

Table 27: Information Highway in PTS Prompt 1988-1993

		Cumulative	
# of Journals	# of Articles	Journals	Articles
1	32	1	32
1	26	3	82
1	24	3	82
1	23	4	105
1	20	5	125
1	18	6	143
1	17	7	160
1	16	8	176
1	14	9	190
3	13	12	229
2	10	14	249
2	8	16	265
5	7	21	300
3	6	24	318
5	5	29	343
10	4	39	383
11	3	50	416
27	2	77	470
75	1	152	545

Table 24: Electronic Superhighway in PTS Prompt 1988-1993	
Top Ranked Journals and Article Yield	
23	Multi Channel News
6	Advertising Age
6	Communications Daily
6	Hollywood Reporter
5	Edge
4	Common Carrier Week
4	Video Store
3	Billboard
3	Business Marketing
3	Crain's Detroit Business
3	Information Week
11 (15%) of 71 journals provide	
66 articles (49%) of 136 total articles	

Table 26: Info. Superhighway in PTS Prompt 1988-1993

# of Journals	# of Articles	Cumulative Journals	Cumulative Articles
1	83	1	83
1	76	2	159
1	66	3	225
1	63	4	288
1	51	5	339
1	33	6	372
1	29	7	401
1	23	8	424
1	22	9	446
2	21	11	488
1	18	12	506
2	17	14	540
1	16	15	556
3	15	18	601
2	14	20	629
2	12	22	653
4	11	26	697
1	9	27	706
3	8	30	730
3	7	33	751
4	6	37	775
9	5	46	820
9	4	55	856
15	3	70	901
36	2	106	973
83	1	189	1056

Table 28: Information Highway in PTS Prompt 1988-1993	
Top Ranked Journals and Article Yield	
32	Multichannel News
26	Communications Daily
24	Information Week
23	Hollywood Reporter
20	America's Network
18	Electronic Engineering times
17	Advertising Age
16	Common Carrier week
14	Electronic Media
13	Local Competition Report
13	Video Store
13	Washington Telecom News
10	Business Marketing
10	Computer Reseller News
8	Communications Week
8	Communications Week International
16 (33%) of 152 journals provide	
265 articles (49%) of 545 total articles	

The cost-effective implications for this data should be quite obvious for issues managers. By focusing on a core group of high-yielding journals, an issues manager can use online databases to monitor the majority of literature on an emerging issue. For this issue, core journals include: **Communications Week, Common Carrier Week, Electronic Engineering Times, Communications Daily, Newsbytes, Multichannel News, Information Week** and **Hollywood Reporter.**

These results suggest that for the Information Highway and its related technical and highway terms, the small nucleus of journals mentioned above yielded a high percentage of total literature. Furthermore, it shows Bradford's Law of Scatter is a reliable source for identifying these core journals.

POINT OF ISSUE SIGNIFICANCE

RESEARCH QUESTION #5: At what point does the coverage of an issue within an online electronic database become significant? At what point can one determine that a topic will become an emerging issue?

Lancaster and Lee define issue significance as measured by growth, spread, and movement. Growth is defined by Lancaster and Lee as growth of literature *in toto*. They also define growth for a "key" issue as one that reaches "some pre-established increment of growth," suggesting a threefold increase in postings within a database from one year to the next. Significance in this study is defined as tripling of citations in a single database over a one-year period. Significance also has components of spread and movement.

Spread is defined as interest in an issue as indicated in the occurrences appearing in an increasing number of databases. Spread involves identifying the first mention of an issue then tracking citation counts over succeeding years. Spread is most useful in a non-retrospective study in which DIALINDEX is used by an issues manager in regular time intervals (quarterly, for example) to monitor spread of an issue into new databases.

Movement tracks an issue from one type of database to another.

This part of the study explores the earliest point at which an issue "takes off." Molitor calls this the point of inevitability, the point at which an issue emerges. Some issues die at a particular point for lack of coverage; other issues "explode" and become "hot." Defining this point allows an issues manager to begin monitoring the issue as early as possible, allowing the manager to have a competitive edge in addressing it, reacting to it, or leading in the discussion of it.

Growth

Growth of literature *in toto* on a particular issue or term, as Lancaster and Lee suggest, could be tracked by conducting DIALINDEX searches quarterly. This tracks spread within the literature through increasing numbers of databases and provides a picture of how an issue is developing. DIALINDEX searches on a number of terms in this study were conducted in 1993 and in the same month in 1994. Tables 1 and 2 (see also Appendix B) show how literature for the term "info highway" changed within one year and spread from a few databases into more databases. There were 34 articles on the Information Highway in 1993 in 23 databases. By 1994 140 mentions of the Information Highway show up in 74 databases. The occurrences in increasing numbers of databases illustrates the concept of spread. According to Lancaster and Lee, combining spread with growth creates an accurate indication of a "hot issue."

Notice how Table 7 illustrates both growth and spread of the term Internet through total numbers of hits. In 1974 one article had mentioned the term in one database. That number grew slowly because only one database included publications between 1974 and 1978. By 1989 Internet articles could be found in 4 databases, illustrating the concept of spread.

In Table 7, with its inclusion of specific newspapers, spread is obvious as hits for Internet occur in increasing numbers of databases over time. By the time the Federal News Service covers Internet in 1991, the term has moved through 9 databases in the sample of

databases.

This is an inexpensive search mechanism and provides a great deal of flexibility. The DIALINDEX feature allows a searcher to conduct searches according to categories. For example, Business & Industry, Business Statistics, International Directories & Company Financials, Product Information, Law & Government, Multidisciplinary—Books, U.S. Newspapers, Worldwide News, Energy and Environment, Computer Technology, Agriculture and Nutrition, Chemistry, Medicine and Biosciences, Pharmaceuticals, Science & Technology, and Social Sciences & Humanities. Newspaper searches can be shaped by section of the country as well with 53 newspapers representing various geographical locations.

Movement

Online database searching capabilities allow issues managers to track movement of an issue through databases reflecting types/categories of literature. For example, Table 6 illustrates how the term "Internet" occurred in science and research literature before it moved into trade and industry journals. As far back as 1982, 53 articles had already appeared within science and industry journals. By 1988 within the Magazine ASAP database, the number of articles, 95, is nearly five times those that appeared the year before. By 1990, coverage had moved from 144 hits in 1989 in PTS PROMPT to 713 hits, indicating the viability of this topic as an issue likely to come to the attention of Congress and the public. The trade press represents a great number of organizations whose products or facilities might be impacted by Internet-related legislation and regulations.

However, the first clue that this may become an emerging issue, appears when the topic moves into the trade and industry press. It is within that database that business is represented and within that database that product announcements occur. The hits in PTS PROMPT represent 62 percent of the total hits in all databases for Internet. See Table 6 which shows PTS Prompt accounted for 1,526 of the 2,456 total hits. When an issue

receives five times the coverage it did the year before within trade and industry publications, it is obvious that the issue will become a significant one to monitor (See Table 6). In the National Newspaper Index, the Internet received seven times the coverage in 1993 as it did in 1992, with 83 hits and 12 hits respectively. This is a four-year lag from the take-off point within trade and industry journals and corresponds with a near doubling of hits in magazine articles in MAGAZINE ASAP from 1992 to 1993.

The best way to see the point at which an issue becomes hot is with a combination of growth and spread. This is determined in Table 6 in which coverage of Internet tripled between 1979-1981. The trade and industry press picked up the issue in 1979 as indicated in PTS PROMPT. Articles tripled in PTS PROMPT between 1983 and 1984, providing the earliest indication that the Internet was an issue worth tracking. (The next time this happened in PTS PROMPT was in 1989-1990.) At the point the Internet became an issue worth tracking by tripling in PTS PROMPT, the general press picked up the Internet in 1983 in MAGAZINE ASAP. Coverage in this database increases from 20 to 95 mentions from 1987-1988. Ironically, the elite press, as reported in National News Index, had not picked up on Internet and would not until 1991. By 1992, the elite press has tripled its coverage and Internet is an established issue in elite newspapers. However, for issues managers that was far too late to begin tracking the issue.

This supports Lancaster and Lee's findings on acid rain, which show that the same year acid rain became an issue within the trade and industry press, the first mention occurred in the general press. However, the general press coverage did not gain significance (significance means triple coverage in Trade and Industry and General Press databases) until 6 years later, when it increased sixfold.

This study supports Lancaster and Lee's suggestion that a tripling of coverage in a database in a one-year period is an indicaton that an issue has reached significance. In this study triple coverage occurred in a one-year period in Trade and Industry databases.

This study shows the importance of monitoring growth, spread, and movement in pinpointing key issues and identifying their take-off points. In so doing, it shows the contribution that online database tracking makes to this process.

SUMMARY OF RESULTS FOR QUESTIONS 1-5

An examination of the results for research questions 1-5 suggests that the first mention of the technical terms for the Information Highway appeared in scientific journals, conference proceedings, or reports from university research centers. This adds support for Molitor's prediction that issues receive first attention in scientific and research publications.

The data indicate that the general press did not bring the Information Highway to the attention of the public prior to legislative hearings and Congressional attention to the issue. While there were mentions of technical terms early in newspapers, they did not seem to connect the Internet with the Information Highway until 1992, when major corporations began merging with other companies in anticipation of commercialization of the Information Highway. This development seemed to be the one that got the attention of the press despite the large public issues facing the public. In this respect, the press did not serve the public well in creating a public forum for discussion of such issues as privacy, antitrust, and security.

Molitor's prediction that press coverage of a public policy issue results in a public outcry for government and Congressional action was not supported in this study.

Bradford's Law of Scatter proved helpful in identifying a nucleus of core journals covering the Information Highway. The data also supported Bradford's prediction that a small nucleus of journals yield a higher percentage of the total literature on a topic or issue.

Finally, the results from this study suggest the finding that an issue becomes "key" in trade and industry literature when literature triples over the period of a year. Further, for this study, scientific literature triples over a two-year period for an emerging issue, not the

one-year period in trade and industry literature. By the time an issue triples in coverage in the general press, it is too late to monitor it as an emerging issue. The take-off point occurs in trade and industry literature at the point when coverage triples in one year.

When the trade and industry press pick up the issue just as the scientific literature has reached a tripling point, it is a clear indication that a topic will be an issue that will be prominent.

Research questions 1-5 demonstrated the appropriateness of the Molitor's Precursor Model for predicting emerging issues, except in the general press phase. In the next section covering research questions 6-10 on practical applications for the public relations profession will be discussed.

DATABASE USE FOR ONLINE TRACKING IN PUBLIC RELATIONS

RESEARCH QUESTION #6: How can public relations practitioners effectively and economically take advantage of online databases for tracking emerging issues that may precipitate significant changes for the organization?

First, this study indicates that trade and industry journals, as opposed to the mainstream press, provide the first notice that this topic will become an emerging issue.

By subscribing to Trade & Industry database, PTS Prompt, or PTS Newsletter, an organization could monitor industry literature for a variety of issues.

Further, this study indicates the advantage that monitoring research and scientific studies provides for early notice of an issue's emergence. Online access to the government database NTIS, where all government agencies are required to post their reports, might provide early access to issues that have come to the attention of government and regulatory agencies.

Newsearch (DIALOG database 211) offers first coverage of articles before they are entered permanently into other databases. Although there are no descriptors or index terms

for searching, full text searches can be conducted by key words[150].

Using Precursor Pointers (see Research Question #7 below) can provide early notice of emerging issues for key word searches within databases.

Electronic Listserves, bulletin board services (BBSs), forums, and other discussion groups[151] organized around particular topics may provide the earliest discussions and notices of topics and issues that will become "hot" in the future. These electronic communities are today's equivalent to Molitor's poetry reading in pubs of the 1960s and 1970s, one of the places he suggested introduction of future public policy issues takes place.

USE OF BIBLIOMETRICS AND NON-QUANTITATIVE METHODS FOR OPTIMUM ISSUE TRACKING

RESEARCH QUESTION #7: How can quantitative (bibliometrics) and qualitative techniques be combined for optimal issues tracking in the electronic database environment?

Data collected for Research Questions 3 and 4, show how online bibliometric searching methodology, a reliable quantitative technique, helps to identify core literature for tracking and monitoring issues. Qualitative techniques—identified here as Precursor Pointers—optimize specific issues, corporations, players, personalities, and journals for tracking focus. For this study, the following Precursor Pointers have been identified:

Precursor Pointers

If a forward-thinking issues manager is scanning core literature addressing an issue, operating an issues gopher or web, monitoring various electronic discussion groups, reading trade and industry literature, and using DIALINDEX to track issue growth, movement, and spread, it follows that other Precursor Pointers will be directing the

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[150]An index term is an approved descriptor that has been formally accepted by the database editors and published. Descriptors are added to enrich the indexing and are used for quick searching or are employed temporarily. A key word is any word within the text of a document.

[151]These are available through commercial vendors such as CompuServe, America Online, Prodigy, and others. On the Internet, thousands of ListServes (subscription discussion groups) are available free through e-mail.

manager's attention to the issue through various environments.

A Precursor Pointer may very well be the first notice, first mention, first indication of an issue for an issues manager. For example, if a manager hears a speech or reads an article by Albert Gore on the Information Superhighway, a Precursor Personality in this study, he or she would undoubtedly be directed to other Precursor Pointers, such as legislation, major players, and industries involved. With the coalescing of pointers around an issue, a manager would not only have first notice, perhaps, of an issue, but identify key Precursor Pointers to track. Percursor Pointers identified in this study as related to the Information Highway are:

1. **Precursor Personalities:** In this case study, various authorities and players emerged at various times as advocates, authorities, or critics of the Information Superhighway. For example, Mitch Kapor established the Electronic Frontier Foundation. Vice President Albert Gore, Jr. introduced legislation consistently in Congress to establish funding and mandates for the Information Superhighway. Anyone following the writings of this former journalist would have been introduced to his dream early on.

Other players include Vincent Cerf and Robert Kahn, scientist players early in the development of the Internet; heads of telecommunications companies as mergers began to increase; writer Bruce Sterling; and **New York Times** reporter John Markoff. Those participants in The Superhighway Summit: A Daylong Examination of the Future of Electronic Media, January 11, 1994, at the University of California, Los Angeles, who appeared on the cover of **Emmy** magazine as "The Super Powers That Be" included Vice President Al Gore, Barry Diller, chairman & CEO of QVC, John Malone, president & CEO, Tele-Communications, Inc.; Rupert Murdoch, chairman & chief executive, News Corporation Ltd.; Raymond Smith, chairman & CEO, Bell Atlantic Corp.; and Mitchell Kapor, founder, Lotus Development Corp. See Table 29 (See Appendix J for a complete list of 38 individuals.)

Table 29: Leading Authorities/Players 1969-1994		
Authorities & Players	**Trade & Industry**	**General Press**
President Clinton	194	118
John Malone	173	68
Vice President Gore	155	62
Ray Smith	147	45
Reed Hundt	123	0
Edward Markey	110	19
Bill Gates	77	50
John Dingell	74	13
Rich Boucher	71	6
Barry Diller	59	51
Rupert Murdoch	42	32
Albert Gore	37	11
John Danforth	26	5
Howard Metzenbaum	24	6
James Quello	22	9
Robert Kahn	13	1
Orwell	11	11
Vinton Cerf	11	4
Mitch Kapor	11	12
President Bush	10	12
George Gilder	9	7
Ross Perot	8	21
Esther Dyson	4	2
Brian Kahin	3	2
John Perry Barlow	2	4
Ed Krohl	2	0
Allan Bromley	2	3
Robert Morris	1	2
James Billington	1	1

2. **Precursor Industries:** In this case study, several industries have become prominent players: telephone companies, cable companies, newspaper publishers, book publishers, online information providers, television networks, the movie industry, legal publishing, and CD-ROM and video producers. As these industries postured and maneuvered for take-overs and mergers, they gained the attention of the general press, who then propelled the issue into the public marketplace.

A savvy issues manager would be tracking press releases issued by these major players. Industry profiles, annual reports, press coverage, product announcements, and other data could easily be pulled together through online database searches and compiled

for review by an organization or corporation. This allows an organization to have earliest possible advance notice of specific company as well as industry trends for shaping its own reaction or leadership moves.

Table 30 illustrates corporate players identified in the general press through a search with the term Information Superhighway. For example, Bell Atlantic was mentioned in 293 articles. The breakdown by years is as follows:

1994—196 articles (June 1994)

1993—97 articles

1992—0 articles.

Developments can occur rapidly. Organizations not poised to take advantage of windows of opportunity in the marketplace are left behind.

Table 30: Coverage of Corporations 1969-1994

Corporations	Trade & Industry	General Press
Bell Atlantic	734	293
MCI	324	109
Viacom	209	97
Ameritech	205	40
Sprint	195	55
NYNEX	191	57
U.S. West	190	71
Paramount	185	107
Southwestern Bell	184	69
Bell South	167	46
Pacific Telesis	125	40

3. **Precursor Legislation:** In this case study, legislation has been introduced over and over again. In December 1991, President Bush signed the High-Performance Computing Act of 1991. At the signing of that document, he predicted the electronic revolution and said it would supersede the importance of the introduction of radio and television into our society. That Act created NREN, the National Research and Education Network. In July 1993, legislation creating the National Information Infrastructure was passed. The FCC and courts continue to grapple with antitrust issues related to electronic

dissemination and mergers or industries into mega-companies. Several bills are now pending to change regulations originally written to address extension of railroad lines in the 1930s.

4. **Precursor Politicians.** Vice President Al Gore heads this list, of course. However, President Clinton should be added. He used electronic forums and forms of delivery for making available speeches and press releases on the Internet. Others who chair powerful Congressional committees dealing with telecommunications issues include names like Rep. John Dingell, Rep. Edward Markey, Rep. John Danforth, Sen. Howard Metzenbaum, Rep. Richard Boucher, Rep. Jack Brooks, and FCC head Reed Hundt.

5. **Precursor Advertisements**: When AT&T released its "You Will" series of ads portraying electronic fax delivery at the beach and other extraordinary forms of electronic communication, the public, through the information function of advertising, was introduced to the Information Superhighway in 1993. MCI unveiled an ad series in January 1994 portraying a child with a New Zealand accent and dressed in 19th Century clothing precociously discussing a new Information Highway where "there will be no more **there**. We will all only be **here**." This study was not intended to confirm whether this ad confused the public or clarified MCI's product line. However, these two ads contributed to a growing precursor environment reiterating the term and elaborating on the concept through national broadcasting network advertising.

6. **Precursor Publications: WIRED** magazine, **Online Access, Internet World**, and any number of e-zines[152] are addressing issues related to the Information Highway. According to the Bradford Law of Scatter data, magazines such as **Communications Week** provided early and comprehensive coverage.

By first monitoring electronic online databases and participating in forums[153] both

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[152] E-zine is a term for "electronic magazine."

[153] There are thousands of forum discussion groups available electronically. Examples include EDUPAGE, an electronic update culled from the pages of major publications, trade and general, for their pertinence to higher

related and unrelated to an industry's line of business, and then observing Precursor Pointers in the Precursor Environment, an issues manager can collect terms for searching online databases through DIALINDEX searches or more complex multi-database searches of various genres of literature.

AN ISSUES GOPHER AND IMPLICATIONS FOR GOPHER DESIGN

RESEARCH QUESTION #8: Could an issues gopher be created online to provide organizational advantage in tracking issues in the competitive marketplace?

Within an organization, construction of a web[154] server (momentum is now heading for the web and away from gopher) could facilitate access to issues-related documents. With the gopher organization, one is limited to building hierarchial menus with no more than 30-40 characters.

Documents placed on a web server might include

1. reports
2. speeches
3. legislation
4. reading lists
5. timelines
6. schedules
7. guide to sources by issue
8. e-mail addresses for government contacts
9. e-mail sources for business contacts
10. daily wireservice updates
11. tracking status for various issues
12. press contacts
13. online resources

The issues manager within a company might be responsible for keeping this updated for the corporation. As employees and management discovered issues pertinent to the company's operation, they could post them or contact the issues manager directly by e-mail.

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education. EDUPAGE is sent three times per week through e-mail.

154 A web is a menu system that gathers Internet or other resources from all over the world into a series of many pages or screens that appear on a user's computer. As the user selects an item or resource or moves from document to document, he or she is probably leaping between computers on the Internet in a transparent or seamless interface without knowing it.

Implications for the design of such a gopher or web include the following:

1. Focus. A gopher allows focus on a particular issue with a variety of documents related to that issue available in one place.

2. Organization. The gopher might be organized by Precursor Pointers, chronologically, or by type of document.

3. Access. Material is available at any time of the day and to any employee with technological skills to access the gopher.

4. Transparency. Despite geographic location, an employee with computerized access via a modem can access the organization's gopher from anywhere.

5. Copyright. Care must be taken not to infringe on the copyright holder's rights in posting documents on a gopher.

TECHNOLOGICAL PUBLIC POLICY ISSUES

RESEARCH QUESTION #9: How do technological concerns evolve into public issues?

According to Molitor, the critical point of no return for the inevitability of an idea becoming an issue occurs in scientific, statistical, and professional journals. In this case study, Molitor's prediction of public outrage does not apply since legislation was enacted BEFORE the public became aware of the issue. The High-Performance Computing Act of 1991 was covered briefly in newspapers. Data in Appendix L from a Harris study on press coverage of the High-Performance Computing Act of 1991 shows that newspapers in communities hosting companies or organizations with a vested interest in high-performance computing provided skimpy coverage.

Had this legislation been given more publicity, the general public might be more aware of the NREN, created by this Act, and the issues surrounding it (privacy, security, copyright, antitrust, etc.).

This study did not support Molitor's Precursor Monitoring Model as universal for predicting how policy issues related to the Information Superhighway diffuse into public awareness. With the failure of the newspaper industry to cover the issue, public awareness

was thwarted and the public was cheated of information about the Information Highway and objective discussions about issues related to it. Without public knowledge, an informed citizenry cannot discuss the issues in the marketplace of ideas. Whether the Information Superhighway was not covered in the newspaper press because of litigation and lobbying efforts by the newspaper industry against the telephone industry is not within the scope of this research. However, it does bring up the question of a conflict of interest as it relates to coverage of the issue and would supply a hypothesis as to why Molitor's Precursor Monitoring Model breaks down at that point.

MEASURING ISSUE SIGNIFICANCE

RESEARCH QUESTION #10: How does the level of issues significance vary from one media genre to another?

Lancaster and Lee proposed that when literature mass triples on an issue within one year, a point of significance has been attained. While they offered this as a hypothetical possibility in their study, the data from this case seems to support that a tripling effect does occur. A tripling effect in science and research literature for this issue seems to occur over a two-year period. This is discussed thoroughly under Research Question 5.

The Internet issue gained significance in PTS PROMPT—journals from industry and trade—in 1986 when number of mentions jumped from 18 to 50. A second bump occurred between 1989 and 1990 when hits jumped from 144 to 713, indicating non-reversible significance within trade and industry literature.

In the general press, significance came late with elite newspaper coverage represented by the National Newspaper Index with only 12 hits in 1992 and 83 mentions in 1993. Earlier issues significance was reached in magazine literature between 1987 and 1988 when mentions of Internet rose from 20 to 95, a jump five times in one year.

Internet reached a level of significance in the Federal News Service in 1992 when

hits jumped from 5 mentions to 28 in 1993.

In this study, the Internet began in scientific literature, moved to trade and industry journals, then into the national press, then into federal and legislative databases, growing to a level of significance in each database. However, in this case, early legislation occurred before the general press covered the issue, not after as Molitor's model predicts.

Related to issue significance is issue intensity. Within an issue-monitoring study, the intensity index may be used to place weight on certain specific aspects of an issue. For example, one could create an intensity scale for articles within databases as the following example demonstrates.

INTENSITY INDEX

To demonstrate a method for ascertaining a measurement of value of some articles over other articles within a database, this intensity index was developed to place weight on articles mentioning Albert Gore and any mention of a technical or metaphor term for the Information Highway. Any combination of Precursor Pointers could be designed and searched for, using a combination of online search strategies and weighted terms.

Within the MAGAZINE ASAP database, a sample of 264 articles published between 1993 and 1994 mentioning Information Superhighway were downloaded. Each article was coded for the following:

1. Number of references to the issue under study (for Information Superhighway, including Information Superhighway) in the headline/subhead—1 point per reference
2. Number of Gore mentions in the headline/subhead—1 point per mention
3. Number of Gore mentions in the first paragraph—1 point per mention
4. Number of technical or highway metaphor mentions in the first paragraph—1 point per mention
5. Paragraph placement within the article for the Information Superhighway mention. A ratio based on the paragraph number in which the first mention for Information

Superhighway was found in the article and the entire number of paragraphs for the article was created, then transformed into a percentage. For example, if a mention was in the first paragraph of a 10 paragraph article, the ratio was 1/10.

Points were assigned for percentage increments. For example, if the first mention occurred in the first 10 percent of the article, 10 points were assigned, the second 10 percent of the article, 9 points were assigned, and so on, down to 1 point for appearing in the final 10 percent of the article.

The total of points created an intensity rating in this case ranging from one to 17 with 17 being the most significant. These 17 points were calculated as follows:

Number of metaphors in the heading = 2 points

Number of metaphors in the first paragraph = 5 points

Paragraph ratio score (where issue is mentioned in an article) = 10 points

The most significant articles of the 264 within the database according to the intensity of significance measure are:

17 points

"The Internet: Today's Information Highway?" by Nick Lippis, **PC Magazine**, May 17, 1994

16 points

"Sex and the Superhighway: Opportunities for Women in the Information Superhighway" by Laurie Kretchmar, **Working Woman**, April 1994.

"Going On Line: The Information Superhighway" by James M. Wall, **Christian Century**, February 2, 1994.

"Bypass on the Information Highway: Al Gore's Plan to Create National Telecommunications Network" by Susan Dentzer, **U.S. News & World Report**, Jan. 24, 1994.

"Fast Lane to the Future: Al Gore Wants to Remove Roadblocks that Limit Competition on the Information Superhighway" by William J. Cook, Jim Impoco, and Warren Cohen, **U.S. News & World Report**, Jan. 17, 1994.

15 Points

"Al in the Balance: Vice President Albert Gore" by David Corn, **Nation**, April 25, 1994.

"Novell's Place on the Highway: Information Superhighway" by Frank J. Derfler, Jr. and David Greenfield, **PC Magazine**, April 26, 1994.

"Will the ISH Be a One-Way Street? Information Superhighway" by Jim Seymour, **PC Magazine**, April 12, 1994.

"Surf Cyberspace: Windows Front Ends to the Internet" by Preston Gralla, **PC Computing**, April, 1994.

14 Points

"The Internet Companion: A Beginner's Guide to Global Networking" by Brent Heslop and David Angell, **PC Magazine**, Jan. 26, 1993.

"PC Execs Educate Congress on National Information Superhighway" by Melissa J. Perenson, **PC Magazine**, Nov. 23, 1993.

"No Transatlantic Bridge for the Information Superhighway" by Donald Frazier, **Datamation**, March 1, 1994.

"Tread Lightly on the Internet: The Right and Wrong Ways to Cruise the Info Highway for Customers" by Rosalind Resnick, **Home Office Computing**, April 1994.

"Distributed Objects From Info Highway Hazards: The Threats Imposed by Object Linking and Embedding and Similar Technologies" by Peter Coffee, **PC Week**, April 18, 1994.

"The Selling of the Superhighway" by Cathryn Baskin, **PC World**, May 1994.

THE INTENSITY INDEX AND IMPLICATIONS FOR RETRIEVAL DESIGN

The intensity index allows issues managers to spend their time productively for two reasons:

1. The intensity index makes possible very focused searches. By incorporating Precursor Pointers, dates of publication, or specific journals, an issues manager can narrow an issue to very specific parameters.

2. The intensity index helps to weed out superfluous articles. By weighting the search with specific search terms, issues managers focus only on pertinent articles.

This method could be used in newspaper databases to electronically search for terms in lead paragraphs and/or headlines or both. It could be modified and adjusted to assign importance to databases where large numbers of hits result and the issues manager

has limited time. For economic reasons as well, only those articles with certain terms in the lead and headline might be downloaded and read. Combined with and confined to significant journals, this method could assist an issues manager in reading most of the significant literature published on a particular issue.

LIMITATIONS OF SEARCHERS WITH DATABASES

Onlline database searching, while providing one of the most comprehensive and powerful research tools, also involves limitations unique to online database design. For this study, 24 of the 25 database publishers were interviewed concerning the design policies of the databases included in this study. The following issues have emerged as factors in online searches:

1. **Years of Coverage.** Databases did not all begin coverage the same year. In the design of this study, care was taken to choose databases that provided coverage for about the same time period.

2. **Variation of Formats.** DIALOG provides databases in several formats: bibliographic, abstracts, fulltext and directory. This study was designed to count the number of articles about the Internet (and its various synonyms). Because this information can be derived from bibliographic, abstract, and fulltext databases, the format was not as critical to this study. Fulltext databases were used exclusively for creation of the Intensity Index. However, the same principles could apply to databases with abstracts only or databases with bibliographic entries if the paragraph ratio is not considered an important element.

3. **Selectivity of Articles.** Several database publishers indicated that staff members made editorial decisions about which articles they deemed important enough to include in the database based on their own personal judgment. These databases do not provide cover-to-cover inclusion of journal articles. In this way, database publishers exercise a gatekeeping function similar to that within printed media. This makes recognition of a trend or important subject up to the descretion of a database publisher.

4. **Duplication of Journals**. Several databases may include the same journals. If these databases are used for bibliometric research, a duplication factor would have to be calculated based on a sample of articles found in the databases chosen. This study's design focused on a sample of database by type based on Molitor's Model to eliminate duplication of journals.

5. **Time Lag.** Trend trackers who need up-to-the-minute information must be

aware that some databases update daily, while others update weekly, monthly or quarterly. Time lag varies by database for the length of time it takes from receipt of the journal to placing it online through DIALOG. This could be an important factor for some policy issues. Another time-related issue is change of format of the database at a specific point in time. For example, PTA Prompt changed from an abstract database to fulltext in 1989. This study showed a marked increase in coverage of the Internet about that time. However, an increase occurred consistently in many databases at that same time supporting the theory that the increase was due to increased coverage, not a database format change.

6. **Search by Index Terms**. Issues managers are well advised not to depend on database editors to do their work for them. Interviews with nearly every database publisher revealed the hesitancy and caution that editors have in assigning index terms and/or descriptors. Afraid of focusing on the wrong term too early, database editors will wait until the term with the most common usage emerges, then assign index terms.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This study tested Molitor's Precursor Monitoring Model and extended work done by Lancaster and Lee, who tested online databases for growth, spread, and movement of an issue through various types of printed literature as it diffuses over time. This study supports Lancaster and Lee's finding that an issue appears first in scientific and research literature. It also addresses their suggestion that early identifers of issues might be database publishers/producers. In-depth interviews with database producers regarding when issues are assigned as descriptors or index terms show database producers to be conservative, for the most part, and cautious in adding new terms. By the time most issues become index terms or descriptors, the issue has become established in the print media.

This study also supported Molitor's notion that public policy issues begin in scientific and research literature and refines the model for scientific and technological issues. Data in this study did not support Molitor's prediction that public policy issues come to the attention of the general public through the general press. According to Molitor, coverage in the general press produces a public outcry of concern resulting in a demand for legislative solutions. The High-Performance Computing Act of 1991 created a national information highway connecting industry, government, and university databases. Clearly, it was a public policy issue. General press coverage of the information highway did not begin in earnest until 1993. At this writing in 1994, the issue is now receiving public discussion in the general press.

Data in this study did not support Molitor's finding that an issue's critical take-off point, the point at which an issue reaches inevitability and the point at which the issue does not decline but becomes a "hot" issue, is in the scientific literature. In this study, between

1989 and 1990 the issue reached the point of inevitability in trade literature, not scientific and research literature. Legislation on NREN in 1991 and the National Information Infrastructure in 1993 resulted in major corporations jockeying for position through industry mergers. This study found that skyrocketing press coverage of the Information Superhighway was linked with coverage of those mergers.

Further showing the newspaper industry's lateness in coverage of the issue is the publication only this spring of **Forum** Magazine's tips on covering the Information Superhighway, and their commentary on "Tracking the Coming of the Information Superhighway" in May 1994.

The newspaper industry's potential conflict of interest dates back to 1981 when the ANPA Board of Directors adopted the "diversity principle," which prohibits telephone companies from transmitting information over their lines in which they have any vested interest. According to Everette E. Dennis of the Freedom Forum, this creates a potential conflict of interest not only for newspaper publishers, but also for reporters. He says, "Letting the public know about these vested interests, while providing impartial coverage, will be difficult to accomplish, yet media credibility and trust depend on it."

How this potential conflict of interest and late coverage of this public policy issue by the general media are playing out will be best addressed in a future study. It appears that newspapers and telephone companies are seeking common ground, perhaps by joining forces to build on each other's respective strength.[155]

However, it is clear from this study that despite the press' antipathy for the term Information Superhighway,[156] the press has helped propel it into the public's vocabulary.

One of the purposes of this study was to determine the extent to which online databases such as DIALOG might assist an issues manager in the corporate or

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155 Walt Potter, "Changed Marketplace, Changed Attitudes" in **Presstime**, September 1993, pp. 27-30.
156 "Begging for a Shorter Superhighway" in **The Forum**, May 1994, p. 7.

organizational setting. Using bibliometrics, retrospective audit, and Bradford's Law of Scatter, this study supported Bradford's prediction that a small nucleus of core journals yields the highest number of articles with journal productivity following a law of diminishing returns as literature scatter represents journals of decreasing relevance to the field. In this study, this is most apparent in trade and industry literature, where core journals provided the highest percentage of coverage on the Information Superhighway. This study also shows that through the inexpensive, regular use of DIALINDEX, databases may be identified early on as those with the most coverage of a technology issue. Within those specific databases, such as Trade & Industry Index and PTS Prompt for this study, a nucleus of journals can easily be documented as those providing the majority of coverage. For searching and tracking efficiency, as well as economic savings in purchasing subscriptions for scanning, identifying these few journals can be a real savings to the organization. Key word online searches allow quick identification of articles, and the intensity index created in this study provides a way for organizations to identify those articles that are most important to their interests.

Further, online databases provide issues managers an opportunity for efficiently confirming that Precursor Pointers are present, are coalescing, and are creating an issues environment worth tracking. Precursor Pointers were identified in this study as authorities and players, specific industries, journalists, magazines, early mention in online discussion forums, advertisements, legislative events, speeches, and government involvement through regulatory action.

A key research question in this study is identification of the earliest possible point at which it becomes obvious that an issue will become a prominent public policy issue, emerging into the public's consciousness and eventually demanding action by Congress or other regulatory agencies. In this study, the earliest possible point occurred in trade and industry literature. Is Lancaster and Lee's three-fold increase a suitable measure? This

study supports that measure within the trade and industry database, but not within science and research literature.

DATABASE USE FOR ONLINE TRACKING IN PUBLIC RELATIONS

In-depth interviews with database publishers were designed to collect data on time lag, selection of index terms and descriptors, and journal selection policies. One application for findings of this study is to determine how public relations practitioners and issues managers can effectively and economically take advantage of online databases for tracking emerging public policy issues that may precipitate significant changes for their organization of affiliation.

Data from this study clearly indicate that trade and industry journals, as opposed to the mainstream press, provided the first notice that this topic would become a "hot" issue. By subscribing to the Trade & Industry database, PTS Prompt, or PTS Newsletter, an organization could monitor trade literature for a variety of issues. Further, this study shows that early monitoring of research and scientific studies provides for early notice of an issue's emergence. Online access to the government database NTIS, where all government agencies are required to post their reports, might be a winning strategy for an issues manager watching technology issues.

While online databases have entered public relations practice for monitoring press coverage for press releases issued by the company, this study focuses on the competitive advantage of early issues monitoring for companies with competitive products. Online databases allow issues managers to track competitors' products, to locate and target journalists writing on the issue, and to identify industry overviews, company profiles, and industry surveys in Standard and Poors or U.S. Industrial Outlook. In addition, online databases allow tracking of products or companies with a regional focus. Searches can be limited or focused on geographical region, publications, years, months, products, etc.

Searches can also be designed to track competitors' press releases in PR Newswire or Business Wire, databases that electronically broadcast press releases online.

A subscription to Newsearch, a daily update database for Information Access Company's six online databases, might aid issues managers in early identification and/or tracking of issues. As a precursor database, Newsearch is a database with indexing for the most recent two to six weeks of current indexing for the following databases:

1. Computer Database
2. Management Contents
3. National Newspaper Index
4. Trade & Industry Index;
5. Magazine Index, and
6. Legal Resource Index.

Online databases must be weighed in terms of their cost versus value. Online databases are value-added products. When time is of the essence for an organization in gaining a competitive edge; when an organization cannot afford to commit an employee to months of research in a library; or when identifying and judging sources and information for evaluating key information relating to a particular issue is the objective, online research and tracking provide sources in virtually every coverage area.

PTS Newsletter, for example, provides industry-specific sources that are often updated weekly—even daily. Focus for most industry newsletters is specifically on identifying trends within the industry. This database, designed for searching key words in the text or title, has newsletters loaded online as soon as they are received. There is no pause for creating index terms or descriptors. In the trade-off for timeliness, coding—for products and industries—is sacrificed.[157]

Online database searching is also a valuable tool for determining which journals or newsletters are core journals for relevance to an issue.

Limitations of Databases for Issues Tracking

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157 June 30, 1994, interview with Ronnie Adams, client services, Predicasts.

