electronic information handling

Electronic Information Handling

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Preface

A national conference on Electronic Information Handling was held on October 7–9, 1964, at the Webster Hall Hotel in Pittsburgh, Pennsylvania. Covering the rapidly burgeoning field of electronic information processing, the conference was cosponsored by the University of Pittsburgh, Goodyear Aerospace Corporation, and Western Michigan University.

In order to cover the spectrum of information handling problems, speakers were drawn from many fields of government, industry, and education. A correspondingly diverse audience of more than 400 persons, representing areas as varied as library science and command and control, were in attendance.

The papers presented, as reflected in the proceedings following, were organized into six sessions, on:

Analysis of the field
End uses of information
Operational experiences
Large-scale systems under development
Shortcomings of electronic information-handling systems
Planning for the future

The common thread running through the conference revolved about explorations of the field of information processing in support of decision-making requirements—decision making at various levels, in various environments, and for various purposes.

Acknowledgments

The assistance and cooperation of Western Michigan University, particularly Dr. George G. Mallinson, Dean, School of Graduate Studies, leading to the organization of the conference, is gratefully acknowledged.

Allen Kent
Orrin E. Taulbee

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Opening Remarks

THOMAS A. KNOWLES

President, Goodyear Aerospace Corporation

As an officer of the Goodyear Aerospace Corporation, I want to tell you how happy we are to join with you in this Conference, and to note the rather considerable *attendance and interest* which have been shown.

Perhaps it would be in order for me to explain why an industrial concern like ours is a party to an event cosponsored with two academic institutions, and how our particular company took the initiative, in this instance.

As you know, providing for our country's national defense and assisting it in providing health, welfare, and research support in areas of national interest involves a tremendous effort, a considerable portion of our national budget being allocated to these important projects.

With the need established, interest has been developed in a number of performing instrumentalities, some of them basically academic in nature, others in the nonprofit category, others in the form of specialty companies, and still others, like our own, as defense-oriented subsidiaries of large corporations working on the industrial scene.

While I cannot speak for all those organizations represented here that support research in such fields as defense and health, I know that they have undoubtedly developed a tremendous background of information-handling data, skills, personnel, and equipment either directly, or as by-products of other endeavors. In our own case, work on items like guided missiles, flight simulators, and space and warefare concepts has necessitated some knowledge of computers, memories, and other intelligence data-handling systems.

With a rather complex product line, our top management can hardly have a detailed familiarity with everything that is going on in all of these fields. Nevertheless, we do have the responsibility of endeavoring to steer the corporate course of action and to ration out our funds and facilities in accordance with some sort of a long-range forward plan, and to do this we talk frequently with those experts our company has recruited from the many technical disciplines, and from our many areas of effort.

In the harsh, competitive business environment in which we live, the various scientists and experts who come to us to ask for added personnel, funds, or facilities, must make a case for their programs in terms either of

the national service we can render, or the volume of business which can be generated.

For a considerable period now the experts of our staff at Goodyear Aerospace have been alerting our management to the imminence of something which they refer to as an "information explosion" or "information revolution," and very frankly they have presented forecasts in the information-handling field which suggests that something tremendous and of significant national import is in the making.

And, while fascinating and intriguing prospects have been pointed out, some of us in management have found the problem so complex, the discipline so interrelated, the very techniques themselves in such an evolutionary form, that we have repeatedly pressed our people to bring more order and planning into the situation in order that we not make sporadic efforts in the field, growing like Topsy; but rather that there be some method and long-range continuity to our management approach and support.

The essence of what I have been able to gather from presentations thus far made to me is substantially this: the national importance of the subject hinges on the fact that in order to achieve our goals of social, scientific, and military progress, far better and more complete information is needed; and that the handling of such basic information is the common denominator of vital things like command and control, artificial intelligence, textual data processing, man-machine and automated library systems.

One also gathers the impression that we will need larger and more complete systems in the years ahead; new machine languages, and new hardware; and that any assault on the interrelated problems will require considerable more investigation of the theoretical and practical aspects, including the development of criteria for measuring comparative performance of systems.

Naturally, much remains to be done in educating ourselves and others about the needs and benefits of such systems; and it seemed to us that uniting the complementary capabilities of university and industrial organizations might stimulate rapid progress towards this end.

Since our people did not feel that substantial attention had already been given to the overall problem in any one place, it was our conclusion that it would be in both the national and our own interests if someone would gather together interrelated leaders in the various fields and disciplines, with a view to discussing just where we stand and just what should be done for our common benefit and advancement.

Because the mechanics of determining what things should be committed to memory or storage, how this should be done, and how fast they should

be retrieved, could well be called out by specifications going beyond those applicable to the defense environment alone, it seemed to us that we should seek the broadest possible base for our discussion of what the field now has and what it should next provide.

In many ways such questions suggest the use of a broad and academic type of approach, for there is a responsibility to reach beyond and think in terms of more than any single classification of problems, or group of industries or services.

It was for this reason that we felt that we should endeavor to work with universities; and the selection of Pittsburgh and Western Michigan was prompted both by geographical proximity and by prior interest and leadership they had already exhibited in this important field.

So that is why Goodyear Aerospace elected to cosponsor this particular conference, and why we have joined with you in a sincere effort to inventory past accomplishments and to plan for the future. Doubting that our company interests and concerns are at all unique, I sense that all of us may have an opportunity to benefit.

