An Interview with

RICHARD CRANDALL

OH 339

Conducted by Paul Ceruzzi

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Charles Babbage Institute
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Richard Crandall Interview

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Abstract

A pioneer in timesharing, Richard Crandall, a University of Michigan graduate, formed Comshare and was its CEO for over 25 years. He describes the evolution of Comshare from its focus on interactive use of computers, through its transition to marketing software products, and to its eventual concentration on executive use of personal computers for business management information and decision support systems. He was Chairman of ADAPSO and its leader in strategic planning as well as an active participant in many committees including the Industry Image Committee. He organized and has been the coordinator of a software company CEO Roundtable since 1994. This oral history was sponsored by the Software History Center in conjunction with the Center's ADAPSO reunion (3 May 2002).

Preface

As part of its preservation activities, the Software History Center (SHC) worked with Dr. David Allison of the Smithsonian Institution's National Museum of American History and Dr. Jeffrey Yost of the Charles Babbage Institute to plan and conduct a number of oral history interviews of early software company founders and other key industry contributors. On May 3, 2002, in conjunction with SHC's ADAPSO Reunion meeting held in Washington, DC, SHC arranged for 15 individual interviews by historians well qualified by their knowledge and interest in computing history.

The following people were interviewed together with the name of their interviewer:

Bruce Coleman, interviewed by William Aspray
Richard Crandall, interviewed by Paul Ceruzzi
Gary Durbin, interviewed by Philip Frana
Martin Goetz, interviewed by Jeffrey R. Yost
Bernard Goldstein, interviewed by David Allison
John Keane, interviewed by Martin Campbell-Kelly
Ernest E. Keet, interviewed by Philip Frana
Frank Lautenberg, interviewed by Paul Ceruzzi
John Maguire, interviewed by William Aspray
Joseph Piscopo, interviewed by Thomas Haigh
Lawrence Schoenberg, interviewed by Martin Campbell-Kelly
Charles Wang, interviewed by David Allison
Robert E. Weissman, interviewed by Paul Ceruzzi
Lawrence Welke, interviewed by Thomas Haigh.
Sam Wyly, interviewed by David Allison

Each interview was tape recorded, transcribed and edited by SHC, the interviewer and the interviewee to ensure clarity and readability without changing style or flow. The original tapes along with the edited transcripts were donated to CBI, which placed the edited transcripts on the CBI website.

ADAPSO History Program
Richard Crandall Interview

Paul Ceruzzi: This is an oral history recorded on May 3rd, 2002 with Mr. Richard Crandall at the Monarch Hotel in Washington, DC in conjunction with the Software History Center-sponsored ADAPSO Reunion meeting. We usually start out with a very brief statement about where you were born and raised and perhaps how you first got interested in this subject of computing and technology.

BACKGROUND

Richard Crandall: I was born in New York City and raised on Long Island. Born in 1943, July 20th. I went to school at the University of Michigan, starting in 1960; 1961 is when I came in contact with my first computer course of which there weren't many at that time. I loved it and had to take a course in each of several schools because there was only one course in the business school and one in the engineering school and so on, then. By my junior year I was teaching Introduction to Computing as a teaching fellow at the University of Michigan. I was also working at the computer center with some people who are well known for having been around back then – Bernie Galler for one, Bruce Arden being another, Bartels being a third, Frank Westervelt being a fourth. While at the computer center I was approached by a salesman from Scientific Data Systems which at the time had provided a scientific computer, the SDS 930, to the University of California at Berkeley. Berkeley's electrical engineering department under the auspices of guys such as a Mel Pirtle, Peter Deutsch and Butler Lampson had been creating some timesharing software for what became the SDS940.

Ceruzzi: Which was an SDS930 that they modified?

Crandall: Yes. They added some memory segmentation, memory paging too.

Ceruzzi: That was done at Berkeley?

Crandall: That was done at Berkeley. In fact I brought with me a control panel from an SDS940. I first came into contact with it through being in contact with them. It was sort of a computer center to computer center contact.

Ceruzzi: So there was one in Michigan?