While some public relations practitioners have complained that online databases require learning complex search strategies, Boolean logic, and difficult commands,[158] database producers have created simple menu-driven databases for easy searching. However, for complicated searches on technological issues, being trained in a particular database's features and search terms is helpful. This may require a day or two in a training seminar.

For issues managers, a dependency on database descriptors or index terms may prove disappointing. When an issue is in its early stages, these terms will not yet have been assigned, according to this study—particularly if the issue is complex with many descriptive synonyms. Data in this study suggest that assignment of descriptors and index terms typically comes late and after editors are sure that a term already has become accepted usage within the literature. By that time, the issue may well have taken off.

While major database providers like Predicasts and Information Access Company provide printed lists of sources within the database, data from this study indicate that contracts with journal providers are in a state of flux. In some cases journal selection is made according to contract negotiations with a journal publisher, not from the needs of the database as determined by the database editors. As a result, databases, while providing consistent access to core journals, are in a state of fluidity.

In NTIS, however, all documents created by government agencies are required by law to be submitted to this database unless classified. The American Technology Pre-eminence Act of 1991 established NTIS as the clearinghouse for government documents effective February 1, 1994.[159]

While time lag varies from database to database, most database producers upload material in a timely fashion, some daily.

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158 Betsy Wiesendanger, "Plug into a World of Information" in **Public Relations Journal**, Vol. 50, No. 2, pp. 20-23, February 1994.

159 June 6, 1994 interview with Melanie McAllister, acting manager, National Technical Information Service.

Economics of in-house searching must be weighed against hiring an information brokerage firm with these factors in mind: staff to perform the search, cost, type of issue and its complexity, and the time factor. However, in-house online searching for fifteen minutes could easily save hours or days of tracking difficult-to-find sources for specialized industries. DIALINDEX searches are quick and easy, inexpensive and valuable for tracking movement of an issue.

AMBIGUITY OF TERMS

Lancaster and Lee suggested that search terms be as unambiguous as possible. In this study, Smart Highway had to be dropped from the study because of its ambiguity. However, this study did not use one exclusive search term. The term Internet emerged as the term found in both technical and general literature from a long list of search synonyms. DIALINDEX searches over a period of time could be quite helpful in determining which term(s) might be most fertile for tracking. For complex, technological issues, it may be necessary to search with more than one term.

EXECUTIVE SUMMARY

This section offers a recap and review of the findings of this research organized by research question. Following the review of research questions, the author offers further observations and results from this research project.

1. Did references to the Information Highway (technical and highway metaphors) first appear in scientific literature?

Yes. Coverage of this issue began in computer convention proceedings, university research reports, and other scientific journals. These first mentions began in 1969-1972 then moved into the trade and industry press.

2. Was general press coverage of the Information Highway skimpy, thereby nullifying Molitor's prediction about legislation following

extensive discussion of an issue by the press?

Yes. This research did not support Molitor's prediction. The press neglected coverage until major corporations began merging in anticipation of commercialization of the Information Highway. The data suggest a breakdown in the model and a failure by the press to provide ample information for a public discussion of the issues prior to 1993. It is unclear whether this is the result of the complexity of the issue, a conflict of interest by the newspaper industry, or the press' failure to anticipate emerging issues.

3. and 4. Does Bradford's Law of Scatter identify the core journals that covered the Information Highway, and did this core of journals yield a high percentage of the total literature on the Information Highway?

This study confirmed the usefulness of Bradford's Law of Scatter in identifying key core journals, and showed that a small number of high-yield journals provide broad coverage of the Information Highway. It is neither practical nor necessary to scan 100 percent of the literature for a topic to track issues. This Law shows what the core journals are and how much of the literature they cover.

5. At what point does the coverage of an issue within an online database become significant? At what point can one determine that a topic will become an emerging issue?

In this study coverage of the Internet, a technology issue, tripled over a two-year period in the Science and Research databases. This study shows that about the time that happened, trade and industry literature began to cover the issue. When coverage within trade and industry literature tripled over the period of one year, the take-off point for the Internet seemed to occur. By the time the literature tripled in general press databases, an issues manager had missed the early "take-off" point for the Internet. Tracking growth and spread with electronic online databases and using the DIALINDEX feature would have assisted a manager in determining this point. Tracking an issue's movement from genre to genre would have provided the manager with an indication of how the Internet issue moved through various types of literature.

6. How can public relations practitioners effectively and economically take advantage of online databases for tracking emerging issues?

Since this study shows that new issues "take off" when they are discussed in trade and industry literature, issues managers might subscribe to Trade & Industry database or PTS PROMPT, or PTS Newsletter. These three had the highest number of hits within the trade and industry genre databases. Furthermore, it would make sense to monitor specific databases pertinent to an organization's industry. In addition, early notice of emerging issues may be in discussion forums on Internet or commercial services. These electronic communities may be the places future public policy issues receive their first airing.

7. How can quantitative and qualitative techniques be combined for optimal issues tracking in the electronic database environment?

This research shows how quantitative techniques (bibliometrics), while valuable for identifying core literature and tracking growth, spread, and movement of an issue, are optimized with identification of Precursor Pointers, qualitative tracking techniques. These Precursor Pointers help a manager identify important players, industries, corporations, politicians, legislation, publications and advertisements in a Precursor Environment.

8. Could an issues gopher be created online to provide organizational advantage in tracking issues in the competitive marketplace?

Yes. Construction of a web server or gopher could place a number of documents online in an easy, menu-accessible format for managers within a corporation. For a global organization, this would allow transparent access from anywhere in the world to an issues "clearinghouse."

9. How do technological concerns evolve into public issues?

This study did not support Molitor's prediction. According to this study, complex technological issues are difficult for the press to cover. The public is only now (since 1993) reading about this issue in the general press.

10. How does the level of issues significance vary from one media genre to another?

This study shows that the issue of the Internet tripled in scientific literature when coverage tripled over a two-year period. The Internet reached significance in trade and industry literature when coverage tripled within one year. The research also introduced and demonstrated a technique, the Intensity Index, for measuring the value of some articles over others. This tool can be adapted and used by issues managers in the electronic environment for quick identification of pertinent literature on a particular issue.

OBSERVATIONS FOR THE PUBLIC RELATIONS PROFESSION

Public relations professionals have an opportunity to take advantage of the emerging technology and make valuable contributions to their organizations. By optimizing issues tracking and identification of an issue's significance, the public relations practitioner can assist company management in proactive leadership, rather than being forced into a critical or crisis situation by late identification of trends and public policy issues.

Practitioners who have highly developed search skills, communication skills, and management skills, will be valued as "gold collar workers" within their organizations. Practicing public relations within the electronic environment may be the Golden Era of public relations. Electronic communication removes the gatekeeping role of the press and creates new avenues for advocacy communication. Seasoned professionals with skills in quantitative research techniques and Precursor Pointers to interpret that quantitative data will be invaluable employees in an organization.

Applications of online issues tracking might elevate issues management to its rightful place as part of the management function of public relations professionals. It is obvious that the Internet and the Information Highway are revolutionizing the communications industry. Network television, computers, cable, telecommunications,

cellular telephones, satellite technology are merging and converging. Managing an organization's communications will require highly skilled professionals.

This, of course, has serious implications for higher education. Colleges and universities will be adapting curriculum quickly and furiously to prepare skilled employees for the industry. This will require professors to keep their skills current. It will also provide an opportunity for colleges and universities to help retrain journalists and public relations professionals. It is an opportunity for higher education to show leadership and equip society for the next century.

Instead of a public relations professional using online databases for monitoring press clippings, a management professional can take advantage of online databases for providing issues identification tracking. Someone within the organization will be performing this function. Public relations professionals can move into that function, should they choose.

ISSUES FOR FURTHER RESEARCH

This study suggests many more related topics for research. The intensity index developed here might be tested on other emerging issues to determine appropriateness.

For the Internet, many legal and policy issues abound. For example, copyright, privacy, security, and antitrust issues must be resolved and addressed. The clipper chip and its implications for freedom of speech and privacy needs research from the journalism community. Digital manipulation of photography has created a new credibility crisis for journalists. With the capability for manipulation in the electronic environment, how might journalists protect their credibility and build into their codes of ethics protections for journalists?

The electronic information environment provides opportunities for higher education to train new journalists and those who need to update their skills. Communications

programs are beginning to struggle with how this is best accomplished. Resources and facilities at higher education institutions place educators in a position to provide leadership to the newspaper and public relations industries.

Because major communications corporations were obviously tracking the Internet and implications of the Information Highway for their organizations, in-depth interviews with issues managers from those organizations could provide insight into how they monitored and tracked this issue.

Just what is the "public interest" in an electronic environment in which anyone and everyone can be a publisher? How will the Communications Act of 1934 be updated to address technology advancements to come?

With John Markham of The New York Times providing early coverage of the Internet, a research study might be designed to determine how elite newspapers covered the Internet and whether they were agenda setters for other media.

It appears from this study that newspapers began coverage when mergers and acquisitions began taking place among large corporations. A study might be designed to determine if economic and financial news drive technological coverage.

During the Presidential Campaign of 1992, the Clinton-Gore team used electronic services such as CompuServe to make available speeches, to provide discussion forums, and to address questions of immediacy. A study might be designed to investigate the role of electronic technology in disseminating issues in Campaign '92.

Vice President Albert Gore, Jr. provided leadership for this issue, not only through his political leadership, but also through his writing. Articles authored by Gore appeared in the **Washington Post, Scientific American, EDUCOM Review,** and other publications. More research could be designed to determine Gore's role as a journalist in the evolution of the Information Highway

How will database publishers make their products affordable and available to a

broader clientele. Some database publishers are reconfiguring their products to attract new clients. Others are customizing their products to the needs of individual clients. Research might reveal the needs of issues managers within organizations and educators within institutions of higher education.

How might the public relations curriculum be supplemented to educate future public relations professionals? How might institutions of higher education re-educate practicing public relations professionals? Courses might be designed to accommodate these and other communications professionals who will need to update their skills.

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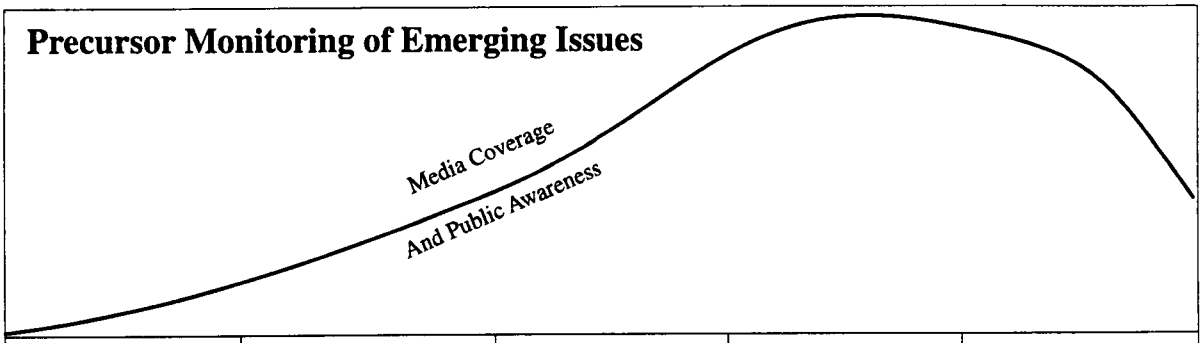
APPENDICES

APPENDIX A

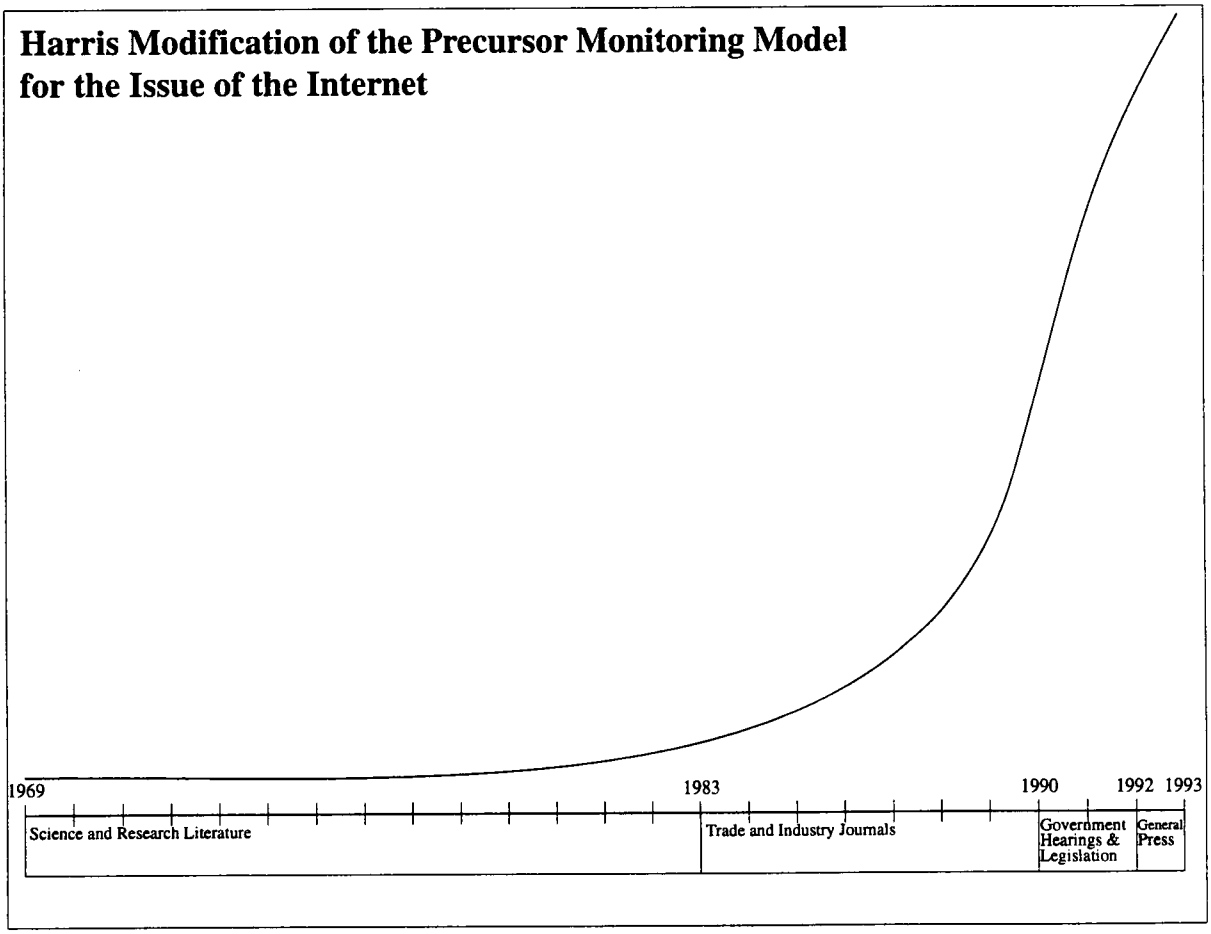
Precursor Monitoring of Emerging Issues



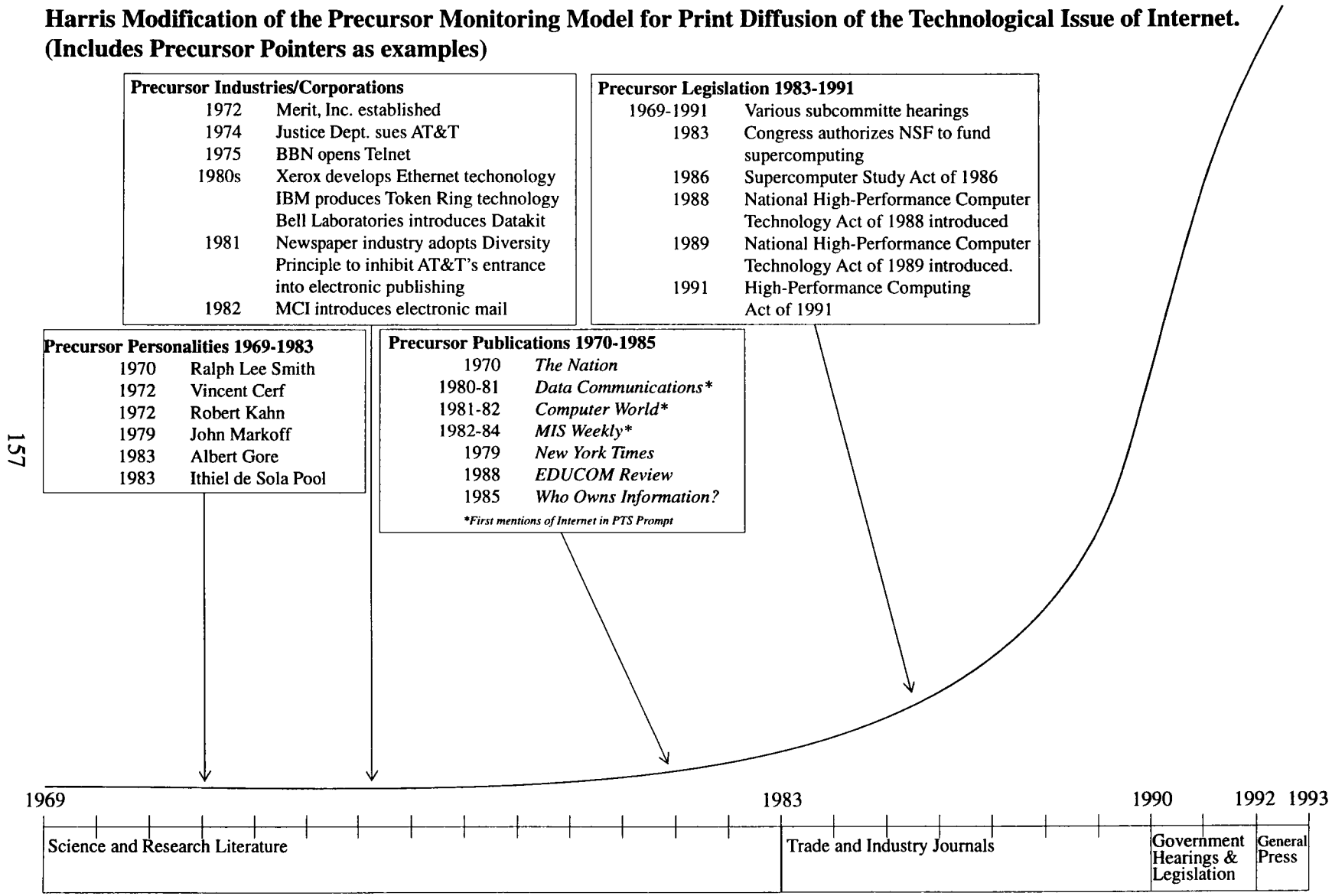
Idea Creation	Elite Awareness	Popular Awareness	Government Awareness	Enactment of New Policy
Monographs, Specialized Periodicals, Science Fiction	Trade Journals, Research Reports, Newsletters, and "Dopesheets"	News Periodicals	Legislative Hearings and Analysis	Legislative Record, Federal Register, Newsletters

From *Information and the Future: A Handbook of Sources and Strategies* by Alice Chambers Wygant and O. W. Markley, Greenwood Press 1988. p. 122

Harris Modification of the Precursor Monitoring Model for the Issue of the Internet



Harris Modification of the Precursor Monitoring Model for Print Diffusion of the Technological Issue of Internet. (Includes Precursor Pointers as examples)



APPENDIX B

```
begin 411

      13jun93 10:58:32 User077446 Session B463.1
           $0.12    0.008 Hrs FileHomeBase
     $0.12  Estimated cost FileHomeBase
     $0.12  Estimated cost this search
     $0.12  Estimated total session cost    0.008 Hrs.
File 411:DIALINDEX(tm)

DIALINDEX(tm)
   (Copr. DIALOG Info.Ser.Inc.)

*** DIALINDEX search results display in an abbreviated ***
*** format unless you enter the SET DETAIL ON command. ***
?SQset files all
   You have 358 files in your file list.
   (To see banners, use SHOW FILES command)
?SQs electronic()information()highway
 Your SELECT statement is:
   s electronic()information()highway
          Items   File
          -----   ----
              2    15: ABI/INFORM(R)_1971-1993/Jun W2
              1    16: PTS PROMT - 72-93/June 14
              1    61: LISA _ 1969 - 1992/NOV
       Examined  50 files
              1   111: National Newspaper Index(TM)_1979-1993/Jun
              1   146: WASHINGTON POST_May 1983 - 10 Jun 1993
              1   148: TRADE AND INDUSTRY INDEX_81-93/JUN W1
       Examined 100 files
              1   233: MICROCOMPUTER INDEX(TM)_1981-1993/Apr
       Examined 150 files
       Examined 200 files
              2   484: Newspaper & Periodical Abs_88-10 Jun 1993
              1   485: Accounting & Tax Database_1971-1993/Jun W2
              1   494: ST. LOUIS POST DISPATCH_ 1988 - 11 Jun 1993
              2   545: INVESTEXT_82-11 Jun 1993
       Examined 250 files
              1   610: BUSINESSWIRE - 86-93/JUN 13
              1   611: REUTERS - 87-93/JUN 13
              2   613: PRNEWSWIRE - 87/MAY-93/JUN 13
              1   630: LOS ANGELES TIMES_ 1985 - 13 Jun 1993
              3   636: PTS NEWSLETTER DATABASE_87-93/Jun. 14
              1   641: ROCKY MOUNTAIN NEWS_Jun 1989-11 Jun 1993
       Examined 300 files
              1   647: MAGAZINE ASAP_83-93/JUN W1
              4   648: TRADE AND INDUSTRY ASAP_83-93/JUN W1
              2   674: COMPUTER NEWS FULLTEXT_AUG 89- JUN 93 WK02
              1   675: COMPUTER ASAP_1983-1993/MAY W5
?             2   707: SEATTLE TIMES_ 1989 - 11 Jun 1993
              1   741: VIRG.-PILOT_1990 - 11 Jun 1993
       Examined 350 files

   23 files have one or more items; file list includes 358 files.
```

```
?s electronic()information()highway
 Your SELECT statement is:
  s electronic()information()highway
        Items   File
        -----   ----
            1     1: ERIC_1966-1994/JUN
            1     6: NTIS_1964-1994/Jul B2
           18    15: ABI/INFORM(R)_1971-1994/Jun W1
           13    16: PTS PROMT(TM)_1972-1994/Jun 20
            2    18: PTS F&S INDEX(R)_1980-1994/JunW1
            3    47: Magazine Index(TM)_1959-1994/Jun W2
            1    60: CRIS/USDA_1994/May
            1    61: LISA(Library&infoSci)_1969-1994/May
      Examined  50 files
            2    88: Academic Index(TM)_1976-94/May W4
            1   111: Natl.Newspaper Index(TM)_1979-1994/Jun
            1   146: Washington Post Online_May 1983-1994/Jun 14
            5   148: Trade & Industry Index(TM)_1981-1994/Jun W2
      Examined 100 files
            1   233: Microcomputer Abstracts(TM)_1981-1994/Jun
           13   258: AP News_Jul 1984-1994/Jun 18
            2   262: Canadian Bus. & Current Affairs_1982-1994/Mar
      Examined 150 files
            6   275: Computer Database(TM)_1983-1994/Jun W2
      Examined 200 files
            5   484: Newspaper & Periodical Abstr._1988-1994/Jun 16
            1   485: Accounting and Tax Database_1971-1994/Jun W1
            2   492: Arizona Repub/Phoenix Gaz_1986-1994/Jun 11
            1   494: St.LouisPost-Dispatch_1988-1994/Jun 17
            1   495: The Columbus Dispatch_1988-1994/Jun 17
            2   496: The Sacramento Bee_1988-1994/Jun 17
            2   497: (Ft.Lauderdale)Sun-Sentinel_1988-1994/Jun 17
            2   498: Detroit Free Press_1987-1994/Jun 16
            3   541: SEC Online(TM) Annual Repts_1994/Jul W1
            7   545: Investext(R)_1982-1994/Jun 17
      Examined 250 files
            1   570: PTS MARS(R)_1984-1994/Jun 20
            5   609: KR/T Bus.News_1989-1993/Jun 19
           10   610: Business Wire_1986-1993/Jun 19
            1   611: Reuters_1987-1993/Jun 19
            8   613: PR Newswire_1987-1993/Jun 19
            1   624: McGraw-Hill Publications Online_1985-1994/Jun 17
            4   630: Los Angeles Times_1985-1994/Jun 19
            3   631: Boston Globe_1980-1994/Jun 17
            1   632: Chicago Tribune_1985-1994/Jun 18
            2   633: Phil.Inquirer_1983-1994/Jun 17
```

12 635: Business Dateline(R)_1985-1994/Jun W2
9 636: PTS Newsletter DB(TM)_1987-1994/Jun 20
2 638: Newsday/New York Newsday_1987-1994/Jun 17
2 639: The Houston Post_1988-1994/Jun 17
2 640: San Francisco Chronicle_1988-1994/Jun 17
2 641: Rocky Mtn News_Jun 1989-1994/Jun 17
1 642: The Charlotte Observer_1988-1994/Jun 17
6 647: Magazine ASAP(TM)_1983-1994/Jun W2
25 648: Trade & Industry ASAP(TM)_1983-1994/Jun W2
2 649: Newswire ASAP(TM)_1994/Jun 17
1 650: Tax Notes Today_ 1986-1994/Jun 20
4 655: BNA Daily News_Jun 1990-1994/Jun 20
Examined 300 files
>>>I/O error in file 672
2 674: Computer News Fulltxt_AUG 1989-1994/Jun W1
6 675: Computer ASAP(TM)_1983-1994/Jun W2
2 701: Saint Paul Pioneer_Apr 1988-1994/Jun 16
1 702: Miami Herald_1983-1994/Jun 14
2 704: (Portland)The Oregonian_1989-1994/Jun 16
1 705: The Orlando Sentinel_1988-1994/Jun 17
1 706: (New Orleans)Times Picayune_1989-1994/Jun 17
3 707: The Seattle Times_1989-1994/Jun 17
1 708: (Akron)Beacon Journal_1988-1994/Jun 17
1 713: Atlanta J/Const._1989-1994/Jun 16
2 714: (Baltimore) The Sun_ Sep 1990-1994/Jun 16
1 716: Daily News Of L.A._1989-1994/Jun 16
1 719: (Albany) The Times Union_Mar 1986-1994/Apr 20
1 720: (Columbia) The State_Dec 1987-1994/Jun 17
1 721: Lexington Hrld.-Ldr._1990-1994/Jun 17
1 722: Cincinnati/Kentucky Post_1990-1994/Jun 17
1 723: The Wichita Eagle_1990-1994/Jun 17
1 731: Philad.Dly.News_1983-1994/Jun 16
1 732: San Francisco Exam._1990-1994/Jun 15
2 736: Seattle Post-Int._1990-1994/Jun 17
1 737: Anchorage Daily News_1989-1994/Jun 17
1 739: The Fresno Bee_1990-1994/Jun 17
1 740: (Memphis)Comm.Appeal_1990-1994/Jun 17
1 741: (Norfolk)Led./Pil._1990-1994/Jun 17
1 743: (New Jersey)The Record_1989-1994/Jun 17
1 746: Time Publications_1985-1994/Jun 06

74 files have one or more items; file list includes 348 files.
One or more terms were invalid in one file.

APPENDIX C

TIMELINE

1969

Dept. of Defense funds ARPANET

October 1969 — "The Future of Broadband communications" is filed with the FCC by the Industrial Electronic Division of the Electronics Industry Association. It predicts a "revolution in communication" which "will profoundly change the way society is structured."

First RFC (Request for Comment): Host Software" by Steve Crocker

1970

ALOHAnet developed by Norman Abrahamson, University of Hawaii

ARPANET nodes use Network Control Protocol (NCP)

May 18, 1970 — Ralph Lee Smith's article "The Wired Nation" is published in a special issue of The Nation in which he envisions cable television as America's "national highway." He discusses "video telephone" service as an "electronic highway."

1971

ARPANET increases to 15 nodes

OCLC is established

1972

MERIT established

International Conference on Computer Communications organized by Bob Kahn with demonstration of ARPANET

InterNetworking Working Group (INWG) created to address need for establishing agreed upon protocols chaired by Vinton Cerf

1973

First international connections to ARPANET established to England and Norway

1974

Justice Department sues AT&T for antitrust violations

1975

BBN opens Telnet, commercial version of ARPANET

1979

Meeting between University of Wisconsin, DARPA, NSF, and computer scientists from many universities to establish a Computer Science Department research network

1980

May 5, 1980 — FCC issues Computer II decision permitting AT&T to become an electronic publisher through a subsidiary starting in 1983

1981

February 4 — American Newspaper Association (ANPA) Board of Directors adopts the "diversity principle" encouraging competition among information providers

BITNET (Because It's Time Network) begins at City University of New York

1982

INWG establishes the Transmission Control Protocol (TCP) and Internet Protocol (IP) for ARPANET (commonly known as TCP/IP leading to one of the first definitions of an "internet" as a connected set of networks--particularly those using TCP/IP and Internet as connected TCP/IP internets

TCP/IP becomes standard for Department of Defense (DOD)

January 8 — Justice Department tentatively settles 1974 suit allowing AT&T into electronic publishing, but barring the RBOCs from doing so

August 24 — U.S. District Judge Harold H. Greene signs a new consent decree in which the "diversity principle" becomes law

MCI becomes first U.S. telecom to offer all forms of communications services: voice, telex, fax, high-speed data and electronic mail services

MCI becomes first long distance company to introduce electronic mail. MCI Mail deploys first single-mode fiber optic system capable of transmitting voice, data, or video information at 405 million bits per second (bps)

1983

NSFNET funded by Congress

1984

Number of Internet hosts breaks 1,000

1986

June 24 — Senator Albert Gore introduces the Supercomputer Network Study Act of 1986 requiring the White House Office of Science and Technology to report to Congress on how the government could promote supercomputing and high-speed computer networking

August 21 — Supercomputer Network Study Act becomes law

MCI introduces the world's first 810 megabit fiber optic link for commercial communications traffic

1987

National Science Foundation (NSF) signs a cooperative agreement to manage the NSFNET backbone with Merit Network, Inc. (IBM and MCI involvement was through an agreement with Merit)

100th RFC (Request for Comments) issued

Number of Internet hosts breaks 10,000

Number of BITNET hosts breaks 1,000

September 10 — Judge Greene authorizes Bells to perform "gateway" services for videotext

November 20 — The Office of Science and Technology Policy (OSTP) issues **A Research and Development Strategy for High Performance Computing** recommending a network linking government, industry, and higher education

December	"A Research and Development Strategy" released by the OSTP
	1988
	MCI introduces first 1.8 gigabit per second transmission
August 11	Senator Gore chairs a hearing of the Subcommittee on Science, Technology, and Space of the Senate Commerce Committee on "Computer Networks and High-Performance Computing"
October 19	Senator Gore introduces The National High-Performance Computing Act of 1988, which included Title II, National Research Computer Network, and Title III, National Information Infrastructure
November 4	Worm in military computers disrupts systems nationwide
November 8	FBI launches investigation in computer virus case
December 5-7	The Library of Congress Network Advisory Committee holds a joint meeting with EDUCOM on "Connecting the Networks." A major focus" the proposed National Research and Education Network (NREN)
	1989
	Number of Internet hosts breaks 100,000
	NSFNET backbone upgraded to T1 (1.544 Mbps)
January	The American Library Association's Legislation Committee places NREN on its Midwinter Meeting agenda
May 18	Senator Gore introduces the National High-Performance Computer Technology act of 1989. Title II is renamed the National Research and Education Network. He calls the National Information Infrastructure in Title III a "national digital library."
June	ALA begins coverage of NREN legislation in two publications
June 20	Rep. Doug Walgren chairs a Subcommittee on Science, Research, and Technology of the House Science, Space, and Technology Committee hearing on the U.S. Supercomputer Industry
June 21	The Senate Commerce, Science, and Transportation Subcommittee on Science, Technology, and Space holds hearings on Senator Gore's legislation
August 3	The National High-Performance Computer Technology Act of 1989 is introduced in the House
September 8	President George Bush's science advisor, Allan Bromley, issues a development plan for NREN in The Federal High Performance Computing Program
October 4	The Subcommittee on Telecommunications and Finance of the House Energy and Commerce Committee holds a hearing on "Networks of the Future"
November 21	Senators Johnston, Gore, and McClure introduce the Department of Energy High-Performance Computing Act
	1990
	ARPANET ceases

	Online Access magazine begins publishing as a quarterly
	Electronic Frontier Foundation (EFF) founded by Mitch Kapor
January 9	First relay between a commercial electronic mail carrier (MCI Mail) and the Internet through the Corporation for the National Research Initiative (CNRI)
January 10	The ALA Council endorses NREN
March	NSFNET and the European Academic Supercomputer Initiative Network link internationally
April 3	U.S. Court of Appeals upholds long-distance and manufacturing restrictions but disagrees with Judge Greene on information services and remands the case for retrial
July 10	The Subcommittee on Defense Industry and Technology of the Senate Armed Services Committee approves the Defense Department bill with $30 million for a high-performance computing initiative at the DARPA (Defense Advanced Research Projects Agency)
October	Congress passes the Defense Department Appropriations bill which includes $20 million for supercomputing and high-speed networking at DARPA
	1991
	WAIS (Wide-Area Information Service) released by Thinking Machines Corporation
	Gopher released by the University of Minnesota
January 24	Senator Gore and 17 co-sponsors introduce the High-Performance Computing Act of 1991
February 5	President George Bush's budget includes a High-Performance Computing and Communications Initiative for a $149 million increase in federal investment in computing research
July 25	Judge Greene lifts restrictions on information services but orders stay of his own ruling
October 7	Appeals Court lifts Greene's stay, freeing Bells to offer information services over their own lines
October 8	Newspapers begin active lobbying efforts in support of U.S. Rep. Jim Cooper's legislation to reduce RBOCs' advantage in telecommunications
November 20, 22	The House and Senate approve a compromise version of the High-Performance Computing Act of 1991
December 9	President Bush signs the High-Performance Computing Act of 1991, which creates NREN and includes full funding ($232.2 million) for the DARPA's High-Performance Computing Program
	1992
	The Internet Society is chartered
	World Wide Web (WWW) is released by CERN

Number of Internet hosts breaks 1 million

NSFNET backbone upgraded to T3 (44.736 Mbps)

Twelve computer vendors joined together in the Computer Systems Policy Project (CSTP) changing the concept of the NREN to the NII. Participants included Apple, AT&T, Compaq, Control Data, Cray, DEC, Hewlett Packard, IBM, Silicon Graphics, Tandem, Unisys, and Sun.

