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Interviewee: Association for Computing Machinery Meeting "Quarter Century View, the Look Back"
Interviewer: Henry Tropp
Participants: William J. Osterman, Harvey L. Poppel, Mortimer Rogoff, Frederic Withington, Harvey Golub, and Anthony C. Octtinger
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NOTE: Transcriber transcribed Tape 1. The majority of the audio was poor with some participants completely inaudible. Tape 2 quality is poor and transcription was discontinued.

[Start Tape 1, Side 1]

.....And we shall try to recapitulate how we got from there to here and then (?) try to say something about how we get from here to there wherever that might be.

The people who seem best qualified to undertake both of these retrospective look and the forward look are a group of men whose livelihood it is to guess at these things and gather as much information as they can, take their life in their hands and give the price. The money, (they therefore are keeping routine price if at all possible, for opposite roles?).

And so we have gathered here a group of distinguished consultants asking each of them to take a look at a facet of computing over the past twenty five years and tell us of their impressions and when they've done that I guarantee the (fellows?) will comment on the presentation.

We agreed that if any of the speakers or any of the panelists feel an urgent need to break in (we won't stand on ceremony?). It would be…to say anything good about the past of computing that would not be controversial.

And towards the end of the afternoon we will also open the floor for questions and arguments from the audience.

The first speaker will tell us about hardware and software trends. What it was like about twenty five years ago, over the past twenty five years. It is William Osterman who is Director of Products and Market Planning for Services?

OSTERMAN:

Thank you. By historical standards twenty five years is a comparative short span of time

in the development of an industry and its underlying technology. To compare the auto... The first actual powered motor car was produced in 1885. By 1910 after a span of twenty five years Ford the Model Tip had just entered its second year of production. There were less than ten thousand miles of highway throughout the nation. The automobile was still the playboy's invention.
Perhaps the terror of the... But consider the other point. The brothers first Wright/air plane flight was in 1903. By 1928 after a span of twenty five years the World was still amazed by Lindberg's solo flight of the Atlantic the year before. And in contrast of course, the aviation industry was still a gleam in the eye of the farsighted producer.

Today, as we mark the silver anniversary of the completion of ENIAC it is apparent that progress in computer technology and the growth and development of the computer industry has taken place at a pace that is nothing short of startling, by earlier standards.

With this, a period of twenty five years, we have seen a long computation speed jump. Increased by a factor of thousands. And we have seen the cost of computation decrease by a factor of perhaps ten thousand. We have seen the development of sophisticated information processing systems experienced in communities of the public and users scattered over a wide geographical area and capable of (confirming?) the processing overflows of dozens of computational acts.

When once the programming part was developed from the punitive era of hostile action to a point where the average high school student can today…plot prepare computational programs with comparative complexity?

Over the past twenty five years we have seen the use of the computer moved out of the research laboratory of the university and become an indispensable tool in tens of thousands of business and Government agencies throughout the world.

And within a period of twenty years, we have seen the development of ten billion dollars in data processing industry.

Upon some reflection, the reasons underlying this rate of growth of technological development our…have seen. During the 1950s and '60s several important forces converged to provide an unusually favorable climate for the development and growth of computer technology.

First, the requirements of the growing defense and space technology created a critical demand for the development of massive computational capability. Secondly, a paperwork that required an explosion of staggering proportions during the post-war era created an insatiable demand for improved data processing methods.

And thirdly, the…of semi-conductor technology provided the technical where-with-all to bring the methods of the computer to tens of thousands of users.

Quite understandably, the rate at which computer hardware and software had developed was accompanied by...

A certain amount of chaos and inevitably some monumental mistakes.
Of course, it is not difficult for us who are today equipped with the infallible powers of hindsight, to point out smugly the errors of the past and to criticize their stupidity. To judge them from decisions that were made during the industry's formative years.

I certainly sincerely hope that my remarks will not be interpreted in this period, and yet I believe that by reflecting the problems and pitfalls of the past are essential.

We can't deny what will serve us in good ahead in the future. Since the middle 1940s, computer planners have had…a number of important technical break-through in the seemingly endless series of product developments and conceptual.

Starting with the development of the transistor in 1948, we can trace the continual progression of breakthroughs and important technical developments. In the latter field, the integrated circuit and its recent successor the NSI?

In the memory field, the ferrite core. The (ferrite film plated wire?) and now the MOX… memories.

In the peripheral equipment field we have seen a series of advances in magnetic tape recording. In drums and discs and printers. OCRs and MITRs and terminal devices of all shapes and sizes?

In the field of machine organization, the list is even longer. To name just a few we have seen the multi-processor, the…processor. A…processor. Multiprogramming information processor. Stacks and stacks of convertible storage.