Crandall: No, there wasn't one, but we did get Michigan Bell at the time to bring a Teletype out to us in Ann Arbor and they sort of hand-massaged a call from it across the country to Berkeley and I recall having demonstrated what the California Algebraic Language (CAL) looked like which had been created at Berkeley. It was an early interactive language and that was in approximately 1964, the fall or so of 1964.

Ceruzzi: Was this the same time that MAD (Michigan Algorithmic Decoder) was being developed?

Crandall: It was actually a little earlier than MAD but MAD was somewhere around 1965 as I recall. The university had an IBM 7094, that was a batch-processing machine, and it wasn't until it got involved in the S/360 66 that became 66M for Michigan that was its contribution to early timesharing in concert with MIT and some other schools.

Ceruzzi: So there was something about the SDS940 that it could do stuff that the IBM system in Ann Arbor could not do?

Crandall: Yes, I would say early on anyway. It certainly was earlier than the IBM 360 series in its ability to do the very critical dynamic memory allocation which was the paging and segmentation logic and that was because of the 930 having gone through its transformation at the Berkeley electrical engineering department which had the abilities to create this sort of hardware addition.

INTERACTIVE COMPUTING

Ceruzzi: I wonder if we are jumping ahead of the game. How is it that you or other people got excited about timesharing or interactivity when everyone else was happy or relatively happy with the standard mainframe method of interacting with a computer.

Crandall: It really had to do with the fact that I was working at the computer center at the University of Michigan and doing some work on a consultive and programming basis for several companies in Michigan. This started stretching the definition of the educational use of the 7094 at the University and so I and a few others were faced with the prospect of somehow getting a computer so that we could continue doing this work on a commercial basis. We just were uncomfortable with the batch mode of trying to do that. It was right at that time when I got exposed again through this SDS sales rep to what was going on at Berkeley and then I got on their computer myself and used it remotely and started talking mainly with Butler Lampson.

Ceruzzi: Talking on the computer or by phone?

Crandall: Over the phone. In those days you had to be on the phone while you were on the computer because things were always going wrong. There were no hard discs at that time so all of the file swapping was done on magnetic tape which was grueling and you kind of had to know when the system was down versus when it was waiting for a tape drive. So you needed the phone. It was a very manual process; however, the concept was very exciting and the programmer productivity was clearly there. This was a way of getting multiple users online simultaneously using one machine. And so from my perspective the opportunity here was to try to make something commercial out of that.

Ceruzzi: Were the Michigan faculty on your side on this?

Crandall: Initially they really knew nothing about it; at the time of the first demo with the Berkeley machine there were a cluster of professors, including Bernie Galler, who gathered around. The fact that I was typing in how to compute a simple least-squares algorithm interactively all the way to Berkeley and back was what impressed them. It really got the thought process going that more ought to happen at the University of Michigan in this regard although not with the 940. They went off in the IBM direction. But they were supportive in a sense. When the four of us decided to try to form a company around this new technology, I was the one who went to California to work cooperatively with Tymshare, U. Cal Berkeley and the manufacturer, SDS. Based on this, the

University of Michigan gave me some doctoral credit towards my PhD. I never did finish my PhD, but I was working in that direction and Michigan was supportive of my going out there to work for a year at Berkeley.

Ceruzzi: So you moved to Berkeley?

Crandall: I actually moved to Palo Alto, which is where Tymshare was and the deal we made with Berkeley was that we had access to their computers from 2 in the morning till 6 in the morning. The only storage that was available to us, because the magnetic tape was so precious, was paper tape on our Teletypes. So we would sign on to the system at 2 AM, we'd feed in the paper tape that we had punched out the night before, and of course the longer your programs got, the longer time it took to input. Then we'd correct the reading errors and then you'd get about an hours worth of productive programming which interactively was significant. It was like the equivalent of twenty batch jobs. Then we had to be careful to leave enough time before six in the morning to punch all that we had done back out on paper tape again.

Ceruzzi: These were standard ASR33 Teletypes?

Crandall: Yes, Model 33 Teletypes, right.

Ceruzzi: Was there anything the equivalent of DEC tapes?

