The Roots of 128: A Hypothetical Documentation Strategy

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Abstract: Documentation strategies have been proposed as a means to respond to the problems of modern records through planned and coordinated collecting activities. The strategies are conveniently defined around some issue, activity, or area, and may be focused on a manageable topic within appropriate geographical and chronological boundaries. A documentation strategy for Route 128—the high technology phenomenon in Massachusetts—is offered here as a hypothetical case study. The proposed course of action could be used to address the problems posed by Route 128, or simulated with appropriate modifications to address other documentary problems.

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THE MAJOR PROBLEMS OF modern documentation—its volume and complexity—require a new approach on the part of archivists and others concerned with records. The archival profession has begun to address the problems and to suggest ways of dealing with them. One option under discussion is what has come to be termed the "documentation strategy." The rationale behind this idea is that traditional collecting activities, shaped by the internal concerns of a single institution, no longer adequately respond to the challenges presented by modern records. A documentation strategy attempts to fill the breach by involving records creators, administrators (including archivists), and users in a joint analysis of documentation problems, and in the planning and coordination of a more unified approach to the creation, collection, and retention of records. A documentation strategy is conveniently defined around some issue, activity, or area—e.g., science and technology—and may be focused on a manageable topic within appropriate geographical and chronological boundaries—e.g., the Route 128 phenomenon in Massachusetts since World War II. It is an ongoing process, flexible enough to allow for refinement from time to time in response to changing conditions and viewpoints.[1]

Any effort to document so broad a topic as science and technology in New England is a formidable one, likely to succeed only with the application of appropriate parameters. A strategy formed around a relatively well-defined subtopic, such as the Route 128 "high tech" companies, provides a possible focus. Such a specialized strategy could later be coordinated with others to develop a comprehensive portrayal of science and technology in general. In preparing for and undertaking a specialized strategy, however, the importance of understanding developments in science and technology at least in broad outline should not be underestimated. A strategy for Route 128 must be planned and implemented with due attention to the larger context of science and technology—its lines of historical development, the patterns of its growth and change, the interaction of its various fields, and its particular relationship to the topic selected for documentation.

Historical Background

The development of science and technology in New England extends from colonial times. In the seventeenth and eighteenth centuries, New Englanders were attracted to science as a curiosity in itself and as a useful tool in a range of pursuits critical to their well-being—navigation, mechanical invention, geography, agriculture, and public health. There was no institutional or government planning involved, nor any sense of science as a full-time professional occupation. Scientific work was carried on in an ad hoc way by individuals from many walks of life—professors, physicians, farmers, mechanics—who had talent and time to devote to it.

Scientific individualism was recognized in Article I, Section 8, of the Constitution, which empowered Congress "to promote the progress of science . . . by securing to authors and inventors the exclusive right to their respective writings and discoveries." But science, in the way it was carried out, quickly became too complex to fit neatly

[1]The documentation strategy concept is discussed in Helen W. Samuels, "Who Controls the Past," *American Archivist* 49 (Spring 1986): 109–24; Larry J. Hackman and Joan Warnow-Blewett, "The Documentation Strategy Process: A Model and a Case Study," *American Archivist* 50 (Winter 1987): 12–47; and Richard J. Cox, "Choosing Documentation Strategies: Further Thoughts on a New Archival Appraisal Concept," unpublished paper prepared for the New York Historical Records Program Development Project, New York State Archives, 1987. The case study presented here is conceived as a complement to Samuels's article.

into such a conception. In the nineteenth century, state and federal governments began to fund and help organize geological coast surveys; centers of industrial chemistry and textile engineering grew up in cities such as Lowell, Massachusetts; and educational institutions, notably the Massachusetts Institute of Technology (MIT) and the "scientific schools" at Harvard and Yale universities, implemented specialized research programs and professional training courses for a variety of science- and technology-related careers. It was no longer entirely appropriate to think of the practitioners of science simply as tinkerers or amateurs working in a haphazard way on their own, or even as individual pathfinders driven by personal initiative. An elaborate framework of external support was beginning to take shape.