And in the software and programming fields, there has been a diversity of development in practice and programming licenses and in insisting that applications stop.

The list of breakthroughs, trends and developments essential in containing? items rejected, that have been tried and rejected. Items that
have never quite caught on. And of course, items that form the backbone of our present computer technology.

As a matter of fact, there has been a capacity to push the state of the computing art at a rate that has strained our ability to maintain a sense of order and balance. And at a pace to spark the computer community to assimilate change.

Within a period of less than fifteen years our history brought us three generations of the computer systems and now the cycle appears to be repeating once again. Although the notion of distinct computer generation has finally lost its significance and...

Many of the effects of this almost blind allegiance to abandoning the state of the art are well known.

First, there has been an all too frequent tendency to extend an inordinate portion of our effort and development energies attacking the wrong problems. I thought of giving this characteristic of the computer system to improve…has proven to be a small computational and instruction processing capability.

And because the internal processing capabilities of a machine have proven to be the most susceptible technological advances, (and go along with the users themselves?), we find ourselves in a situation today throughout our life a generation of three hundred horsepower automobiles. And a highway system which is attuned to thirty mile an hour speeds.

Although it is…at the surface, for years for the problems of an input/output…the fact remains that the…of our present day… installations are hopelessly overpowered computationally and still …input/output mechanisms.

A second consequence of our commitment towards innovation and change in the Computer field…on the all too frequent failure to fully anticipate the complete technical and economic consequences of a…for development.

Perhaps the most local example of this is the so-called (Precept Zero?) which occurred during the middle 1960s with the introduction of the third generation computers. With a naiveté which in retrospect seems incredible, thousands of computer users accepted the challenge of converting their installations to a completely new…armed with a handful of conversion tabulating tools and an abundance of computing techniques.

The chaos and economic consequences of this (National?) conversion program are all too well known. And the effects are still being felt. This attack would suggest that the architectural standards of the second generation sort of persisted in the present or subsequently became…

I was instead suggesting that a set of people produced too much too soon without due regard to the host of consequences. Although perhaps a short term economic debit to the supplier can in the ultimate analysis only prove possible to the supplier and user alike.

We can sight other perhaps less dramatic examples of…this morning. We can consider the popularization of direct access storage devices for data file storage long before the availability of the actual file data in software. As a result of the present day computer users as you know organized to full status disc riveted files in a completely sequential batch so that from a cost effectiveness viewpoint they would be part of magnetic tape.

But consider the role of the…For a number of years the…disposal of the hardware

incidents necessary to perform the…in a communications oriented environment. I am speaking now of the…multiplex project and the interrupt systems in similar hardware…enhances. But both of the systems thought
control it was necessary/over the communications oriented systems of any complexity. Do we get that decision, generalized…for the control of a complex teletype system? Do we get that…disposal of diagnostic reconfiguration of… software to provide a reasonable fail…

As a consequence, how many cases have been sighted (to tell a profit?) in system failures which simply resulted from attempt to accomplish too much too soon? I would like to spend a moment specifically considering the software field in the context of my earlier remarks comparing the change and enervation in the computer field.

Unlike the computer hardware field which sets a line of breakthroughs
and technology which give dramatic advances in cost effectiveness, progress in the software field has necessarily been at an evolutionary pace.

For the software designer has not had at his disposal a series of technical breakthroughs to the development of the transistor or theoretic core memory which have often to the advances committed quite often to the advances to the state of the art.

This is not to say that we have to try to (accelerate ?) the progress of software technology. On the contrary, in order to keep pace with the ever advances of hardware development and in order to comply with the commitments of our marketers all along the approach has been the same. By applying (dimensions?) of programmers and designers to software development projects numerous attempts have been made to progress development schedules and stimulate progress.

The results of this brute force approach to software development are well known. Actual schedule slippages and (?) products imposing accepting supervisory overheads and unrealistic (core memory requirements?).

On the other hand, those program products have proven to be outstanding performers in terms of their (?) and responsiveness to future needs. And almost always that. Inevitably, they were the products of small and highly (motivated ?) development techniques.

Their design was based on a clearly defined act of requirements in an attempt to be all things to all men.

And their overriding characteristics were of design and avoidance of unnecessary requests. To briefly summarize, during its first twenty five years, the computer history has been the subject of a (panic?) parade of technical engineering progress and engineering…than perhaps any other industry in the history of human enterprise.

These advances hardware and software have provided a technical foundation for what in

the not too distant future; will become our largest and most important industry.