Crandall: No, no there wasn't. There was paper tape. At least at that time. See Berkeley had no interest in commercializing the technology. So they didn't really care how many simultaneous users the system could handle which at the time was about six.

Ceruzzi: And who did the system programming to make that much happen – six simultaneous users.

Crandall: Peter Deutsch was the primary systems programmer, an extremely bright young student. Pirtle was a professor. Peter was really the core of it technically and I think that he came from MIT because there was a guy that came to work for me at Comshare who worked with Peter at MIT. His name was Steve Weiss. Also a brilliant and systems-oriented developer.

Ceruzzi: But SDS was Max Palevsky's company. Did you ever meet him?

Crandall: Yes, I did meet him. In fact his wife, his ex-wife, lives now in Aspen which is where I live. But it wasn't so much Palevsky that we interacted with directly. I think it was Bob Adams who went to Xerox and became in charge of the non-copier new product divisions. That of course never went anywhere in Xerox.

Ceruzzi: Was SDS like IBM not so sure about timesharing as a way to go?

Crandall: Well no, they got very intrigued with it in fact, which was the reason why they financially supported both Tymshare and Comshare making a commercialized version of and enhancing the Berkeley effort. So they contributed some people and they also gave six months of free rent to both Comshare and Tymshare for the first computer that we each had. That was huge – these were $35,000 per month model computers.

At the end of that development effort, when they went and got a Data Products disc which was a 17-megabyte disc with plates the size of a table 4 feet in diameter, we created a disc operating system. It increased the system capacity to about 12 or 13 simultaneous users. In approximately September of 1966 we each went our own way. Tymshare, U Cal Berkeley, SDS and Comshare each took a copy of the system we had all developed.

Ceruzzi: Was this a friendly break-up?

Crandall: It was a friendly break-up. We each went our own way and of course Tymshare and Comshare did the most development after that to further commercialize the offering.

Ceruzzi: And was ARPA – Advanced Research Project Agency – funding any of this?

Crandall: No, they weren't funding it directly. I mean that was going on and certainly a piece of it was going on at the University of Michigan as well as some other schools. To us ARPA was more of a research network-oriented thing that was interesting, but we didn't really see its value at the time in commercialization. It turned out, by the way, that it was a 940 that was the first host computer to connect to a BBN network node that became the start of the Internet – the 940 at the Stanford Research Institute.

Ceruzzi: But didn't ARPA have a lot of money that they were giving out freely to certain people?

Crandall: Yes, but its goals, its purposes were really to create a collaborative network and it was sort of initially for defense and then research and educationally oriented applications.

COMSHARE

Ceruzzi: And your goal was something else.

Crandall: We really wanted to be commercial. We wanted to sell time-sharing through applications and so did Tymshare. Tymshare and Comshare had slightly different strategies but from the same core. Tymshare really wanted to sell computer time. Comshare wanted to sell applications that were being run by multiple people on the computer at the same time.

Ceruzzi: Any particular applications?

Crandall: At the time it was whatever companies we could sign up had a need to do. I remember doing conveyor-belt design optimization for a company called Rapistan in Michigan and I remember doing missile-trajectory calculations for Lear-Seigler and stock price predictions for White Weld, an investment banking firm then.

Ceruzzi: And when these people came to you, who wrote the program, the application software?

Crandall: We were doing the application software. That led us down a path of being fairly software-oriented as a services company and in fact, getting ahead of ourselves, in the early 1970s we produced a financial modeling language available only on timesharing and then a report writer and then a database management language. All of which we would only offer on a service basis, not as a software sale initially. That was our way of differentiating the service.

Ceruzzi: And what language was it written in, this early stuff?

Crandall: A lot of it was in machine language. We did some programming in FORTRAN. There was a FORTRAN that I guess was initially developed at Berkeley.

Ceruzzi: Interactive?

Crandall: Yes it was interactive. I developed an interactive Algol but that kind of went nowhere – that was my own personal project for just getting used to the technology.

Ceruzzi: What I'm thinking about is that this must have been a tremendous programming effort to do this for your company, or was it?

Crandall: You mean to get it financed?