As it continued to expand, this framework took root firmly in the twentieth century, not just in New England but throughout the nation. Mobilization during wartime was its most dramatic impetus. During World War I, the federal government established close relations with the chemical and optical industries and with academic institutions to create a system of highly organized team research on weaponry and other projects deemed essential to the national interest. A similar scenario occurred during World War II, but in a broader range of fields and to an unprecedented degree that radically and permanently altered the relation of science to government, industry, and academe. Contractual devices were used not merely to procure specific pieces of research, as they had been in World War I, but also to set up whole research centers, financed by government and administered by particular companies or academic institutions. This enormous organizational scheme was viewed as so successful that, with appropriate variations to accommodate a postwar environment, it became an important pattern for scientific development after 1945, and has remained so to the present time.[2]

The Route 128 phenomenon—the clustering of high technology firms adjacent to a highway circling the Boston area—is a good example of how this pattern has evolved.[3] During World War II, MIT, with the support of government contracts, established the Radiation Laboratory, the Instru-

[2]For a general discussion of the evolution of modern science in relation to social institutions, see J. Stefan Dupre and Sanford A. Lakoff, *Science and the Nation: Policy and Politics* (Englewood Cliffs, N.J.: Prentice-Hall, 1962); George H. Daniels, *Science in American Society* (New York: Alfred A. Knopf, 1971); John T. Wilson, *Academic Science, Higher Education, and the Federal Government, 1950–1983* (Chicago: University of Chicago Press, 1983); A. Hunter DuPree, *Science in the Federal Government* (Cambridge: Harvard University Press, 1953); Ina-Susanne Spiegel-Rösing, *Science, Technology and Society: A Cross-Disciplinary Perspective* (London: SAGE Publications, 1977). A classic interpretation of the development of science in New England from colonial times through the Civil War is Dirk J. Struik, *Yankee Science in the Making* (Boston: Little, Brown, 1948).

[3]Among the studies of the phenomenon are Edward B. Roberts and H. A. Wainer, "New Enterprises Along Route 128," *Science Journal* 4 (December 1968): 78–83; and Nancy S. Dorfman, "Route 128: The Development of a Regional High Technology Economy," *Research Policy* 12 (December 1983): 299–316. See also Edward B. Roberts, "A Basic Study of Innovators: How to Keep and Capitalize on Their Talents," *Research Management* (July 1968): 249–66; W. Allen Pennington, "Lessons from Route 128?" *Science Journal* 4 (December 1968): 3; Nancy S. Dorfman, *Massachusetts High Technology Boom in Perspective: An Investigation of Its Dimensions, Causes, and the Role of New Firms* (CPA 82–2) (Cambridge, Mass.: Center for Policy Alternatives, MIT, April 1986); and Edward B. Roberts and Donald H. Peters, "Commercial Innovation from University Faculty," *Research Policy* 10 (1981): 108–26. Several master of science theses written in the Alfred P. Sloan School of Management, MIT, have focused on special aspects or examples of this phenomenon, e.g., Dean A. Forseth, "The Role of Government Sponsored Research Laboratories in the Generation of New Enterprises," 1966; Jerome Goldstein, "The Spin-Off of New Enterprises from a Large Government Funded Industrial Laboratory," 1967; Paul V. Teplitz, "Spin-Off Enterprises from a Large Government Laboratory," 1965; and Herbert A. Wainer, "The Spin-Off of Technology from Government-Sponsored Research Laboratories: Lincoln Laboratory," 1965.

mentation Laboratory, and the Servomechanisms Laboratory to perform specialized defense-related work in radar and navigation instrumentation.[4] The electronics focus of this research continued during the postwar era and was accompanied by the establishment of other laboratories at MIT. The Digital Computer Laboratory developed the magnetic core memory and the landmark Whirlwind Computer, Lincoln Laboratory has worked on computer technology and space communications, and the Artificial Intelligence Laboratory became a pioneer in that discipline.