Nevertheless, it is in my view that in our desire to stimulate the growth of our industry and to advance the state of the computing art, we have all too frequently disavowed the philosophy of advancements at any cost to change
the (state of the machine?).

Fortunately, /the past few years we have been able to observe that this set of attitudes in the computer user community, which I believe will ultimately serve as an indispensable governor on the rate at which product change and advancements are permitted to (uphold?).

Up until the late 1960s the manufacturer makers of computer tapes was a by-word of the computer industry. For the seemingly insatiable demand for data processing capacity and the naiveté that stems from inexperience, the computer user all (walked through?) to be an Instrumental part during this industry's formative years.

However, with the experience of three generations of computers, with the sobering effects of a recessionary economy, and with the self-reliance that stems from an (Impossible?) world, a wide-spread maturity of the computer user community is in evidence today.

As a consequence, we can foresee a new sense of discrimination in the computer user and the computer buying processes which is characterized by a terrible consideration of the compatibility and conversion consequences of (the new maturity?). And insistence of far economic justification.

Among the short term effects of this new found maturity and sense of buying discrimination has been the level of computer shipments during the past two or three years. A failure to spontaneously embrace new products…a temporary surplus in-16-productlon capacity in the computing industry.

As difficult as these short term consequences may be to accept, it is my conviction that this maturing of the user community has contributed a (logical?) sense of balance for the industry. A long overdue constraint of our rate of product obsolescence and a solid economic foundation for the growth and development of the computer industry during the next quarter century. **(Applause).**

OCTTINGER:

Thank you very much. I trust that some of the later speakers and also the members of the panel…will examine critically the main theme that Mr. Osterman has set us, namely the much…dislocation. And perhaps/address themselves to the question if they like the conclusion in the first place as to what development cycle…

Having started off with a look at the hardware and software both of which played a part (?) to the rest of us, our second speaker will talk about the real software, people resources.

Harvey Poppel is the Vice President of the Consolidated (?) Corporation and he will tell us about people. How we are going to…population zero growth. Population growth over the next 35 years… **(Voice fades out).**

POPPEL:

In comparison with this talk, I was surprised to find that looking back…I quickly realized that it was probably a lot smarter…

But, in the words of that famous commercial, "You've come a long way baby", and the principal factor I believe, is (?). And the both principal factor in/our successes and the many problems spawned by the progress we have made.

Now, just as at the start of this presentation, the types of people resources will take up most of the day, include the management of people, what I call, information services function. I would like to generalize what I call information systems management…activities, the average program, the operations people who ran computers (?). And let us not forget (user parts?). **(Voice fades out).**

Now looking back the obstacles which we faced were (astronomical?). The major goals that the early information service organizations were to convert computer (?) operations and as many of you will remember, several (?) installations (?) were justified .....**(Voice fades out).**

The second goal was to computerize the basic financial applications. Payroll ability.

The third major goal of these organizations was to build and develop a common threshold among the operating staff, starting (?). And to keep that staff in pace with the technological developments which…

The other major goal of course, in the early days was to convince the data processing equipment (developers ?) that we should keep (?) rather stubborn resistance to change. **(Voice fades out).**

Now to meet these goals, the available talent was rather sparse, and there was little or no common ground on which to build the organizational foundation. The early computer management had a great source of talent provided he read technical knowledge experience. Application formality and a series of (?)organization.

The primary source, I think as you look back (?) were what was (?) the data processing era. Operators (kept records ?) Consistent with that is the accounting engineering

(typists?) who were brought in by the automation of their functions. And in the early 60's the emergence of certain kinds of computers.

Now, this posed a major challenge in trying to harness and digress a series of (spy?) interests without any relevant (choice?) of management experience or techniques.

This was a little like trying to obtain a (?).

Now, how did we accomplish these resources in the early days? I hope you can make out all the details on this slide on all the points on the (key character?) of information resource services organization that we had.

First of all, you probably see cause for most of the early application in many organizations. **(Voice fades out).**

The top financial executive was given (the overall responsibility of data processing?).

Second of all, the…**(Voice fades out, cannot hear completion of paragraph).**

The (program?) group which concerned itself with the (?) program and the maintenance of the early programs, which, by the way, was under the distinct impression of (talents?) under these (?) organizations.

I think, it's notable in this study. **(Voice fades out).** And then, of course the operations group would handle the basically new operations... **(Voice fades out).**

Now, a couple of other things, in this organization structure. The fact that the (?) units were often splintered in multiplication (of the computer?) in these types of organizations by our limited program functions and therefore there was a lack of commonality of the standardization of progress (development?). And certainly, major... **(Voice fades out).**

Most important was the fact that this series of (on the right hand side?) accomplished were major functions (which needed to be ?) but were not often accomplished (effectively by most ?) organizations.