Spring — First book released electronically by McGraw Hill's electronic publications line, PREMIS

March 9 — Interactive Multimedia Association creates an Intellectual Property Task Force

May 7 — Rep. Jack Brooks introduces bill blocking Bells from entering the information business based on antitrust issue

May 15 — Brian Kahin and Bruce McConnell present "Towards a Public Metanetwork" at the Columbia Institute for Tele-Information

July 1 — House Judiciary Committee passes Brooks bill to govern the REBOCs' role in information services

1993

Newspaper Association of America and Bell representatives work toward a legislative settlement

InterNIC created by NSF to provide specific Internet services:
- directory and database services with (AT&T)
- registration services (Network Solutions)
- information services (General Atomics/CERFnet)

U.S. White House goes online
- President Bill Clinton: president@whitehouse.gov
- Vice President Albert Gore: vice-president@whitehouse.gov
- First Lady Hillary Clinton: root@whitehouse.gov

Internet Talk Radio begins broadcasting

United Nations and World Bank come online

AT&T releases its "You Will" advertising campaign about the Information Superhighway

January — **WIRED** magazine hits newsstands

July — U.S. National Information Infrastructure Act passes

September — **Time** magazine goes online through America On Line (AOL)

September — **Internet World** magazine goes from obscure newsletter to glossy newsstand magazine

September 15 — Information Infrastructure Task Force publishes **The National Information Infrastructure: Agenda for Action**

December 21 — Vice President Gore outlines administration telecommunications policies in a speech at the National Press Club

1994

2 million computers accessible over Internet representing 1,000 four-year ear colleges and universities, 100 community colleges, 1,000 U.S. high schools, 300 U.S. academic libraries, 15,000 regional, state, and local U.S. networks, and 6,300 foreign networks in 100 countries

Peak month NSFNET traffic reaches 30 billion packets

NASA provides T3 services to Ames Research Center and Goddard Space Flight Center through direct connection to NSFNET

NASA launches its Advanced Communications Technology Satellite

National Institute of Health (NIH) and NSF fund 15 "Medical Connections" grants for academic medical centers and consortia to connect to the Internet

NSF and ARPA establish 5 operational "gigabit" testbeds

Jan 1 — MCI begins initial Network MCI advertising campaign package about the Information Superhighway

January 11 — Superhighway Summit, UCLA with participants from many industries. Vice President Gore outlines administrative policies regarding telecommunications

January 18 — High Internet usage reported after Los Angeles area earthquake

January — **HOTT (Hot Off the Tree)** publication founded

U.S. Senate and House provide information servers

First flower shop takes orders via the Internet

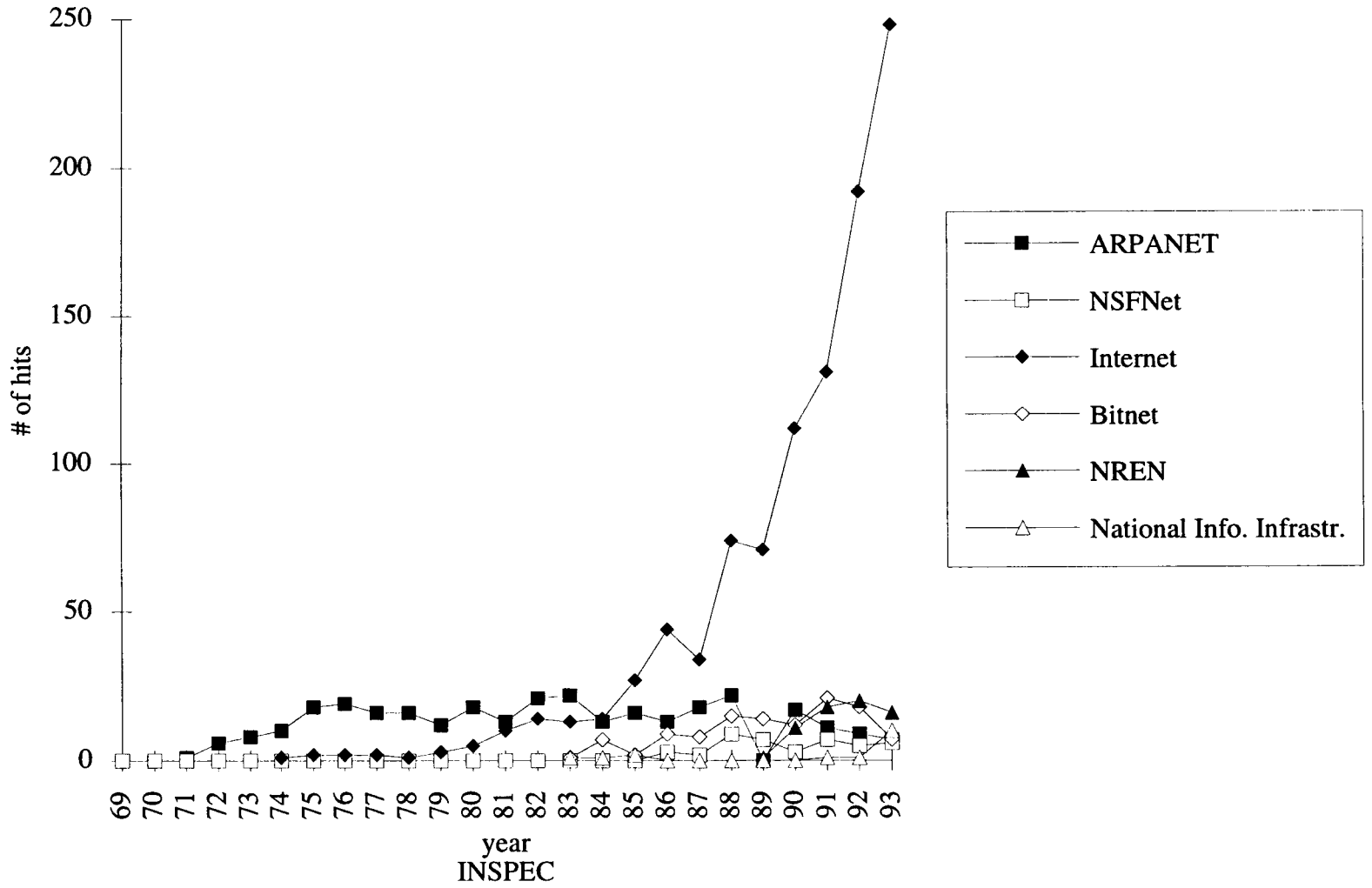
March 21 — Vice President Gore discusses the Global Information Infrastructure (GII) at the International Telecommunications Union

May 25 — **Time** magazine goes online with its Daily News Service

May — **The Freedom Forum** publishes a special issue for journalists on the Information Superhighway: "Road to the Future"

June — Two millionth visitor logged onto **Time** magazine through AOL

APPENDIX D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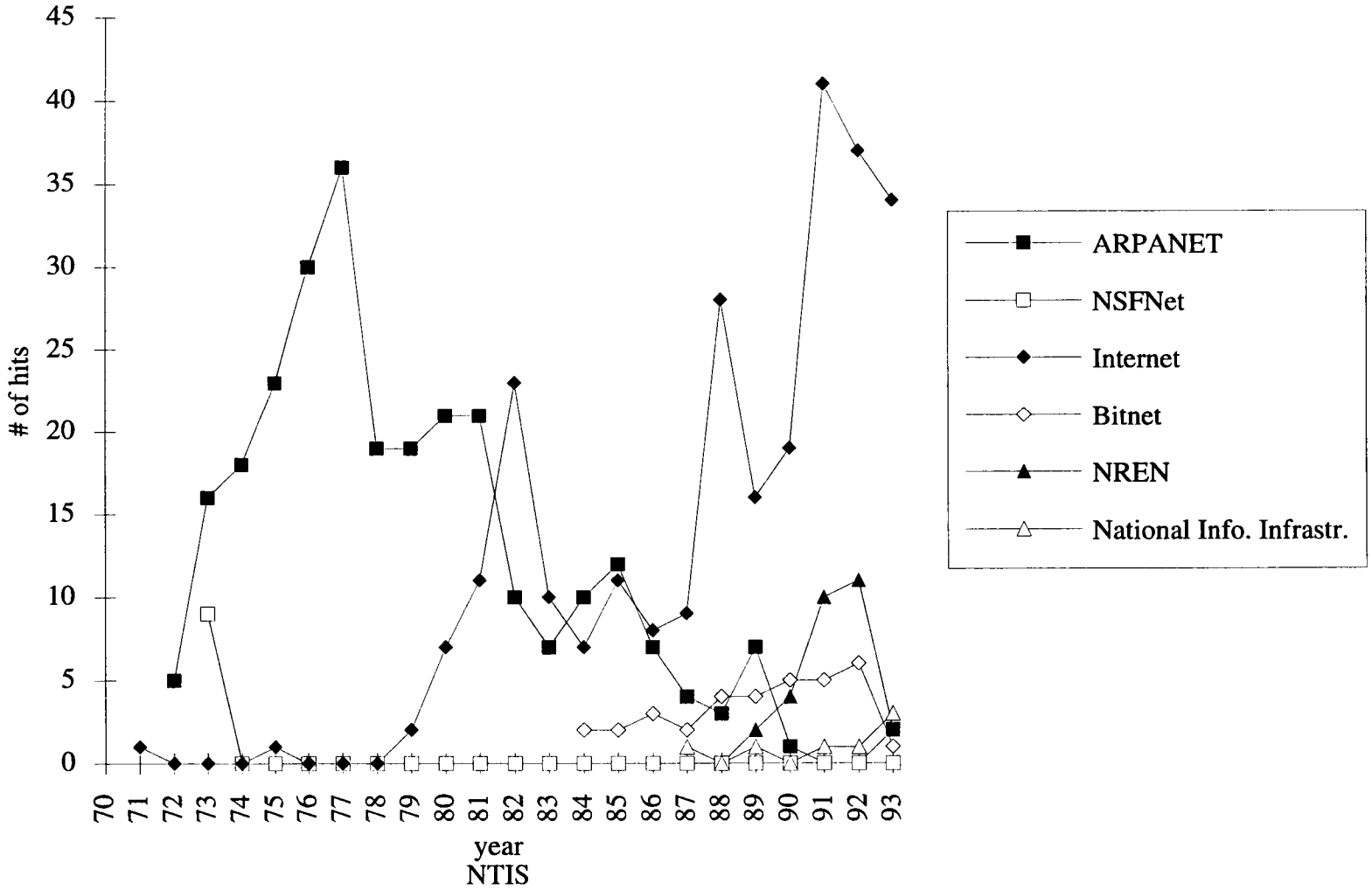
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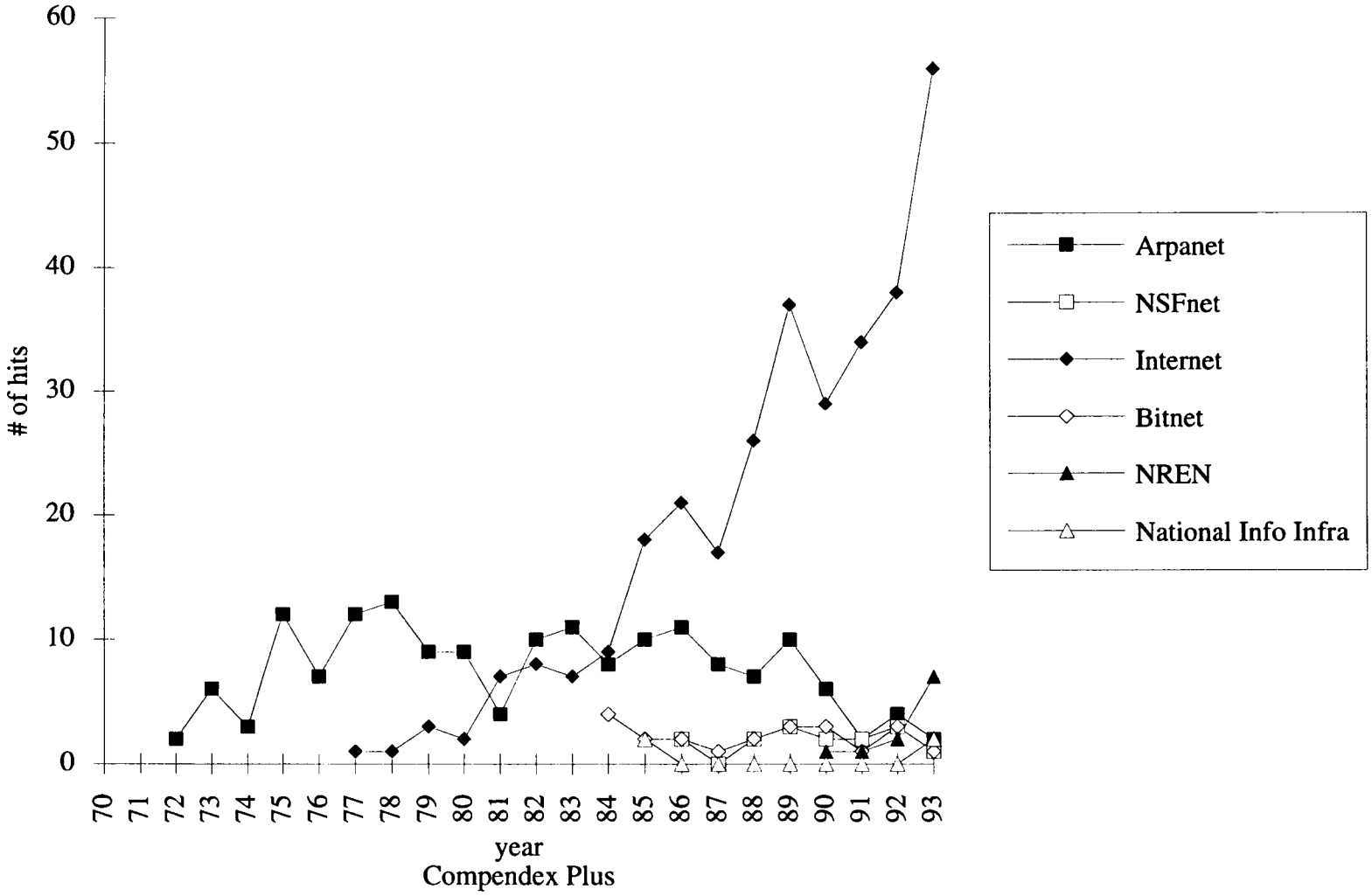
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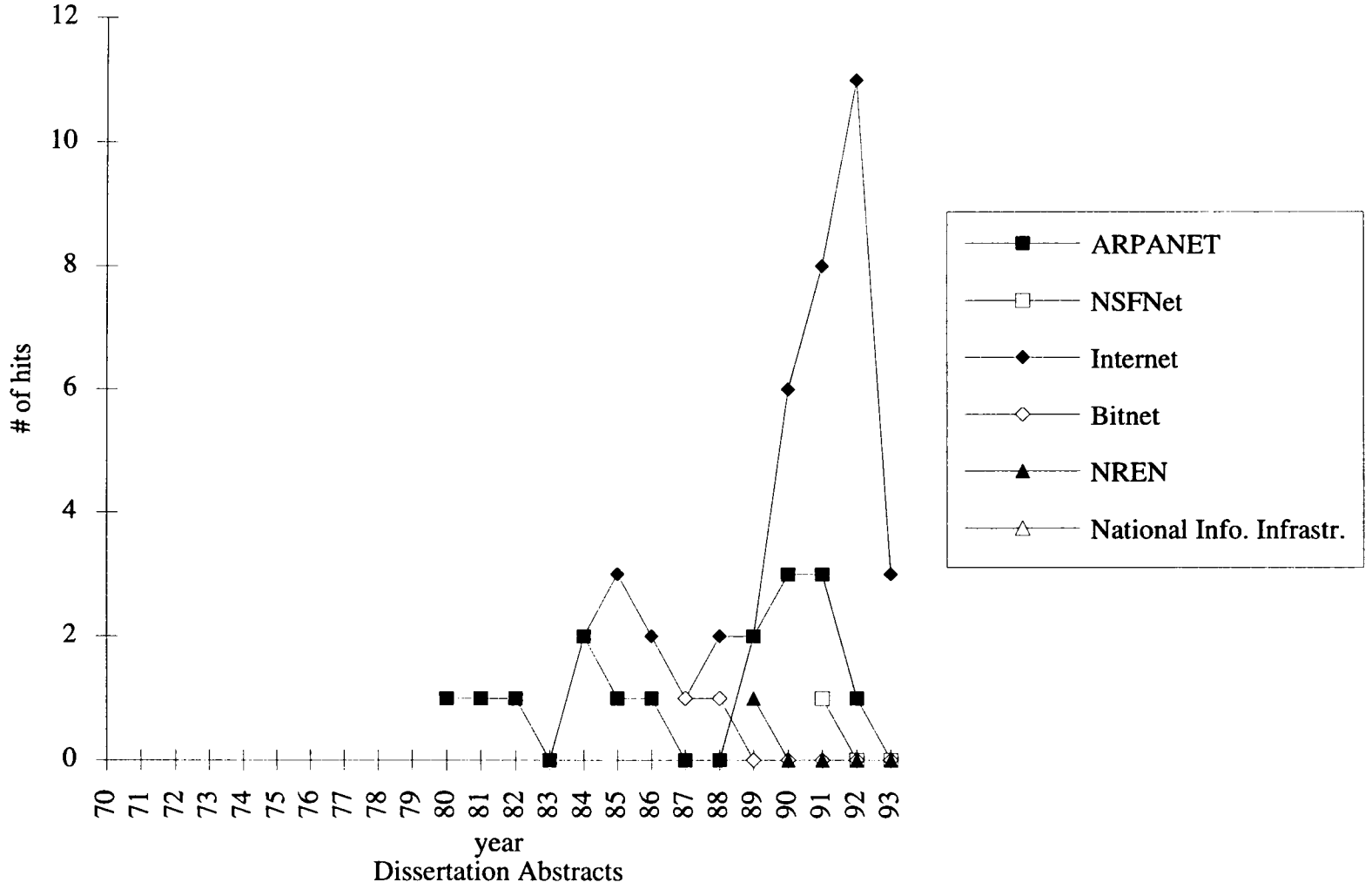
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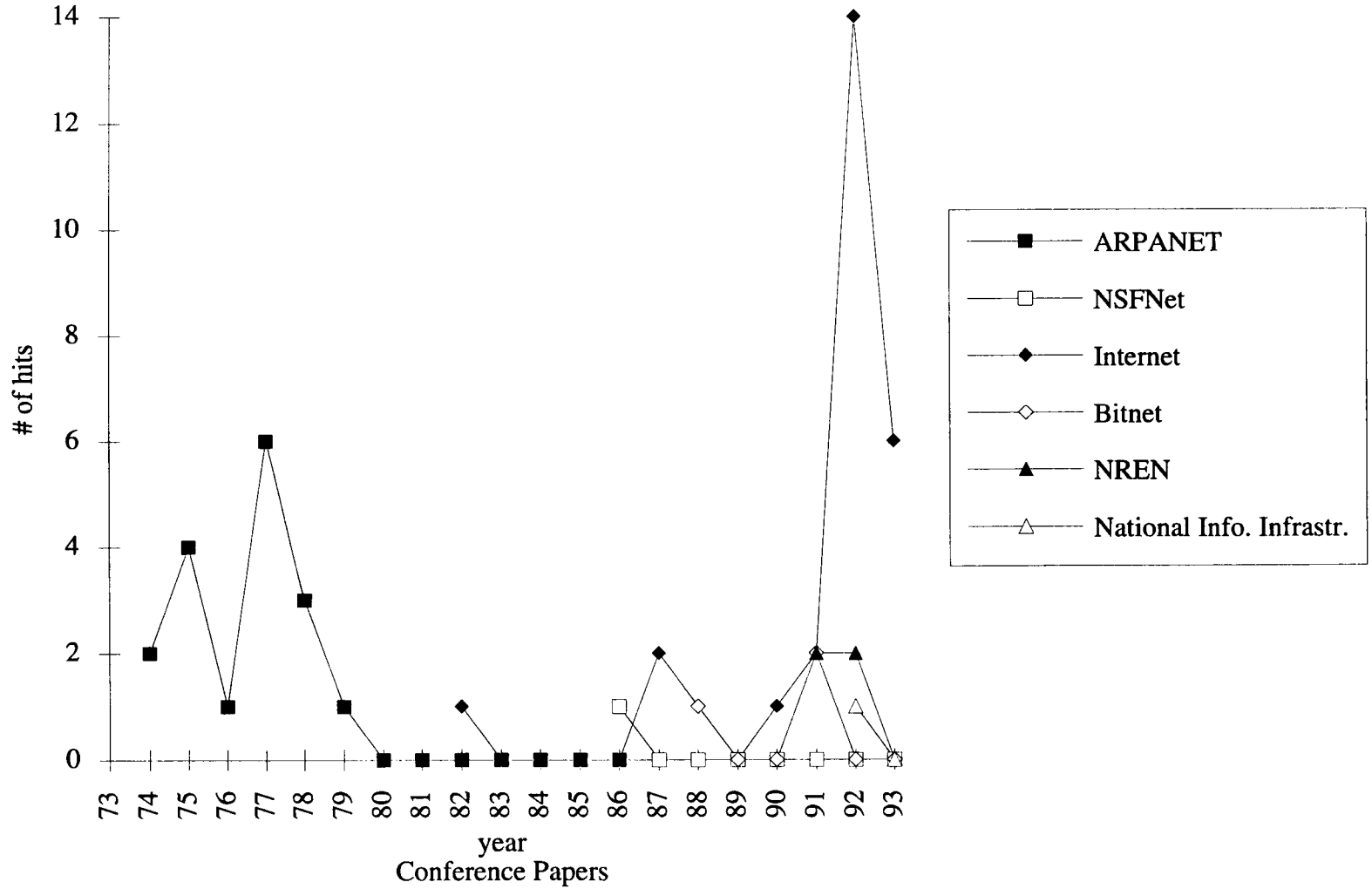
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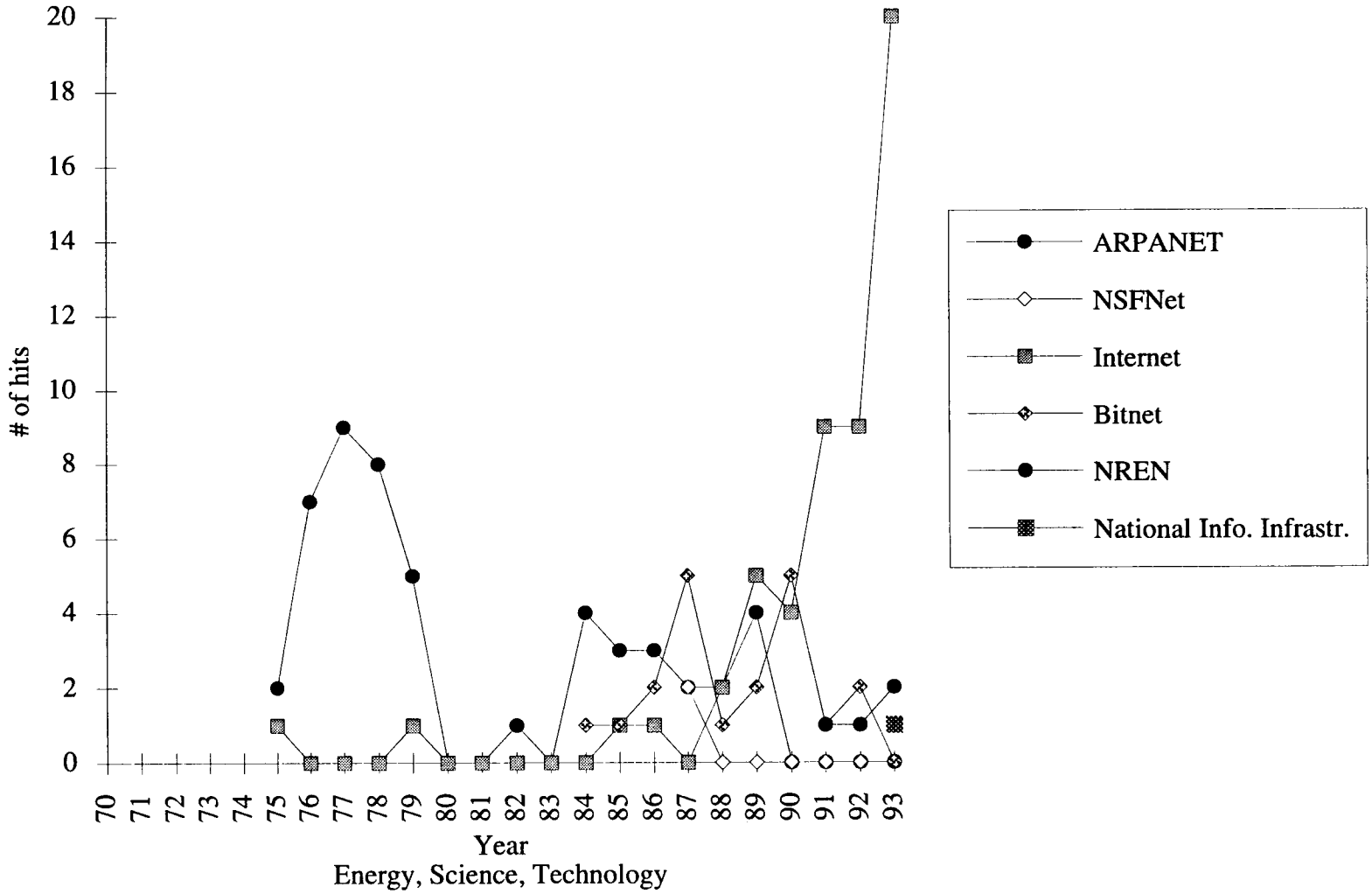