Ceruzzi: No just to write this application software that you were talking about.

Crandall: The productivity from interactivity was beyond belief in relation to what we were used to. You know we had been submitting four thousand cards in card decks into batch processing and getting one run a day, maybe. And here you were interacting. One thing that was very good about what Berkeley had done is that they had not only done their work but they had debugging tools that were available so you really were tremendously more effective than one would have imagined a programmer being in those days. You know, what we were trying to accomplish was sophisticated then but nowhere near as sophisticated in relation to applications today. Because now we've got all these building blocks we can utilize. But it was a huge leap in productivity then, though.

Ceruzzi: About how many people were programming then? How big was the company?

Crandall: Well Comshare was maybe 15 people around then – most of whom were developers. There were two or three sales reps. There were mostly developers, some system programmers and some application programmers. So that was kind of the genesis of Comshare.

FINANCING COMSHARE

Ceruzzi: How was it funded?

Crandall: Its first round is what today you would call angel investors. It was the local hairdresser and the local banker and this and that, and each of us put some of our own money in. The funding from SDS was huge – contributing the computer. It wasn't really until 1967 that we attracted the Weyerhaeuser family to be an investor and they invested a fair amount of money – I can't remember exactly – but a million to two million dollars – somewhere in that range with

convertible debentures. And then Comshare was very early in going public. We went public in November of 1968.

Ceruzzi: Was that during the go-go years? Did you use that term? Did people use that term?

Crandall: Oh yes. It was really hot, in fact I had dug up a sheet here – it was November 22, 1968. We went public for what looked like a huge price to us. In fact it was higher than we even tried for and we raised, it looks like 3 or 4 million dollars which was a huge amount of money then. And that gave us plenty of capital. At the time I headed up the technical effort, I was the technical executive. Another one of the guys was CEO. His name was Robert Guise, Jr. He was a classic entrepreneur in that he really didn't pay attention to budgets or whatever and so even all this money we raised at public offering was literally gone a year later in opening sales offices around the country.

Ceruzzi: But you weathered that?

Crandall: We did, in a very trying sort of way. The Continental Bank had gotten involved from a debt standpoint and Rodman & Renshaw was the Chicago broker dealer that brought us public. They all got very unhappy with how fast the company had gone through the money and forced a management change. The CEO, Guise, was forced out and, even though at the time I think I was 21, which these days is no big deal but then was still very young, I found myself becoming CEO of Comshare. That happened in August of 1970.

Ceruzzi: And that was the time when the go-go years ended, right?

Crandall: It broke. That was the aerospace recession. We had negative net worth, we had no money. We were losing money and had about $3 million in revenue as I recall and something like $7 million in expenses per year. But we learned that you have a lot of leverage when you are broke because nobody thinks they are going to get anything back. And so another fellow joined me who had been a consultant with the outfit that had created the GE timesharing system. The head of that effort was Gerry Weiner. The guy who came to work for me was Richard Eidswick - he came to Comshare and we kind of split responsibilities. He took care of all the grueling effort of keeping the company alive financially while I went off on the sales and technical side to get the product improved and a better sales force put in place. And we did go somewhere. About a year and a half later we broke even and got into profitability and then started a huge growth decade in the 1970s.

TIMESHSARING

Ceruzzi: And was there a particular reason that you were able to turn it around?

Crandall: Well, it was a very compelling economic story to companies, where they could get little slabs of extremely productive computer use for development purposes. And so we billed customers on a pay-as-you-use basis and they always used more than they thought they were going to use.

Ceruzzi: And did you break out the payment by CPU time versus connect time and all that?

Crandall: Yes. CPU, connect time and storage – the classic timesharing model. And in fact I recall writing some papers, because I was already involved with ADAPSO at the time, on the pricing and cost model of timesharing.

Ceruzzi: Did you or other people do a lot of analysis about how to break even or how to make money at this?

Crandall: Very much so. In fact I did write a paper. I can still dig it up but I don't have it with me. It was called "The Real Cost of Timesharing" and the purpose of it was to show enterprises an alternative solution. Manufacturers such as IBM at the time were trying to convince people that all you had to do was buy the hardware to run a timesharing business. As I recall, the hardware costs were something like 17% of the total cost and so by surveying all the other costs associated with the network and people support we were making the argument that it really was more economic to buy from a service firm than to go in-house.

