CHARLES BABBAGE INSTITUTE
NEWSLETTER
Volume 10, Number 4
Summer 1988

CENTER FOR THE HISTORY OF INFORMATION PROCESSING

A Project Report

Tools for Documenting High-Tech Industry

The Problem

In 1938, the archivist O. W. Holmes expressed his concern over the collection of business records, and called for guidelines to "intelligent selection." Since then, better appraisal methods have been cited again and again as the key to making sense out of collecting these records. For many areas of business the argument is moot because chance has already narrowed the range of business records available for preservation; the problem no longer involves selecting the best materials, but finding any usable materials. With the computer industry, however, the option of selecting the "best" materials remains open, largely because the industry is relatively young and significant business records survive. The manufacture of electronic computers began in earnest in the 1950s, and other aspects of the industry (such as service bureaus, time-sharing, software houses) are barely thirty years old. The explosive growth of the computer industry and its high rate of change, coupled with the high volume of records indicative of any modern business, all make for a wide range of choices for the archivist. Assuming a reasonable level of support for archivists to preserve such records, the key to documenting the computer industry involves an adequate response to Holmes' challenge. How do you select collections that best document the activity of the industry? And within a single business, how do you ensure that the enterprise is adequately represented by the range of records preserved?

During the past year CBI has been working to provide answers to these questions. The impetus for this research arose from CBI's work in the development of a National Collecting Strategy for the history of computing (see *CBI Newsletter*, Vol. 8, No. 2). With a grant awarded by the National Historical Publications and Records Commission and cooperation given by the Control Data Corporation, CBI conducted research aimed at improving the selection and appraisal of historically valuable business records in high-technology industries.

Existing literature relating to the appraisal of business records does not provide much information on industrial activities. Earlier articles on selecting business records tend to be too simplistic in their prescription ("save all minutes..") or simply discuss the lack of appraisal criteria. Recent efforts have moved away from prescriptive guidelines and looked at the structures that shape documentation. For example, in 1985 Joan Haas, Helen Samuels, and Barbara Simmons, all of the Massachusetts Institute of Technology, published *Appraising the Records of Modern Science and Technology: A Guide*. In this guide, scientific and technological activities are divided into their component parts, and documentation likely to be associated with each component is discussed. The guide was developed with the belief that appraisal requires understanding of the activities involved, considering the entire range of documentation available, and preserving those records that best document the activity. The guide focused on scientific and technological activities in academic settings. Those interested in industrial activities can learn from the MIT guide, but there are marked differences between industrial and academic activities, and between the records the two sectors generate. Thus, CBI's forthcoming guide will provide a complementary analysis for high-technology activities and documentation in the industrial setting.

continued on page 2. . .

CBI Plans 10th Anniversary Celebration

This fall CBI will commemorate the 10th anniversary of the founding of CBF by sponsoring the first Charles Babbage Institute Lecture to coincide with the annual meeting of the Charles Babbage Foundation Trustees and Directors.

First CBI Lecturer

Professor Allen Newell
Professor of Computer Science
Carnegie Mellon University

will speak on
"To Know Is Not to Say:
On the history of ideas in
computer-inhabited worlds"

October 3, 1988
University of Minnesota
Minneapolis, Minnesota

Professor Allen Newell

Computers in Your Pocket: The History of Hand-Held Calculators—A Traveling Exhibit

The Computer Museum has organized an exhibit of rare and unusual calculators from around the world.

The exhibit includes 64 artifacts, eight interactive elements and one video. Among the most significant of the artifacts are the oldest mechanical pocket calculator, designed by Samuel Morland in 1666 in England; Napier's Bones (1617); rods, often made of bones, used by European astronomers and mathematicians; and the first scientific hand-held calculator, the HP35 (1972). The exhibit also includes other interactive devices like a giant slide rule and the two-gear Webb Adder (patented in 1869 in the U.S.).

The exhibit was funded by Hewlett-Packard Company and will be circulated by the Smithsonian Institution Traveling Exhibition Service (SITES).

Those interested in learning more about booking "Computers in Your Pocket" should contact Carol Harsh, SITES Coordinator for Scheduling, telephone 202-357-3171. □

CHARLES BABBAGE INSTITUTE
NEWSLETTER

The Charles Babbage Institute, Center for the History of Information Processing, is sponsored by the University of Minnesota and the information processing community. Arthur L. Norberg, Director.

The Charles Babbage Institute Newsletter is a publication of the Charles Babbage Institute, University of Minnesota, 103 Walter Library, 117 Pleasant Street S.E., Minneapolis, Minnesota 55455, telephone (612) 624-5050. The *Newsletter* reports on Institute activities and other developments in the history of information processing.