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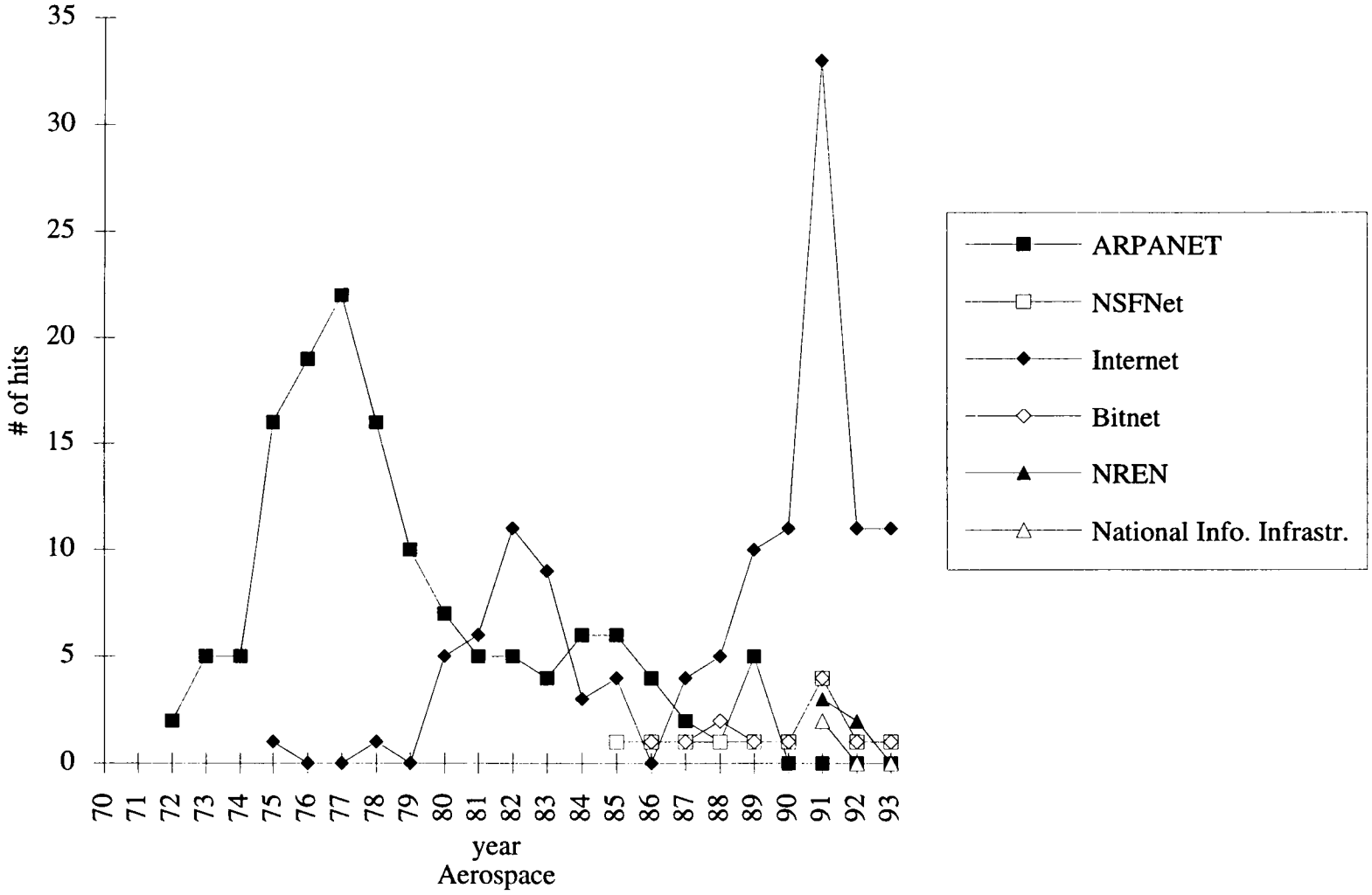
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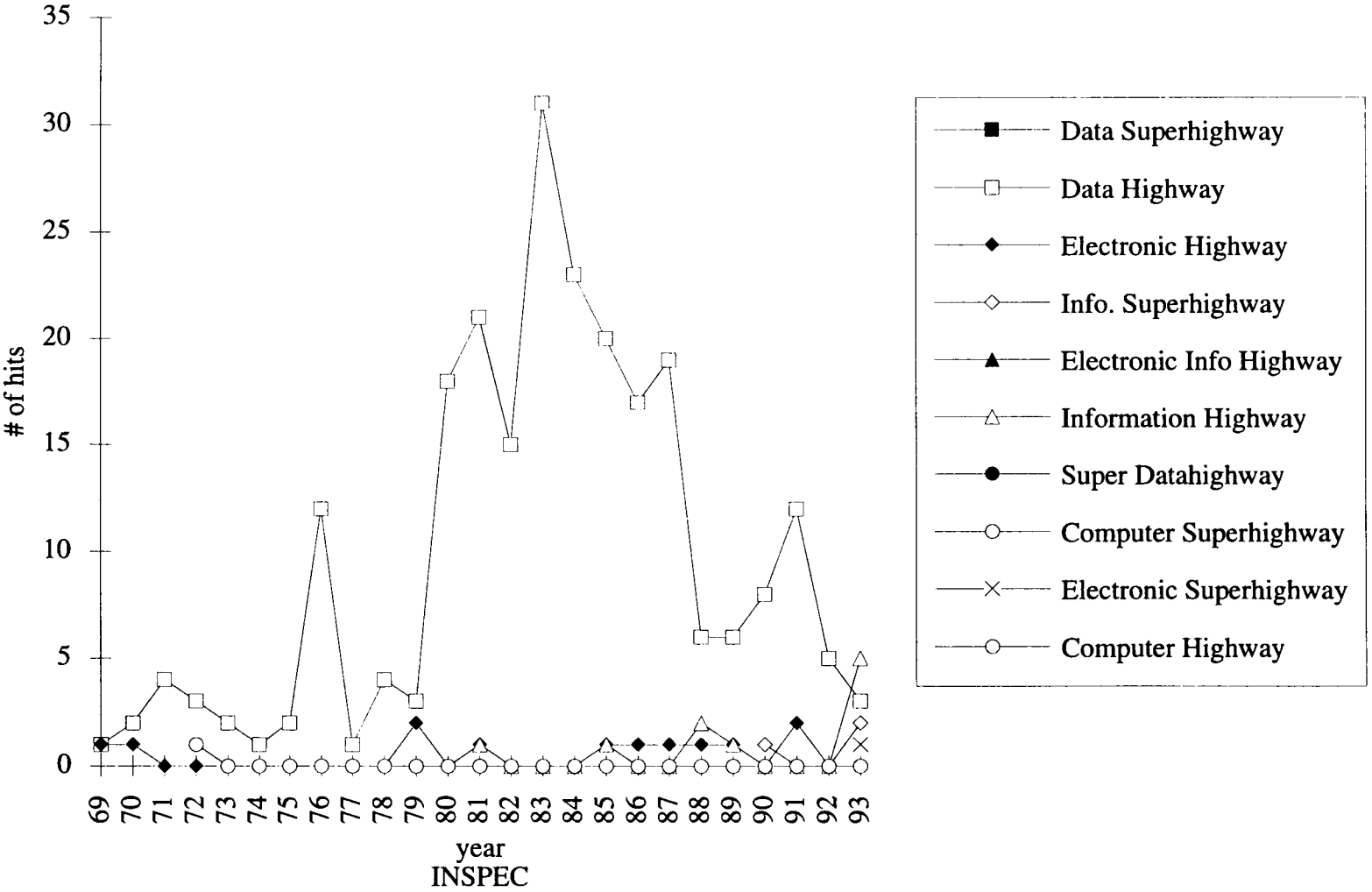
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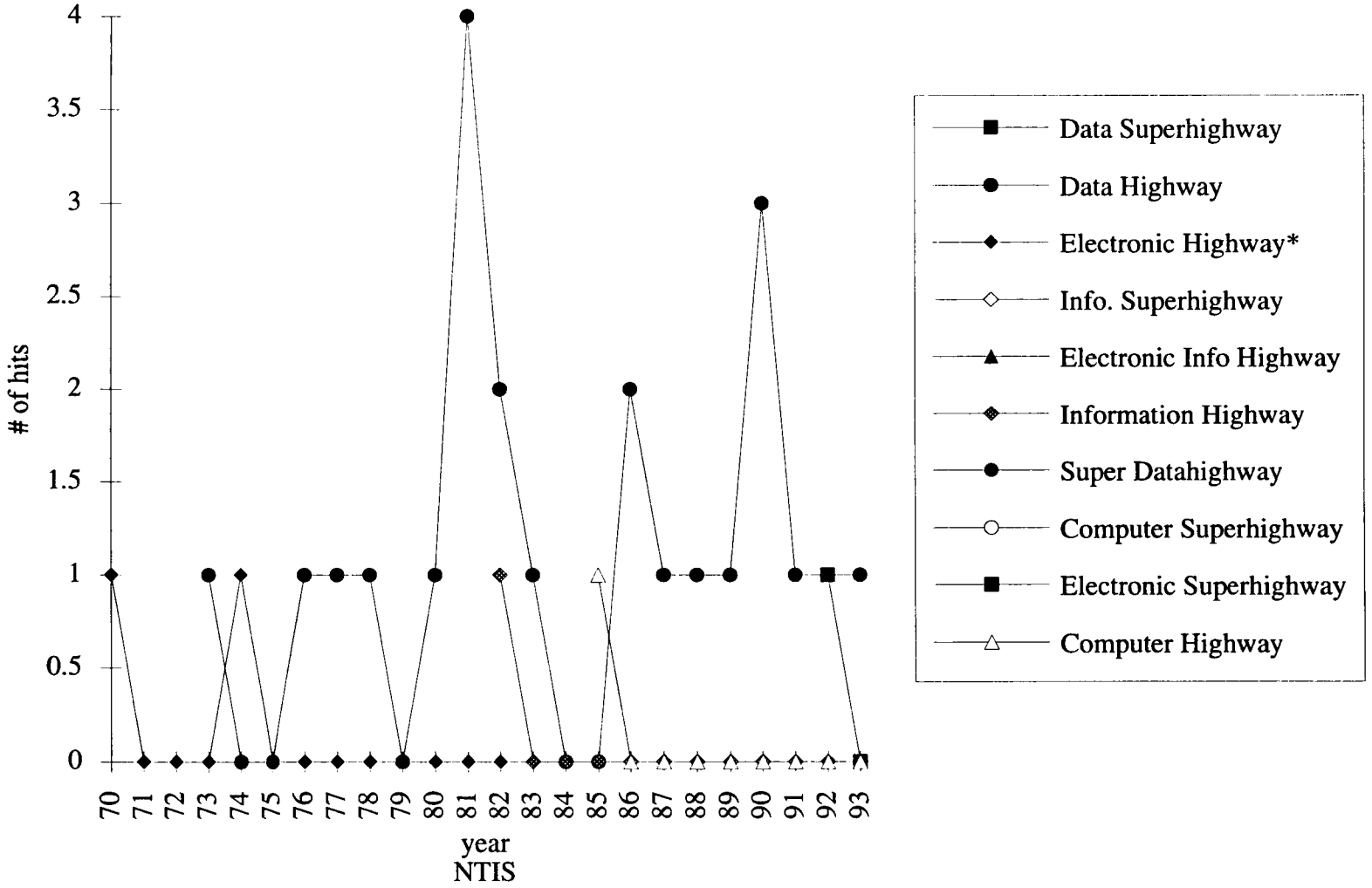
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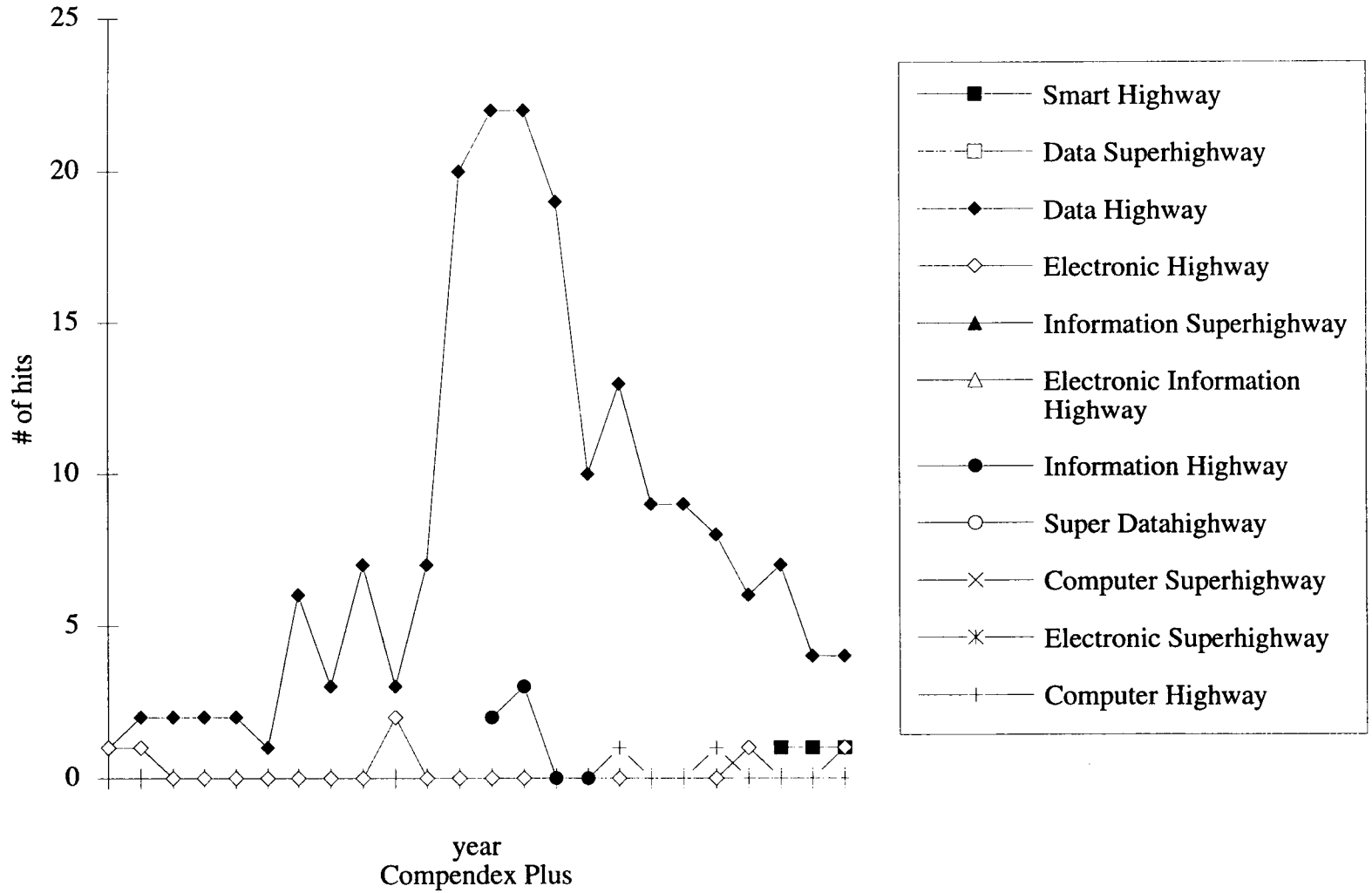
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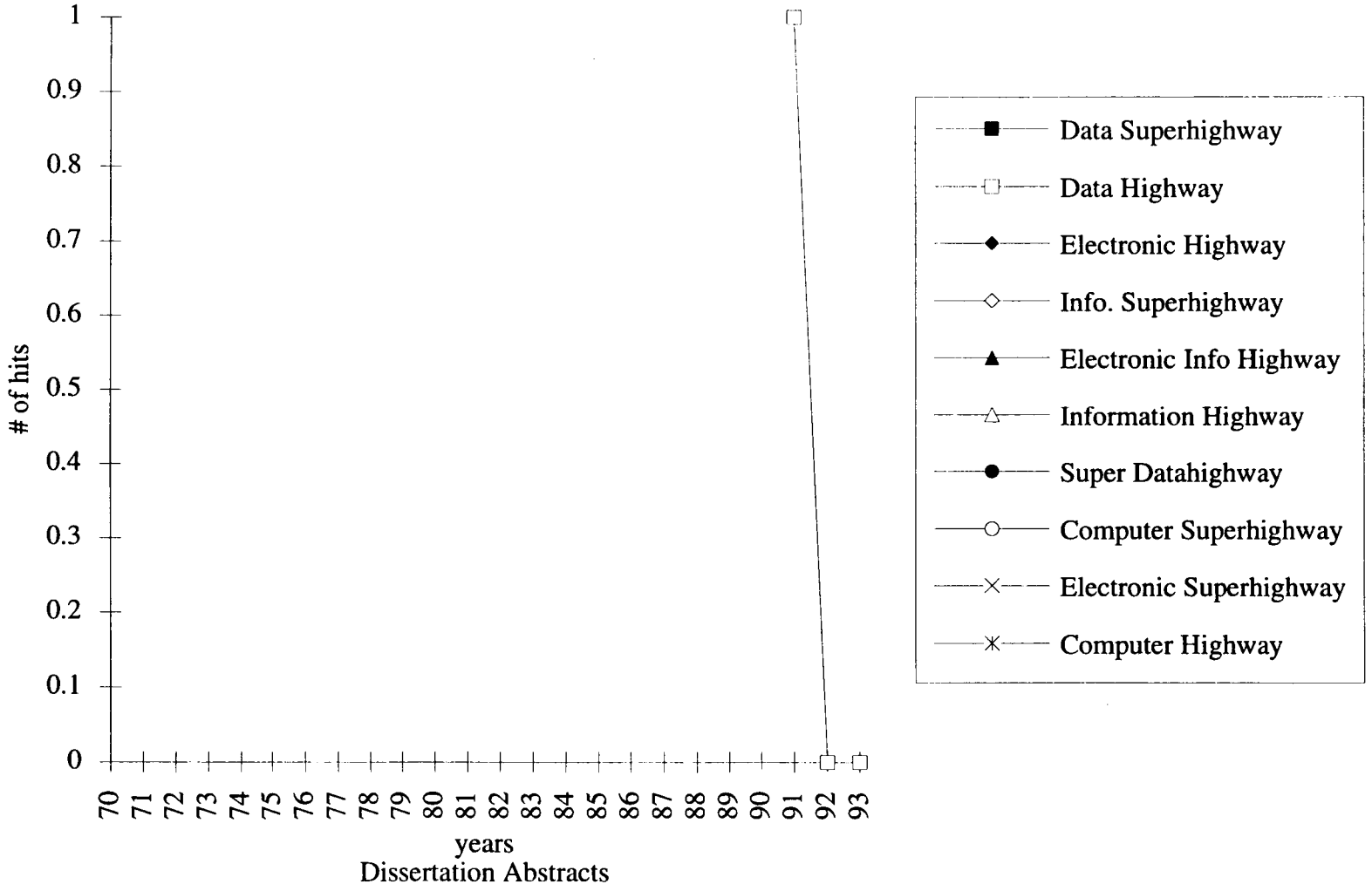
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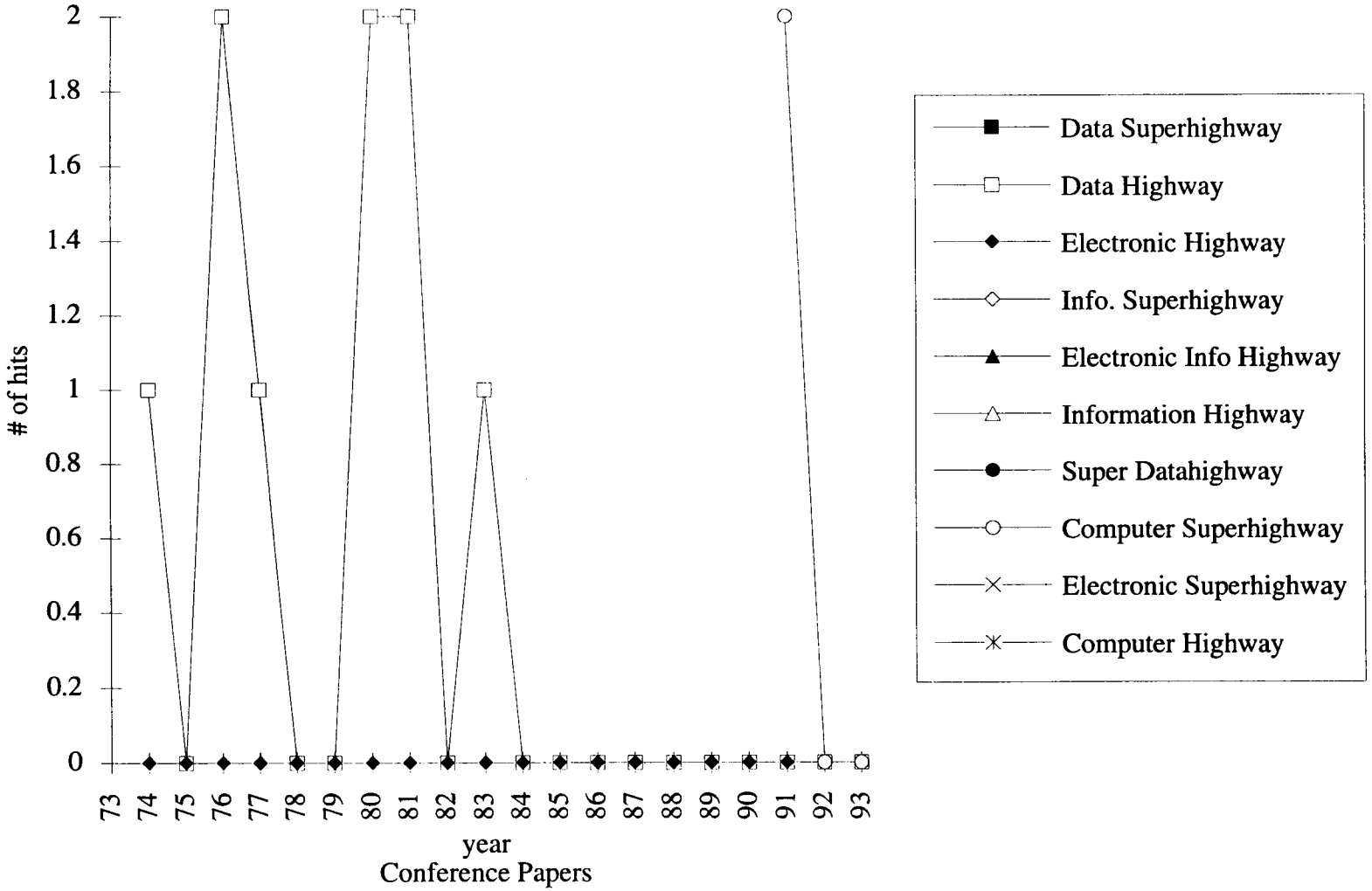
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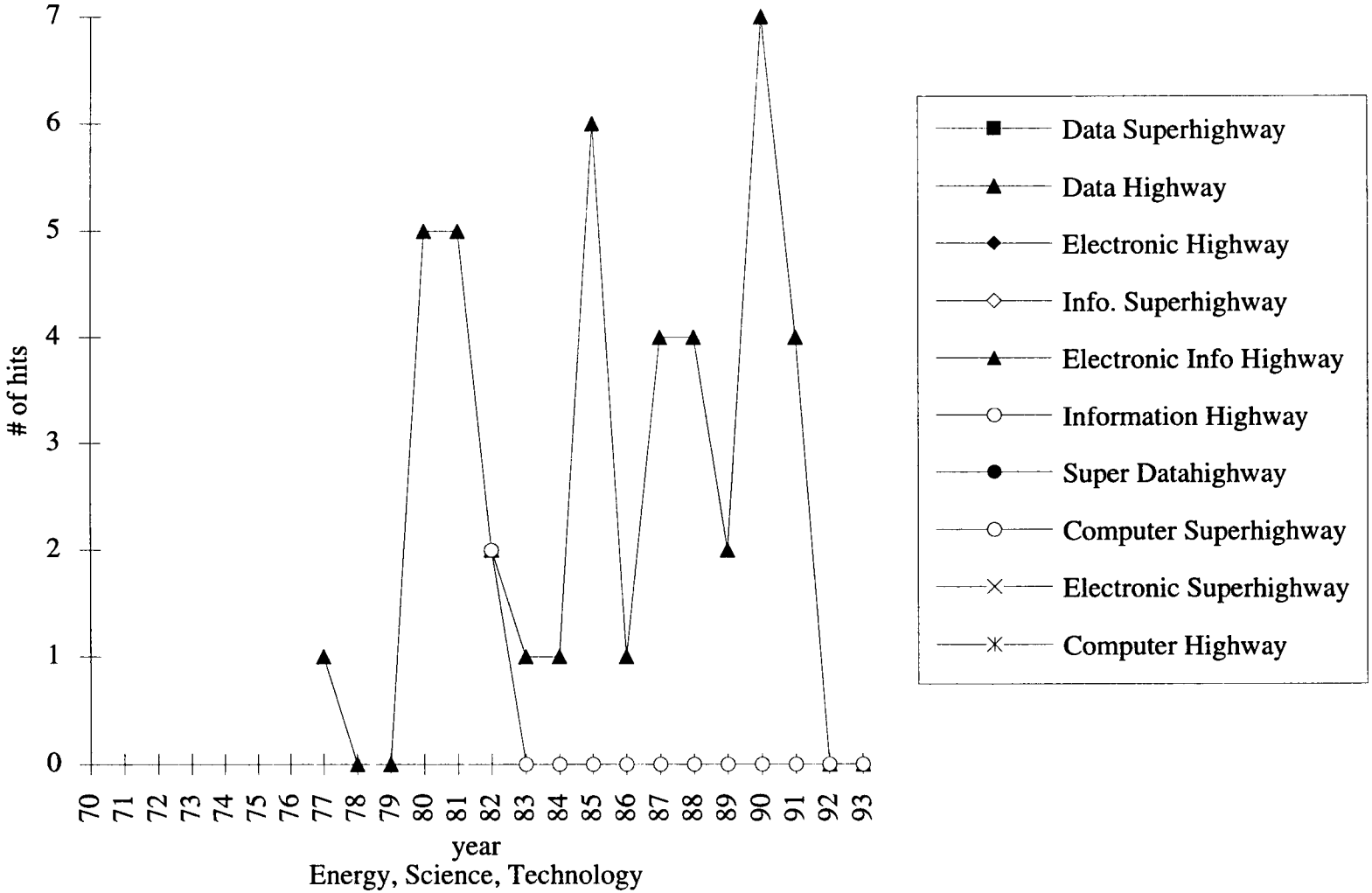
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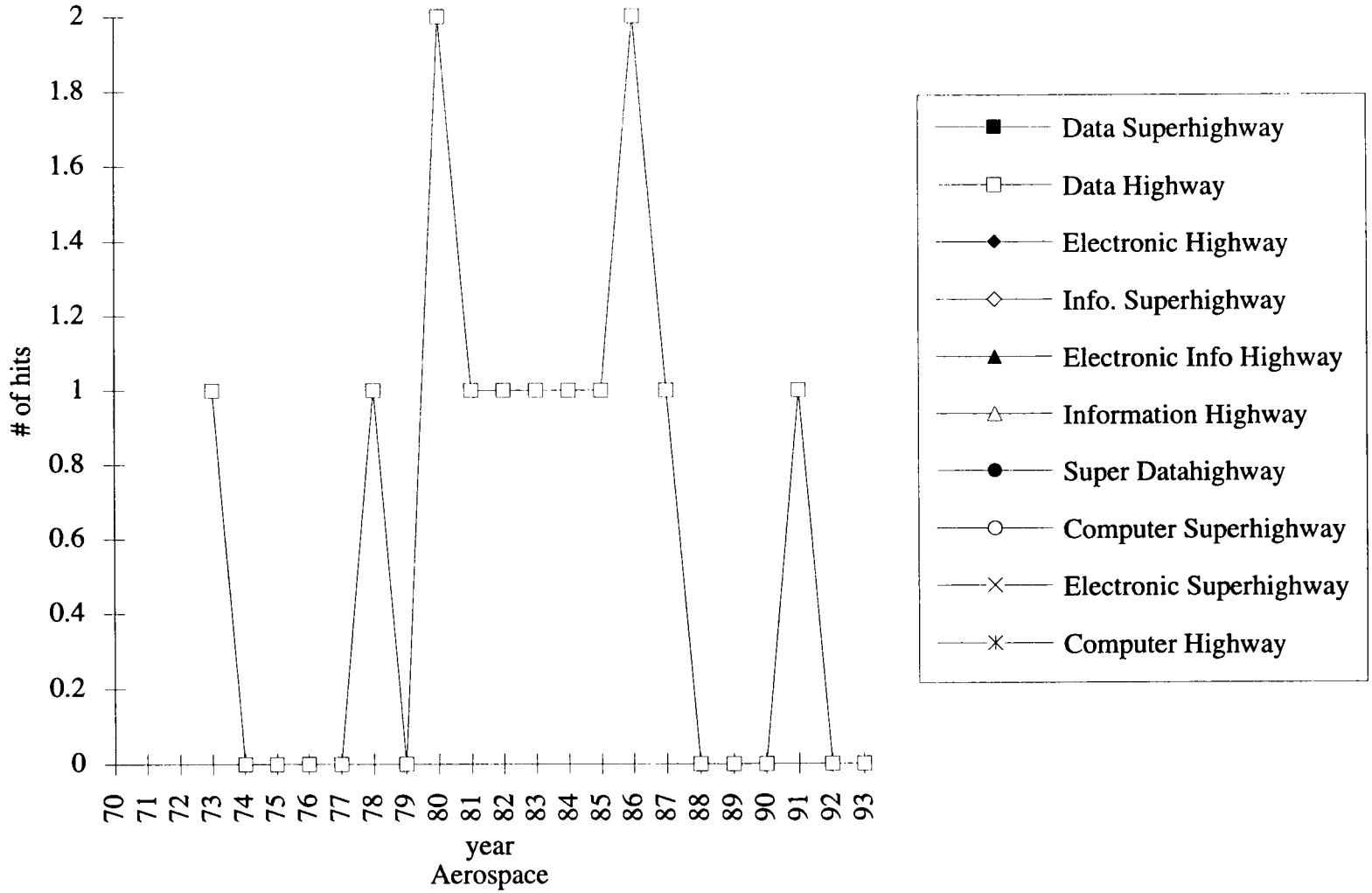
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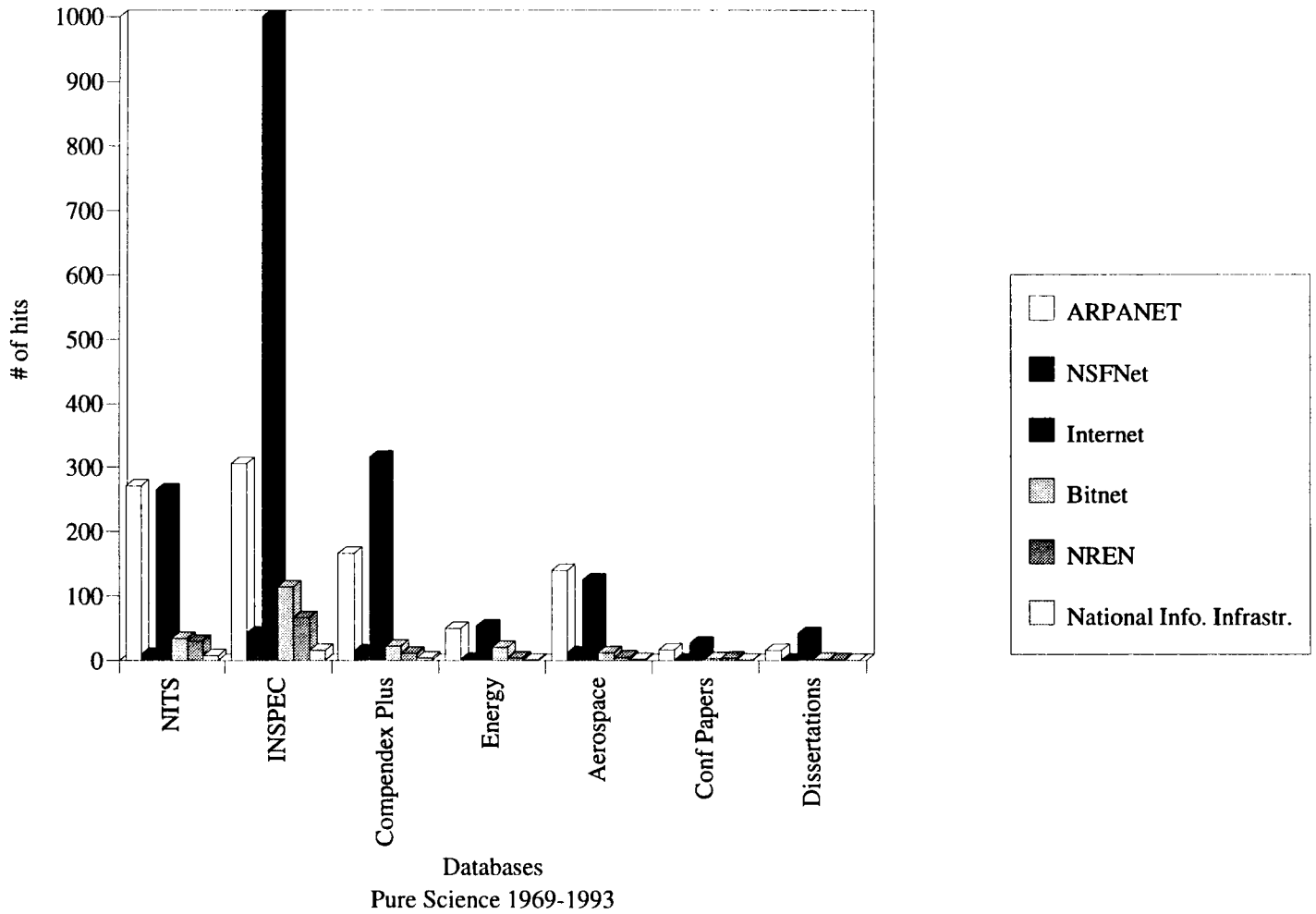