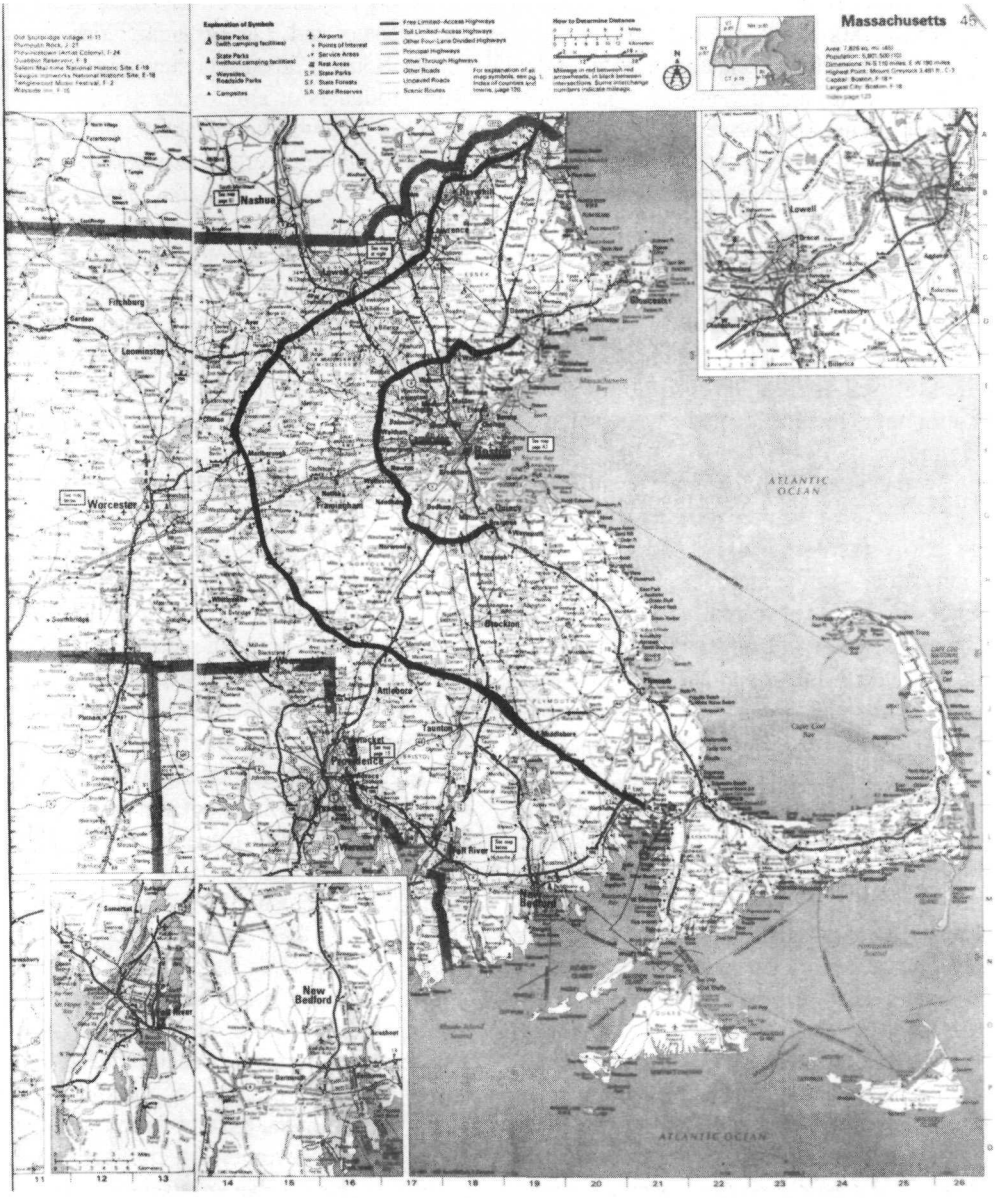
By the late 1950s computers and electronics had supplanted older industries—primarily textiles, leather goods, and machine tools—as the major emphasis in New England. MIT's research laboratories continued to grow and became a rich source of technical and financial entrepreneurs anxious to exploit the new industry's potential. A distinctive "spin-off" effect took place. Laboratory employees began to set up their own companies, housed at first in small, cheap quarters in the industrial buildings surrounding MIT and the abandoned textile mills near Lincoln Lab in Lexington, Massachusetts, and later building finer accommodations in the Route 128 area and even beyond, in other parts of eastern Massachusetts and southern New Hampshire. One study in the late 1960s identified more than one hundred new Massachusetts firms founded by former MIT laboratory and academic department employees, and suggested that this by no means represented the whole.[5] While the spin-off phenomenon in fact has included other educational institutions in the area, such as Northeastern and Harvard universities, most of the Route 128 entrepreneurs have been MIT graduates or employees.

Route 128 was an attractive site for industrial and commercial expansion. Originally laid out in the 1920s, the highway was broadened and lengthened in the 1950s to expedite travel around the densest suburbs and to keep traffic out of downtown Boston. The result was a semi-circular highway with a ten-mile radius from Boston, starting and ending at the sea. Proximity to the financial and educational center of New England, coupled with the availability of space for buildings immediately adjacent to the highway, have been prime advantages exploited fully by the numerous fledgling entrepreneurs. The confluence of technical expertise, venture capital, land developers, and an able work force has contributed to the area's rapid corporate growth. Although the electronics industry in Massachusetts has outgrown Route 128, spreading well beyond the highway and even back into Boston itself, it remains identified with Route 128 because that is where it blossomed. In effect, "Route 128" is the term still loosely used to describe a phenomenon that has come to encompass a much larger geographic area.