That (even by?) accomplished of all today are (?). First, the operating plant concentrated overall with an establishment planned organization. Second is that/of priority.

Third, is a (contemplated knowledge?). Fourth, is (**Speaker goes on to list seven points, but audio is so bad this cannot be picked up**).

(Tape continues to be completely inaudible for several more sentences).

Lastly, the most important thing suffered was the occupant. Namely, the occupier. By

the best available talent...(**Speaker's voice becomes inaudible**).

Now, (?) the shortest period of time, the best tried system was often (in the role of mass coverage?). **(Voice fades out).**

Now the next imposing slide is a matrix which again, is unfortunately is rather difficult to make out. It has a couple of…**(Voice fades out).** And isolated because of ... **(Voice fades out).** Certainly the symptoms are not hard to spot.

NOTE: Transcriber did not continue to transcribe the remainder of Mr. Poppel's comments since this portion of the tape is almost entirely inaudible.

ROGOFF:

Good afternoon ladies and gentlemen. My task in these proceedings is to represent the user community. In looking back, the first twenty five years of computer technology.

We are all familiar with the tremendous advances that have been made over the past quarter century. In terms of hardware, software, architecture processing speed, memory capacity (?) Reliability, cost performance and all the other parameters whereby we measure improvements of computer technology.

But the (words of the business?), that is to say the world of the computer user, does not seem quite as impressed with the fruits of our labor as we know it.

During the next few minutes I would like to explore with you a few of the ways that computers forced our attention or application and where the user has had to adapt to the restrictions of the computer.

Gradually causing a threshold break in the expanse of capability. I submit that in many cases the user has been forced to view his own world through the wrong end of the telescope when he rates the computer when it is in operation, as well as computer techniques which show you some of these constraints, rather than proclaiming the users (?).

Let's look first at the commercial aircraft line industry and the computerized (reservation?) system. Let's look at those systems where they are in operation. They are generally descendents from the American Airline (?) that goes back to the middle '50s when the first plan was undertaken.

Its first operational use began in 1963 and I believe the second generation machines are, under which it was built are now being replaced by third generation equipment.

No doubt there has been a great deal of evolutionary development that has resulted in fairly smooth operation. It is almost certain that airlines would have a great deal of

trouble handling today's passenger loads without some assistance.

But let me put my question to you. Have you ever reported in the middle of a journey at many intermediate stops when you have to change your itinerary and needed a new ticket? In this case, in direct reply, that it is necessary to many waste minutes waiting at one of those counters and placing a (?) that you always avoid.

After waiting to reach a clerk, who after a long sigh begins the process of recalculating your fare. This can be extensively complex if you are traveling with members of your family over the weekend and into a special holiday period where the complications of fare are beyond belief.

Today's reservations systems don't handle this problem. So here's one case where users, both the passenger and the airline employee are poorly are served by the reservations system.

And this raises the question as to why this is so. The answer lies of course, in the very large data processing communications load that is to be imposed
over and above the present loads that are dedicated to (justify?) the space available on all possible scheduled flights and the subsequent assignment of space in the name of the specific customer.

(Saber?) can process about three thousand messages a minute. Computerized ticketing(?) doubling the communications burden. But communications is not the whole story. The extra processing work has to be computered into a memory of all possible combinations. And then often times the choice would probably raise the cost of the system beyond any airlines willingness to pay.

In part this extra burden comes from the inability to device simple programming schemes that would quickly zero in on minimum cost ticket. The program in existence tends to laboriously calculate all the possibilities and then pick the lowest price for the customers.

Half the clerks don't work that way. They know almost instinctively which ones would be the best ones to try. They don't try the silly ones first. In other words, I don't include in this poor service entirely through lack or cost of hardware. Rather, it's also the inability to buy a programming system which can employ a reasonable size computer to do routine, but complex jobs.

Here is an example of an operation that remains compromised and where there has been a cause for (legitimate?) use. I'll stick with the airlines reservation system for a moment longer to introduce my next example. The language used by reservationists agents to communicate with the system is composed of a set of three character (a line?) that takes on the average about three weeks to learn.

And continuous use by the agents is required to stay professional. This language at best is

clumsy. It was designed as the major alternative to prevent (lines of public carriers to be transmitted?).

Three characters a line may seem a familiar way of (logic?) to many of you. But the ladder, with no (additional ?) adders has a vocabulary limited to three letter words.

Why should the users in this case, the reservation agent, be forced to use an artificial language which hasn't given total consideration in terms of human ability, but major consideration in terms of computer capacity.