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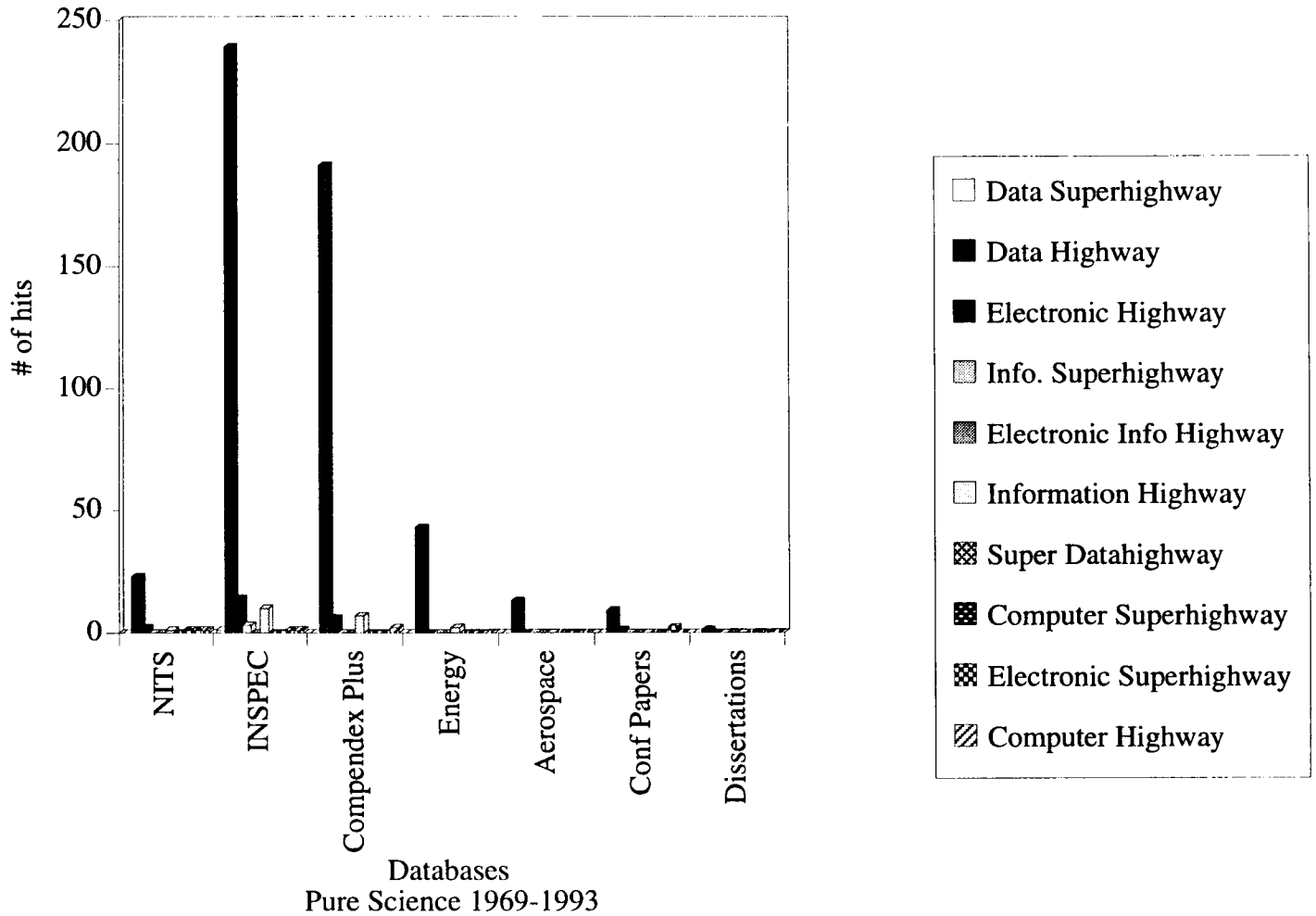
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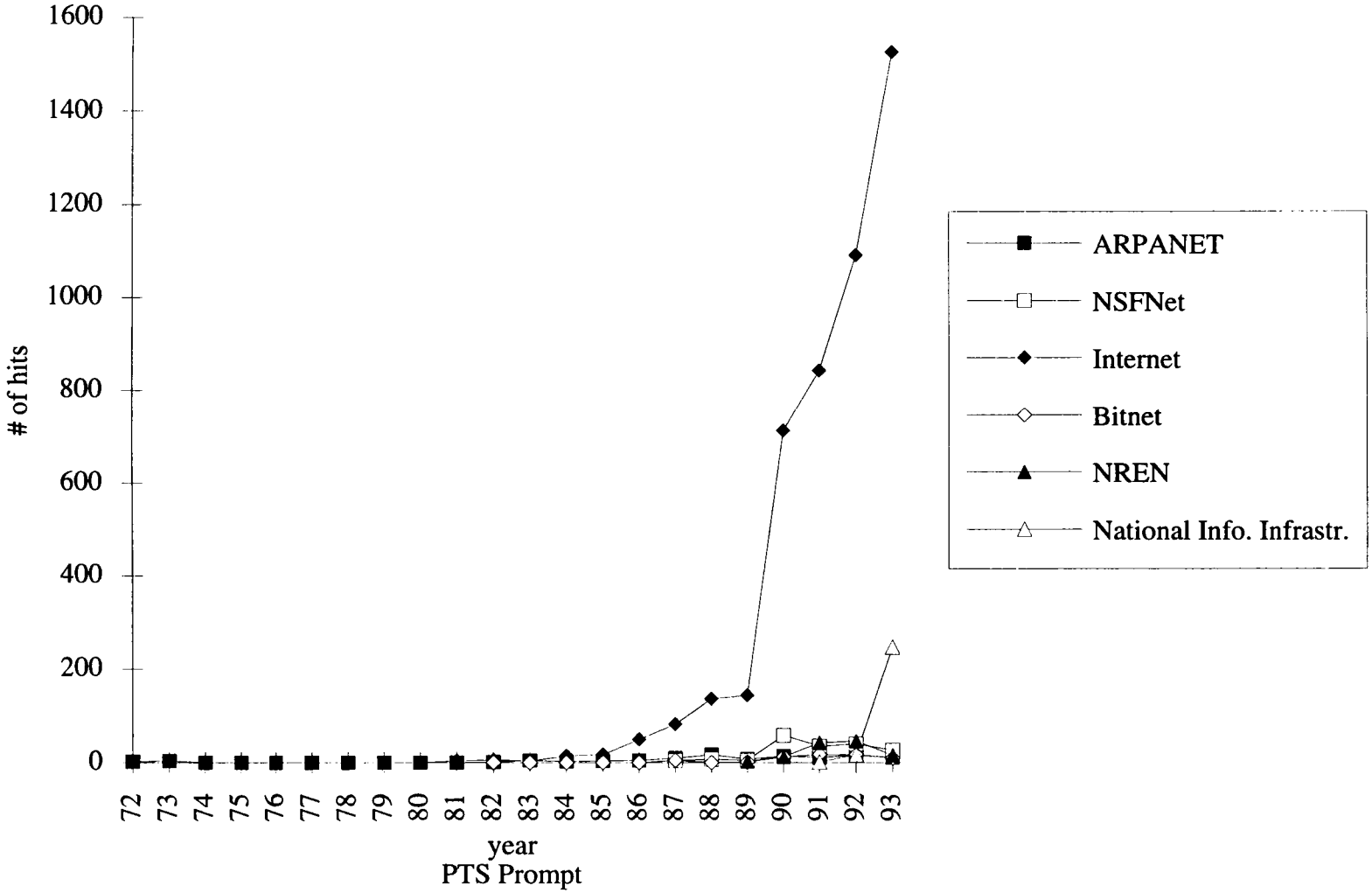
APPENDIX E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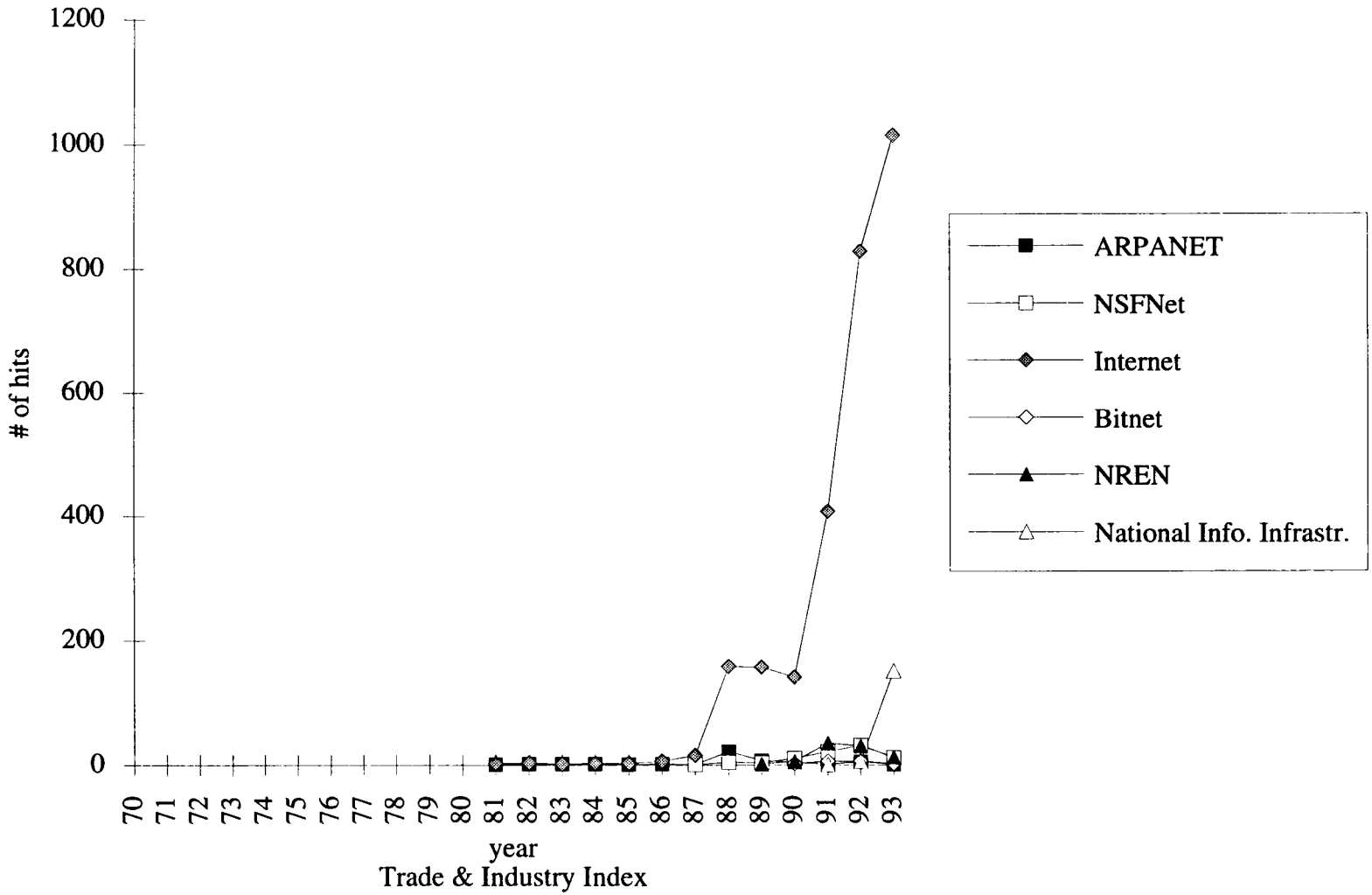
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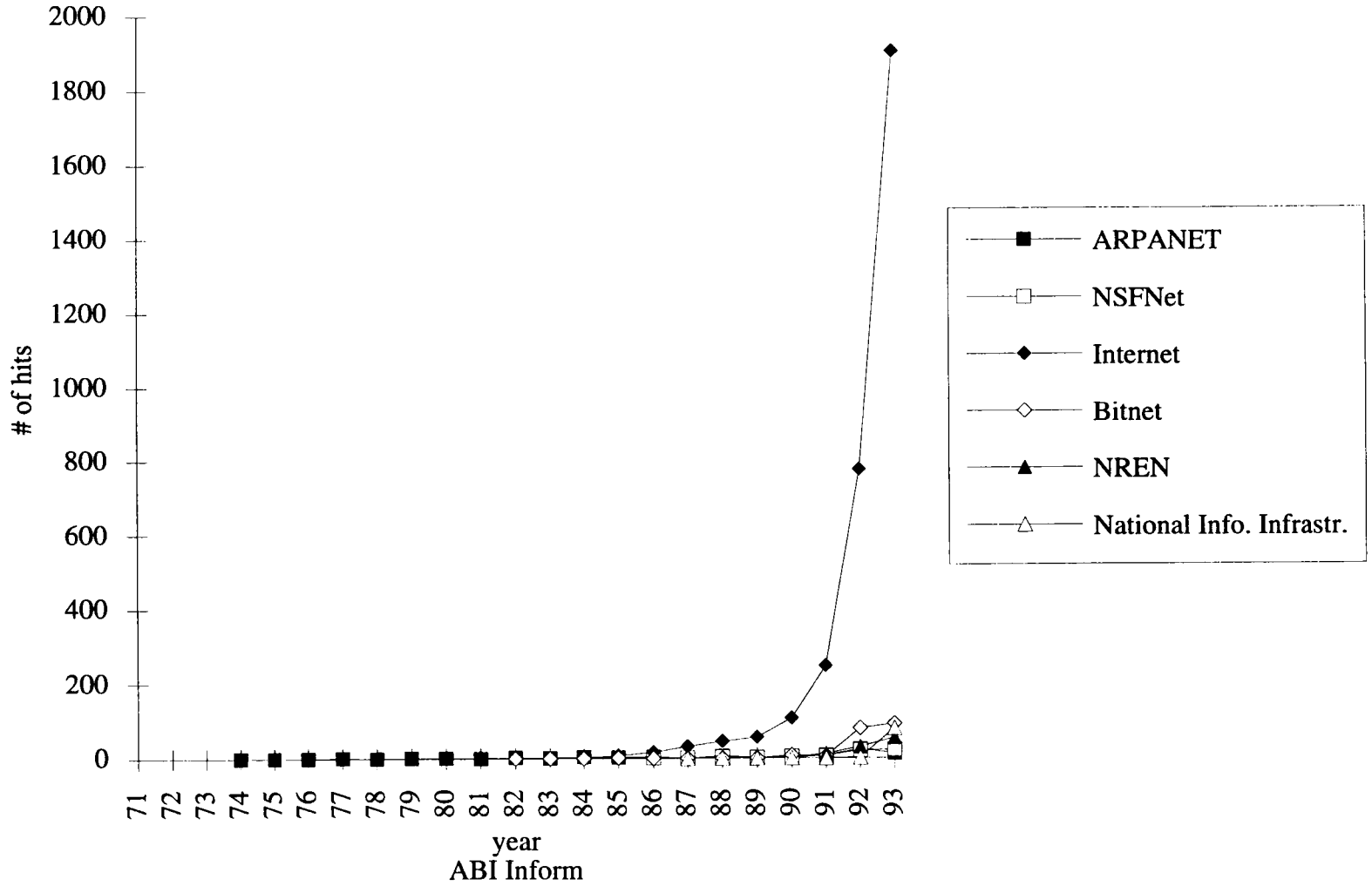
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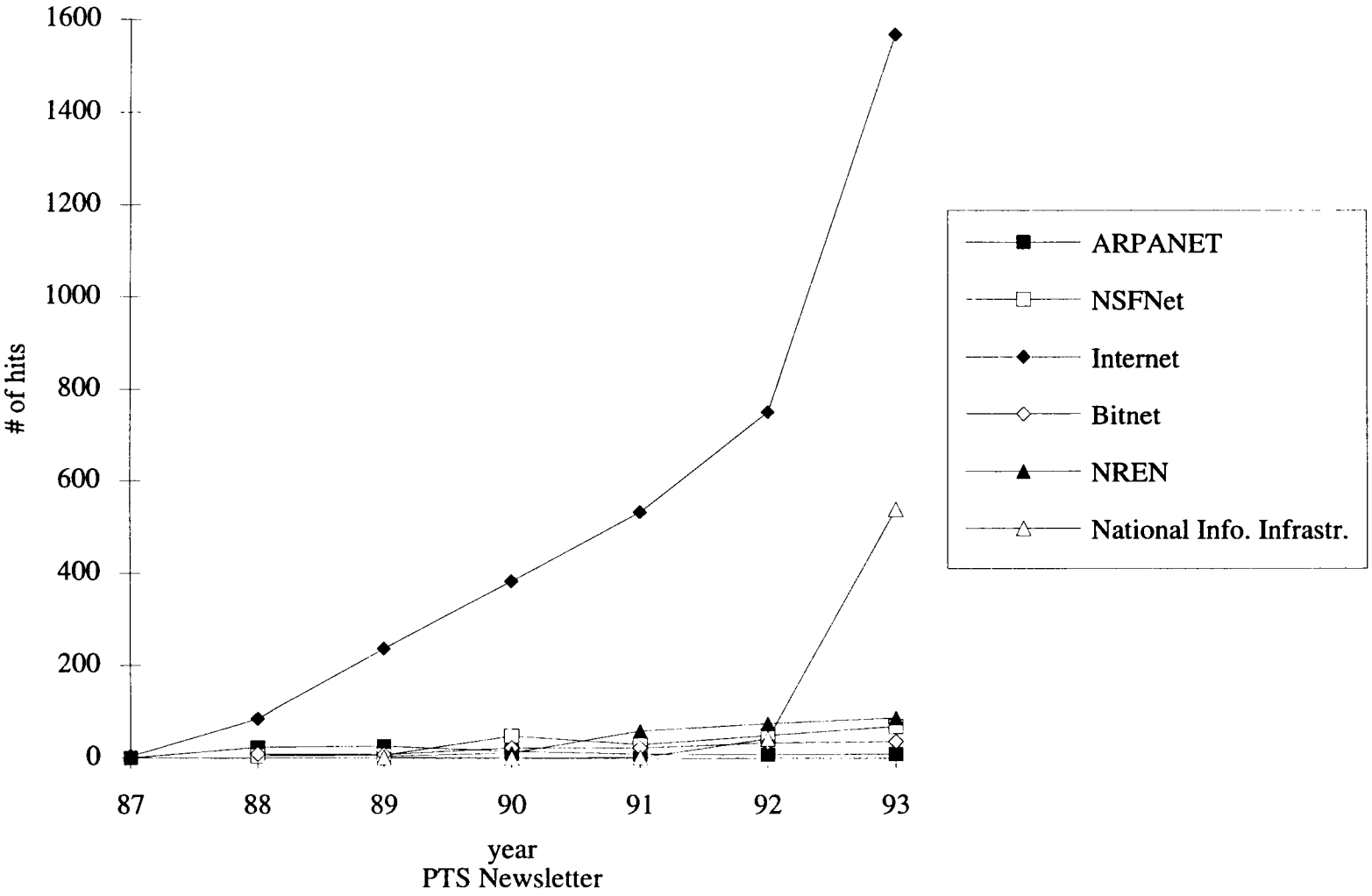
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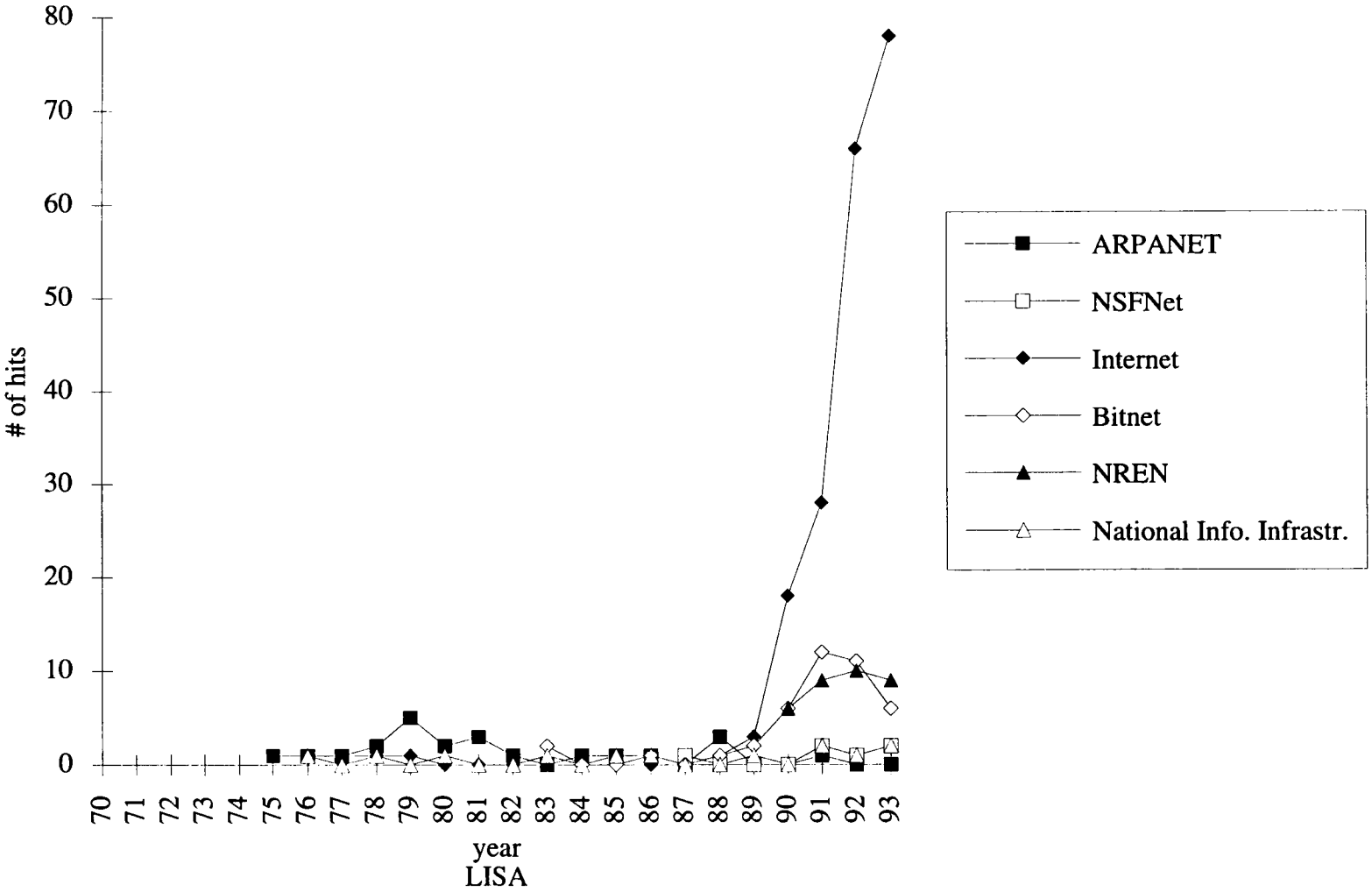
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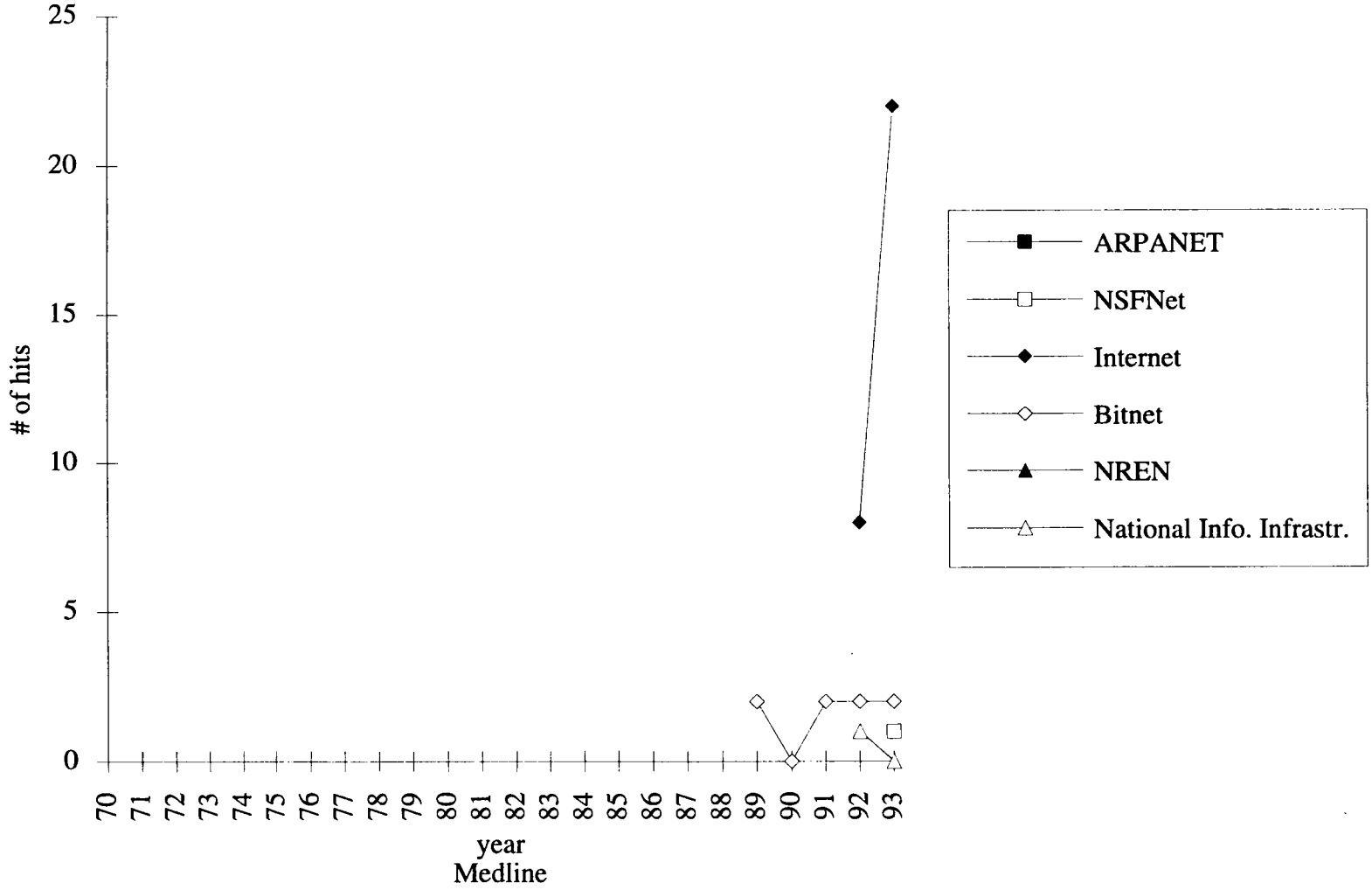
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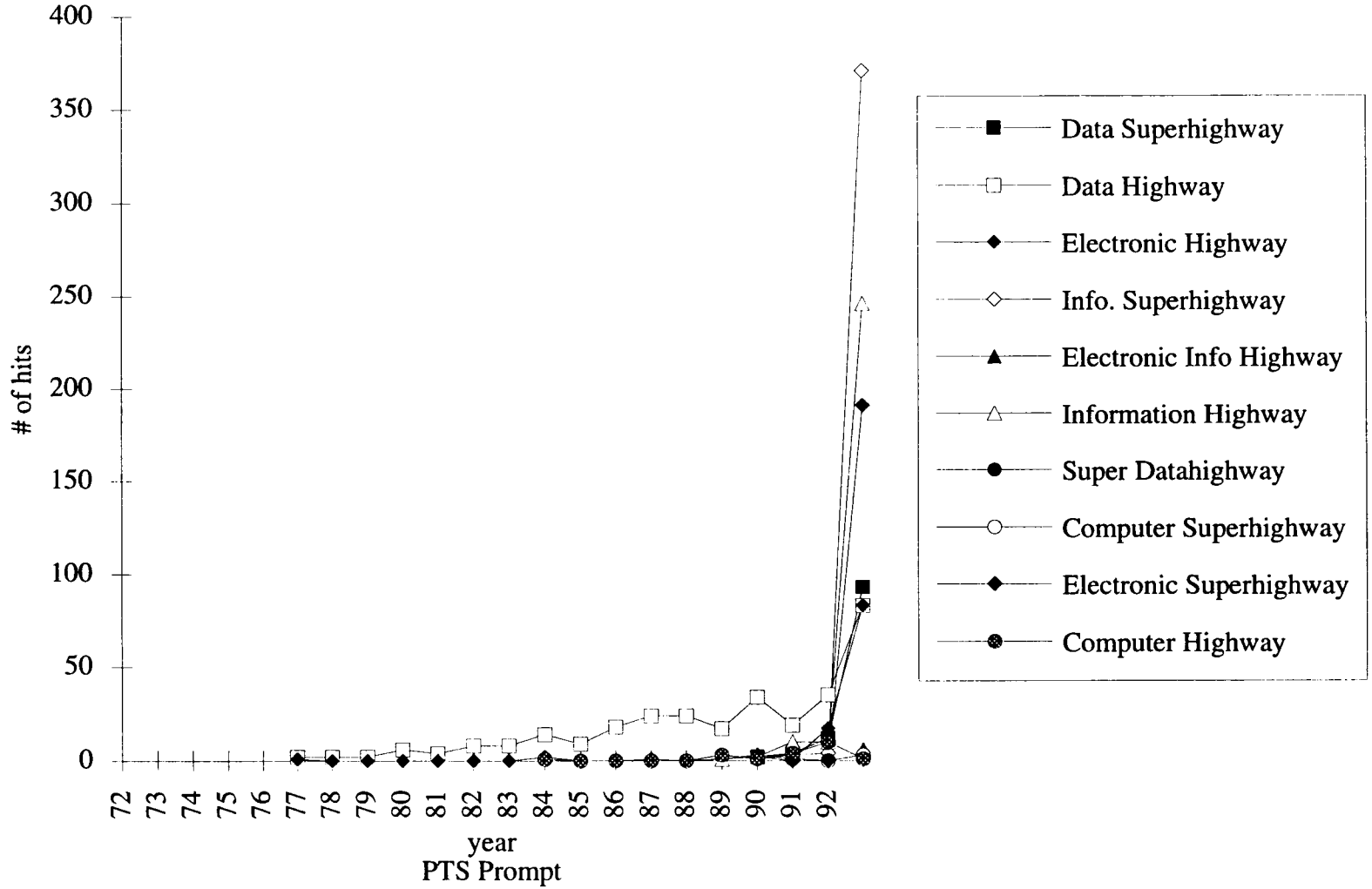
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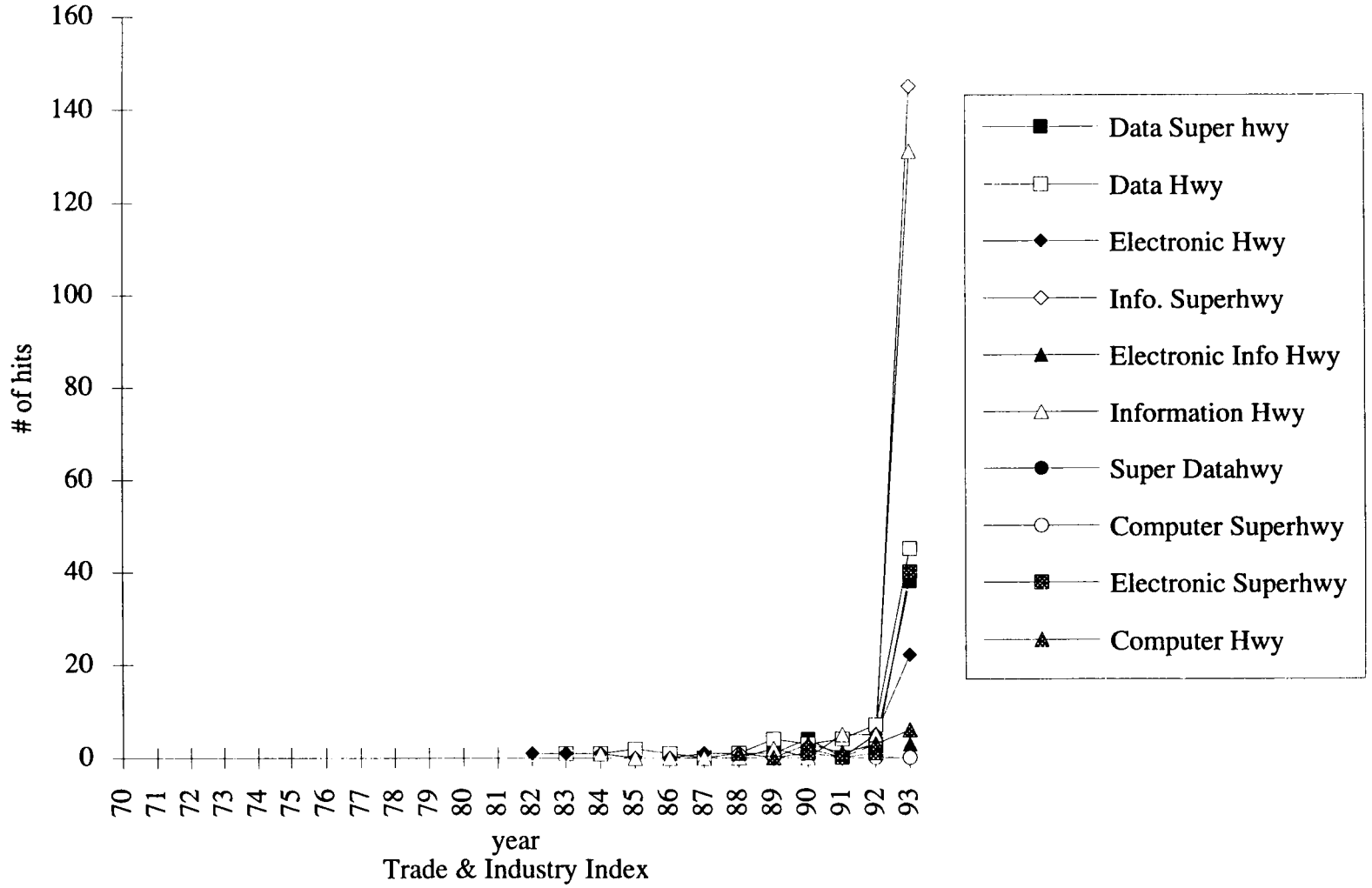
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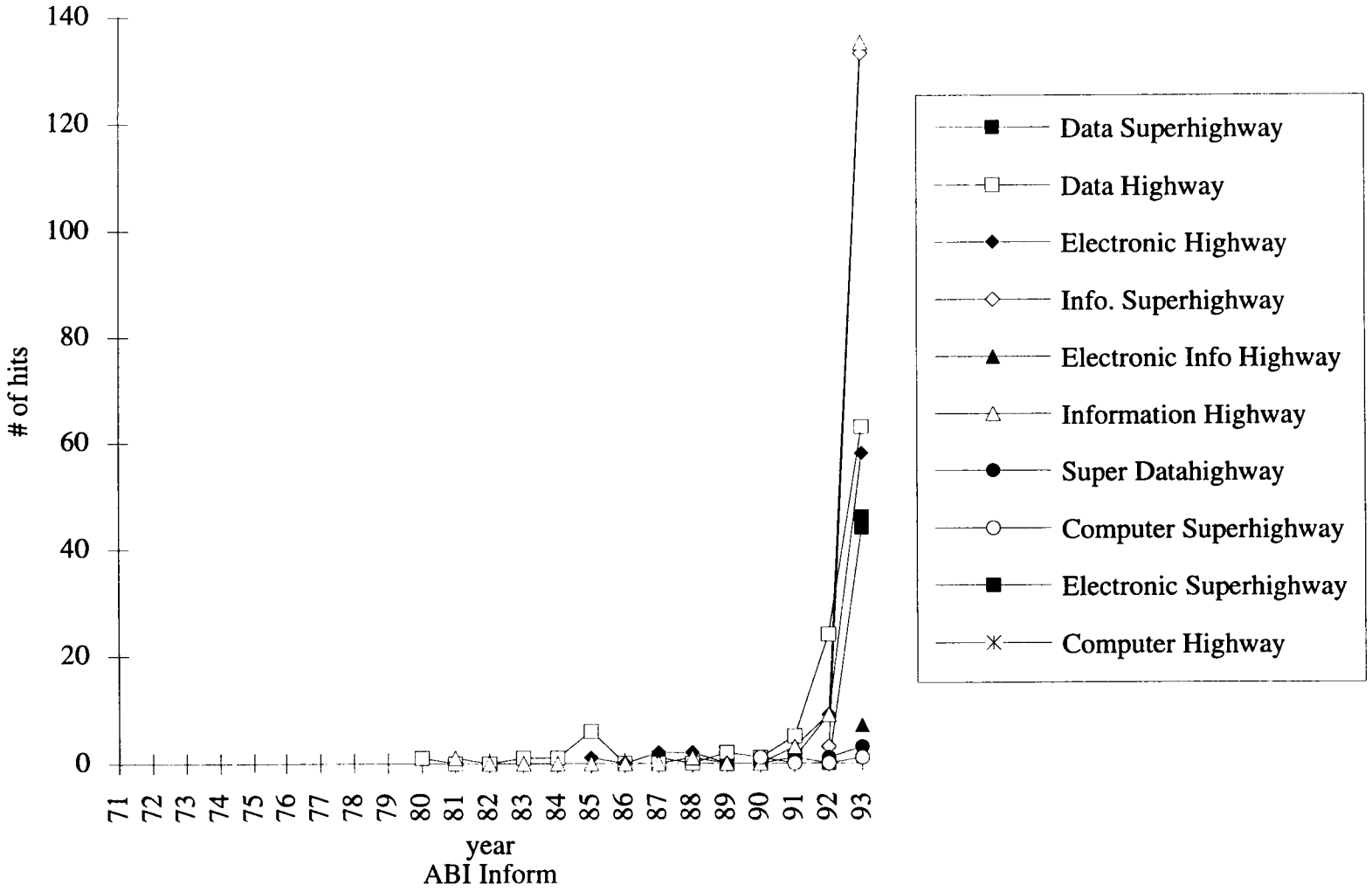
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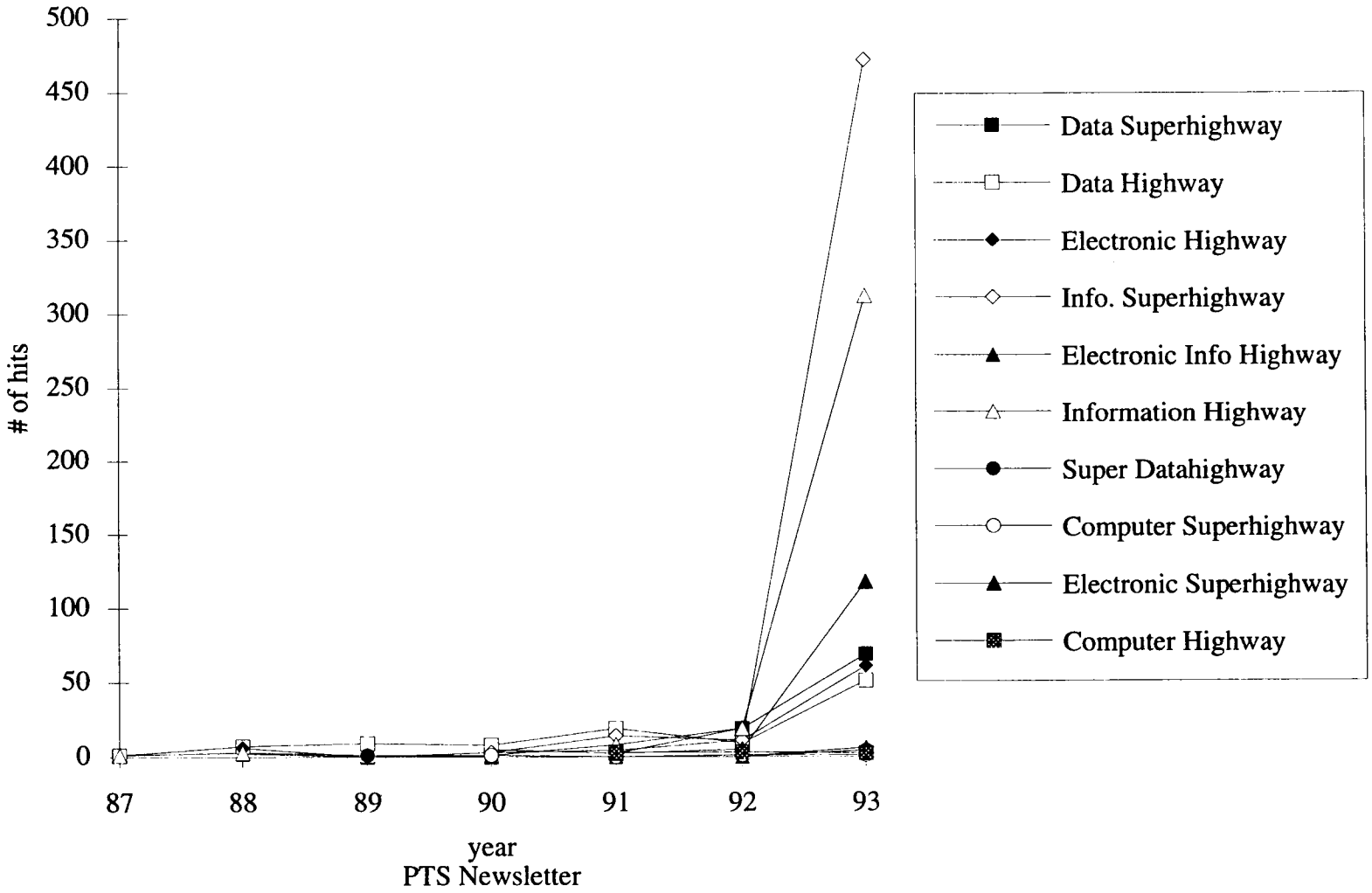
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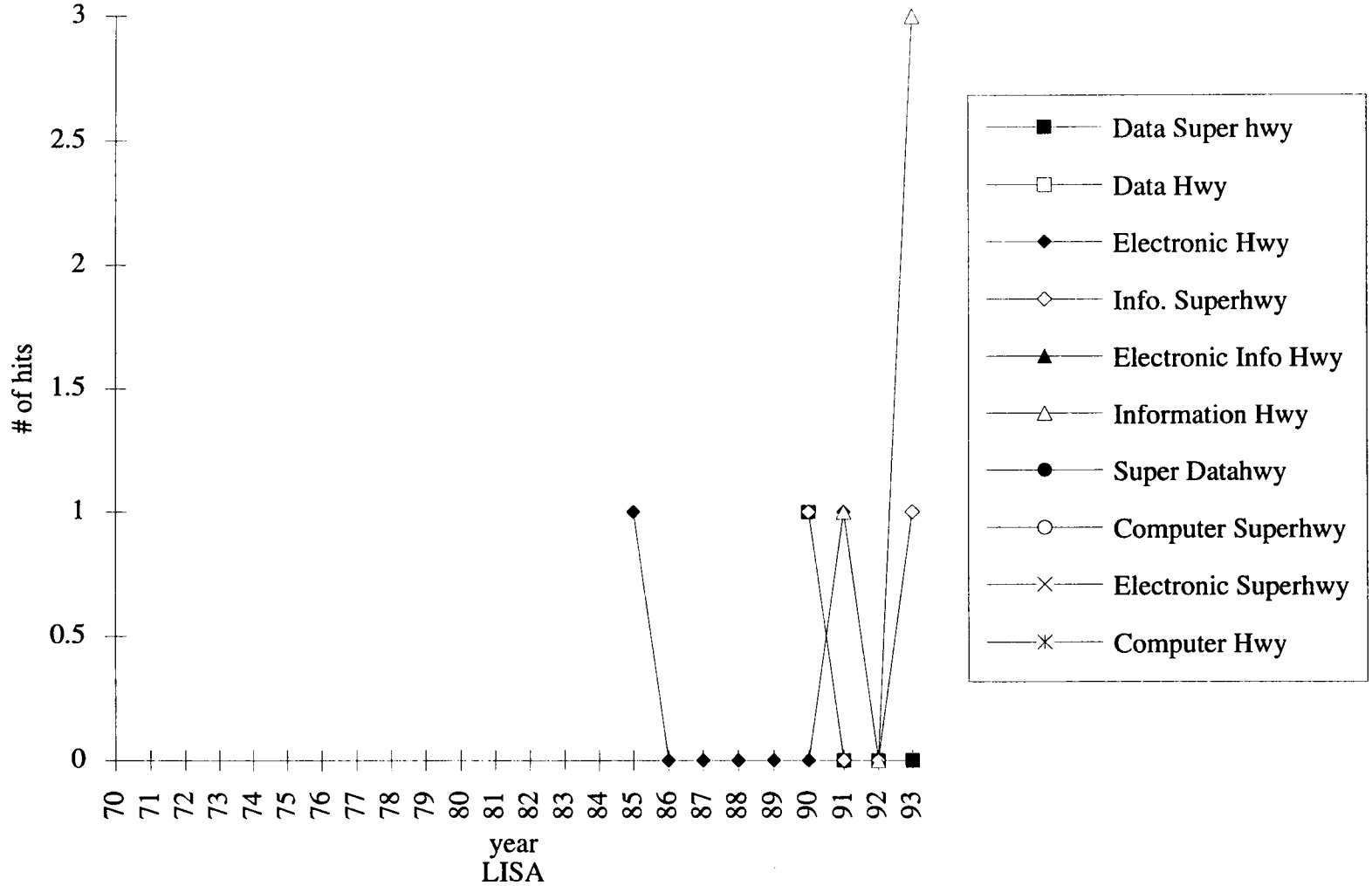
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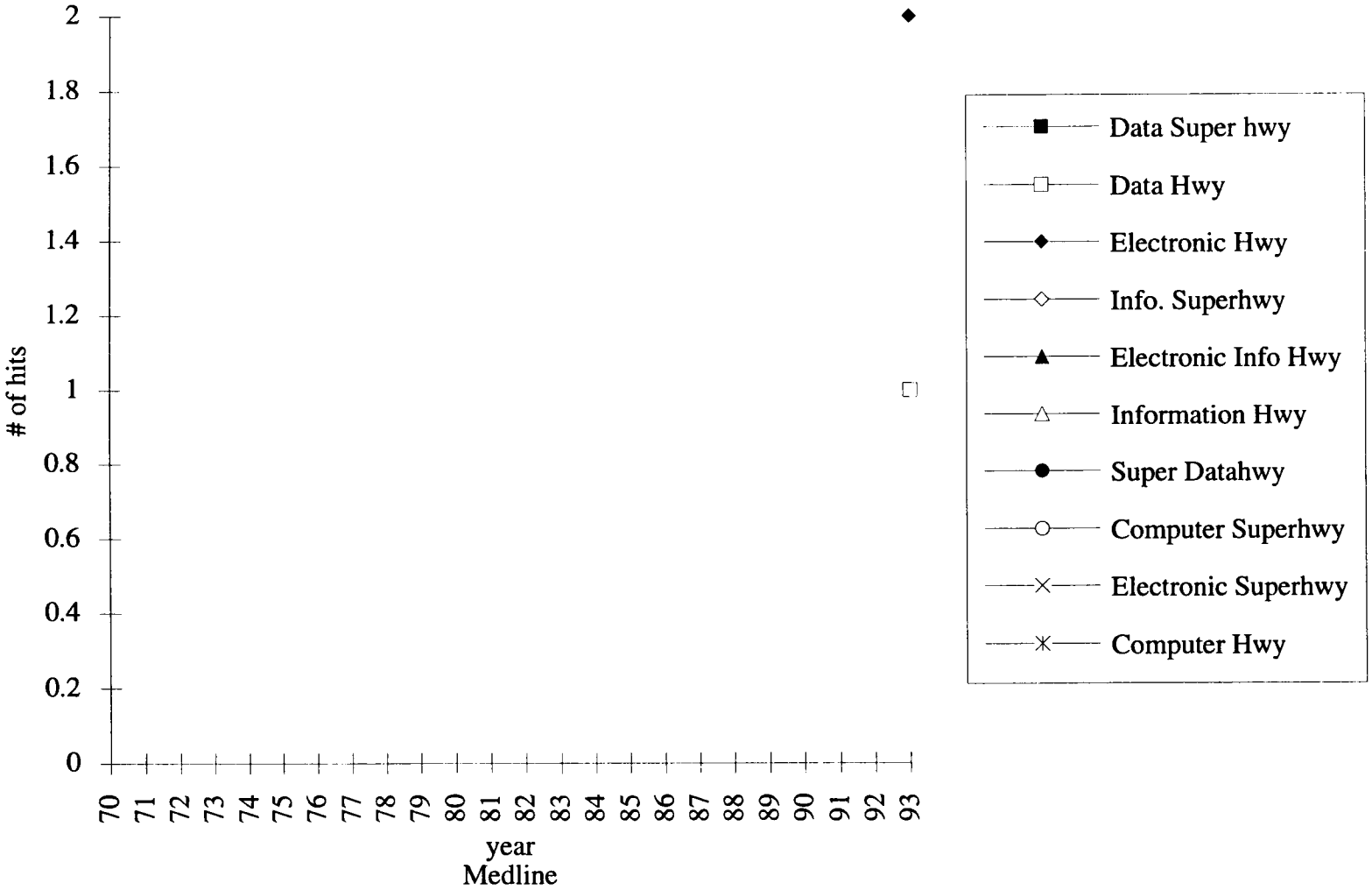
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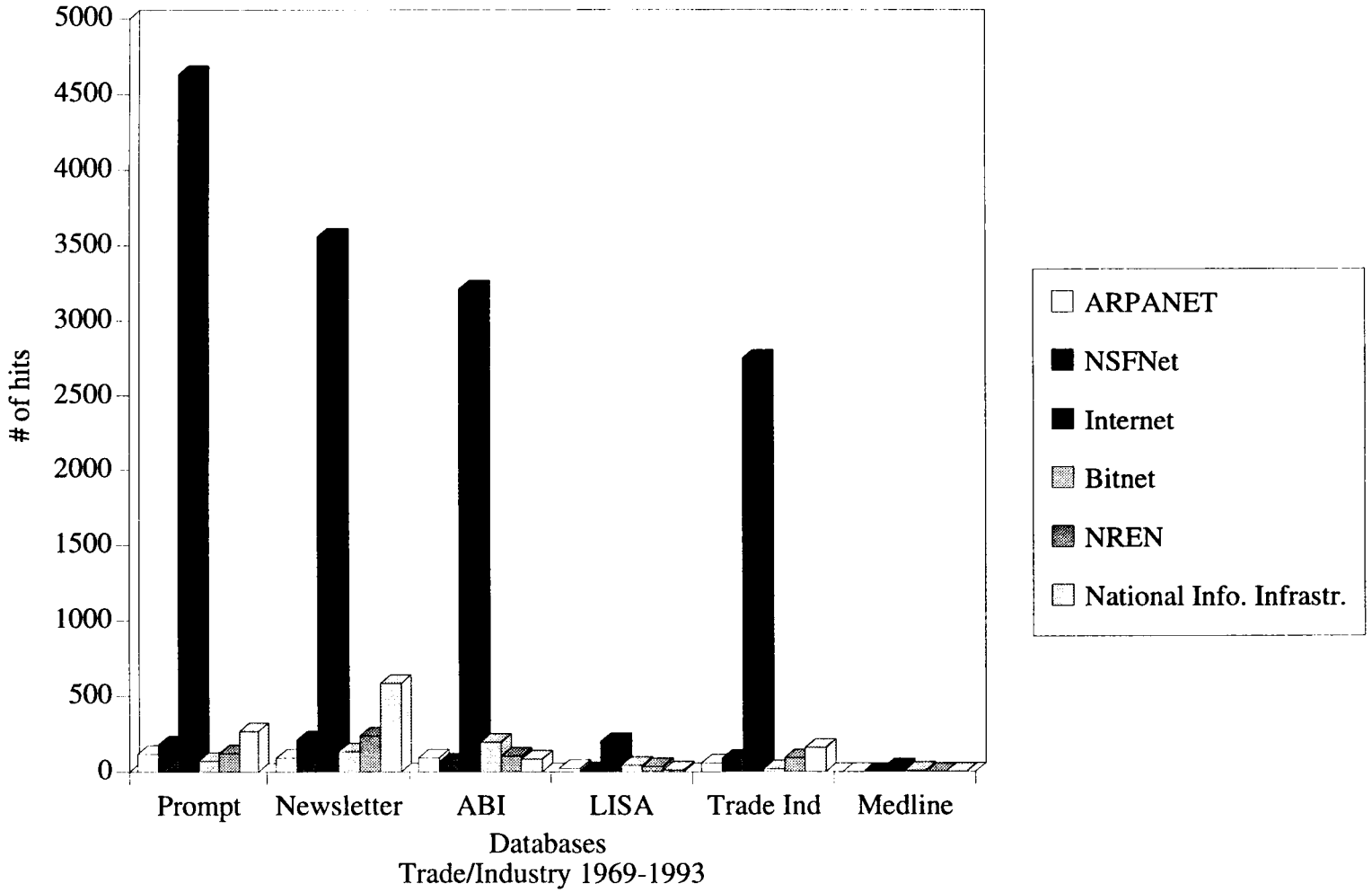
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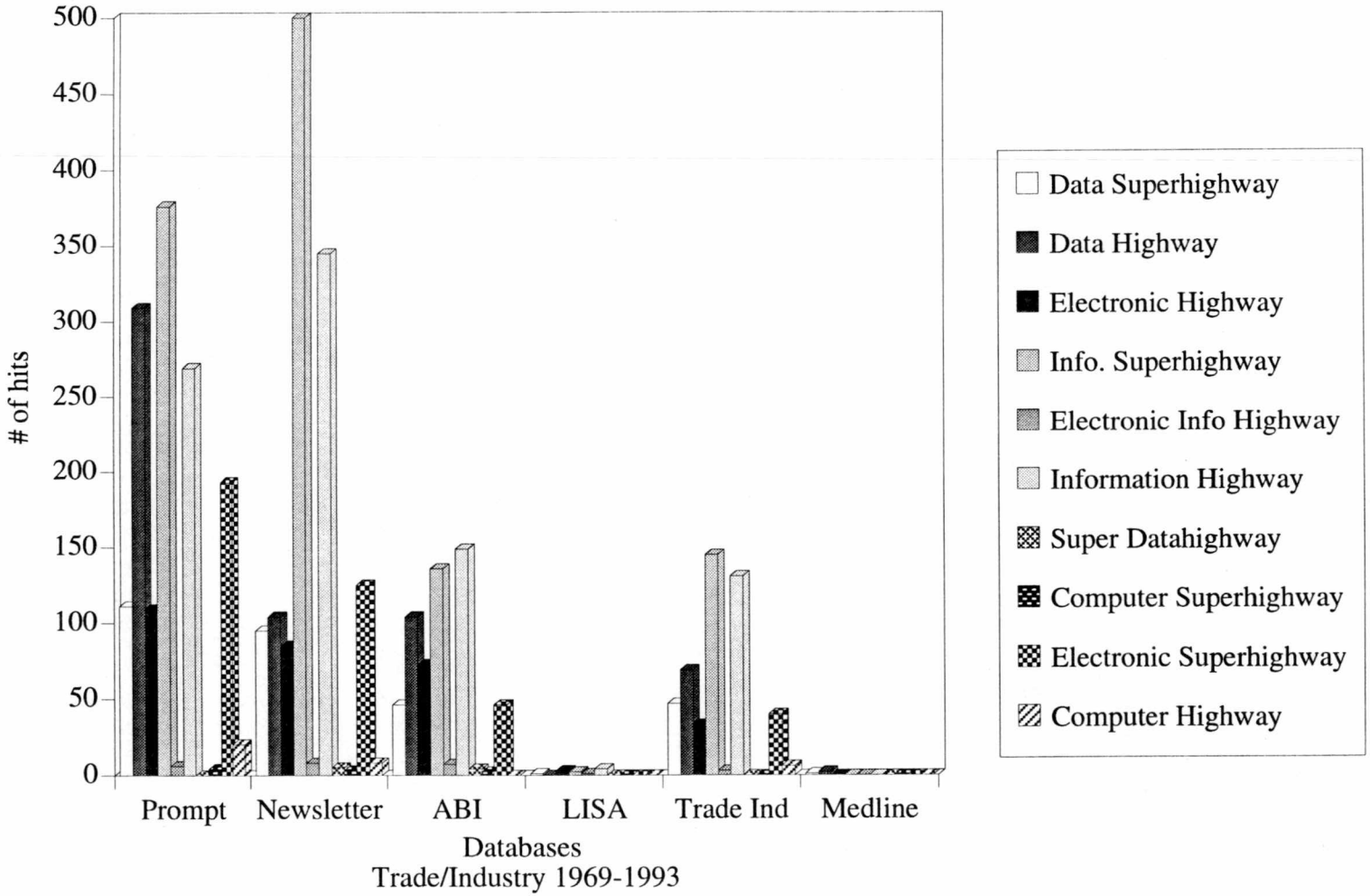
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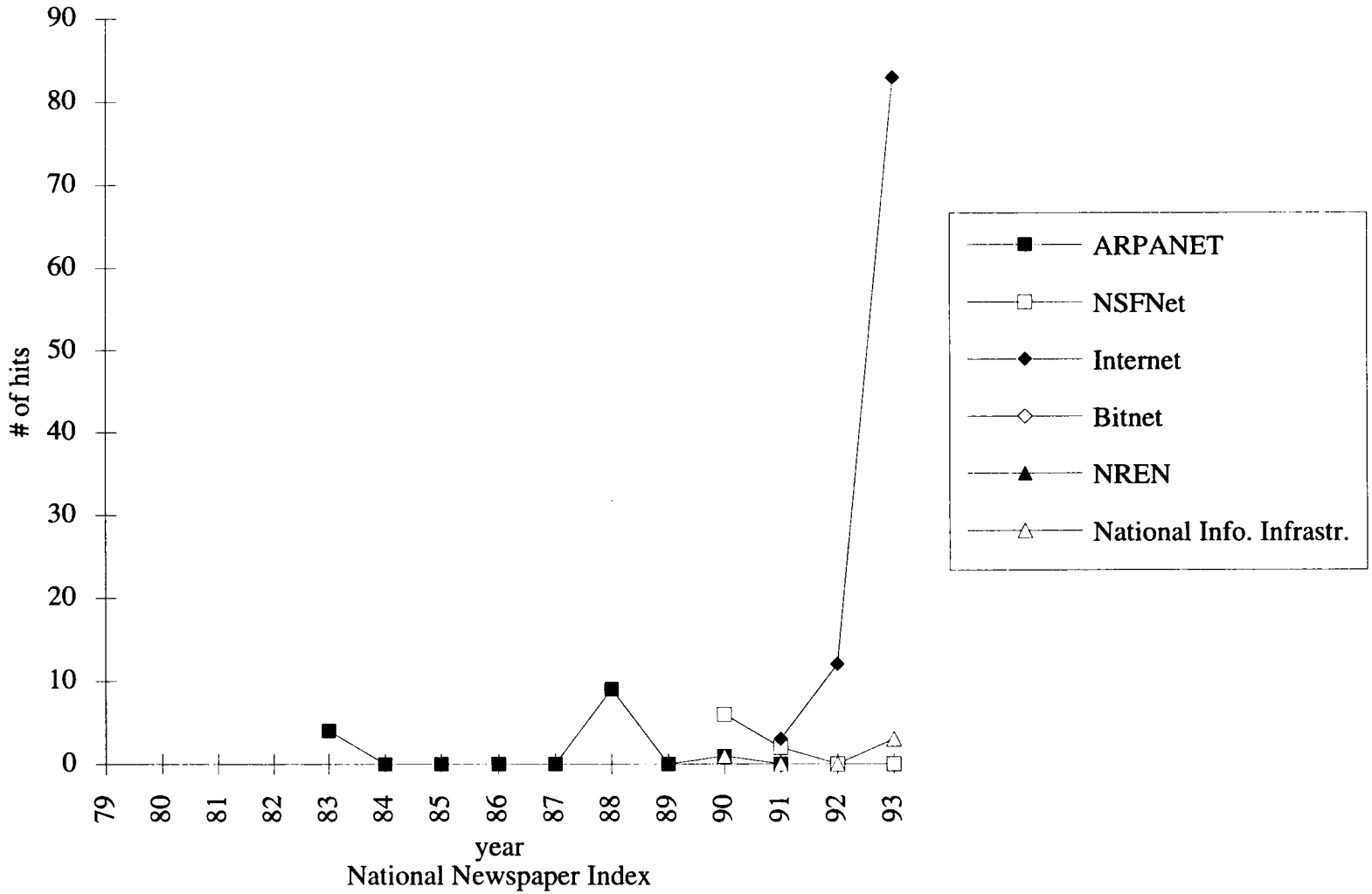
Computer Highway