The Route 128 firms, spun off in the first instance from MIT's academic laboratories, have spun off from each other as well in response to continuing opportunities for discovery, refinement, and financial profit in the field of computer technology. The growth in the number of such companies, however, is no longer restricted to the electronics industry. The strong relationship

[4]The Radiation Laboratory was later replaced by the Research Laboratory for Electronics, and the Instrumentation Laboratory was renamed the Charles Stark Draper Laboratory. The official government history of the Radiation Laboratory is Henry Guerlac, *Radar in World War II* (New York: American Institute of Physics, 1987). Studies of the other laboratories and the history of modern MIT include Henry Etzkowitz, "The Making of an Entrepreneurial University: The Traffic Among MIT, Industry and the Military, 1860–1960," in *Science and the Military: Sociology of Science Yearbook*, ed. E. Mendelsohn and M. R. Smith (Dordrecht, The Netherlands: Reidel, forthcoming); and Karl L. Wildes and Nilo A. Lindgren, *A Century of Electrical Engineering and Computer Science at MIT, 1882–1982* (Cambridge, Mass.: MIT Press, 1985).

[5]Roberts and Wainer, "New Enterprises along Route 128," *Science Journal* 4 (December 1968): 79.



Map of eastern Massachusetts highlighting the two circumferential highways: Routes 128 (on the east) and 495. From the *Road Atlas* © copyright 1988 by Rand McNally & Company R.L. 88-S-16.

between academic lab and company, and between company and company, is now observable in other high technology fields, including biotechnology and materials processing. Meanwhile, federal contracts remain an important source of research and development funding in many cases, reinforcing the complex, tripartite link in science among government, industry, and academe.

The way modern science and technology have evolved presents special problems for

archivists and others concerned with the issue of documentation. First, with the increasing number of scientists and scientific enterprises, the sources that are potentially of permanent value have expanded. Second, these sources are more complex. It is no longer possible to assume that the papers of an individual scientist represent a complete record of his or her work, nor would it be wise to rest assured that an aggregation of papers of many individual scientists comprehensively documents a particular scientific field, or science in general. The scientific enterprise has become characterized more by teamwork than individual initiative, and the resulting interdependence of individual scientists and institutions—government, corporate, and academic—generates a vast and complex body of documentation that includes sources often not fully represented in the papers of individuals. Third, records have become more diverse and are dominated less by extensive correspondence files, the backbone of the traditional archival collection, and more by reprint runs and the trappings of automated data. Fourth, the quantity of documentation has increased several fold as a result of widespread reliance on photoduplication and word processing. While these problems are not unique to science and technology, they are perhaps more imposing in these fields because of their extremely rapid development.

The problems are aggravated in the case of corporate organizations, such as the Route 128 companies, by narrow views of the uses of records. Private industry tends to regard records as strictly internal documents geared to promoting cost-effective management and satisfying certain legal requirements. This perspective is reinforced by strict standards of secrecy surrounding company activities and products. The notion of preserving data for historical or sociological analysis, or even long-range economic observation and planning, is foreign. Few permanent archival programs exist, and even they are perceived primarily as internal mechanisms for legal self-protection and public relations. The Route 128 companies conform to this pattern. The only formally established program is that of the MITRE Corporation, which was set up originally in response to patent litigation and which maintains a predominantly inward focus.[6]

The documentation strategy provides a means of tackling some of the major problems of modern documentation, but is as yet untested. Among the issues that remain unclear is the question of scope. How large or small a portion of the universe can be examined? For example, is it useful to devise a strategy to examine the documentation of the high technology industries on Route 128, or in Massachusetts following World War II, or in the United States in the twentieth century? Taking into account the usual time constraints and limitations in resources, how many documentation strategies are feasible? For that matter, how many are desirable? The answers to such questions will become clearer as strategies are examined and tested. Route 128 may or may not be an appropriate scope for a documentation strategy. This essay does not resolve that question. Rather, Route 128 is used here as a vehicle to clarify how a documentation strategy might be carried out. As yet there is no commitment to undertake this project; it remains a hypothetical proposal.

[6]For a history of the MITRE Corporation, see *MITRE, the First Twenty Years: A History of the MITRE Corporation, 1958–1978* (Bedford, Mass.: MITRE Corporation, 1979). Although comprehensive survey information is lacking, a recent *Directory of Business Archives in the United States and Canada* (Chicago: Society of American Archivists, 1980) reported only 210 business archives. This figure represented approximately a 50 percent increase over a ten-year period, but still reflected a tiny proportion of the total number of businesses in the United States and Canada.

Initiative

A documentation strategy begins with a champion, a prime mover, who has a special stake in documenting a particular issue, activity, or area. In the case of Route 128, there are several possible prime movers. The MIT archivist may want to document the companies as spin-offs of the institute; the archivist of the commonwealth may want to document the economic impact of the companies on Massachusetts; economists and industrial planners connected to organizations such as the High Technology Council may want to document the companies as a pattern of innovation in order to determine how similar concentrations of high technology may be replicated.