This then looks at the (generals?) of the (adder machine?) in communications. And it's a little like looking under a (?).

Our twenty five history of language for intended toy use by people who talk to computers is highly comparable to dead languages, either specialized languages or the purpose languages and so on.

Our (?) is frustrated by the puzzled members of the user community. In a quarter century of technological development and much (?) capability of contemporary computers why do we have to have this to write
English into the machine?

At least if the computer can't understand English because it's my (letter I'm writing?) why can't they male that letter, three letters a line is not a fair compromise. (LAUGHTER).

But it is a compromise and that's what this discussion on language has been all about.

The user isn't compromised because the computer's capability das continued to force language development every time you restrict it from a human viewpoint.

There seems to be no validity in the notion that systems programmers will continue in the traditional manner to employ assembly level and (?) procedural (?).

But there is no technological reason that the bulk of the (entries?) should be so constrained. To put it another way, the constraint is strictly technological. Another (?) imposed on you.

Our solutions to date has been to create an intermediary called programmer who we know, is able to speak as ably to computers as to users. The right of the (?) may belong to us. It turned out to parallel that of the railroad fireman, the need for which turns out to be rather tragic.

The answer to this problem of language restrictions may lie in the increasing dependence on hardware. Probably the latest developments in computer technology in the past twenty

five years are the (?) magnitude increase in accurate (device density?) that we have achieved between the vacuum tube and large scale integration.

That we have increased its reliability and system availability rather than going the other way at least the (device densities?) have increased. This great computer capability means that we can have more complexity per cubic inch and this is where we will probably find the solution to the language problem.

In other words, the language translation can take place while the machine itself without forcing the user to learn a special language.

Now let's take a look at the very (?) application that is probably in use by every company represented in this room, namely financial reporting. I would like to relate a little story that is actually based on a composite cross-section of American industry.

Once upon a time, in the 1950s there was a financial Vice President who got his company's periodic financial statements from the traditional source, the accounting department. Furthermore, whenever he wanted a closer look at a particular cash (data?) or a breakdown of a specific regions earnings, year to date or any other special report, our Vice President knew that he could call on good old John in the Accounting Department to put together the information he desired in a matter of a day or two.

You know what happened next? The company tried a computer, in the late '50s or early '60s and proceeded in the name of progress punch to (audit an accounting?). The result, today our Financial Vice Presidents while receiving a monthly computer punch out and would like a detailed report of some particular aspect, calls the man at the data processing and is told that his request will cost several thousand dollars and take three weeks to develop and decode a program. To extract the operational data and (for better reporting?).

That (?) to that experience a couple of times, the frequency of special requests is likely to fall off very quickly. As a matter of fact, a whole lot of organization returned their computers for this very reason. Because the comptroller was a long time ago an expert and knew how to get the reports he wanted when he wanted them.

Has the computer (?) the Financial Vice President? Yes, of course. It's probably more accurate and timelier information that spans and summarizes a much larger collection of data that wouldn't have been possible without a computer.

But where he is limited he finds himself up against a rigid pattern, the chief accountant will instinctively do what is deep inside those figures and can pull out (sets of errors?) that needed further inspection. That's all there is to logic that's replaced by a set of combinations of an analyst or programmer who (can answer boldly the requests?) whose assets have not yet been programmed.

Believe me, this is a very common occurrence. And although we can each take pride in

the fact that today's level of progress could not survive without computers, we must recognize the terrible frustration of the users of accounting information when they need insights that have not been anticipated when the program was recently written.

One plain answer is usually injected at this point is time sharing. But time sharing is no answer. Interaction of the data base is no answer, unless you are able to quickly the construct the programs for a set of statements for a (that they obtain the data that will be needed to answer the questions that just arose for the first time.

The machine has been sliced into small pieces so that many users can obtain answers at the same time; they simply install a less capable machine. It can't handle an (avalanche?) of data problems. In a sense, this is not (with the computer?).

The information contact lies in the uncertainties of the problem and the unpredictable quality of the answer. If you agree with this point, then you will agree
That the (brief program days in decision making?) are not very helpful. And that the ways of a new approach to allow us to try the uncertainties and where there is little predictability.

I'll stop giving examples at this point because there is no value in dragging it up any more. They are all basically the same anyway. Namely, in spite of a great deal of mechanical assistance to routine processes, it is still not possible to get human-like sensitivity at the (?) of a computer.

We are really able to set it (bustles?) and (bows?) rather than gray matter. In my opinion, this explains the discomfort that many users feel towards these electronic colleagues.