Electronic Mail Addresses for CBI

Arthur L. Norberg, Director:
ANorberg@umnacvx.bitnet
William Aspray, Associate Director:
WAspray@umnacvx.bitnet
Bruce Bruemmer, Archivist:
BBruemmer@umnacvx.bitnet

continued from page 1...

The Study

The foundation for the CBI study was an analysis of selected activities of the Control Data Corporation: the development of the 1604 computer, the development of the PLATO computer-based education system, and the acquisition of C-E-I-R, Inc., an early computer service bureau company. The selection of these three activities was designed to provide a sampling of different industrial activities over time, as well as a cross-section of markets (e.g., mainframes, terminals, computer services, industrial education, software). Since Control Data moved from an entrepreneurial business to a large corporation within the time that spanned the three activities, these investigations allowed us to compare research and development, marketing, sales, planning, and other industrial activities at different points in a company's growth. Such analysis also provided information about changes in records associated with those activities, which proved helpful in making comments about the appraisal of business records in general.

The foremost goal of the study was the development of appraisal criteria transferable to other high-technology business-related collections. Following the example of the MIT guide, we believed that the form of information that would best help determine the historical value of records would be an analysis of industrial activities, followed by a description of records associated with each activity. We use our analysis of industrial activities in the computer industry as the starting point for a more general description of activities in high-technology industry generally.

A second goal of the study was to determine the value of alternative sources of historical information when corporate records are unavailable. In other words, if a core collection of corporate records had been destroyed or was not accessible to historians, were there other sources that might be useful in interpreting aspects of the company's history? Alternative sources include government documents, litigation files, technical reports, and other information commonly available to the public. This goal was one reason behind choosing to study C-E-I-R. There, we did not expect to find an intact collection of corporate records and wanted to determine if there were any special considerations involved in documenting a corporate acquisition.

The third goal was to assess the effectiveness in an industrial environment of one aspect, documentary probes, of the "documentation strategy" approach to appraisal. This approach to appraisal is encompassed in the work of Richard Cox, Larry Hackman, and Helen Samuels, who define the concept of "documentation strategies." While the concept is concerned primarily with broadening the definition of documentation for a given area by developing cooperation between a number of interested institutions (records creators, libraries, museums, and archives), it emphasizes the need to examine the entire spectrum of historical information available to researchers and determine what information is needed to document a given area before looking at extant records. The accurate documentation of high-technology industries requires an understanding of the industrial context before any evaluation of corporate records is possible. Hence, the primary goal of the CBI study.

Through documentary probes we wanted to capture the range of documentation associated with the development of software, hardware, and computer services. Basically, a documentary probe involves four steps. First, the area needing to be documented must be defined and probes chosen. Second, background information for each of the probes is collected. Third, the probes are compared to the industrial activities description and a plan for each probe is developed. This stage involves the use of interviewing to help identify historically significant aspects of each probe and any variance from the model description. In our project, this step was an iterative process, inasmuch as the study involved simultaneous development of the industrial activities description. Fourth, sources are identified and analyzed and documentation is preserved. This last stage involves not only the acquisition of traditional archival records, but includes oral history, publications, artifacts, and other sources.

continued on page 3...

An early IBM 704 computer system site owned by C-E-I-R. It was located at the company's offices in Arlington, Virginia, circa 1950. C-E-I-R was the subject of one of the probes investigated during CBI's study of documentation in high-tech industries.

continued from page 2. . .

The success of a documentary probe depends on the number of products investigated and how well the products characterize the business. At Control Data, we chose three probes that we felt would involve the most important aspects of the corporation's history. One of the more important characteristics of our probes is the time span: they span the beginning of the company in 1957 to the mid-1970s. In these probes, we could sample information during different stages of development: a young, entrepreneurial firm in established markets, and a mature firm looking for new markets. We also attempted to choose activities that would reflect broadly CDC's participation in different markets. The activities also had to be of obvious significance to the company. The 1604, for example, was CDC's first computer; it established the company in the computer industry.

The project formally began in March 1987, with permission from the Control Data Corporation (CDC) to allow the project staff access to its records. The availability of the records and the ability to interview key employees at Control Data were essential to the success of the study, and the company provided full cooperation. A description of the project was carried in the corporate newsletter, and a letter of introduction was available for employees who wanted assurance that we had a legitimate "need to know." We also received the cooperation of the CDC archivist and his assistant, and this aid proved invaluable during the study. CBI's archivist, Bruce Bruemmer, served as the principle investigator, and in June 1987, he was joined by Dr. Sheldon Hochheiser as project historian.