APPENDIX F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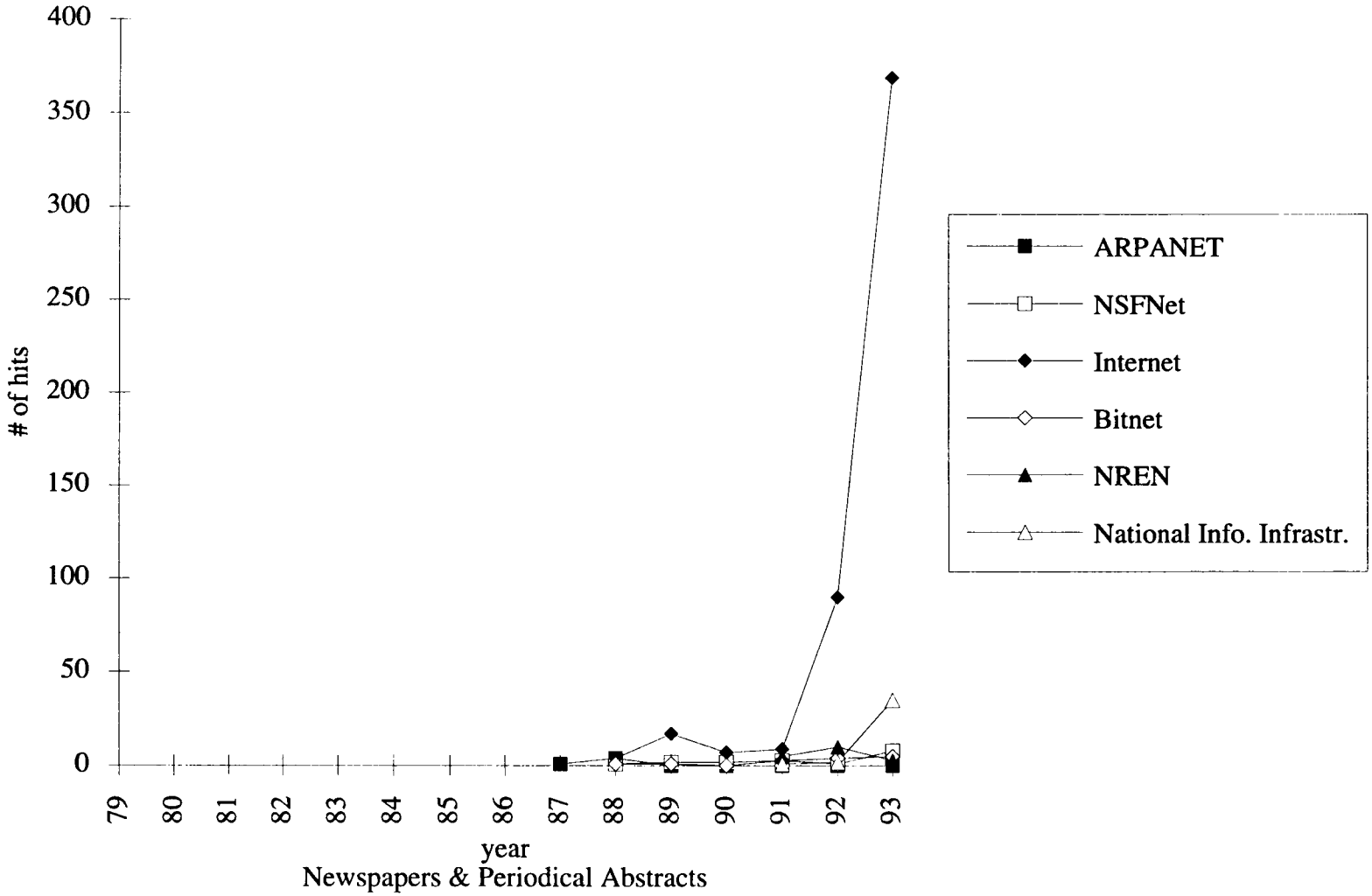
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.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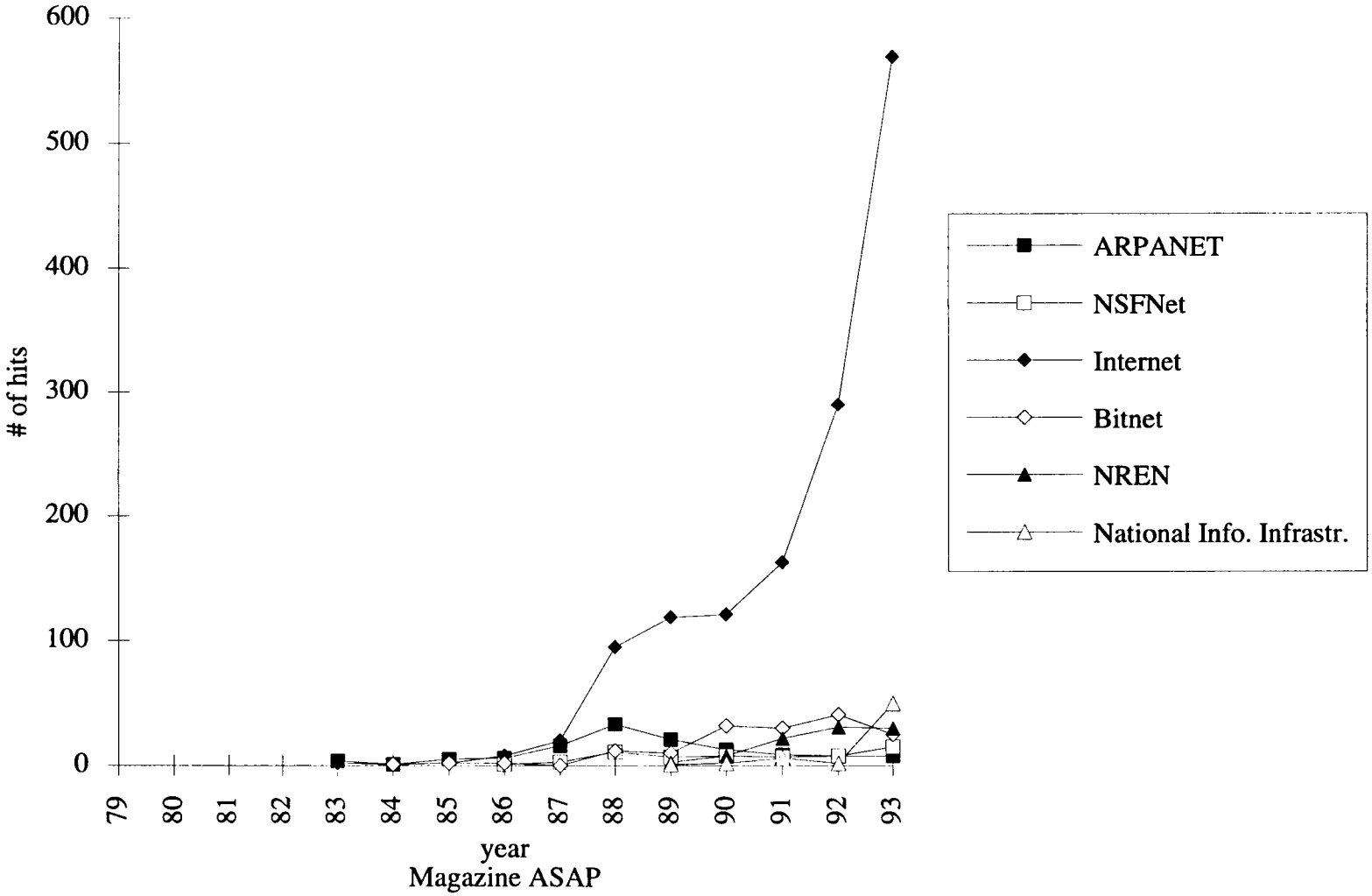
93
year
Newspapers & Periodical Abstracts
ARPANET
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.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92
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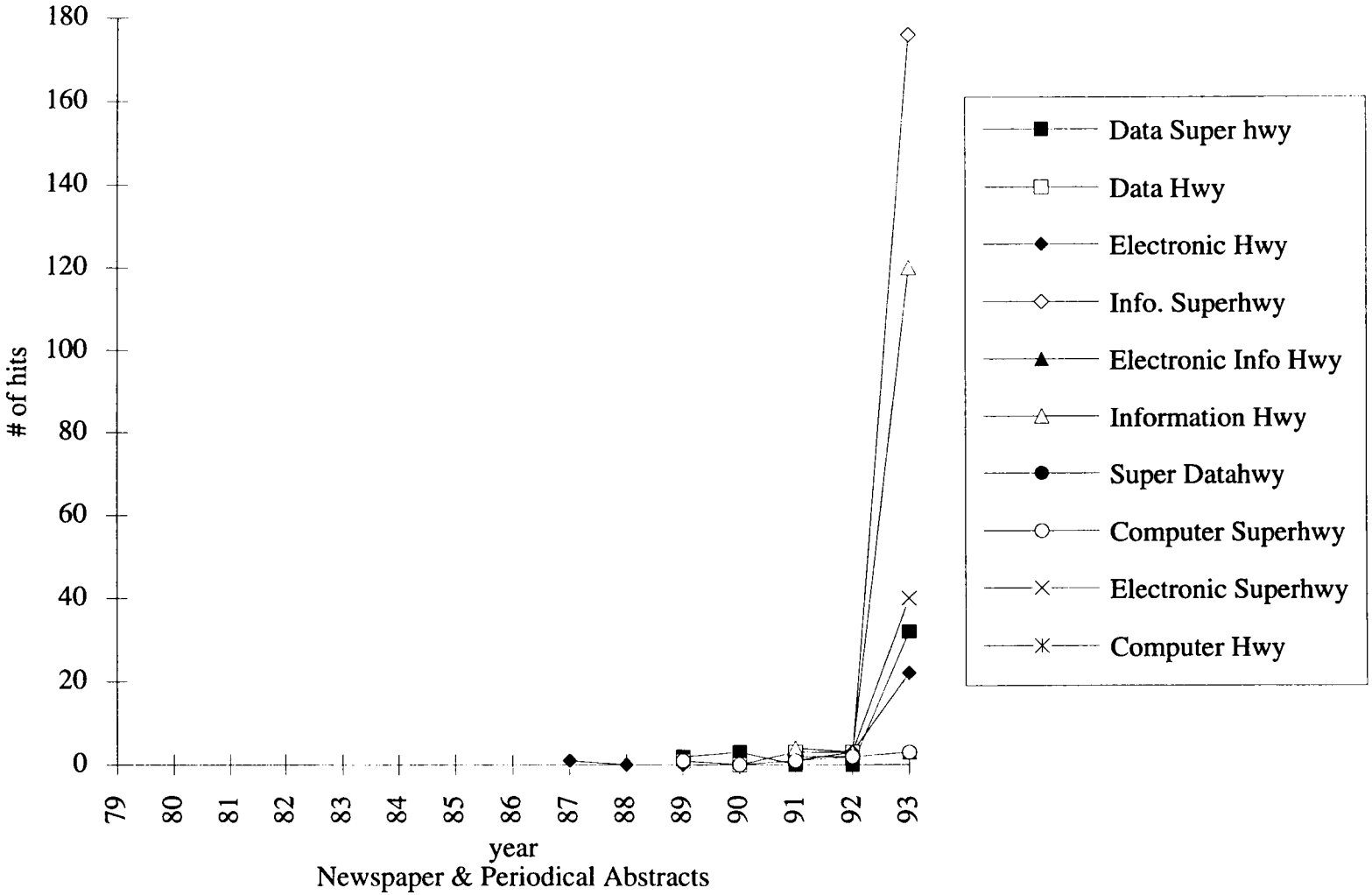
year
Magazine ASAP
ARPANET
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.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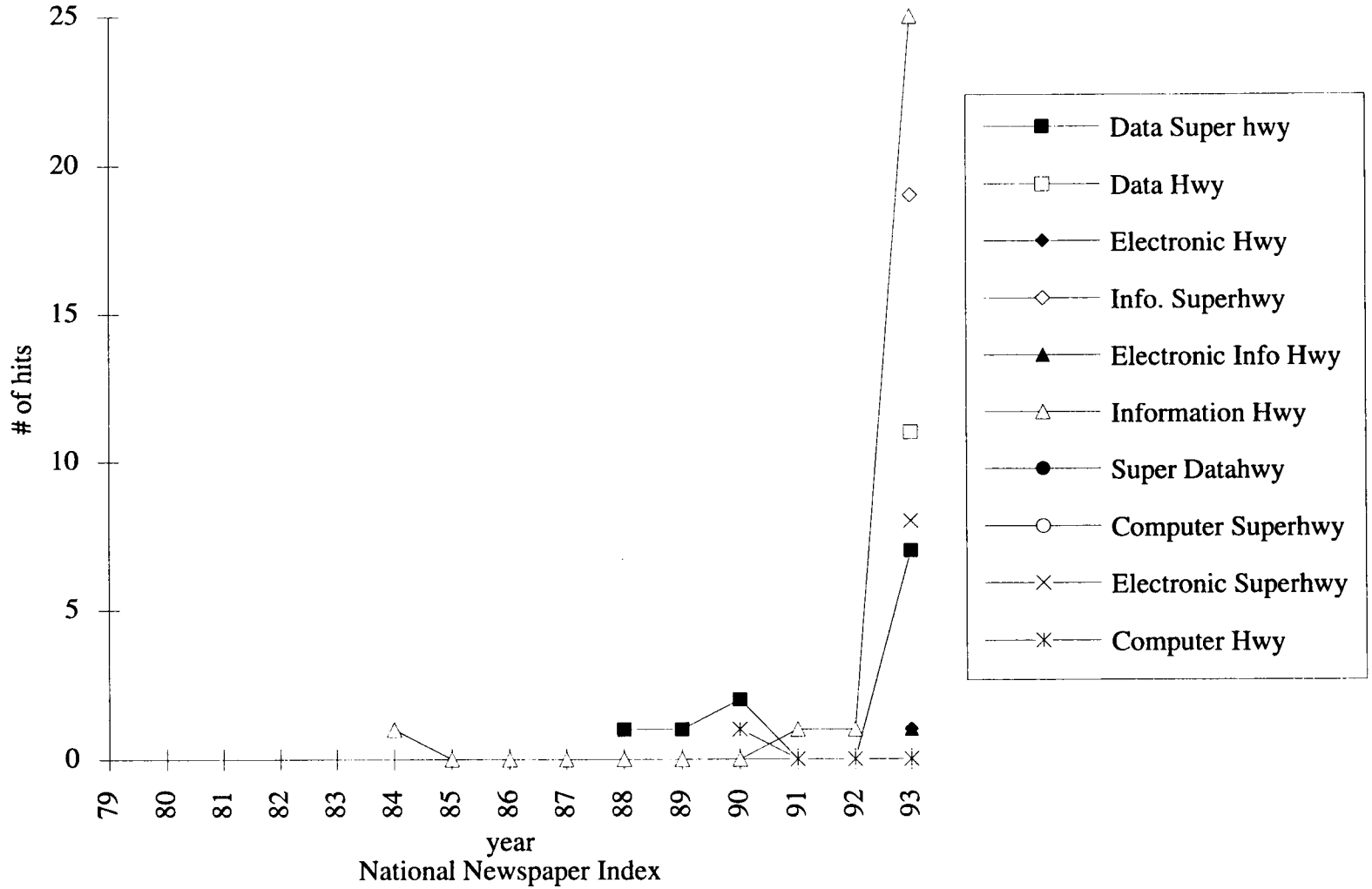
87
88
89
90
91
92
93
year
Newspaper & Periodical Abstracts
Data Super hwy
Data Hwy
Electronic Hwy
Info. Superhwy
Electronic Info Hwy
Information Hwy
Super Datahwy
Computer Superhwy
Electronic Superhwy
Computer Hwy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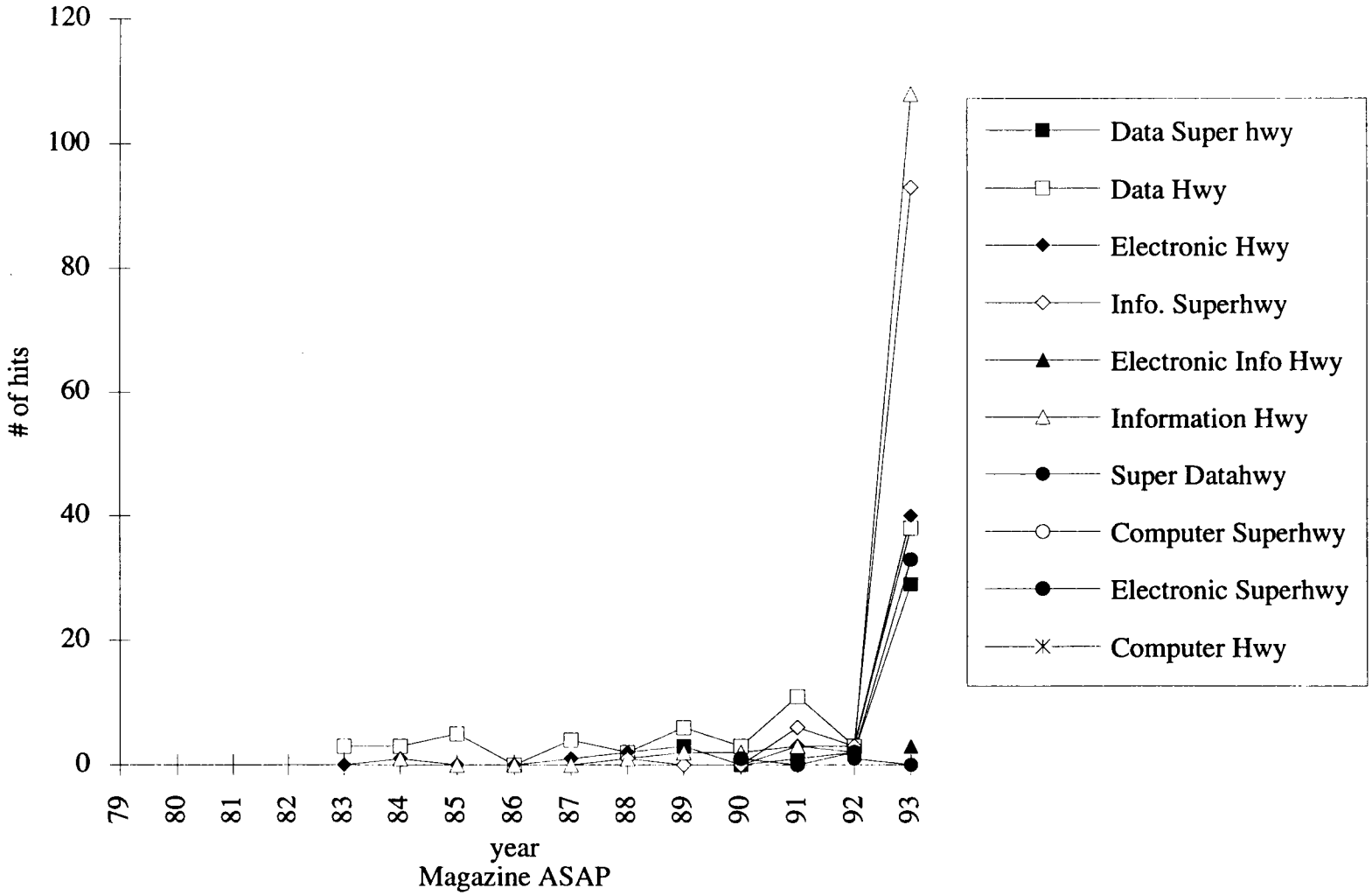
91
92
93
year
National Newspaper Index
Data Super hwy
Data Hwy
Electronic Hwy
Info. Superhwy
Electronic Info Hwy
Information Hwy
Super Datahwy
Computer Superhwy
Electronic Superhwy
Computer Hwy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92
93
year
Magazine ASAP
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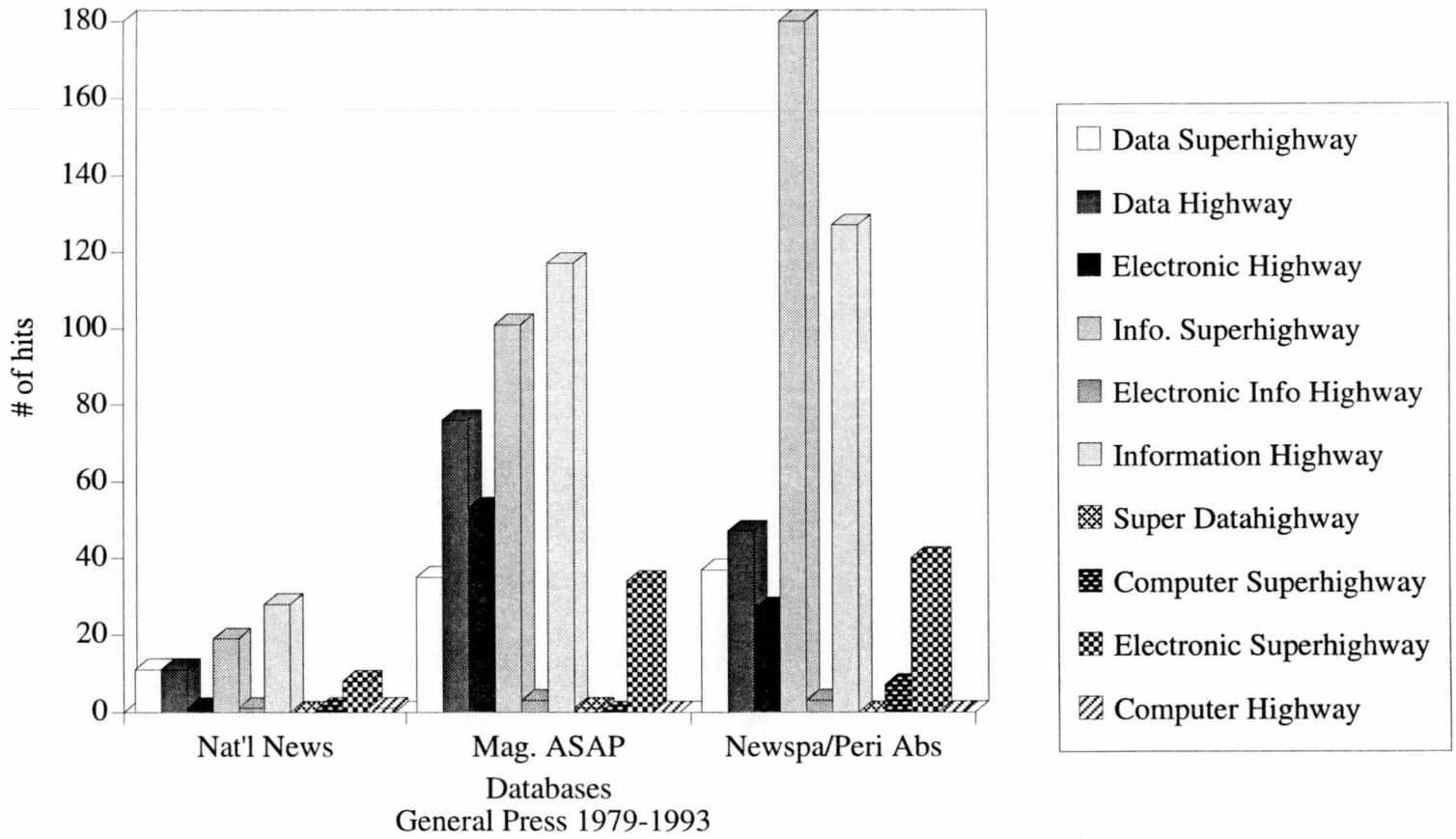
Information Hwy
Super Datahwy
Computer Superhwy
Electronic Superhwy
Computer Hwy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80
60
40
20
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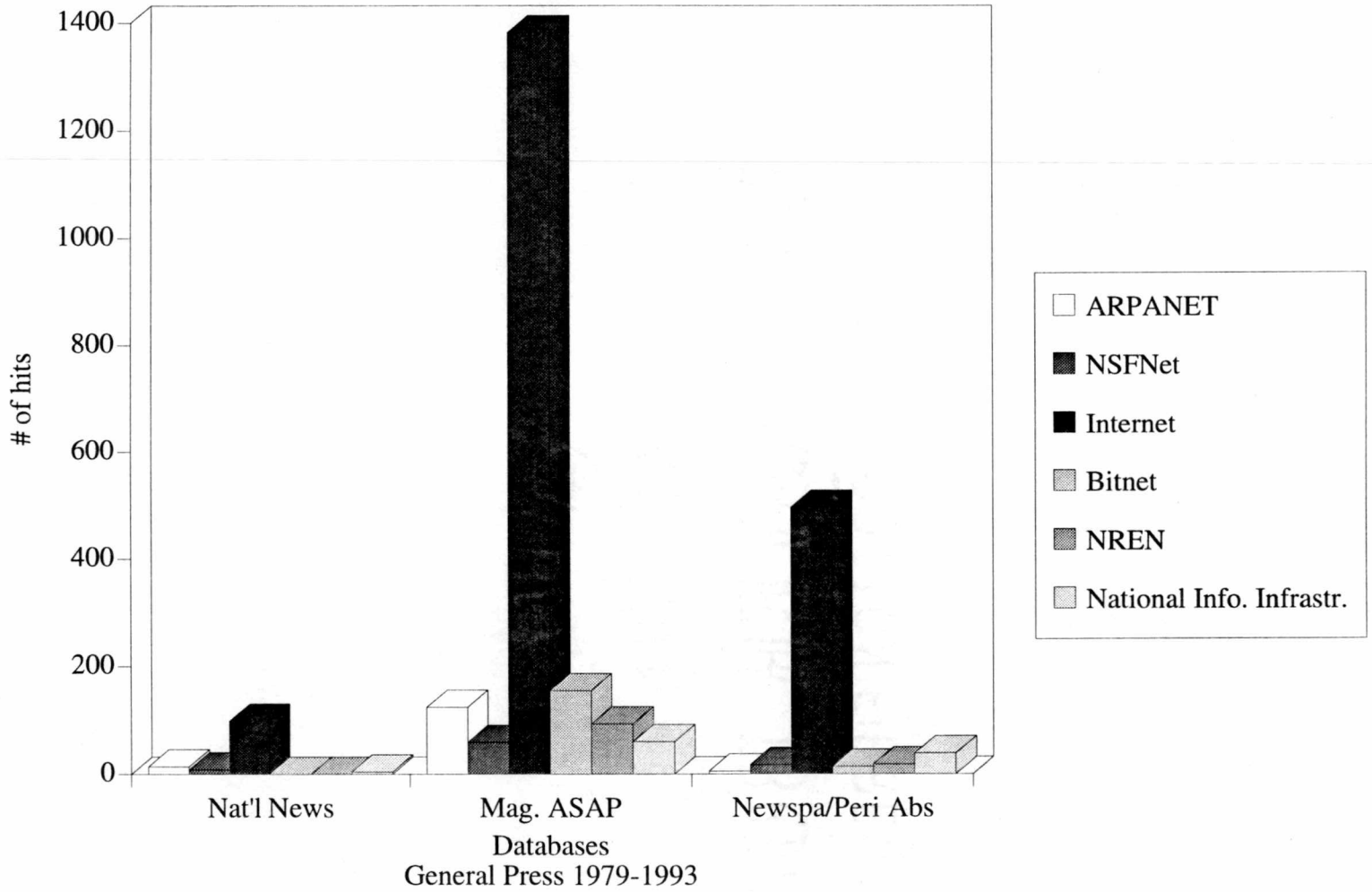
# of hits
Nat'l News
Mag. ASAP
Newspa/Peri Abs
Databases
General Press 1979-1993
Data Superhighway
Data Highway
Electronic Highway
Info. Superhighway
Electronic Info Highway
Information Highway
Super Datahighway
Computer Superhighway
Electronic Superhighway
Computer Highway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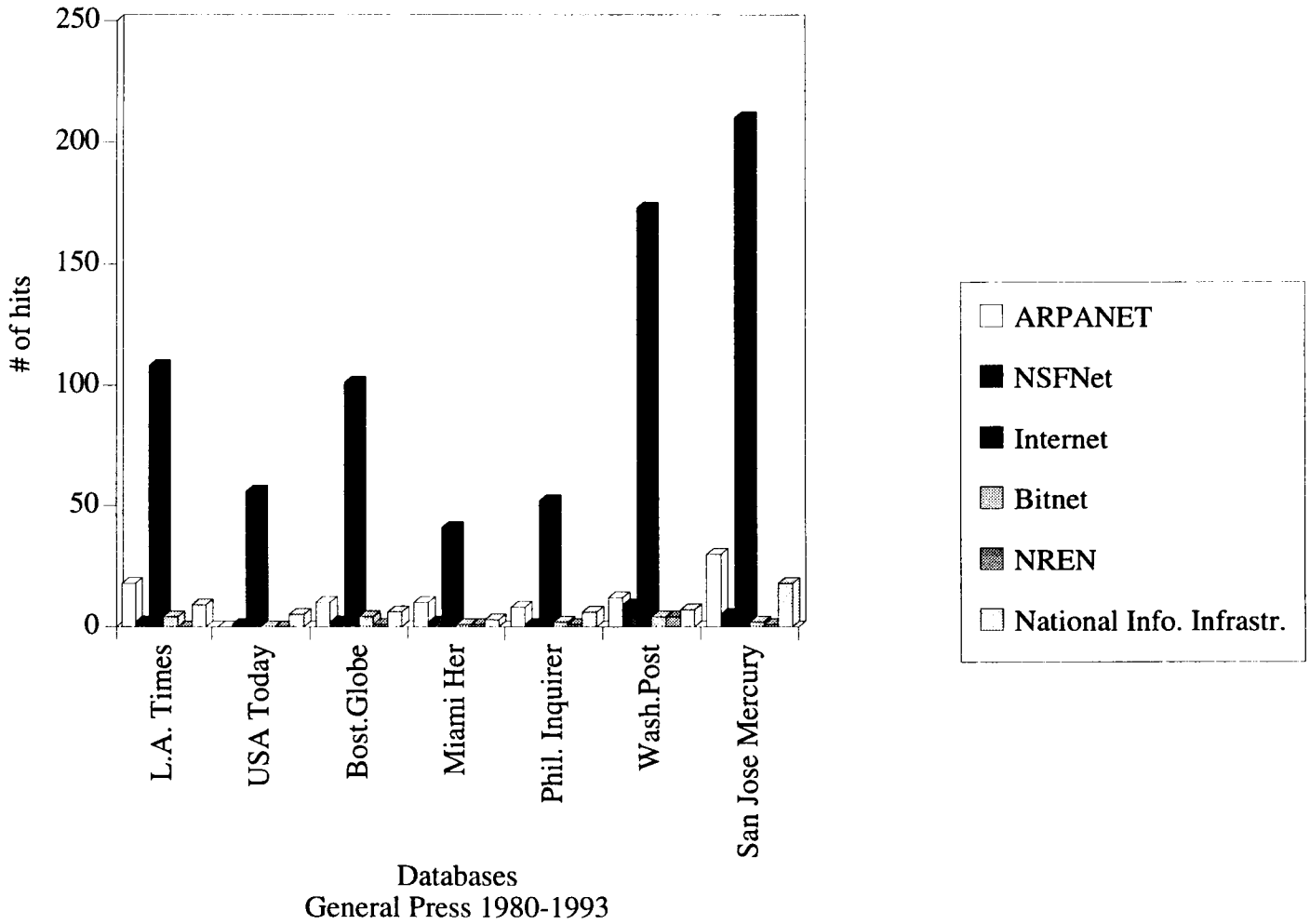
Mag. ASAP
Newspa/Peri Abs
Databases
General Press 1979-1993
ARPANET
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.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100
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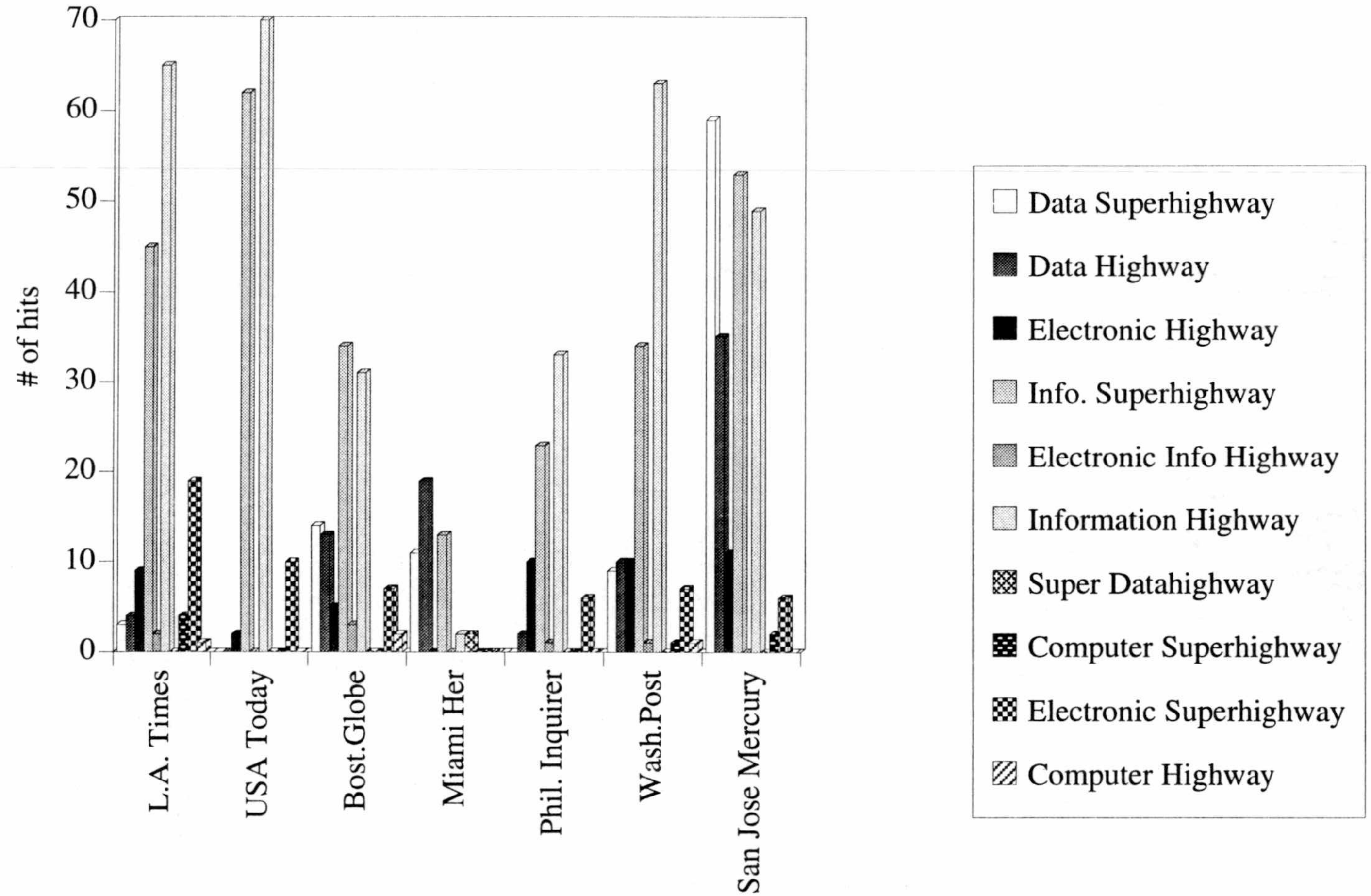
# of hits
L.A. Times
USA Today
Bost.Globe
Miami Her
Phil. Inquirer
Wash.Post
San Jose Mercury
Databases
General Press 1980-1993
ARPANET
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.