Considering the vast, elusive, and cross-institutional nature of the potential documentation, these individuals would not ordinarily find it feasible to undertake such a project on their own. Their activities remain focused on and for the most part limited to carrying out their specific institutional roles. But they might very well feel strongly enough about the importance of the project to mobilize a sustained, coordinated effort.

Planning and Implementation

Once this happens, the documentation strategy is off to a good start. The next step is for the prime mover(s) to assemble a group of advisors to provide intellectual and political support. The advisors are chosen to represent the creators, users, and curators of records. This group, which might number about twelve, should include individuals representing some of the following pertinent occupations and activities: historical researchers, such as economists, sociologists, or historians of science, technology, and business; bankers and financiers, representing venture capital firms and real estate developers; officials in city, state, and federal government with insight into the government's role in fostering regional economic growth; senior administrators from commerce and industry, preferably with established connections to Route 128 firms; workers on the technical and support staffs of particular companies; archivists from state and local governments, academic institutions, industry, and relevant subject-oriented centers; librarians specializing in technical literature or working in an industrial environment; museum curators with expertise in the preservation of modern technical instruments; representatives of public advocacy groups, such as Science for the People or the Union of Concerned Scientists; and possibly a geographer, architect, or city planner.

Purpose and Goals

The first task of the advisory board is to articulate the purpose and goals of the documentation strategy. Why document the Route 128 phenomenon and what should the documentation strategy accomplish? The overall purpose might be conceived as an effort to gather and preserve sufficient documentation to assure current and future understanding of the Route 128 phenomenon, or the high technology industry in eastern Massachusetts. The topic, though, is very broad and requires further definition. Reasonably precise chronological, geographical, and topical boundaries need to be established. Documentation strategies are a continuous process, so one may assume that the work will include further documentation, but at what chronological point should the strategy begin? Precursors of the Route 128 firms can be traced back to the founding of MIT's World War II Radiation Laboratory. Should the strategy begin then, or with the development of the relevant technology in the 1950s, or with the establishment of the first firms? The phrase "Route 128" is used to describe the phenomenon, but does this accurately delineate the actual geographic boundaries of the topic? What cities and states will be included in the study? Should the strategy include firms that have industrial plants relevant to the study in the

area but whose corporate headquarters are elsewhere? How should the strategy handle influences from outside the defined geographic area, such as the impact of federal funding and regulations?

Topical Boundaries

At this point the topical boundaries of the strategy should also be established. Route 128 is most closely identified with the high technology industry, primarily minicomputers; as headquarters for six of the top nine money makers among minicomputer manufacturers—including the Digital Equipment Corporation (DEC), the pioneer of the mini—Massachusetts is the heart of the industry. But "high tech" is not confined to computers or other electronics-related activities. Though computer hardware and software still predominate, companies are appearing in many fields, including biotechnology and materials processing. The advisory board must weigh the current and projected impact of these newer industries, and determine how and at what level they fit into the documentation strategy.

While the primary focus of the strategy is on high technology companies, many other institutions have played key roles in the development of Route 128. Academic institutions have provided training bases for the founders and technical staffs of the companies; cities have stimulated development through regulation and funding and have experienced physical growth stemming directly from the industries; banking, venture capital, and real estate firms have provided means and direction; organizations such as the High Technology Council have provided broad leadership; and the media—newspapers, radio, and television—have given the phenomenon high visibility. These influences overlap and so reinforce each other. Ideally a strategy should encompass them all, and it can do so because it is well suited to handling issues that involve multiple institutions. One

The Assabet Mills in Maynard, Massachusetts, home of the American Woolen Company from 1899 to 1950, is now corporate headquarters for DEC (the Digital Equipment Corporation).

of the basic principles of a strategy is that archival records should be preserved by each institution while at the same time coordination of record keeping among institutions minimizes duplication and assures the preservation of a representative body of documentation. The advisory group provides a mechanism to help carry out this principle.

Specific Objectives

After outlining the goal and scope of the strategy, the board moves on to establish more specific objectives. A major objective is to target particular firms, products, events, and individuals to be documented. The strategy assumes that not everything can or should be documented. A selection process is developed that will adequately document the successes, failures, anomalies, and routine events encompassing the Route 128 phenomenon. Though the advisors may start with impressionistic feelings—perhaps a few prejudices—the actual selection should be based on solid background research and structured guidelines. If necessary, additional expertise should be enlisted to help address specific areas in greater detail. Historians, economists, sociologists, company administrators, and government officials may be canvassed for their special experience and understanding of the possible focus of a documentation strategy.

In establishing specific objectives, the advisory board might first frame a list of key questions. For Route 128 these might be in five categories: technical, economic, social, political, and educational.

Technical

—What was the state of the technology that made the Route 128 phenomenon possible?
—How has the phenomenon advanced the technology?
—What were the key technical achievements?
—What were the key failures?
—Who were the key individuals, teams, and firms?