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Keynote Address

EDISON MONTGOMERY

Vice Chancellor — Planning
University of Pittsburgh

Until a week ago the Chancellor of the University of Pittsburgh, Dr. Edward H. Litchfield, was looking forward to talking to you at this time. Without warning, he received, through the Department of State, word that his Excellency Diosdado Macapagal, President of the Republic of the Philippines, had accepted a long-standing invitation to visit the University of Pittsburgh on October 7 and receive an honorary degree. The Chancellor was faced with the difficult choice of either not appearing before you this afternoon or precipitating a minor international incident. I am sure his choice to be host to President Macapagal is a fortunate one for United States foreign policy, although it will work a hardship on those of you who are in this audience this afternoon. With deep apologies, he has asked me to substitute for him and to give you the substance of the message he had prepared to open this conference.

Let me, therefore, join Mr. Knowles, President of Goodyear Aerospace Corporation, and Dr. Miller, President of Western Michigan University, who will be addressing you at tomorrow evening's banquet, in welcoming you to Pittsburgh and introducing this national conference on "Electronic Information Handling."

COVERAGE OF THE CONFERENCE

The topics to be covered during the conference are in the same area of interest that the University of Pittsburgh has assigned to a new part of the University, the Knowledge Availability Systems Center. This interest is not confined to a Center within the University. It has become a new university-wide philosophy.

Dr. Litchfield stated this philosophy in the Fall of 1962, and made it one of the major specific goals of the entire institution. He chose the term Knowledge Availability Systems to represent an activity far broader than "information retrieval," and to indicate concern with nothing less than the total problem of making knowledge available for desirable social purposes—currently and in the future.

Activities in this field had been pursued at the University of Pittsburgh

before the establishment of a university-wide effort. Notable among these activities are:

1. The Health-Law Center, which has concerned itself with the storage on magnetic tapes of the statutes of many States, in order to accelerate their retrieval and thus facilitate legal research.
2. The Model Drug Prescription Project, in our School of Pharmacy, which has involved the electronic storage of drug prescription information for correlation with the side effects discerned by prescribing physicians.
3. The Crystallography Laboratory has been using computers to correlate data relating to crystal structures.

The Knowledge Availability Systems Center, established in September 1963 under the direction of Allen Kent, was charged with the responsibility of developing a program of research, operations, and teaching relating to the entire spectrum of information activities from the time information is generated until the time it is disseminated and put to use.

What has happened during the first year of activity?

1. A teaching program has been established which provides masters' and doctoral candidates with an opportunity to major in the emerging field of information sciences. Twenty-one credits are already offered in this program with about 250 students at the masters' level having taken, or now enrolled in the first course of the series. Three full-time candidates for the Ph.D. are already studying with the Center, representing, we are told, perhaps the total national crop of full-time students in this area.
2. In recognition of this strong start, the name of the Graduate Library School was changed on June 1, 1964, to the Graduate School of Library and Information Sciences to reflect our regard for the importance of this program.
3. The health sciences are represented in the new effort by the development of a Diseases Documentation Center, which will collect and interpret information, both published and clinical, relating to specific disease entities.
4. There has been substantial cooperative effort with Dr. Stafford C. Warren, Special Assistant to President Johnson, in drafting plans for a National Science Library System to cope with burgeoning periodical literature. This plan was presented publicly for the first time at a conference here at the University of Pittsburgh on the subject of Library Planning for Automation, held on June 2–3 of 1964.

5. A program for the spin-off of information developed through the national space program to industry in Pennsylvania and West Virginia is well under way. This operational KAS effort has been undertaken under contract with the National Aeronautics and Space Administration.
6. The Avco Corporation has made the University a gift of the Verac equipment. This hardware developed by Avco in collaboration with the Council on Library Resources permits the microreduction of records (at a reduction of 140 to 1) and their rapid retrieval.
7. We have received, on long-term loan, InSite equipment from the Beekley Corporation. This device permits ready searching of files using the peek-a-boo principle, but unlike other such systems, permits on-line printing of search results. One of the applications now being considered is that of class scheduling and registration.
8. The Photon, a computer controlled photocomposing system, has been acquired from the National Institutes of Health. The Computation and Data Processing Center has already, in its Project Upgrade, developed programs which involve automatic transfer of text from monotype and linotype paper tape to magnetic tape and which permit proofreading and editing of original manuscript composition through computing programming. With the aid of Photon, corrected manuscript may be set in a form ready for printing.
9. A detailed survey of the specialized information centers in this country has been completed in order to discern opportunities for developing a common, standard language that will permit interdisciplinary exploitation of the information stored.
10. The application of gaming theory to the investigation of relevance of IR systems is in progress. This program, supported by a generous grant from the National Institutes of Health, is looking into the use of a "heuristic information-retrieval game" to measure the behavior of users of IR systems in order to develop criteria for the system design.

I could mention many more things that have happened here, but suffice it to say now, that even in one year, starting with a new center, there are fifteen faculty and staff members now engaged in this program, involving the Graduate School of Library and Information Sciences, the School of Medicine, the School of Pharmacy, the Division of the Humanities, the School of Engineering, and the Division of the Natural Sciences.

Although we are gratified with the progress we have made in the field of the information sciences, there is a second group of reasons why we regard this conference as important.