I plan to look at the other side of the coin though tomorrow when we look again at the next quarter century. This is a prime period and covers 198if but falls short of the new century. If these symbols and numbers mean anything, one hundred would mean a look at a (?) dependability from (?) muscle. Or whether we are going to break that with a new era of flexibility and sensitive support, to the (thankful?) human being. Thank you. **(Applause).**

OCTTINGER:

Thank you very much Mr. Rogoff. I've heard all the brief proceedings (?). And if programmers had all the (?) at hand, we're in great trouble. **(Laughter).**

But I must confess at being somewhat puzzled by this outpouring as most of you know me and recognize me as a chartered whistle blower. I **(Inaudible)** if the members of the panel will look at the (?) a little more closely and (?).

Our next speaker takes us back to technology and a closer look at how we got here in terms of hardware and software and by all means. Fred Withington is the Senior (?) of the

Garfield Corporation. Ted.

WITHINGTON:

In the beginning there were Eckert Mauchly and engineering business associates. By 1953 both had disappeared in favor of (brands?). The other brands (appeared on the field by then IBM, (?), Underwood, Bendix, EGA, (?) and Computer Research and (?) I can't remember all their names.

In 1960, the number of general purpose computers (?) had increased to no less than 43. Now, in 1971, only ten of those names survived. As independent (competitors?) and computer technology has not fit the frame of those (?).

The reasons for this high immortality are primarily explained by the problems associated with computer systems (?) support by a (?) and maintenance.

However, the basic technology has also posed problems. In the beginning the manufacture of computers was mostly a matter of hand assembly with electronic components available in the general market.

In a peripheral way, it was largely a matter of assembly or adaptation of existing punch card computer tape. **(Voice fades out).**

It was remarkable how much (?) in introducing the full (assembly of ?) peripheral system for UNIVAC I. (?) to prove this point. Not to take away any credit that is due, it was simply impossible to (?) technology (?) from scratch.

As the years passed however, the requirements of the manufacturer to become master of in house original peripheral equipment technology simply grew. As did the requirement for sophisticated in house electronic technology. Indeed, the growth of the digital computer industry (?) with the explosive progress of digital electronics technology, which had been (exactly?) most spectacular.

Its progress can be most dramatically (?), but it's no (?) from the negative point of view. From that of the then existing technology in the industry that (evolved?) Before the onslaught of digital electronics.

Perhaps few remember now that the analogue computer business was one that started the digital business. For a while there was a struggle for supremacy. The analogue machines fought back against the initial onslaught of the digital computer by adopting digital electronics themselves.

First in the form of the digital differential analyzers and later in the form of hybrid computers. Finally however, the analogue computer gave way almost entirely.

The punch card machines lived longer, also partly by adopting digital electronics in the form of externally programmed calculators. The f«» punch cards has the first step (in the late 60s?). The UNIVAC (?)

However, the stored program system has now reached a point where all undue remnants of manufacture are disappearing. More recently, the territory of digital electronics has spread outward into the territories of other existing machines as well.

The accounting machine for example, all but the smallest of which have now have now incorporated into the electronic rather than mechanics logic. And the desk calculator where electronic models have now swept the electronic more expensive than ever before and less expensive than ever before. **(Voice fades out).**

Digital systems have also replaced those existing technologies and control systems. Hydraulics, (automatic?) relay and…**(Voice fades out).**

As digital electronic technology continues, to improve, the computer manufacture has essentially had its problems to play around the problems of rentals and financing and marketing, investors' support that has (helped?) so many early ventures in the field.

The (main?) computer, introduced in the early 1960's by digital equipment, was by virtue of its low price, a (?) and less, more satisfactory market (?), in which users purchase the machine data and require little or no individual support.

The mini computer fields that of course, pace had even more frantic pace of proliferation and bloodshed /than the general purpose field, and it's still
Not settled down. Many computer data (?) Are overlapping in different ways with (?) and district general purpose computer systems is a subject that requires discussion. And then there is the software history, wherever that is. There's no real (way?) to even start, because from the first the manufacturers of computers provided (?) subroutines, (?).

Also, there was already in existence before the advent of the computer (?). He thought gradually that the use of computers offering package (?) computer science were very (?).

Probably however, it's fair to say that software history first made its major role in the '50s. When the appearance of fully programmed time shared business software with the explosion of the service bureau industry into conversational time sharing (program series ?).

However, there is little doubt that the long term purpose and (?) of the (?) computer. Indeed, some of us feel that (?) from this discussion that the dominant general purpose computer industry seemed on the one hand to be (?) computers and on the other, by the purchasing software's (?) industry, they completely lose the traditional orientation towards (?)

(I resent that remark?).