The first task was to collect all available background information for the three probes. This required a literature survey of trade publications, technical reports, newsletters, court records, and other documents that would give us a chronology of events and any information about any unusual aspects of the three activities. Information about the 1604 was easily obtained because of its status as CDC's first commercial computer and the product that initiated the company's success. While technical material was plentiful, information relating to the early organizational development of the company was not. Some good information was obtained from testimony given in lawsuits, but the best sources

continued on page 4. . .

The Adelle and Erwin Tomash Fellowship in the History of Information Processing 1989-90

The Charles Babbage Institute is accepting applications for the Adelle and Erwin Tomash Graduate Fellowship to be awarded for the 1989-90 academic year to a graduate student whose dissertation will address some aspect of the history of computers and information processing. Topics may be chosen from the technical history of hardware or software, economic or business aspects of the information processing industry, or other topics in the social, institutional, or legal history of computing. Theses which consider technical issues in their socio-economic context are especially encouraged.

There are no restrictions on the venue of the fellowship. It may be held at the home academic institution, the Babbage Institute, or any other location where there are appropriate research facilities. The stipend will be $6,000 plus an amount up to $2,500 for tuition, fees, travel to the Babbage Institute and relevant archives, and other approved research expenses. Priority will be given to students who have completed all requirements for the doctoral degree except the research and writing of the dissertation, though less advanced and incoming graduate students are also eligible to apply. Fellows may reapply for up to two one-year continuations of the Fellowship.

Applicants should send biographical data and a research plan. The plan should contain a statement and justification of the research problem, a discussion of procedures for research and writing, information on availability of research materials, and evidence of faculty support for the project. Applicants should arrange for three letters of reference, certified transcripts of college credits, and GRE scores to be sent directly to the Institute. There is no special application form.

Complete application materials should be received by January 15, 1989 by the Charles Babbage Institute, University of Minnesota, 103 Walter Library, 117 Pleasant Street S.E., Minneapolis, MN 55455, U.S.A. Telephone 612/624-5050. The number of awards is dependent upon funding. □

continued from page 3. . .

were summary reports and other documents found in the corporate archives.

Information about the development of PLATO was also easy to locate, but more difficult to interpret. Writings about the system itself tended to be reports of case studies of PLATO's educational use and was superficially informative about its development. The financial press was somewhat more useful because it was skeptical about PLATO's chances for success from the beginning, and this made the system newsworthy. CDC's active role with PLATO began in 1973. Development work had been conducted by the Computer-Based Educational Research Laboratory at the University of Illinois. Since PLATO is a relatively recent product, it is not surprising that we found only one published source that treated it as a historical subject. While PLATO's contemporary nature complicated the task of understanding the system's history, it offered some new insights that added to our knowledge about the documenting of industrial activity at Control Data. First, as we noted above, it widened the time span of our study, thus enabling us to compare CDC as a start-up business and CDC as a mature corporation. Second, it was possible to compare industrial research and development with development activity in an academic institution. Third, it gave us insight into the difficulties in documenting a recent product whose life had not completely expired.

Learning about C-E-I-R's background was more problematic. There were few records of any kind in CDC's archives, and only a folder of articles on C-E-I-R could be assembled from computer trade and the financial press. The most comprehensive source was a small collection that had been donated by C-E-I-R's president to the CBI archives. It was sufficient to assemble a chronology and some important names, but enabled little else.

Following the initial background research on the 1604, C-E-I-R, and PLATO, we moved on to the next planned stage: inventorying and analyzing records held by Control Data. Control Data has two major collections of non-current records—the corporate archives and warehoused records stored by records management. With the assistance of the archivist, all of the records in the corporate archives that were obviously pertinent to the probes were quickly located. Of particular note was a series of executive history narratives, which were written at the request of the CDC president. These documents were written by the executive in charge of each organizational unit of the corporation, and ranged from straightforward chronologies to rather engaging histories of certain units. More importantly, they gave considerable insight into the industrial process at Control Data. Other useful documents were oral history interviews of executives conducted by CDC's archivist. Of our three probes, the 1604 was the best documented in the archives.

To retrieve records relating to the three probes, we scanned over 12,000 pages of the master box list of warehoused records for certain number codes or obvious keywords. From this review, nearly 500 boxes were recalled for examination. Notes from this activity were compiled and transcribed into a microcomputer file, and the data were transferred to a simple database program to ease access to the information. After this lengthy exercise we had more than adequate knowledge of the personalities involved, the key events, and the interplay between development, marketing, manufacturing, and other industrial activities.