Ceruzzi: You were saying that it was really very compelling to a customer for development purposes. That's a little different from what you were saying earlier about selling applications.

Crandall: No, because it wasn't so much selling applications. It was selling the development of applications. So we weren't yet at the point of having a standard application which you would envision in a software product that was sold repetitively. It really was that we could create an application for you on a custom basis and you can run it on our system. So the whole experience was from development clear through to operation. In today's terms it was not only the upfront professional services but also the hosting was what we were selling. And the benefit of the hosting being in the service is that the pricing is incremental. It moved with the fortunes of your business and it moved with the degree to which the application got utilized. Also, applications in those days were not just developed once and they were done. It was continuing development. So this was a very productive environment in which to implement change.

Ceruzzi: Somewhere along the line SDS was bought by Xerox.

NETWORKS

Crandall: Yes, but we are sort of skipping over the networking. I ought to mention that, because the initial concept of Tymshare, Comshare, Allan Babcock Computing, GE and BBN was the interactivity of a timesharing system but not broad scale networks of computers.

Ceruzzi: It was a mainframe with tentacles coming out.

Crandall: Exactly. Because networking was literally against the law.

Ceruzzi: Because of AT&T's monopoly?

Crandall: Exactly. In other words, you were not allowed to resell telecommunications and I can recall very specifically, one of our guys, a fellow by the name of Walt Manning, in his basement, wired together a frequency division multiplexer which is a device that divides up a line into multiple pieces and we experimented with that. We actually leased a telephone line from Ann Arbor to King of Prussia, Pennsylvania, and put one of these frequency division multiplexers on it in order to be

able to get a customer base in Philadelphia. Well as soon as Pennsylvania Bell learned that we were putting one of these FDMs on the line they shut us down and they said, you can't do that because that is reselling telecommunications, it's against the law. So, at that time, there was a concept that you could connect the computer to a telephone line but you could not connect a multiplexer. So we pushed Pennsylvania Bell – this was in 1967 – for a definition of a computer. And they came back and they said that a computer is a device that can at least store some information – even one bit of information – and forward it. That's how they came back so we changed the design of this multiplexer and we changed its name. Instead of a multiplexer we called it a store and forward device and we put a little bit of onboard storage so that as bits came in, we stored them, pulled them right back out again and sent them on. They were forced to allow us to connect onto the line and for us that opened the era of networking. That was very coincident with what was going on at General Electric which was doing something similar to commence networking, as was Tymshare. But we all reinvented the wheel and it was a couple years later that companies went into the business of selling digital store-and-forward multiplexers.

Ceruzzi: I'm trying to think of how this relates to the famous stories about Arpanet and packet switching.

Crandall: These are not packet networks.

Ceruzzi: No, they were dedicated lines that you held open for the duration of the transaction.

Crandall: Essentially what these multiplexers were doing is what is happening today with fiber optics with dense wave division multiplexing. We were taking a line and dividing it into discreet channels that were essentially like having multiple dedicated wires all stuffed into one line. So that was taking the economics from one leased line to ten or twelve in capacity, individual lines, each one of which would essentially have a modem on it that a Teletype can connect into. So even though that was pretty trivial it was a huge leap economically. But it was not packet switching at all. In fact at the time packet switching looked very inefficient to us. It was very adjacent to what was happening to Arpanet but we much preferred this approach because it was much more immediate and looked to us to be more viable.

Ceruzzi: It's still not networking though. It's still a dumb terminal connected to a mainframe, isn't it?

Crandall: Well, it's a dumb terminal connected to a modem at a remote telecommunications mode which is connected in a Star network. So it's definitely a network and furthermore all of us then essentially created our own network interface computer (nic) device that was at the nose of the star so that if one leased line went down, it could either use a back-up leased line which you did in major cities, or could dial-up to another one of these devices, so there was redundancy and even alternate routing. It was a multi-node affair but it wasn't really peer-to-peer at all. It was still a star hierarchical kind of network.