Economic

—Which economic factors made the phenomenon possible?
—What were the sources of funding for the firms?
—How has the phenomenon affected the economy of the area?
—Will future developments be conducive to economic vitality in the region?
—How will the developments affect the economies of other regions?

Social

—What has been the impact on the work force?
—How have the environment and the towns along Route 128 been affected?
—What will be the impact on patterns of urbanization and population distribution?

Political

—What role did the governments of the cities, state, and nation play?
—What was the impact, positive and negative, of legislation and regulations?
—What was the effect of federal funds, specifically military funding?
—What influences have the companies exercised in the political process?

Educational

—What has been the role of academic institutions in producing company founders, staffing the companies, and determining their activities and products?
—Have continuing education programs been shaped by the needs of the Route 128 companies?
—What ongoing interaction is there between the firms and the universities; what is the effect of this interaction on the companies and the universities?

Each of these questions can be used to develop a more specific list of issues and ultimately a list of firms, events, and people that best illustrate those issues. For instance, in analyzing software companies that have developed on Route 128, one might ask: What are the distinguishable types,

which companies are most typical, and how have their products evolved in relation to the needs of their clients? Although computer hardware companies develop software to make their machines work, many innovative and trend-setting developments have taken place in the software companies. Several distinct types of software firms may be differentiated: (1) main-frame software: companies such as Cullinet that develop giant data base programs for mainframe computers such as IBMs; (2) PC software: companies such as Lotus and Javelin that develop business software for PCs; (3) non-business research and development software: companies such as Softech and Ektron that develop specialized software packages for the scientific and technological community, funded primarily by federal agencies such as NASA; and (4) educational software: companies such as Tom Snyder Productions and Spinnaker Software that produce an assortment of games and instructional programs. Any attempt to document software developments on Route 128 should also take into account the fact that general research and consulting firms such as the MITRE Corporation, A. D. Little, and Bolt, Beranek and Newman also have made significant contributions in this area.[7]

Nature and Quality of the Documentation

Once the issues and examples have been clearly defined, the next step is to assess the nature and quality of the potential documentation relating to each event, unit, or activity. This assessment is based on the premise that the integrated record of any issue exists in many forms—unpublished, published, visual, artifactual, and machine-readable. A documentation strategy outlines a procedure to assess the availability of this information irrespective of form. Consider, for example, the development of the magnetic core memory, the discovery that made stored-program computers a practical, commercial reality. The patent provides a drawing and technical details; the published technical reports provide comprehensive information about the development and potential uses of the discovery; the research team's internal technical memoranda and weekly progress reports provide a detailed record of the actual work involved; the office files of university administrators and federal funding agencies document policy discussions and funding decisions; personal files of the participants detail how the work proceeded and reveal interactions between colleagues and competitors; court records and legal files document the extensive patent litigation; company files document a variety of proprietary, manufacturing, and marketing concerns and activities relating to applications of the core; photographs chronicle the construction and installation of core memory; manuals for specific machines that installed core memory shed light on its uses. Finally, there are examples of core memory itself—the actual artifact as it was built and installed in the first machine that used it, the Whirlwind Computer.[8]

By examining the component goals, activities or functions, and results of a given endeavor, it is possible to assess carefully the information generated. Once the components are understood, the merits of the

[7]The authors are grateful to Oliver Strimpel of the Computer Museum for this example.

[8]For general background on the core memory, see Kent C. Redmond and Thomas M. Smith, *Project Whirlwind: The History of a Pioneer Computer* (Bedford, Mass.: Digital Press, 1980); and Emerson W. Pugh, *Memories That Shaped an Industry: Decisions Leading to the IBM System/36* (Cambridge, Mass.: MIT Press, 1986). The records of the core memory patent litigation, available in the Institute Archives and Special Collections of the MIT Libraries, suggest the full complexity of the documentation.