To bring this talk to a close, we can (?) with a (sparkle of ?) of pride, that the past twenty five years has brought fast acceptance of the stored program digital computer for a (?) of functions far beyond the imaginations (?) of even the most enthusiastic (?). This probe has been made possible by the great progress of the digital electronics and by both systems and applications software as it has evolved.

These areas are now if anything, progressing at even faster rates. (?) the pace of dislocation caused by these forces (?).

As a result, in the foreseeable future may be the most profound change in the computer industry since its inception. (?) Thank you. **(Applause).**

OCTTINGER:

The speaker, Mr. Withington spoke about product prosperity. Let me inject here what might have happened. The (?) and the software cuts for (?) programmers have been set on the equivalent lines of (?) of at least fifteen years we ago, where would we be now? I guess that answer is one that from the start that, can be part of an example of the railroad industry (?).

We heard Mr. Withington tell of the people who have, do the computer work. Mr. Golub will tell us about the people they worked for and what (?) the acquired over the past twenty five years. Harvey Golub is Principal (?) Company and he will talk to us about (lessons?) for management.

GOLUB:

Twenty five years is a long time. I can only speak from personal experience about half of that period, I can read about the rest. And it strikes me that the period in which I was involved can be characterized by about three things.
A great deal of challenge. A lot of money and perhaps (?). Let me describe again about my (?) from my early days at IBM, in which three months after I joined the firm I had (?) a program (hardware program ?) As a result of that, of that experience, I was assigned as an instructor in the user room.

In the midst of that (?) office, they asked me to come back and (co-check ?) a customer card (in the 604 ward?). For those of you who don't remember the 604s they are calculative equipment. We did (forecasts?) on 604s in training (?).

And the only thing that had accounting (?) calculus. And my… (**Next few paragraphs completely inaudible**).

One of my colleagues defined, in a moment of leisure the life cycle in systems development projects in six stages. Phase one was our enthusiasm with which we expected to conquer the world. Phase two was disillusionment. Phase three was total confusion. Phase four was assertion of guilt. **(Laughter).** Phase five was (questioning the beginning?). **(Laughter).** And phase six was the promotion of (non participation?) **(Laughter). (Applause).**

It seems to me that the last twenty five years between the practitioners of art and science systems have a long suffering involvement attached to a large degree of passing through each of these phases. Some of us have passed through them many times (?).

Twenty five years is a long time. And what's happened to data processing in the past twenty five years? Well probably the bulk of us weren't even working then. In looking around I suspect that some of us weren't even born then. So that's a long time to explore what was going to (save the world from ?).

The computer (committees and the like?) have allowed us to go to the moon with increased frequency and to (place telephone calls?). It has allowed us to run (?) best network in the world and receive our (?).

And impressive range of occupations surely plus a significant impact on society is deserving. As helpful as the track has led (already?) it is useful in a way that you would like to see it in our (department?).

Our (methods?) are okay. Certainly (as applied to office jobs?). (I think you will agree?). Given the excitement, challenge and growth which fortunately we haven't lost, what really have we learned? When I started to write down what I hoped we had learned I came up with a list…**(Voice fades out)**. It was sort of like Ed (Gurney's?) list of contacts about facts you need to know about computers. Long in detail and not relevant.

And I wrote ray first list and showed it to one of my partners, (?).
(Next few sentences inaudible.)

And then did the computer work? It helped create a revolution in the office and contributed a massive increase in productivity.
Second lesson. As valuable as computers are and they certainly are, they cannot (?) as such, in a good, imaginative, innovative manner.

Thirdly, beyond that, while computers can (?) of major competitive aid to a Corporation.

Fourthly, we have learned about the number of times that those most knowledgable…all the newspapers and magazines
(Remainder of sentence inaudible).

And fifth, we have learned of the opportunities to misuse the computer for economical involvement is enormous. All of which can mean that...
(Remainder of sentence inaudible).

And sixth, finally and perhaps most important, computers can be used for better understanding (to be democratic?). How important, how (in part can they relate,?) and what factors can make a difference in the forming of a Government?

Let me cover each one of these briefly. Lesson number one. (?). I think this is (the most important lesson ?) over the past twenty five years. If you take our hand new technology and made it do some very interesting things (?)to the society.

Industry (?) technology. That industry that led virtually to the revolution in the office and factory. And it certainly issued an impact, pardon me, perhaps it issued an impact in the industrial revolution,

We know that (?) information (?) our society (?). We don't think much today of clerical replacement, but it's what happening to the office (records?) that (adds ?) to our credibility. (?).

No one would think today of running an insurance company or an average (?) company with social security (these days ?) without replacing our computers with a clerk (?) the (millions?) of people who work for them. In the last twenty five years the (?) purposes, the offices and factories have been the same.