The analysis of records was not expected to fully document the 1604, C-E-I-R, or PLATO. There were obvious gaps of information in each of the three probes. For example, the records revealed little information about the sales process for the 1604. Likewise, there was little evidence of the development and manufacture of PLATO equipment. This missing information was captured largely through a series of over thirty interviews of executives, managers, and other personnel conducted by the CBI staff. Most of the interviews were recorded, and a few will be made a part of CBI's oral history collection. Though most were conducted in the Twin Cities, Dr. Hochheiser spent a week at the University of Illinois to interview staff of the Computer-Based Educational Research Laboratory and to inspect records relating to PLATO. A number of interviews were also conducted in the District of Columbia, the former headquarters of C-E-I-R.

The findings of the study will be contained in a guide to documenting high-technology industries, expected to be distributed at the end of 1988. It will describe the environment of high-technology industry by means of a model of industrial activity, and will describe a tactic for understanding the scope of documentation within a business by the use of documentary probes. The guide will be useful to archivists who are interested in documenting high-technology firms, historians whose research involves high-technology industry, and business people who are interested in preserving an adequate record of their firm's history.

Principal Findings

Overall, the three probes were successful in supplying historical information about the entire company, the various industrial activities, and the scope of documentation that was available, even though certain aspects were under-represented. For example, PLATO originally offered promise as a case study of software development, but we later learned that much of the basic development work had taken place at the University of Illinois before CDC became involved.

C-E-I-R proved the least productive of the three probes, probably because it did not represent a single product. While it was primarily chosen as a case study of an acquisition, we also wanted to learn about its service bureau operations. As more was learned about PLATO, we had hopes that C-E-I-R, a developer of custom software, might serve as a substitute probe for a software product. Unfortunately, there were no sources of information at the level of detail that we needed for either of those areas. The C-E-I-R records we required simply did not exist, and other sources were not informative.

At the same time, the probes furnished useful information that we had not anticipated receiving. Since CDC's contribution to PLATO was later than we had originally thought, it gave a perspective of the company and its documentation that ran up to 1980. It also provided examples of hardware development that proved useful for comparison to the 1604. The 1604's product life was longer than expected, and did illustrate early software development to a certain extent.

The use of probes was deemed superior to a traditional records survey for a number of reasons:

continued on page 5. . .

continued from page 4. . .

- The volume of records to be inspected was reduced. With far less effort than inventorying all of the extant records, we obtained information about the records held by the company, knowledge about areas that were not well-documented by records, and the basis for choosing other projects to document. Based on the three probes, anyone conducting subsequent probes in CDC will have a far easier time locating records, identifying other sources of information, and understanding the organization of the corporation.
- It was easier to comprehend the change in documentation over time. Since the probes were focused on particular projects, it was easier to follow the effect of organizational changes and changes in business functions on the state of documentation. For example, as the company adopted strategic planning or "phase product" reviews, the nature of planning documents changed. Similarly, as the company moved from an entrepreneurial firm to a mature corporation, some historically valuable records were no longer produced because key executives had other demands on their time. Other means of understanding organizational change, such as through organizational charts, have not proven very effective.
- More important, "lower level" sources were identified. The records in storage tended to be biased towards the perspective of high-level executives. Since the probes sought documentary information across business functions, the probes were not subject to these biases. As we began to use interviews in our probes, we discovered that middle managers gave more useful and detailed explanations of work flow and records creation, particularly in research and development, manufacturing, and product support and enhancement.
- Documentary questions about recent developments could be addressed. Our probe of PLATO, which brought us up to 1980, gave us a good indication of the current types of records produced by the company. This was made possible largely through interviews of CDC employees.

We also noted some limitations. First, probes will not work if people are unwilling to divulge information. Had Control Data not given its full support to the project, the quality of information would have suffered catastrophically. As it happened, there was not a single CDC employee that we felt was not completely candid with us. Second, the more diversified a company, the less effective a series of probes will be. Control Data's markets, for the most part, do not stray from the computer industry. We learned very little in areas where CDC has operations outside of the computer industry, such as Commercial Credit Corporation. A series of probes relating to, say, Honeywell's Information Systems Division would not say much about its industrial controls business. A highly diversified conglomerate, such as Litton Industries, would require probes in each separate division.