Feb. 28, 1956 J. W. FORRESTER 2,736,880

MULTICOORDINATE DIGITAL INFORMATION STORAGE DEVICE

Filed May 11, 1951 4 Sheets-Sheet 1

Fig. 1

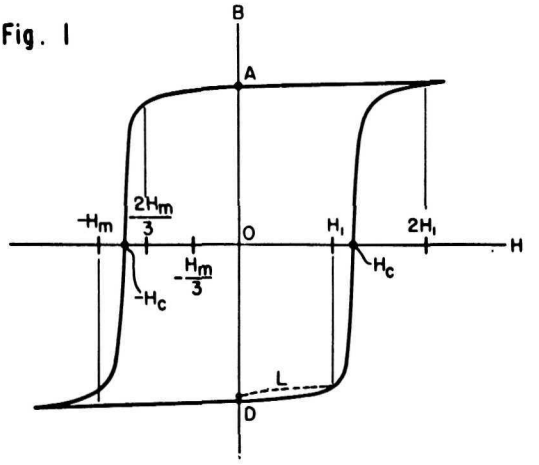
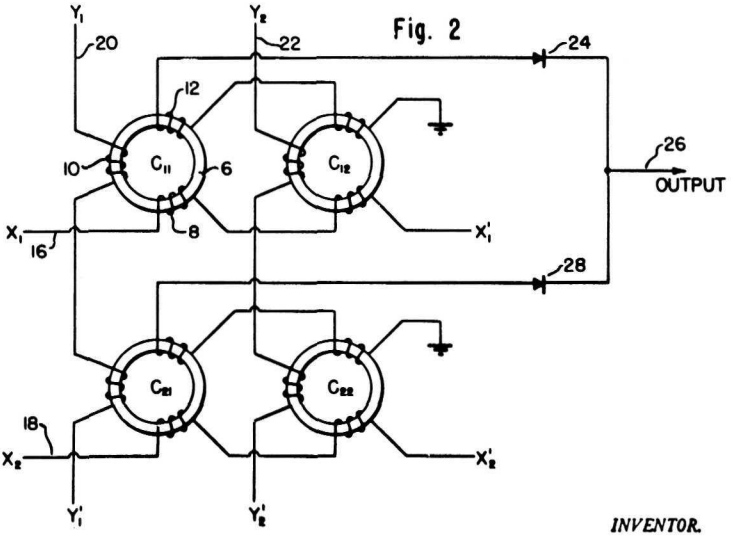


Fig. 2



INVENTOR.
JAY W. FORRESTER
BY Kenway Jenney Witter & Hildreth
ATTORNEYS

The 1956 U.S. patent awarded to Jay W. Forrester for magnetic core memory. The high-speed ferrite cores proposed in this patent made stored-program computers a practical, commercial reality.

documentation become clearer.[9] For instance, the most accessible and voluminous record of modern science and technology is the published journal and technical report literature, but this reveals little about the policy decisions behind the work, the false starts, the actual building of the equipment, or the particular role of staff involved in the work. Research proposals, project data, and correspondence must be sought to complete the record. If equipment is to be preserved, related documentation must also be preserved to enable museum curators to maintain it and explain its function and use. In effect, familiarity with *process* is essential to informed decisions about when the published record is sufficient evidence or when additional documentation should be sought. In certain instances where no or few records survive, external sources such as the published literature, tax returns, and patent records assume added significance. A knowledge of the availability and content of such records enhances the ability of those responsible for preserving documentation to make the necessary and sometimes difficult decisions.

Selecting a Permanent Base

Before the strategy can proceed to test this theoretical framework in the context of real situations, a permanent base for the strategy should be established. As the emphasis is on planning and cooperation, not collection, the base need not be at an archival institution. Possible sites for a Route 128 strategy include the Archives of the Commonwealth of Massachusetts, the Institute Archives at MIT, the University Archives or the Baker Library (Business School) at Harvard University, the Computer Museum, or perhaps even one of the companies. The chosen institution must commit space, equipment, and a certain amount of ongoing funding, but outside supplementary support from industry, the federal government, or other sources will be required. Though the prime movers and the advisors should be able to accomplish their work on a voluntary basis, the implementation of actual surveys will require funded staff. The staff might be either regular employees of the institution assigned to the project on a part-time basis, or individuals specifically hired from outside. Archival experience and a familiarity with records and activities in an industrial or commercial setting are desirable qualifications.

Tests and Surveys

On the basis of the list of key issues, firms, products, events, and individuals drawn up by the advisory board, sample surveys are then made to confirm the availability of the documentation. Two or three examples chosen from each of several categories (e.g., software developments, memory systems, PCs) will provide the opportunity to test and evaluate the availability of documentation. Archivists, assisted by advisors, will interview participants in particular projects and founders of specific companies to ascertain the kind of documentation that was originally created. Surveys in the form of questionnaires or additional on-site interviews will then reveal specifically what records—published, unpublished, and artifactual—have survived. Discussions with creators and potential users will help establish the relative merits of preserving these records. The results of the surveys also should begin to indicate what is not well documented—specific categories of activities or specific firms—and to suggest guidelines for archivists, librarians, and museum curators on the types of records to be sought and their

[9]This is essentially the approach taken in Joan K. Haas, Helen W. Samuels, and Barbara Trippel Simmons, *Appraising the Records of Modern Science and Technology: A Guide* (Cambridge, Mass.: Massachusetts Institute of Technology, 1985; distributed by the Society of American Archivists). The advice in this manual could be used to guide the selection of documentation for the Route 128 project.

eventual disposition. While such guidelines might recommend that a full range of unpublished, published, and artifactual records be retained for the development of key machines and components, it could also advise that for the more routine or derivative machines the published technical and product literature is sufficient. The guidelines might also contain recommendations about the creation of records so that future activities will be adequately documented. It would be important to outline the minimum required documentation for both hardware and software developments.