Lesson number two. Have the computations of data processing moved the computers (?).

However, the computer can at most compliment good management. It can't create it. And it can't substitute for it. In a number of situations the design is for a system that won't work, or don't work well because of our belief that better information and more sophisticated systems will of themselves improve the quality of management in the decisions they make against (probability?).

Let me illustrate this point if I may. I've given this example several times. One client of ours found that he could sell items to customers (?) that were available and substitutional products/that they were often selling the least profitable products. The client diagnosed this problem as a largely information one. That is the sales (?) in the profit margin (as compared to the product?). And they believed that it survived (automatically a product they would sell a more profitable product.

So they decided they needed data processing and they installed it and (?).

And they found that nothing much changed either in pattern of sales or profits of the firm. (?) finally revealed the reasons for this. What the sales to compensate on the basis of

gross sales profit, the amount of profit, is a consequence that no amount of information is going to change (?) without (our wanting to change the value system as represented by how they would pay?). (whether or not the computer had that impact?) on the structure of management as a whole.

A further indicator (?) would be that computers are bringing significant changes in the way they are (?) constructed. Specifically in (scenario?) or something like that.

As (?) by the capability of using the computer and storing increasing amount of information for products and (?) and presenting for decision making to top management. That top management function will increase (in scope and complexity?) And at the same time you know what happened to (?) who essentially withered away or at least was substantially reduced.

In a serious way, what often happened. However, as we all know, quite the opposite really happened. Organizations brought it continually (more into central life?) and continually shifted the responsibility and authority to (?) departments.

But the computer as such has had a relatively good impact on either organization decision making or organization.

I think that has changed and we will talk about that in a moment. The effects of the computer then in total have been either to revolutionize management or organization structures,

And the companies that you are today are not (built without computers?) but those who have been able to (?) management today.

Lesson number three. Note the (?) of these computers. As many of you know, who have tried, it is very difficult to manage your own (corporate?) tax (when the computer is out of business?). However if such measures did exist we could examine it the following way. First we could look at the number of (?) for sale (in dollars ?). (?) from these computers is the reduction of clerical staff.

Therefore the computers (?). Within an industry we expect to see correlation between computer investment and number of people (on the staff?).

Secondly, you might attempt to measure on the basis of sales (?). Again, a major claim to that is the computer's total assets. Particularly for such items as business (?) or indeed the manufacture in other facilities. And the computer relieves the (faculty?) for these purposes and we expect in many industries to see the historical pattern whereby those who have (investment ?) of computers have higher sales (?).

Certain (?) of these profits (?) the computers have always been susceptible to incur, you

can expect to see a pattern of both higher profit and greater growth for those companies who have large investments.

Now to (discuss whether?) the computer investment does make a discernible difference. I recently examined data for investment of computers in a hundred companies and eleven manufacturing industries plus services. And from those companies I ran within the industry all the companies that had invested in computers and I(?) to discuss the number of employees (?) on sales and sales (?) based on profits.

And I (found that out of?) eleven industry groups, four industries did (?) process of correlation and computer investments (?). However, the correlation (?)

And out of the three industry groups that had essentially no correlation, I (?) had negligible profits.(?) I don't conclude from this that computers (?) an organization.

But rather (they predict a path?). That if that task does (?) significantly competitive, that means that they have not resulted in major competitive (?) for the product.

It seems to me that this would largely be to dictated because of other economic factors that dominate the company's performance. Of course that would (control ?) the sources of supply for operating of (?) network. Or indeed have the (account examined?) would be far than the computer, more (?). Thus while the computer has a remarkable effect they have not resulted in (?).

Lesson four. The technological (comparative by computers?). (?).

Because very often the technologist are working for managerial control. But I use management in this sense. I mean it in its broadest context for determining the purposes of this technology in equipment. How should we use this to relate to requirement?

There seems to be a general law when things are in operation for most technologies and which are (?) which I call technological comparatives. Sounds like(comparitory?) That is it seems to me that too many cases we design for limits of technology simply because it's there. And that's (?) the case rather than (?).

Another way of looking at it is to (?) in a set of eight a system. Eight percent of the (?) will be divided by twenty percent of the system. I can demonstrate the technological comparative.
(Next few paragraphs completely inaudible).

An important solution to this problem over the past few years, has been to…I have been (riding this course for a long time?). Yet it seems to me that this is the only viable

solution, in getting the profit (evaluation?)

(Following sentences inaudible).

Lesson number five. The opportunities for making that area very large.

(NOTE: Transcriber did not continue with Mr. Golub's speech since it continues to be mostly inaudible).

[End of transcript]