A Model of Industrial Activity

The predominant characteristics of high-technology industry have a marked effect on the type of documentation produced by high-tech firms. These characteristics include an emphasis on research and development, short product-life cycle, large technical staff, and innovative products. "High-tech" generally includes industries such as aerospace, computing, pharmaceutical, chemical, biological, communication, electronics, medical equipment, and test equipment. Our analysis of activities at Control Data serves as a platform for a model of activities in all high-technology industries; our intention was to go beyond our study of the three probes and obtain supporting examples from other industries. Collectively, the staff of the Charles Babbage Institute is familiar with the processes and documentation in several different high-technology industries. Information beyond our experience was solicited from other archivists and business historians. Our guide aims to capture the distinctive nature of high-technology; we do not claim that our schema will hold for other types of business activity.

The model consists of seven functions: basic research, research and development, marketing, planning, sales, production, and product support and enhancement. We also examine basic support services that cut across most of the seven functions. These include primarily financial and legal support. In the guide, the discussion of each of the seven business functions is divided into three sections or levels. These deal respectively, with: 1) the definition of the function and analysis of it as a process, 2) the documentation typically created by the process, and 3) additional observations, designed both to illustrate the first two levels with specific examples, and provide additional guidance to "real world" processes and documentation problems. Some specific activities, such as industry-sponsored users groups in the early computer industry are characteristic of particular fields rather than high-technology as a whole; these will be mentioned in our guide where it is appropriate.

The support services differ from the sequential functions in several ways. Their interactions with any industrial process are likely to extend over a considerable portion of the overall product life cycle. Typically, support service areas are not concentrated on a single industrial area, but instead provide specialized assistance across business functions. We give two of these support activities, financial controls and legal support, the same detailed three level treatment that we give to the sequential stages. These seem to be the two support areas most central, pervasive, and necessary to high-technology industrial processes. In addition, high technology, by its pioneering nature, tends to raise a variety of unique legal issues. An additional six support areas that impinge less directly on the high-technology process are described more briefly.

Our model of activities for high-technology industry was developed for those who are unfamiliar with the details of industrial activities and their records. The notion of a serial process that flows from basic research to research and development, planning, marketing, production, sales, and product support and enhancement is bound to seem simplistic to anyone who has had to work within that framework. But any archivist faced with the task of documenting a high-technology company would be handicapped without a basic understanding of this process. Similarly, an historian not having knowledge of this process would need to acquire it before being able to understand how a company functions. Thus, we articulate information that has always been known, but not easily obtained.

continued on page 6. . .

continued from page 5. . .

Other Findings

While the model of industrial development and the documentary probes are central to the study, we tested other assumptions that are critical to documenting high-technology industry. A detailed discussion of these will appear in the guide. The findings pertain to:

Corporate Acquisitions— Young high-technology businesses are particularly vulnerable to take-overs and mergers by other companies, and every time this occurs it lessens the likelihood that substantive records will survive. Our choice to study C-E-I-R was made because it represented a typical acquisition by Control Data, a high-technology corporation that had a strategy of supporting growth through the acquisition of businesses. While it was difficult to develop substantive generalizations about the documentation of acquisitions, many of these were reported in the last *CBI Newsletter*. Of particular note is the body of information that a purchasing company will compile prior to an acquisition; at CDC these records were created by special task forces designed to investigate all legal, financial, and intellectual property obligations that would be inherited after the acquisition.

Other Sources of Historical Information—In the context of the probes, we explored how well a business could be documented without having access to its core business records. This is a situation often faced by corporate historians, either because the company has prohibited access or the records have been destroyed. The typical sources outside the corporation are government records, trial records, technical reports, newspaper and magazine articles, and the papers of individuals.

Oral History—For relatively young firms, oral history represents a valuable source of historical information. It is being used more frequently by historians, even when a good collection of paper documents is available. Corporate archivists are often faced with the task of developing a comprehensive oral history program; we believe that the model of industrial activity and the use of probes offers a good framework for this task. Of course, the probes themselves rely heavily on oral history.

Machine-readable Records—The study did not uncover many specific cases where machine-readable records represented a significant source of historical information. It is assumed that this was the result of the time period examined, and not a statement that machine-readable records are insignificant in documenting business. There was evidence of subtle changes in the use of computers that could greatly effect the quality and availability of historical information in the future.

Conclusion

The publication of these findings is, in many ways, a starting point for other research of use to archivists and historians. As more is learned about the changing nature of documentation, it is hoped that pragmatic models and other tools can be developed to improve the state of documentation for high-technology businesses, and business in general. The project staff was particularly intrigued by work that melds historical studies and archival research. Our work with probes and our model of industrial activity needs to be verified by others in different environments. We hope that studies by others will take place under circumstances that ultimately result in the preservation of more business records. □

CHARLES BABBAGE INSTITUTE
NEWSLETTER

The Charles Babbage Institute
103 Walter Library
117 Pleasant Street, S.E.
University of Minnesota
Minneapolis, MN 55455