Databases
General Press 1980-1993

APPENDIX G

The Boston Globe														
	80	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**
ARPANET	1	0	0	1	0	0	0	0	5	2	0	0	0	1
NSFNet									1	0	0	0	0	1
Internet								1	4	5	6	2	2	81
Bitnet										1	1	0	0	2
NREN										1	0	0	0	0
National Info. Infrastr.										1	0	0	0	5
Data Superhighway										1	0	0	0	13
Data Highway				1	0	2	1	0	0	0	1	0	2	6
Electronic Highway							1	0	0	0	0	0	1	3
Info. Superhighway													3	31
Electronic Info Highway														3
Information Highway													1	30
Super Datahighway														
Computer Superhighway														
Electronic Superhighway														7
Computer Highway			1	0	0	0	0	0	0	0	0	0	0	1
Total:	1	0	1	2	0	2	2	1	10	11	8	2	9	184

Miami Herald												
	83	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**Total:**
ARPANET	3	2	0	0	0	3	0	0	0	0	2	10
NSFNet										1	1	2
Internet			1	1	0	2	3	4	1	3	26	41
Bitnet							1	0	0	0	0	1
NREN										1	0	1
National Info. Infrastr.											3	3
Data Superhighway							1	0	0	0	10	11
Data Highway											19	19
Electronic Highway												0
Info. Superhighway	1	0	0	0	0	0	0	0	0	0	12	13
Electronic Info Highway												0
Information Highway											2	2
Super Datahighway											2	2
Computer Superhighway												0
Electronic Superhighway												0
Computer Highway												0
Total:	4	2	1	1	0	5	5	4	1	5	77	105

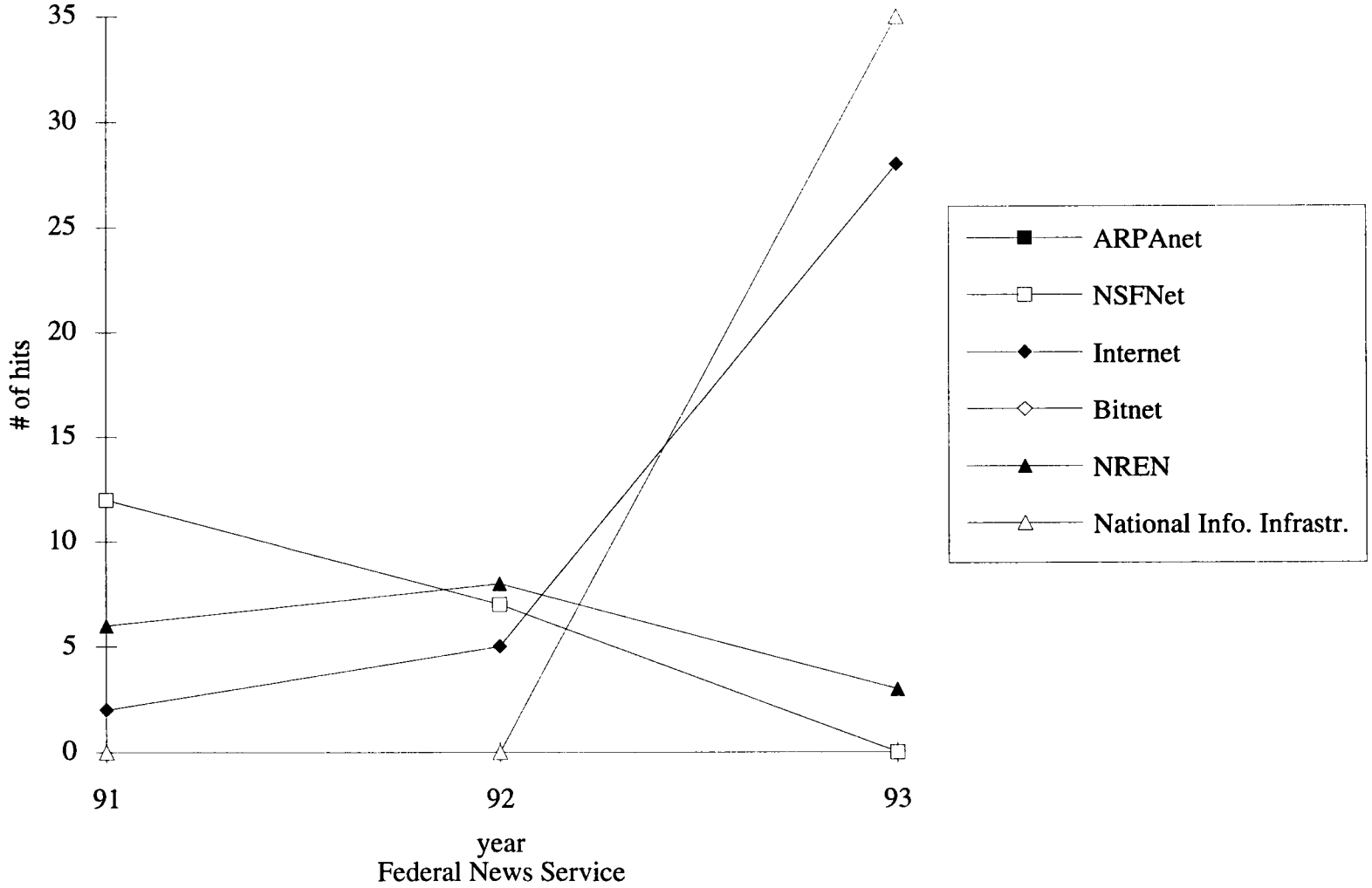
Philadelphia Inquirer														
	81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**Total:**
ARPANET			2	0	1	0	0	5	0	0	0	0	0	8
NSFNet								1	0	0	0	0	0	1
Internet								5	4	6	2	4	31	52
Bitnet											1	0	1	2
NREN											1	0	0	1
National Info. Infrastr.													6	6
Data Superhighway														0
Data Highway										1	0	0	1	2
Electronic Highway				1	0	0	0	0	0	2	1	0	6	10
Info. Superhighway													23	23
Electronic Info Highway													1	1
Information Highway											2	1	30	33
Super Datahighway														0
Computer Superhighway														0
Electronic Superhighway													6	6
Computer Highway														0
Total:			2	1	1	0	0	11	4	9	7	5	105	145

The Washington Post												
	83	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**Total**
ARPANET	1	1	2	0	0	6	0	0	1	1	0	12
NSFNet		0	0	0	0	1	0	3	1	3	1	9
Internet	1	3	4	2	3	16	6	11	7	19	101	173
Bitnet									3	1	0	4
NREN		1	0	0	0	0	0	0	0	2	1	4
National Info. Infrastr.											7	7
Data Superhighway							1	2	1	1	4	9
Data Highway										1	9	10
Electronic Highway				1	0	0	2	1	1	1	4	10
Info. Superhighway								1	1	0	32	34
Electronic Info Highway									1	0	0	1
Information Highway			1	0	0	0	0	3	2	3	54	63
Super Datahighway												0
Computer Superhighway							1	0	0	0	0	1
Electronic Superhighway											7	7
Computer Highway										1	0	1
Total	2	5	7	3	3	23	10	21	18	33	220	345

Los Angeles Times										
	85	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**Total:**
ARPANET	1	0	0	15	1	0	0	0	1	18
NSFNet				2	0	0	0	0	0	2
Internet		1	0	7	5	5	7	8	75	108
Bitnet					2	0	0	1	1	4
NREN										0
National Info. Infrastr.								1	8	9
Data Superhighway					1	0	0	0	2	3
Data Highway							1	0	3	4
Electronic Highway	1	1	1	2	0	1	0	1	2	9
Info. Superhighway							1	0	44	45
Electronic Info Highway								1	1	2
Information Highway					1	0	0	3	61	65
Super Datahighway										0
Computer Superhighway									4	4
Electronic Superhighway									19	19
Computer Highway									1	1
Total:	2	2	1	26	10	6	9	15	222	293

San Jose Mercury										
	85	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**Total:**
ARPANET		2	2	20	4	1	1	0	0	30
NSFNet						2	1	0	2	5
Internet				9	20	27	19	13	122	210
Bitnet			1	1	0	0	0	0	0	2
NREN							1	0	0	1
National Info. Infrastr.								2	16	18
Data Superhighway					2	1	0	2	54	59
Data Highway			2	3	1	0	3	1	25	35
Electronic Highway		1	3	1	0	0	2	1	3	11
Info. Superhighway	1	0	0	0	0	0	0	1	51	53
Electronic Info Highway										0
Information Highway						1	1	0	47	49
Super Datahighway										0
Computer Superhighway					1	0	0	1	0	2
Electronic Superhighway									6	6
Computer Highway										0
Total:	1	3	8	34	28	32	28	21	326	481

APPENDIX H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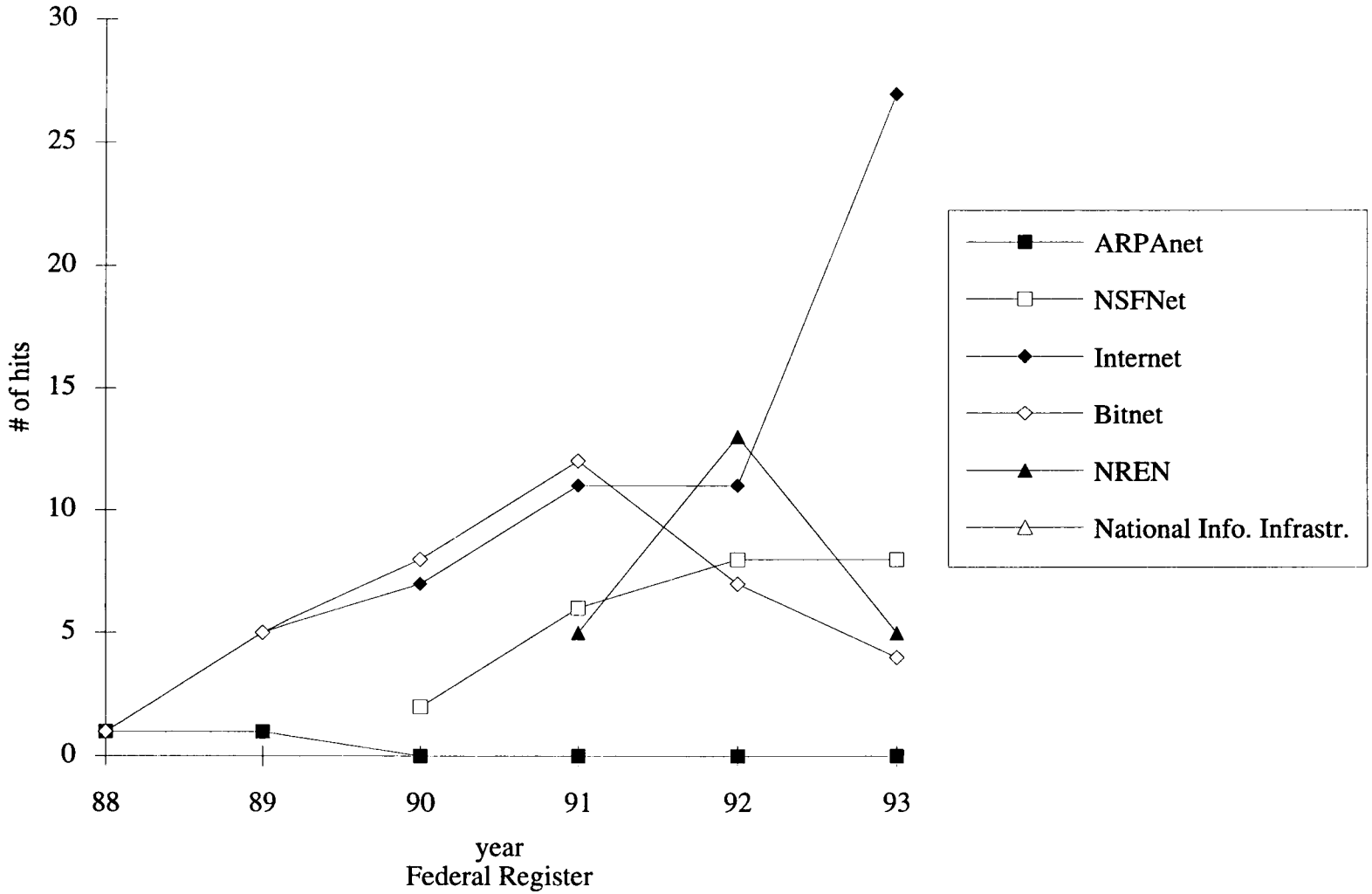
year
Federal News Service
ARPAnet
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.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20
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10
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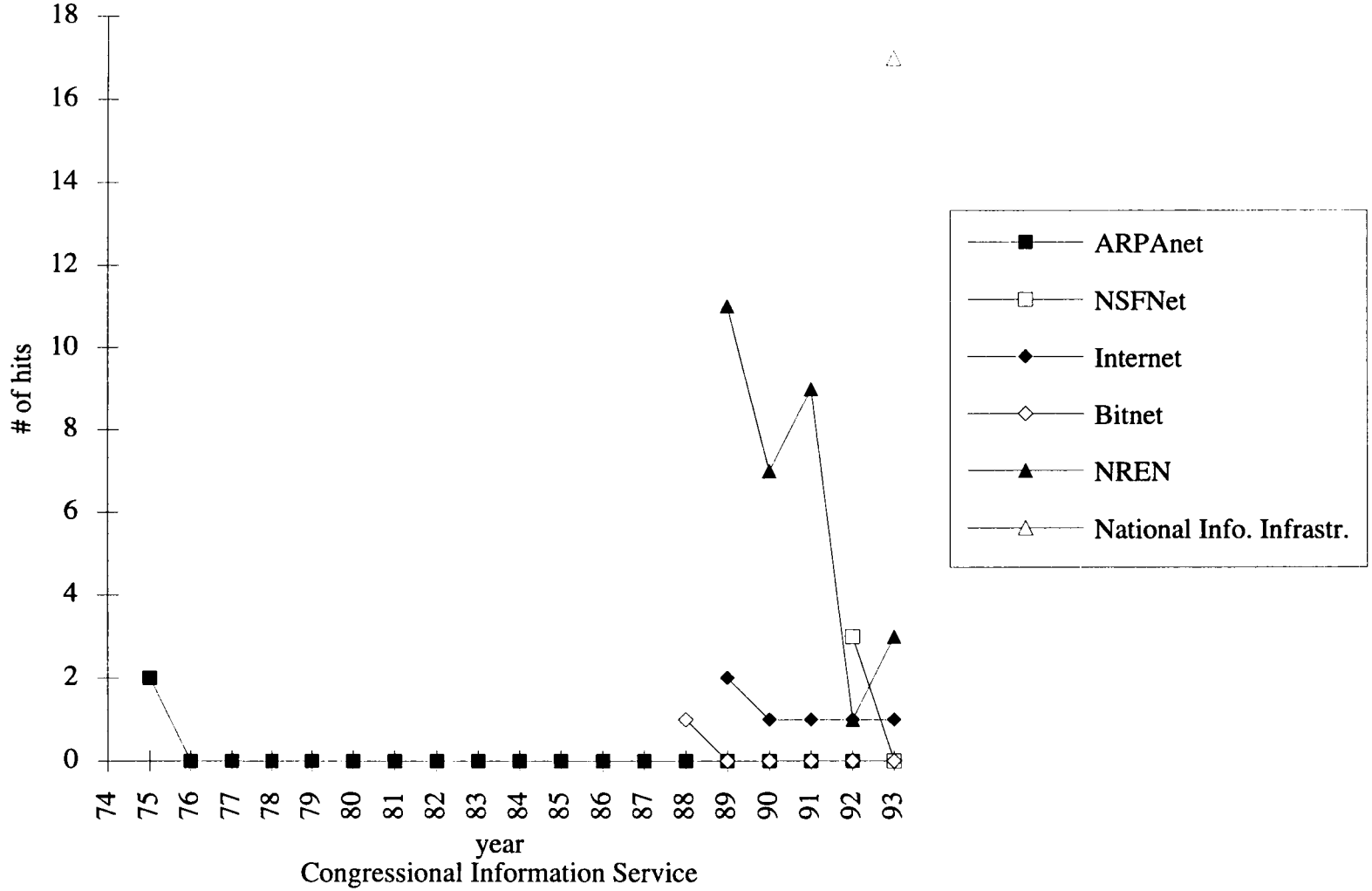
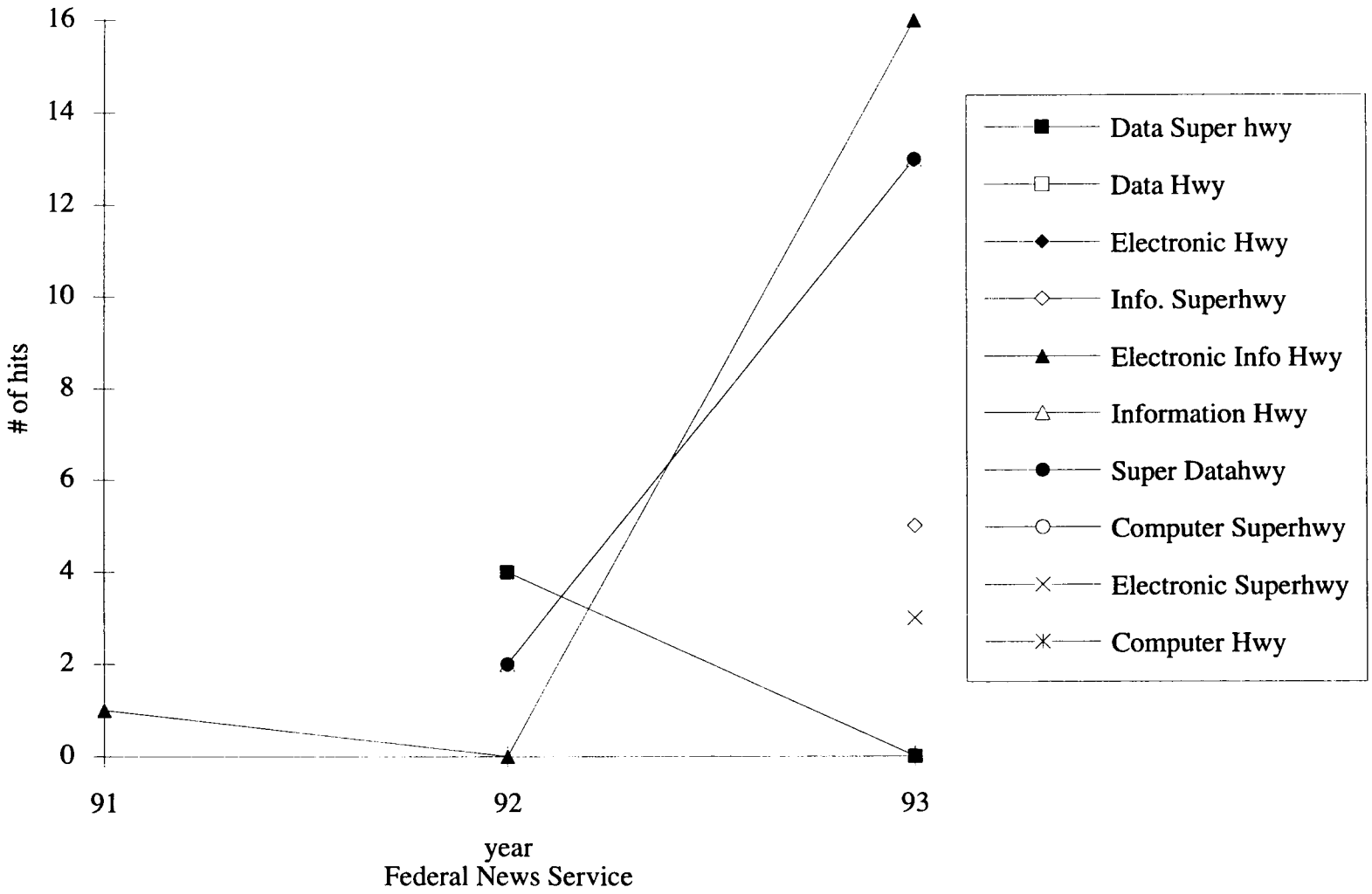
year
Federal Register
ARPAnet
NSFNet
Internet
Bitnet
NREN
National Info. Infrastr.



Congressional Information Service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91
92
93
year
Federal News Service
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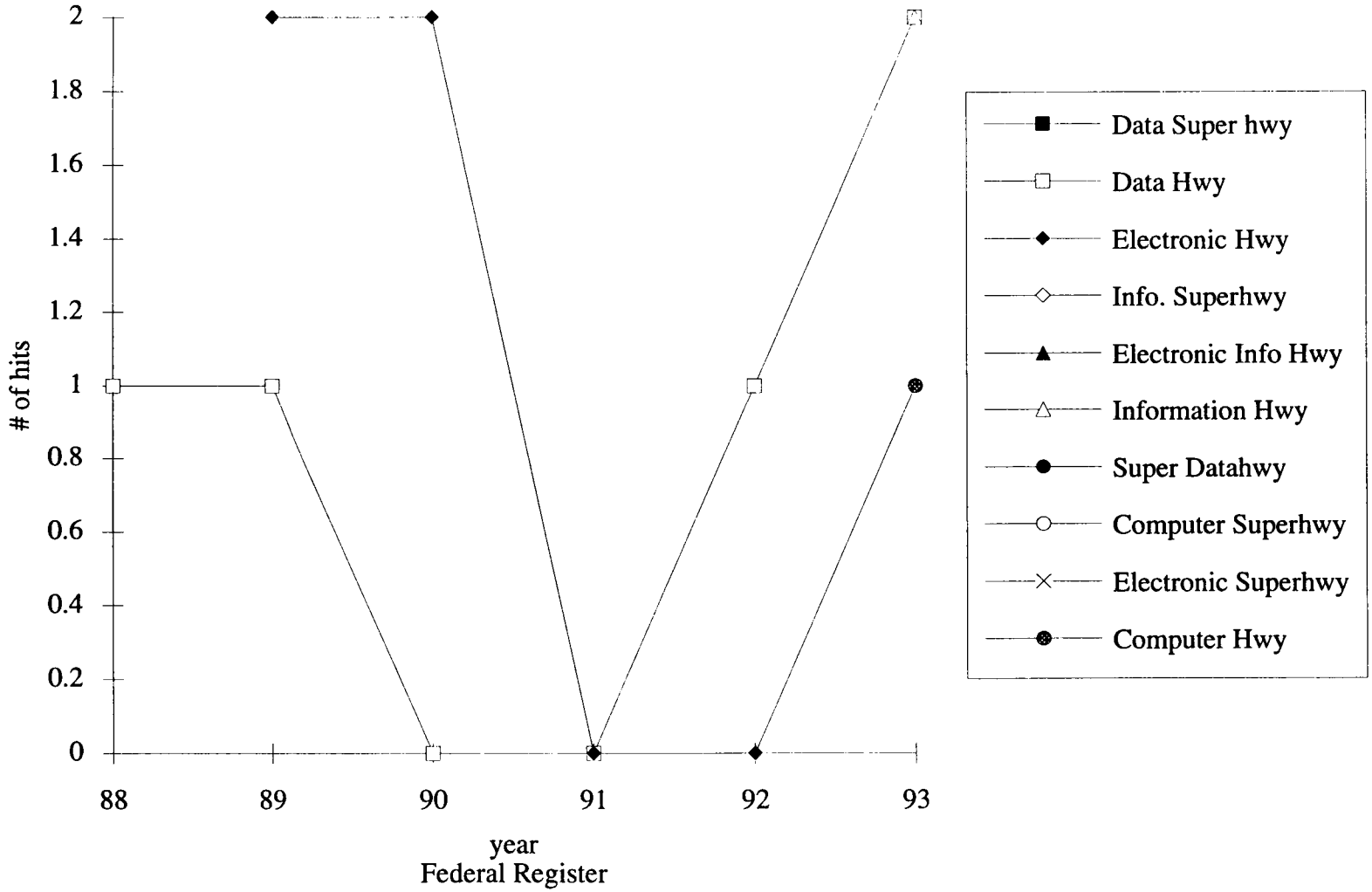
Data Hwy
Electronic Hwy
Info. Superhwy
Electronic Info Hwy
Information Hwy
Super Datahwy
Computer Superhwy
Electronic Superhwy
Computer Hwy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90
91
92
93
year
Federal Register
Data Super hwy
Data Hwy
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Info. Superhwy
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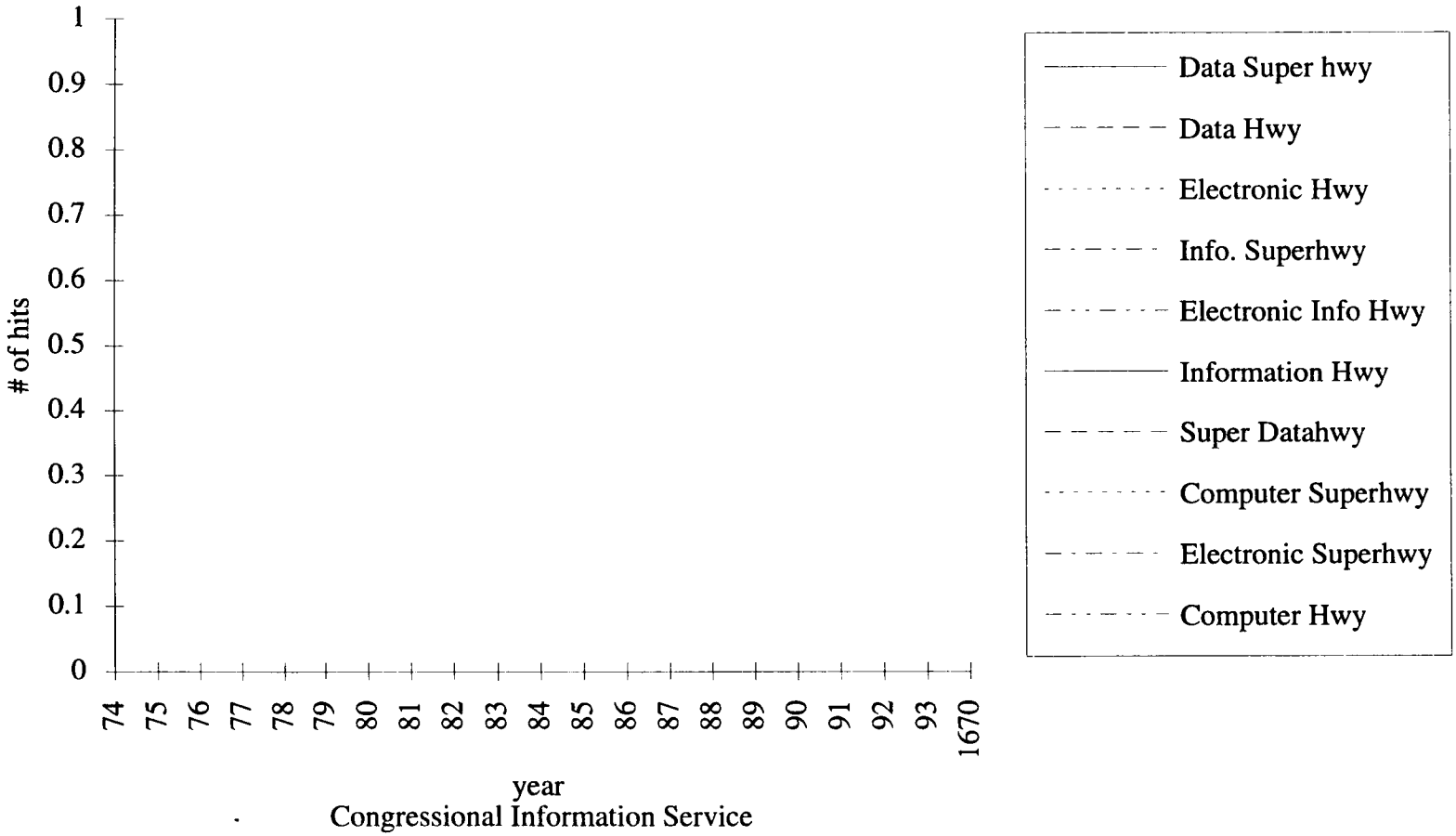
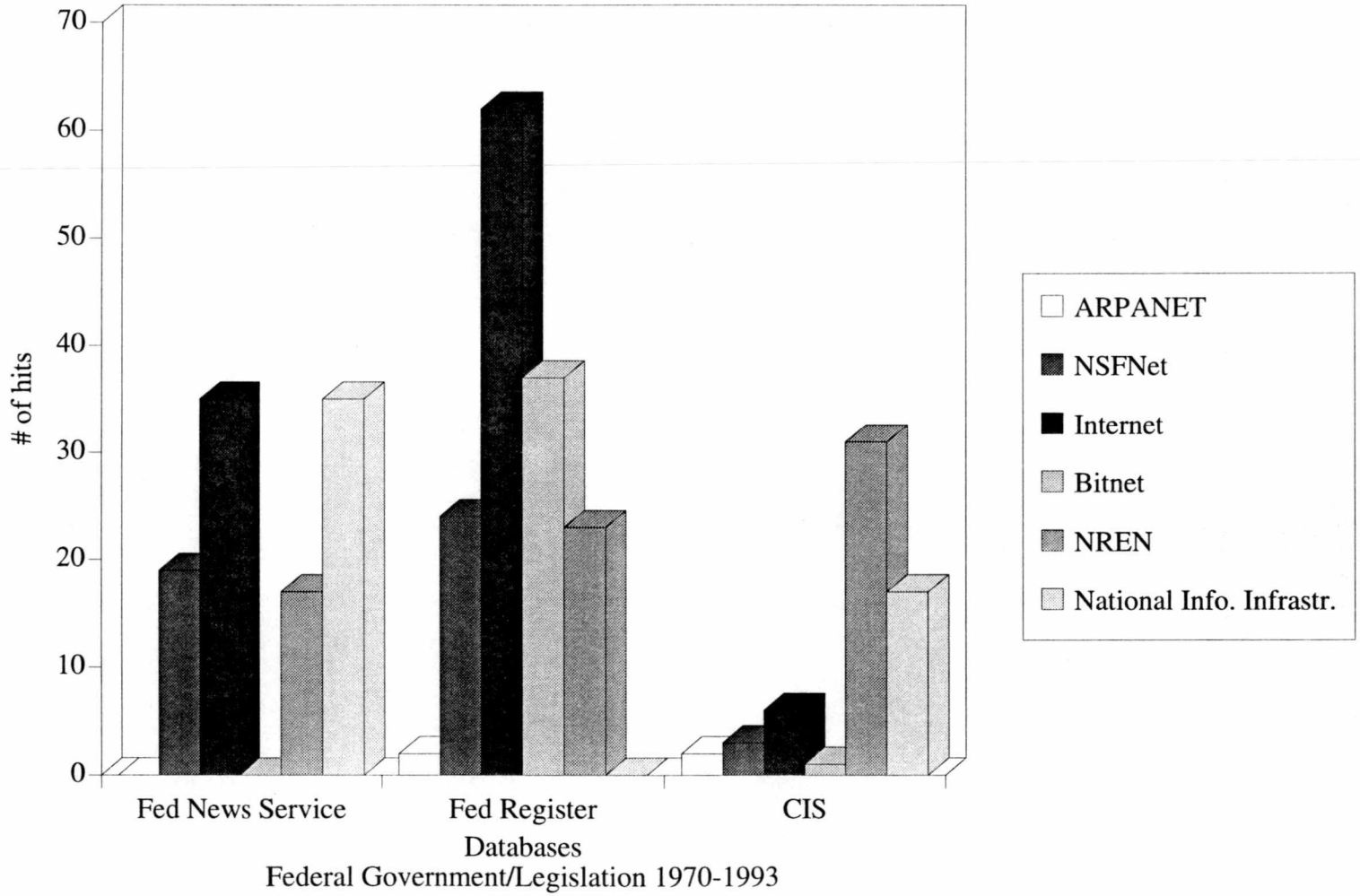
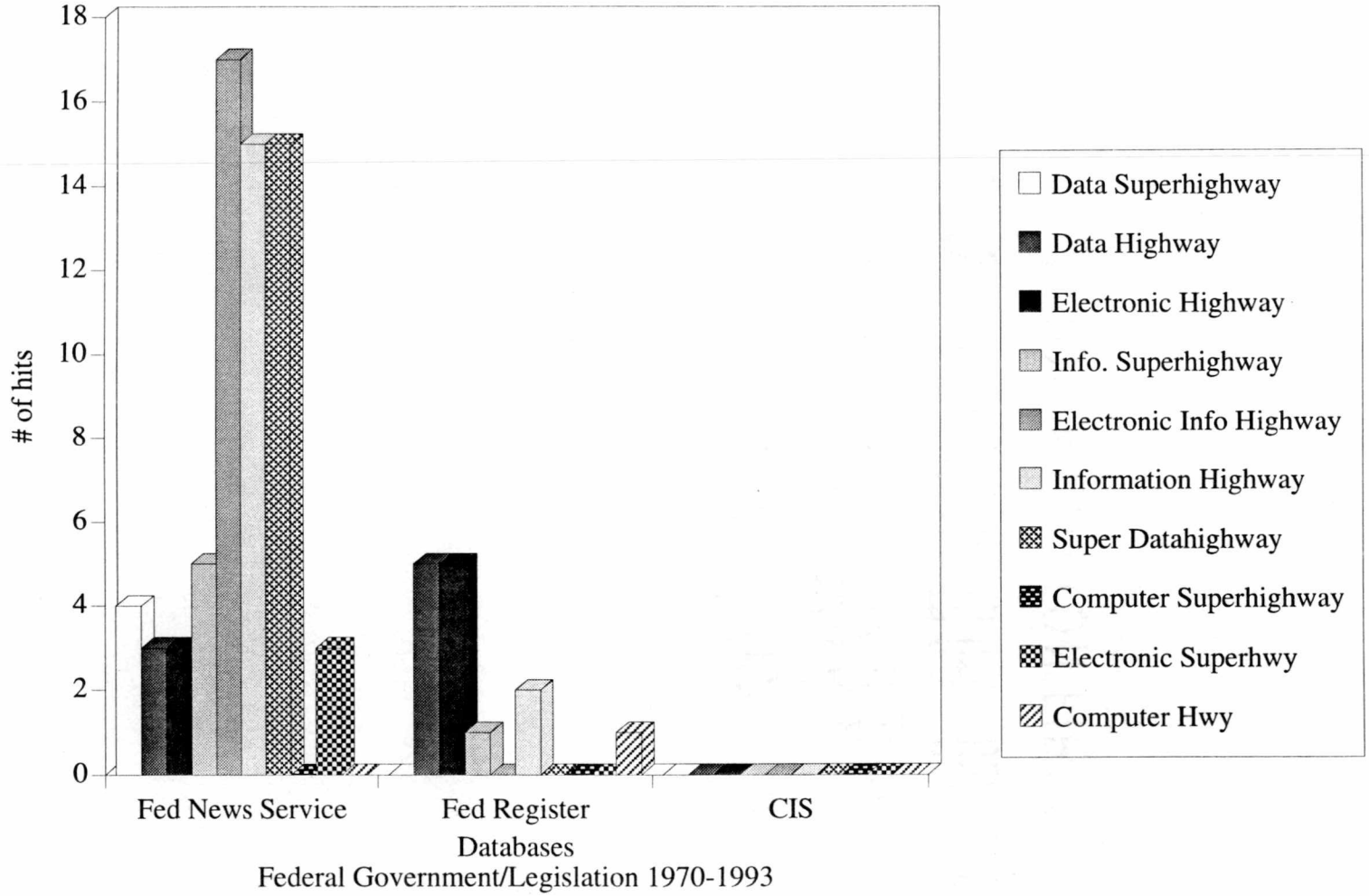
Information Hwy
Super Datahwy
Computer Superhwy
Electronic Superhwy
Computer Hwy