Ceruzzi: The terminals weren't totally dumb either.

Crandall: The initial terminals were Teletypes and they were dumb, but not in the second manifestation of timesharing with smarter terminals. That's right.

Ceruzzi: But they were teletypes though you were saying, mechanical printing, line at a time kind of thing.

Crandall: Exactly, exactly. So the whole concept of synchronous telecommunications to higher speed smarter terminals came later, that was really kind of an IBM thing in our mind. The 3270 type terminal device required much more intense computer usage from each terminal. Anyway, that was just a brief little sojourn to the networking side because that really opened the horizon geographically.

Ceruzzi: And it probably kept the timesharing model alive.

Crandall: Well it certainly made it a bigger business and more amenable to our being a public company with continuous growth. Otherwise we had already begun the process of setting up four different data centers in different geographies in the country because we thought what we'd have to have is local star networks tied into a machine. As soon as this networking thing got sorted out with the phone companies we pulled back and consolidated everything into one data center in Ann Arbor. And then Tymshare pulled back into Cupertino. So that was very major in terms of releasing the blockage. Let's go back to what you were asking.

COMSHARE HARDWARE

Ceruzzi: The SDS computer company was sold to Xerox. Was that the hardware platform you kept using?

Crandall: Yes. We got very commercial with the 940 and we tweaked and tweaked it to the point where it was like a 24 user timesharing system which is very productive and its rental costs came down with time. SDS then went and produced the Sigma series of computers – Sigma 7, Sigma 9. And we developed from scratch an operating system for that system – that was called Commander II, Commander I was our name for the 940 timesharing system. We collaborated with no one on that Sigma system. We developed that on our own and the core developer was Steven Weiss who I mentioned to you before. He was one of these 14-year-old geniuses that had a 1401 in the basement and his father was a professor at MIT and so forth and he moved to Ann Arbor and we got thrown together and we built a systems team around him including some others. So we became one of the early genuine systems developers of timesharing systems. Not only in the work that we had done cooperatively for the 940 but then also the system for the Sigma series and that really became the backbone and the real engine. I mean we wound up with some twenty or twenty-five 940's but the Sigma system was even more capable. It was sort of like the 747.

Ceruzzi: It was a better machine.

Crandall: It eventually was a better machine. We certainly had our struggles and problems with SDS reliability. We had to be very self sufficient, even with hardware repair, because real-time systems had a whole different debugging problem. Interrupts happen and how do you know what happened when, where and so forth and so you really needed some good people – you needed to be very self sufficient in those days. It was kind of like the Wild West.

Ceruzzi: Did you ever think of going to IBM or General Electric or Honeywell hardware?

Crandall: We did. We looked at it several times seriously with IBM. We just couldn't work out the economics. It was very, very expensive. They really tried selling us a number of times. Initially IBM got into the timesharing although they didn't really believe in it because they were pushed by the universities including Michigan. They did it just to say they had an entry but not to be the most attractive one to really get involved in the industry. So IBM didn't really get into the swing of things until later.

Ceruzzi: What about the PDP10?

Crandall: Well the PDP1 initially and then moving up to the minicomputers and then moving up to PDP10. That got popular with some but by that time we were up and self sufficient with the Sigma 7 and Sigma 9, and economically it didn't make any sense to make a lateral switch. It was not a generation jump at all. It was a comparable system, so we didn't see the economics of a change. Much later we did switch to IBM.

Ceruzzi: Did SDS or Xerox eventually write them off?

Crandall: Xerox bought SDS. They didn't totally write them off because then it got sold to Honeywell.

Ceruzzi: But eventually, by the mid 1970s, the Sigma 7 was no longer being supported was it?

Crandall: That is correct and it was during that period that we made the commitment to gradually change over to IBM equipment. But we did maintain our own operating system and eventually maintained our own hardware. We built a hardware maintenance organization and bought other people's used computers and cannibalized them for parts. I mean we were running Sigma 9's probably until something like 1988. So, we got very self sufficient with it. I mean for a while we just didn't care if anybody was in the business. At least for that equipment. It was very economic, obviously it cost us nothing except the maintenance costs.