Placing the Documentation

With the surveys well under way and the guidelines firmly in place, next comes the process of trying to place the documentation that is to be preserved. Some of this work is carried out by the project staff, but ideally the project should proceed cooperatively with staff from individual institutions working on their own records. Where institutional or corporate archival programs exist, survey and placement pose few problems. Where such programs do not exist, other professionals in the organization—managers, secretaries, technical staff—may be recruited and directed. The whole process builds on the commitment of each institution to the preservation of its own records.

Each documentation strategy molds its program to meet the particular problems posed by the environment being documented. For Route 128 a special concern is the dearth of archival repositories in the corporate sector. Although most of the educational institutions that would be involved in the project have archival programs, only one firm, the MITRE Corporation, now has an archives. While the commonwealth and the city of Boston have archival programs, neither is in a position to accept nonofficial records. Other special collections, including the Boston Public Library, the Massachusetts Historical Society, and the Baker Library, have collected little on this topic because of the limitations imposed by their resources or collecting policies.

That the responsibility for the care of records should be borne by the records creators appears to be a reasonable expectation. American industry has not, however, established a sterling record in this regard, and entrepreneurial companies, including the high technology firms, are probably the worst of all.[10] A key element of the documentation strategy will be not merely to place documentation outside a company if that is the only way to ensure its preservation, but to encourage the creation of archival programs by companies. An educational program should be prepared to stress to company managers the value of archival and records management programs. The High Technology Council or the Industrial Liaison Office at MIT might be persuaded to sponsor such activities. Building upon industry's concerns for access to information and for cost effectiveness, a seminar for business and information managers could raise awareness of the value of archival and records management programs. Seminars and educational brochures could be followed up with individual consultations by archivists and records managers to specific companies.

Many companies, especially the smaller ones, may never be convinced and may always see an archival program as just one more financial burden. An alternative would be for several firms to cooperate in a plan in which a central facility would provide archival and records management services,

[10]The final report of the Joint Committee on Archives of Science and Technology (JCAST) discusses this among other problems relating to the industrial records of science and technology. See Clark A. Elliott, ed., *Understanding Progress as Process: Documentation of the History of Post-war Science and Technology in the United States* (Chicago: Society of American Archivists, 1983), esp. 11–13, 44. David Noble also explores the problem in "Higher Education as an Industrial Process," *Midwestern Archivist* 2, #2 (1977): 35–53.

including storage and reference, on a contract basis. Although previous American experiments along these lines have failed, as for example in Wisconsin in the 1960s and 1970s, this method has been successfully used in other countries, including Sweden and Australia. In Australia two universities collect and service industrial collections, supported by annual fees from the companies; in Sweden a private cooperative venture provides records management and archival services to companies that support these activities through membership, storage, and service fees.[11] It might be possible to learn from these programs and adapt a version suited to the American corporate environment. The same venture capital that launched the Route 128 companies might be sought to support a central facility for corporate records. If the plan proves unfeasible, still another alternative would be to determine if any existing archival programs would reevaluate their collecting policies and accept selected outside materials.

Modifications

As it proceeds, the strategy will be constantly altered in response to what is found and not found. Although the strategy may have targeted the records of A, B, and C software companies, perhaps only C still has an adequate record of its activities; A went out of business and left no records, while B exists but destroyed all its records. The survey reveals, though, that companies X and Y meet the same selection criteria as companies A and B. X and Y exist, have maintained good records, and are willing to participate in the project. As changes in the strategy prove necessary, success will depend on how informed and cohesive a framework the advisory board has mapped out. Furthermore, neither the framework nor the strategy is necessarily permanent; contingency plans should be made for suspending the project in the event it is determined that enough has been done, or the need no longer exists, or resources need to be channeled into another strategy or a new approach altogether. Reexamined fifty to one hundred years hence, no framework or strategy will be judged perfect—documenting just the right aspects of the development of Route 128 with just the right balance of issues and companies. But that is the risk of all selection processes, and archivists have a responsibility at least to try their hand at making the right choices.

[11]The programs in Australia and Sweden were observed by Helen Samuels and Anne Van Camp respectively during recent visits. The collections in Australia are maintained at the Archives of Business and Labour, Australian National University, Canberra, and at the Archives, University of Melbourne.