Congressional Information Service



Federal Government/Legislation 1970-1993



Federal Government/Legislation 1970-1993

APPENDIX I

All Search Terms

	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	Total
Science & Research																										
2	2	3	5	10	10	12	22	33	19	21	20	41	46	50	68	58	69	87	82	129	101	164	203	250	308	**1813**
6		1	1	5	26	19	24	31	37	20	21	29	36	36	18	19	26	20	17	36	31	32	58	58	43	**644**
8		2	3	4	8	5	13	13	16	21	17	18	31	42	43	40	42	51	35	46	63	48	48	55	75	**739**
35												1	1	2	0	4	4	3	2	3	5	9	13	12	3	**62**
77						3	4	3	7	3	1	2	2	1	1	0	0	1	2	2	0	1	8	17	6	**64**
103							3	7	10	8	6	5	5	5	1	6	11	7	13	9	13	16	15	12	23	**175**
108				2	6	5	17	19	22	18	10	14	12	17	14	10	12	8	9	9	17	13	47	15	13	**309**
sub-total:	**2**	**6**	**9**	**21**	**50**	**44**	**83**	**106**	**111**	**91**	**75**	**110**	**133**	**153**	**145**	**137**	**164**	**177**	**160**	**234**	**230**	**283**	**392**	**419**	**471**	**3806**
15						1	1	0	3	1	2	3	5	6	8	9	22	25	39	60	65	128	292	984	2658	**4312**
16				3	4	1	0	0	4	2	3	8	9	18	18	36	32	75	129	185	185	856	996	1315	2914	**6793**
61							1	2	2	4	6	3	3	1	3	1	3	3	1	5	6	32	57	89	102	**324**
148													4	7	6	8	6	10	19	190	178	182	486	938	1624	**3658**
155																					2	0	2	11	28	**43**
sub-total:				**3**	**4**	**2**	**2**	**2**	**9**	**7**	**11**	**14**	**21**	**32**	**35**	**54**	**63**	**113**	**188**	**440**	**436**	**1198**	**1833**	**3337**	**7326**	**15130**
111															4	1	0	0	0	10	1	12	6	13	158	**205**
484																			2	10	24	12	32	120	856	**1056**
647															9	8	14	17	44	157	175	190	261	395	1023	**2293**
sub-total:															**13**	**9**	**14**	**17**	**46**	**177**	**200**	**214**	**299**	**528**	**2037**	**3554**
101							2	0	0	0	0	0	0	0	0	0	0	0	0	1	13	8	10	5	21	**60**
660																							21	28	122	**171**
669																				4	14	19	34	40	51	**162**
sub-total:							**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**27**	**27**	**65**	**73**	**194**	**393**
Total	**2**	**6**	**9**	**24**	**54**	**46**	**87**	**108**	**120**	**98**	**86**	**124**	**154**	**185**	**193**	**200**	**241**	**307**	**394**	**856**	**893**	**1722**	**2589**	**4357**	**10028**	**22883**

Guide to database numbers

2 INSPEC	**103 Energy Sciency & Technology**	**148 Trade & Industry**	**101 CIS**
6 NTIS	**108 Aerospace**	**155 MEDLINE**	**660 Federal News Service**
8 Compendex Plus	**15 ABI/INFORM**	**111 Newspaper Index**	**669 Federal Register**
35 Dissertation Abstracts	**16 PTS Prompt**	**484 Newspaper & Periodical Abstracts**	
77 Conference Papers Index	**61 LISA**	**647 Magaznie ASAP**	

APPENDIX J

Super Power Players/Participants in the Superhighway Summit
January 11, 1994
UCLA's Center for Communication Policy

1. Deborah Kaplan, vice president & director, division on technology policy, World Institute on Disability
2. Vice President Al Gore
3. Richard Frank, president, The Walt Disney Studios
4. Andrea Rich, executive vice chancellor, UCLA
5. Jeffrey Katzenberg, chairman, The Walt Disney Studios
6. Michael Schulhof, president & CEO, Sony Corp. of America
7. Barry Diller, chairman & CEO, QVC
8. Gerald Levin, chairman, CEO, & president, Time Warner Inc.
9. John Malone, president & CEO, Tele-Communications, Inc.
10. Rupert Murdoch, chairman & chief executive, News Corporation Ltd.
11. Paul Goldberger, cultural news editor, New York Times
12. Quincy Jones, co-CEO, Quincy Jones•David Salzman Entertainment
13. Raymond Smith, chairman & CEO, Bell Atlantic Corp.
14. Richard Notebaert, president & COO, Ameritech
15. Pat Harvey, anchor, KCAL
16. Michael Eisner, chairman & CEO, The Walt Disney Company
17. Scott Sassa, president, Turner Entertainment Group
18. Alan Schwartz, senior managing director, Bear Stearns & Co.
19. Lucie Salhany, chairman, Fox Broadcasting Company
20. Alan Kay, fellow, Apple computer
21. Geraldine Laybourne, president, Nickelodeon/Nick at Nite, vice-chairman, MTV Network
22. Jerry Della Femina, president, Jerry Inc.
23. Brian Roberts, president, Comcast Corp.
24. Robert Iger, executive vice president, Capital Cities/ABC, Inc.; president, ABC Television Network Group
25. Stephen Case, president & CEO, America OnLine, Inc.
26. Robert Kavner, executive vice president, AT&T; CEO, Multimedia Products & Services Group
27. Bernard Shaw, principal Washington anchor, CNN
28. Mitchell Kapor, founder, Lotus Development Corp.
29. Robert Johnson, founder & CEO, Black Entertainment Television
30. Dick Cavett, host, The Dick Cavett Show, CNBC
31. Edward McCracken, president & CEO, Silicon Graphics, Inc.
32. Thomas Kalinske, president & CEO, Sega of America, Inc.
33. Paul Saffo, director, Institute for the Future
34. Bob Crestani, executive vice president & head of TV, West Coast, William Morris Agency
35. Lawrence Ellison, president & CEO, Oracle Corp.
36. Lynn Sherr, correspondent, 20/20, ABC News
37. Philip Quigley, president & CEO, Pacific Bell; group president, Bell Operating Companies
38. Ruth Otte, president & COO, Discovery Networks

APPENDIX K

2:INSPEC
1964-

IEEE Service Center
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
908-562-5549

Martha Ferrer, Online Trainer

WHEN ARE DESCRIPTORS/INDEX TERMS ADDED?

Indexing staff and editors are in the UK. Everyone on the editorial staff is an expert in an area (i.e. physicists, electrical engineers). Terms are added as technology dictates. They have a pulse. As they see things evolve, as they read the literature, they will add terms.

First, terms are entered into identifier fields as new buzz words because it takes awhile for a term to be defined.

DO YOU HAVE POLICIES THAT LIMIT THE NUMBER OF INDEX TERMS PER DOCUMENT?

8-10 generally. 10-14 identifiers. If more apply, more are assigned.

WHO GENERATES ABSTRACTS?

Use the original author's abstract—exception: when editors cut it at 250 words or the article is by a foreign author.

WHO DOES THE INDEXING?

In-house staff.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

Have sometimes cleaned up inconsistencies and typos.

DO YOU EVER GO BACK AND CROSS-REFERENCE?

No regular schedule.

DO YOU HAVE A WAY OF REFLECTING NEW CONCEPTS BEFORE IDENTIFIERS ARE CREATED?

It used to be that a journal was pulled apart and (articles) assigned to different editors who decided informally. Now, journals are edited online and electronic indexing is automatically done for 40 percent of the files.

WHAT IS THE TIME LAG FOR GOING ONLINE?

2 weeks

DO YOU ADD DATED MATERIALS TO THE DATABASE?

Yes. Information as received could be one year after the event took place—especially if it is foreign.

Materials might be added after a lag if materials are unique and valuable to science within a subject area.

DO YOU DROP MATERIAL ALREADY IN THE DATABASE?

No.

WHAT IS YOUR POLICY ON FOREIGN LANGUAGE MATERIAL?

Mostly English—80 percent. Since the Soviet regime changed we are now seeing a shift, a downtrend in eastern European countries and an increase in English language documents. Also, we're seeing an increase in Korean documents. We do a random sample every two years to see where our information is coming from.

6:NTIS
1964-

National Technical Information
U.S. Dept. of Commerce
5285 Port Royal Road
Springfield, VA 22161

Sue Willis, Technical Information Specialist
Melanie McAllister, Acting Manager for the Division

WHEN ARE DESCRIPTORS/INDEX TERMS ADDED?

Over a long period of time. Depends on 1. frequency of use, and 2. if searchers determine whether it becomes a hot topic. Even scientists can't decide on what will become the common term. "Hot topics" evolve from the market, use by the President, people's requests, National Critical Technology.

WHO GENERATES ABSTRACTS?

Two thirds come from clients; government agencies are required to submit abstracts. One third come from subject indexers.

WHO DOES THE INDEXING?

Six subject indexers. Articles are distributed by subject expertise; some go out to contractors.

Have an ongoing developing thesaurus which is informal and based on individual subject expertise. Share hot information among each other. Individuals decide what is "hot" by

- reading journals and magazines
- attending meetings, training seminars, exchanging information
- reading reports

DO YOU EVER GO BACK AND RE-INDEX OR CROSS-REFERENCE ANYTHING?

Not really. Use CD-ROM to check.

WHAT IS THE TIME-LAG FOR GOING ONLINE?

Two to six weeks before actually going online. set bi-weekly. If an item is a priority, customers decide; sales dept. reports what issues are being requested by phone. Then we hand-carry documents; they don't go through the system.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

We don't make that decision. It is initiated by the sources/agencies. The new law, American Technology Pre-eminence Act of 1991, went into effect Feb. 1, 1994. It requires all government agencies to submit information to NTIS. They can't hold back document unless they are classified. They can't use their own discretion on what to release.

WHAT IS YOUR SELECTION POLICY ON DROPPING MATERIALS?

We don't drop materials. Go back to 1964.

77:CONFERENCE PAPERS
1977-

Cambridge Scientific Abstracts
7200 Wisconsin Ave.
Bethesda, MD 20814

Anthea Gotto, Manager, Electronic Systems
Cheryl Droffner, Editor

ARE THERE OFFICIAL SELECTION POLICIES?

No. It's at the whim of the editor; the editor's judgment is based on limitations of time. There is a list of conferences always covered which is topical. But there is a general inconsistency in that. It's a problem. May cover a conference for three years, then stop.

WHEN ARE NEW DESCRIPTORS/INDEX TERMS ADDED?

Subject classifications and headings are the same. Index terms are computer generated from titles of papers. Cheryl makes a list, then makes an editorial judgment depending on the type of word and the amount of material on it.

DO YOU HAVE POLICIES LIMITING THE NUMBER OF INDEX TERMS PER DOCUMENT?

Yes. Subject headings are limited to 2-3 per record. There are not limits to index terms.

WHO DOES THE INDEXING?

Editors.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

On the whole, no. With the electronic version, less so.

WHAT IS THE TIME LAG FOR GOING ONLINE?

Six months prior. We index from preliminary announcements ahead of proceedings. Sometimes not all papers are presented.

DO YOU ADD DATED MATERIAL TO THE DATABASE?

No. There are plenty of current things.

DO YOU DROP MATERIAL ALREADY IN THE DATABASE?

No.

WHAT IS YOUR POLICY FOR DECIDING WHAT IS NOT COVERED?

Time and energy. There are 12,000 papers per issue/printed.

108:AEROSPACE

Aerospace Database Service
American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street
New York, NY 10019

212-582-4901

Adam Bernacki, Information Specialist

ARE THERE OFFICIAL SELECTION POLICIES?

General guidelines that were relaxed recently.

HOW ARE THEY CONSTRUCTED?

There are 72 categories grouped into 10 major categories. Thirty percent is aeronautics; the other is chemistry, physics, remote sensing, and information science.

WHEN ARE NEW DESCRIPTORS ADDED?

There are procedure indexes. Suggestion is made to the chief lexicographer at NASA. on his approval a term is entered into the NASA Thesaurus. Whenever a word appears significant enough, it is discussed by abstractors and indexers. It is informal arguing; they "squeeze their brains out."

WHO GENERATED YOUR ABSTRACTS AND INDEX TERMS?

These are combined into one function.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

Yes. In an effort made in the early 1990s 10,000 records were re-indexed to conform to new vocabulary and index.

WHAT IS THE TIME LAG FOR GOING ONLINE?

Depends on type and publisher. Two weeks to six weeks.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

Not as a rule although there are exceptions.

DO YOU DROP MATERIAL ALREADY IN THE DATABASE?

Yes. Can't think of an instance.

WHAT IS YOUR POLICY ON FOREIGN LANGUAGE MATERIAL?

We cover 40 languages. A significant portion of the database is foreign language. 15-20 percent is Russian.

(a search of their total records, however, indicates that 16 percent of the database is made up of non-English materials.)

S UD=?

s S1 not LA=English

1,951,563 TOTAL RECORDS
307,851 not English
1,643,712 English

35:DISSERTATION ABSTRACTS
1861-

15: ABI INFORM
1971

484:NEWSPAPER AND PERIODICAL ABSTRACTS
NEWSPAPERS—1989-
PERIODICALS—1988-

UMI/Data Courier
620 South Third St.
Louisville, KY 40202-2475
800-626-2823

Rick Koehler, Assistant Editor
Mary Beth, Documentation Specialist

ARE THERE OFFICIAL SELECTION POLICIES?

Do market research on customer interest, circulation numbers, requests, and common sense. Use Katz Publications.

WHEN ARE NEW DESCRIPTORS ADDED?

When we feel there is a need. Editorial staff does revision every one or two years. For example, a year ago when virtual reality was a new concept, a hot topic. Justification was done through free-text searching on our databases and others for the number of hits. Regarding lag time, we can add terms quickly. We added Persian Gulf War rather quickly. Had the subject term War and geographic term in two weeks. Terms are submitted to managing editor. Some terms are too general—there is competition.

Subject terms and index terms are the same. They are generated by the author/source.

DO YOU HAVE POLICIES THAT LIMIT THE NUMBER OF INDEX TERMS PER DOCUMENT?

Varies from database to database. Usability of the database reflects the quality of the indexing. Controlled vocabulary: accurate and adequate.

WHO GENERATES YOUR ABSTRACTS AND INDEXING?

We have 20 indexers and editors who index 1600 publications per year.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

Yes. If a customer points out an error. We rarely find mistakes like that. Online it's tough; can be changed more readily on CD file. Can't do an entire reload of database.

DO YOU EVER GO BACK AND CROSS-REFERENCE?

Yes. Between files. At ABI we sued to authorize subject terms. In the future we are going to have cross links with one large database. We'll try to make names and companies consistent.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

Some we've taken back to 1986. It depends on the publication.

WHAT IS YOUR SELECTION POLICY ON DROPPING MATERIALS?

We never really drop something once it's there.

WHEN DO YOU LOAD INFORMATION?

We update daily. It gets online one to two weeks past publication on the newsstand; newspapers a week to two weeks.

HOW DO YOU DECIDE WHAT IS NOT COVERED?

It depends on individual database and whether it has long-lasting research value.

Do not cover crime, traffic accidents, weather, advice, cooking, sports box, short filler, classified ads.

OTHER COMMENTS:

Any list is a moving target.

LISA (Library and Information Science Abstracts)
1969-

Bowker-Sauer, Ltd.
Maypole House
Maypole Road
East Grinstead
West Sussex RH19 1HH
United Kingdom

Nick L. Moore, Managing Editor
Abstracts & Indexes

WHEN ARE DESCRIPTORS/INDEX TERMS ADDED?

Changed from using CRG classification scheme to a thesaurus on computer. Terms are taken from they used before. They have been updating archaic terminology such as dropping the hyphen in on-line and taking the space out of database.

New descriptors/index terms are added in the circumstance of "literary warrant," usage in publications, and when editors come across new terms. It's very hard to know if this is going to be the term of usage. They try to follow how the literature is using terminology. The term Internet has not been resolved. Use "network," a term which is the bane of their lives.

Use a program developed by Bowker in New Jersey called Advanced Revelation. When it performs validation checks it checks every subject descriptor against the thesaurus and throws up the new terms. The editor uses his own judgment as to whether to make those index terms.

WHO GENERATES ABSTRACTS? WHO DOES THE INDEXING?

Use freelance labor in the last few years for commercial reasons; it's cheaper. One in-house editor does indexing, a far less rigorous process.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

It's very difficult to do that. We're doing it now as an exercise for our CD-ROM and online database. We've developed a tool to pick up misspellings.

HOW DO YOU DEAL WITH TIME LAG?

Currency is defined as the time elapsing between the arrival of the periodical in the LISA Office and the dispatch of the printed issues to subscribers. The currency of the online service is much better than the printed service, but I have no comparative data. The data refers to LISA Issues 4/94 to 6/94 and shows the fraction of the total periodical articles records that appeared in the LISA during particular 4-week segments.

Weeks	4/94	5/94	6/94
4-8	2%	2%	5%
9-12	22%	20%	26%
13-16	23%	25%	20%
17-20	12%	11%	20%
21-24	26%	30%	13%
25-28	7%	5%	5%
29-32	2%	4%	1%
33-36	1%	1%	5%
>36	4%	2%	5%

The company is researching their time lag situation to determine their decision to use an all-freelance staff has impinged on their currency.

WHAT IS YOUR POLICY ON DROPPING MATERIALS?

It's very difficult to persuade on-line vendors to reload files. We hope to convince DIALOG to upload file 61 to correct mismatched descriptors. They are reluctant to do it because of cost. However, we will have a full update on our autumn disk. It will have a computerized thesaurus for LISA and CTI like we use here. We are the first to use a new thesaurus with a facility to lead you from non-preferred terms to preferred terms and that indicates related terms.

Washington Post Online
April 1983 -

The Washington Post Company
1150 15th Street N.W.
Washington, DC 20071
202-334-6744

Sandy Davis

WHEN ARE NEW DESCRIPTORS ADDED?

There is a standard header for every story and 20 fields we can use, including people, organizations, etc. There is a subject field and we have a 2400-term thesaurus which is set up in a hierarchy. We try to make it general in nature. The Information Highway would be placed in a Communications Information broad category with hierarchical terms beneath: telecommunications or digital information. Also, the key word field contains words of description such as Whitewater or Iran-Iraq War. We have amended the thesaurus only three times in seven years.

WHO GENERATES ABSTRACTS?

Newsbank does its own abstracts.

WHO DOES THE INDEXING?

A couple of firms do this.

WHAT IS THE TIME LAG?

Articles go online the next day.

WHEN DO YOU LOAD INFORMATION?

The next day.

HOW DO YOU DECIDE WHAT IS NOT COVERED?

We do not carry syndicated columns, except to two vendors who hide text field, but you can see that it ran. We do not publish classifieds, sports agate, Ann Landers, puzzles online.

ADDITIONAL COMMENTS:

Dow Jones, Nexis and Datatimes will attach the corrections that have run on stories to the original stories. They are heavy on quality control and check numbers to make sure they got all the stories.

American Cybercasting makes the Washington Post available to colleges and universities. The same feed goes to CompuServe and Legislate databases. They get the first version of all stories online (50 stories). These include the entire A section, columnists from Metro section, stories on Congressional legislation, and the lead stories in business and style.

National Newspaper Index
PR Newswire 1988-
New York Times Book Review 1979-
New York Times Magazine 1979-
Christian Science Monitor 1979 -
Los Angeles Times 1982
The New York Times 1979
The Wall Street Journal 1979-
The Washington Post 1982

Trade & Industry
1981-

Magazine ASAP
1983-

Information Access Company
3621 Lakeside Drive
Foster City, CA 94404
800-227-8431

Cheryl Penick, Information Specialist, Client Services

ARE THERE OFFICIAL SELECTION POLICIES?

Yes.
1. Copyright and licensing determines if and which database.
2. Editorial Dept. determines which journal goes into which database.
3. Selective for every journal title.

WHEN ARE NEW DESCRIPTORS ADDED?

Descriptors =index terms. The Editorial Department handles it. Indexers have a controlled vocabulary list, a formal list. If enough occurrences of that term warrant inclusion, then it is added to the vocabulary. Have temporary descriptors as well as a computer list that generates terms.

DO YOU HAVE POLICIES THAT LIMIT THE NUMBER OF INDEX TERMS PER DOCUMENT?

No. the average is three. It is unusual to see more than five.

WHO GENERATES YOUR ABSTRACTS?

Totally in-house.

WHO DOES THE INDEXING?

Editorial Dept. has indexers and abstractors.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

Yes. We make corrections.

DO YOU EVERY GO BACK AND CROSS-REFERENCE?

No.

WHAT IS THE TIME LAG?

7-10 days for indexing. Our articles first appear in Database 211 (Newsearch) in citation and maybe abstract form for two to six weeks, then they spin to their home files where full text is added.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

Yes. Usually from the date of contract on.

WHAT IS YOUR SELECTION POLICY ON DROPPING MATERIALS?

We may remove an article if there is a problem, but that's pretty rare.

WHAT IS YOUR POLICY ON FOREIGN LANGUAGE MATERIAL.

We have no foreign material. Everything is in English.

WHEN DO YOU LOAD INFORMATION?

It depends on vendor and file.

COMMENTS RELATING TO MAGAZINE ASAP

Articles are selected. May choose 19-20 of the most important articles. Indexers make the determination of what the most significant articles are. Have specific criteria for which columns to include.

TIME LAG: In MAGAZINE ASAP references first go to Newsearch, then to Magazine Index, then to Magazine ASAP.

COMMENTS RELATING TO TRADE & INDUSTRY INDEX:

More and more international information is being added to this database, but the language is only English.

PTS NEWSLETTER
1988-

Predicasts
11001 Cedar Ave.
Cleveland, OH 44106
800-321-6388

Ronnie Adams, Client Services

ARE THERE OFFICIAL SELECTION POLICIES?

Don't know; if so, based on copyright.

WHEN ARE NEW DESCRIPTORS ADDED?

There are none. Searching is by key word in context (KWIC). There is an industry code by group of newsletters. We sacrifice coding for timeliness.

WHO GENERATES ABSTRACTS AND INDEXING?

We have none.

WHAT IS THE TIME LAG?

24 hours after we have received it from the publisher it goes online; however, there are some batch things.

DO YOU ADD DATED MATERIAL?

No.

WHAT IS THE SELECTION POLICY IN REGARDS TO DROPPING MATERIALS?

Yes, we drop, or they drop us. Contracts end and we lose full-text rights.

PTS PROMPT
1972-

Predicasts
11001 Cedar Ave.
Cleveland, OH 44106
800-321-6388

Ronnie Adams, Client Services

ARE THERE OFFICIAL SELECTION POLICIES?

Yes. Selections are judged by business. It is complex based on arrangements with the publisher. We also look at lasting value.

WHEN ARE NEW DESCRIPTORS ADDED?

We have codes: product code, event code, country code and SIC codes attached to manufactured products; no trademarks or brand names, however.

HOW ARE INDEXES AND ABSTRACTING GENERATED?

In house.

DO YOU GO BACK AND RE-INDEX ANYTHING?

No. We hope to make improvements in the future.

DO YOU GO BACK AND CROSS REFERENCE?

As it becomes appropriate.

WHAT IS YOUR TIME LAG?

7-14 days for abstracting. Daily updates. Depends on many factors, including the journal, the electronic format, and the embargo imposed. Some are added weekly, some monthly.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

No. In rare cases up to on year. Normally our contract specifies our right to begin in January.

DO YOU INCLUDE FOREIGN LANGUAGE MATERIAL?

No, but 50 percent of our material is international.

MEDLINE
1965-

National Library of Medicine
8600 Rockville Pike
Bethesda, MD 20894
800-638-8480

Olga Diamondis, Technical Assistant

HOW ARE NEW DESCRIPTORS OR SUBJECT HEADINGS ADDED?

Subject headings change slowly. They are updated yearly in December. There are 1000 pages of subject headings in the thesaurus. Pre-exploded terms have a search set.

WHO GENERATES YOUR ABSTRACTS

Journals.

WHO DOES THE INDEXING?

National Library of Medicine.

DO YOU EVER GO BACK AND RE-INDEX ANYTHING.

No.

DO YOU EVER GO BACK AND CROSS-REFERENCE?

In the thesaurus.

WHEN DO YOU LOAD INFORMATION AND WHAT IS THE TIME LAG?

Varies by journals. AIDSLINE is updated weekly and CANCERLIT is updated monthly.

DO YOU ADD DATED MATERIALS TO THE DATABASE?

No.

DO YOU DROP MATERIALS?

No.

WHAT IS YOUR POLICY ON FOREIGN LANGUAGE MATERIALS?

25 percent is foreign language.

CIS (CONGRESSIONAL INFORMATION SERVICE) 1970-

Congressional Information Service
4520 East-West Highway, Suite 800
Bethesda, MD 20814
800-638-8380

Stephen Daniel, Director, Congressional Legal Services
(formerly managing editor and index editor 1973-1981)

Pat Simon, User Support

HOW ARE NEW DESCRIPTORS ADDED?

We wait and see that a term will stick around. We have an evolving thesaurus. We are a relatively mature database. We are slow to add terms. We add terms once a year. We are more conservative because of the CD-ROM product and 20 years of material being searched simultaneously.
In the 1970s we revised monthly.
In the 1980s we revised quarterly.
In the 1990s we do it yearly.

WHO GENERATES YOUR ABSTRACTS?

They are done in-house by indexers and abstractors then sent to a microfiche facility. Abstractors produce a main abstract plus an abstract of witness testimony which does not indicate "for" or "against."

DO YOU EVER GO BACK AND RE-INDEX ANYTHING?

No. It's a pain.

DO YOU EVER GO BACK AND CROSS-REFERENCE?

Yes. We do a great deal. It is one of the secrets of our success. That's the game here. We publish a monthly and cross reference quarterly. We make the terms the same for a given piece of legislation. Each one has 5-10 accession numbers.

WHAT IS YOUR TIME LAG?

We are two months behind.

DO YOU ADD DATED MATERIALS?

Yes. On hearings we go back and pick up things not available.

DO YOU DROP MATERIALS ALREADY IN THE DATABASE?

No.

FOREIGN LANGUAGE MATERIAL?

No.

WHEN DO YOU LOAD INFORMATION?

Monthly.

FEDERAL REGISTER
1988-

DIALOG Information Services, Inc.
3460 Hillview Ave.
Palo Alto, CA 94304
800-334-2564

Dale Smidt, Senior Information Specialist

This database is equivalent to the printed version. Federal Register Abstracts is another database available through DIALOG that includes summaries.

Summaries are produced by the Government Printing Office (GPO), who sends them to a producer, who sends them to an intermediary. They are then converted to DIALOG format and are run in a conversion text.

FEDERAL NEWS SERVICE
1991-

Federal News Service
620 National Press Building
Washington, DC 20045
202-347-1400

Todd McKenzie, Vice President

WHAT ARE YOUR SELECTION POLICIES?

Customer demand
Economics
Copyright contracts

HOW ARE DESCRIPTORS ADDED?

Descriptors are FNS originated and are 25-30 characters. Otherwise they are assigned electronically by DIALOG.

By the human who is typing it (Congressional hearings, speeches, Presidential statements, State Department briefings, Defense Department briefings, testimony and statements by senior officials in Budget, State, Treasury, Commerce, Trade and Defense, National Press Club luncheons, statements by foreign dignitaries while in the U.S., selected coverage of U.N. events, prepared testimony from Capitol Hill.)

Hire transcribers for hearings who type 100-130 words per minutes, 70,000 to 90,000 characters per day.

WHO GENERATES ABSTRACTS AND INDEXES?

Don't have any! Did a market survey; we got no revenue from abstracts.

DO YOU DROP MATERIALS ONCE THEY ARE IN THE DATABASE?

Only if a request or if a problem.

WHAT IS YOUR TIME LAG?

Transcribe one day, online the next. The State Department pays us to get their own briefing. The microphone there is the one we tap into. It's public information. We hold some things for client sensitivity regarding terrorism even though it's public information. It's a catch 22.

WHEN DO YOU LOAD INFORMATION?

Several times per day.

OTHER COMMENTS:

We have an agreement with Bell Atlantic to see how our information can be delivered on their Information Highway.

We also have a Custom Program for clients needing customized data. We found our clients were overloaded with information so we provided a menu. Clients are allowed so many items to order from the menu for a subscription fee from.

We are looking at the European Eastern Bloc countries. They are untapped and are going to explode like Asia of the 1980s.

We found there was a need for scanning prepared testimony. We're filling that niche. Could go on CD-ROM.

Sixty percent of our customers are journalists (Sun, Washington Post, L.A. Times, Washington Times, Japanese newspaper that's the largest in the world (10 million) Yomiuri Shimbun, Tass, Eastern Bloc papers, embassies, largest bureau in Moscow, etc.)

We do translations of English to _____.

We offer customized service for 1400 topics.

We are looking at our pipeline moving into satellite.

APPENDIX L

NEWSPAPER COVERAGE OF NREN AND THE HIGH-PERFORMANCE COMPUTER ACT IN RESEARCH COMMUNITIES

DATE	AP	Boston Globe	Houston Post	Knoxville News-Sentinel	San Jose Mercury	Seattle Times	Washington Post
1992		House Panel Passes Computer Bill May 9, 1992 100 words		UT Buys Supercomputer for Scientists' Research Needs April 5, 1992 250 words TVA Asked to Fund Network 154 words Mar 13, 1992 (AP) Mark Up Wins for Tennessee Delegation Jan 5, 1992 485 words			Gazing at the Future of Networks: Vast Flow of Information Opens Many Markets for Entrepreneurs Jun 22, 1992 Series 1155 wd Internet's Evolution Becomes Computer-Era Revolution Jun 1, 1992 Series 1096 words
1991				Good News for Oak Ridge: Supercomputer Dec 30, 1991 498 words Oak Ridge to Get Supercomputer Dec 21, 1991 700 words Gore to Make Six Stops Tuesday Dec 2, 1991 185 words U.S. Grant Buys Supercomputer, Prestige for UT Dec 2, 1991 452 words Computer Network Bill Moves Ahead Jul 13, 1991 206 words Gore Urges Support for Computer Network June 30, 1991 310 words Road Work Seen as Way to Boost Economy Jan 6, 1991 810 words	High-Tech Infrastructure Computing Act Is an Important Step Toward Modern 'Data Highway' Nov 29, 1991 277 words Congress Gives Boost to 'Data Highway' Nov 26, 1991 767 words U.S. 'Information Highway' Computer Network Foreseen Nov 24, 1991 (NYTimes) 660 words	Scientists Pleased with Proposed $78 Billion Budget for Civilian R&D Feb 13, 1991 (Wash Post) 512 Paving the 'Information Highway': National Network to Link Computers Gets Bush Backing Feb 15, 1991 (Newsday) 1280 words	Setting Ground Rules for the 'Digital Future': Experts Debate America's Role in the Information-Handling Network of the 21st Century May 28, 1991 1264 words

DATE	AP	BOSTON GLOBE	HOUSTON POST	KNOXVILLE NEWS-SENTINEL	SAN JOSE MERCURY	SEATTLE TIMES	WASHINGTON POST
1990							Networking the Future: We Need a National 'Superhighway' for Computer Information, by Al Gore Jul 15, 1990 2448 words Government, Industry Envision Bulding a 'Data Superhighway'; National Science Poundation Leading Effort Jun 8, 1990 368 words
1989	U.S. Policy Makers Must Guard Against 'Haves' and 'Have Nots' Oct 5, 1989 450 words Library of Congress Wants to Help Develop a National Research and Education Network Sept 15, 1989 313 words White House Science Office Advocates Computer Network Sept 10, 1989 435 words Administration Poised to Boost Supercomputers Sept 7, 1989 522 words NSP Argues Senate Bill Not Needed June 21, 1989 472 words	$1.9 Billion Computer Network Plan Sept 11, 1989 423 words (AP) Bush to Call for 5-year Push on Computer Tech Sept 9, 1989 323 words (AP)	A Network of of Supercomputers High-Speed Systen Could Spark Other Industries: Expert Sept 11, 1989 286 286 words (AP) White House Backs Sophisticated Computer Strategy Sept. 8, 1989 261 words (AP) Data Network Links Legislation Worries NSF Offical June 25, 1989 360 words (AP)		Paving Way for for Data 'Highway' Sept. 17, 1989 1260 words 'Highway' for Data Proposed: Bush Planning High-Tech Boost Sept 7, 1989 (WPOST) 957 words Computers: Bridge Global Barriers Apr 16, 989 672 words		Bush to Unveil High-Tech Initiative; $2 Billion Computing Project Would Include Data 'Superhighway' Sept 7, 1989 928 words Behind Computer 'Virus': Network's Lax Oversight; GAO Asks Role for President's Science Office Jul 20, 1989 528 words

Boston Globe, #12, cir. 521,354, Dialog '80-Aug. 3, 1992
Houston Post, #28, cir. 328, 621, Dialog '88-Aug. 3, 1992
Knoxville News-Sentinel, cir. 103,386, Vu-Text Sept. '90-Aug. 5, 1992
San Jose Mercury, #36, cir. 278,676, Dialog June '85-Aug. 1, 1992
Seattle Times, #45, cir. 233,995, Dialog, '89-Aug 3, '92
Washington Post, #6, cir. 780,582, Dialog '82-Aug. 4, '92
Source: Editor & Publisher International Yearbook, 1991 and from "Top 100 Daily Newspapers in the U.S. by Circulation, 1990" The Universal Almanac 1992

VITA

Born in Topeka, Kansas, Pamela Maize Harris attended high school at Platte Valley Academy, Shelton, Nebraska, graduating in 1970. She entered Union College in Lincoln, Nebraska, in August 1970, and transferred to Southern College, Collegedale, Tennessee, in 1971 where she received a B.A. in English with minors in communications and speech and secondary teaching credentials in 1975.

In August 1974, she joined Madison Academy, Madison, Tennessee, as an English, speech, and journalism teacher. While in the Nashville area, she began work on a master's degree at George Peabody College of Vanderbilt University in 1975, graduating with an M.L.S. in 1979. She taught English, speech and journalism at Forest Lake Academy in Orlando from 1980 until she joined Classic Chevy Club International as executive producer of video products, special projects coordinator, assistant editor of **Classic Chevy World** magazine, and media relations coordinator in 1983. Harris continued as a contributing editor of **Classic Chevy World** when her husband's career took them to Texas, where she worked as a journalist with the **Wood County Democrat**, **Tyler Magazine**, **Tyler Life** and managing editor of the East Texas Edition of **Texas Farm & Ranch News**. She has been a public relations and advertising consultant for various clients since 1983, is an investigative reporter for **Liberty** magazine, and has covered local politics and other issues for the **East Hamilton County Journal** and **Corporate Chattanooga** magazine. She also served as a writer and editor for two anthologies for high school English classes.

In 1987 Harris joined the Corporate Communications Department of Blue Cross and Blue Shield of Tennessee in Chattanooga as an editor, speech and policy writer, and monitor of health-related legislation.

In 1989 she joined Southern College in the Journalism and Communications Department. Harris entered the University of Tennessee in Knoxville in August 1991 as a doctoral student in the College of Communications. She obtained her Ph.D. in Communications in August 1994. Harris, an assistant professor who teaches for the English Department as well, was appointed chair of the Journalism and Communications Department at Southern College in June 1994.