Ceruzzi: And you still had customers to keep it going?

Crandall: Plenty of customers. In fact we had 940 customers until about 1985 which was an astonishing run for that equipment. Eventually more and more work got done and IBM got serious about being in the online systems arena and that became clear to us. We made an acquisition, a company in Chicago called Computer Research Corporation, that had IBM-based timesharing technologists in addition to an IBM system.

Ceruzzi: Was this their classic mainframe or was it some other platform that IBM was building like the AS400 or something?

Crandall: No, it was the System/360, model 67. And then it graduated into the later models all of which were online. And we eventually had a whole mix of equipment and it was very viable to make a business out of them but that's a good 15 years after we had started.

COMPETITION

Ceruzzi: Let me just see how this is. We talked about Tymshare which had a slightly different business model of selling just pure time or something more like that. Anybody else that was a competitor of yours?

Crandall: Well there was General Electric certainly. General Electric was very oriented towards selling time.

Ceruzzi: Was that Genie or did I get that wrong? Did they have a name for their network?

Crandall: Genie was a project of theirs and I'm not sure if it ever got done – I mean it was just a huge development, as a matter of fact I think that was co-developed at MIT. But the GE Dartmouth effort was the commercial one, the GE Basic. That was the commercial service that was economic and it worked and it was a fine system to do algebraic language-based development and it was successful for years. There was also SBC -- Service Bureau Corp.-- which was IBM's subsidiary and entry into this world.

Ceruzzi: And that was, they had a consent decree that required that they separate it.

Crandall: That's right and that of course was very beneficial. And there were others, I mean I remember there was one called Data Logic and there was Dialog.

Ceruzzi: Dialog, I remember that was one that Lockheed bought.

Crandall: The important thing about Dialog was that it was going to set up a European operation and hired all of the top sales management from GE, for GE hardware and services in Europe. And they never funded them – promised they would, but never did. And we went and hired the Europeans lock, stock and barrel immediately. We had the benefit of investment from a Canadian firm, Polysar, which was a synthetic rubber producer who thought they were high-tech or wanted to be high-tech. So, in exchange for us setting up in Canada, they provided the expansion funds for us to buy this team and expand into Europe. If we get to it at some point, I brought a few articles. But at a later point when Polysar finally concluded that they wanted to get out and we wanted to acquire the rest of the ownership of the Canadian company, that's when we ran into problems with the Canadian government which had an agency called FIRA – The Foreign Investment Review Agency – that didn't want any U.S. incursion through purchase. And there was a firestorm that resulted in articles like this – "Canadian Feds Nixing a Takeover Bid Could Lead to Computer War." And "Canada Blocks Comshare's Takeover Plan" from The Ann Arbor News, Wednesday October 4th, 1978.

And the other one was the Toronto Star I think but that triggered a significant effort at ADAPSO which I headed which stretched out into all kinds of non-tariff trade barriers that we wanted to go after. But the Europeans were also doing all kinds of things to prevent American service firms and eventually software firms from doing business there.

ADAPSO

Ceruzzi: So maybe this is a good time to bring in ADAPSO and how you got involved with that.

Crandall: I was involved very early, somewhere around 1968 or 1969. What was going on before that was really a service bureau trade association that guys like Bernie Goldstein and Frank Lautenberg were involved with. As it started to expand we got involved – we were originally our own group of timesharers but joined into ADAPSO and formed a separate timesharing section called RPSS, the Remote Processing Services Section and I was a founder of that section. The main focus of our efforts in that section had to do with the federal regulatory policies with regard to telecommunications, which we already discussed. That was the thing that opened up the geography. Eventually that expanded more and more. But it got significant budget from a trade association standpoint because these firms started growing rapidly and had money and were going up against the whole telephone company infrastructure so there were a lot of Washington lawyers who were brought into the fray. For a long time a very significant chunk of the ADAPSO budget was spent on the timesharing section, on telecommunications barriers. Then eventually this non-tariff trade barrier business became another significant issue.

Ceruzzi: So it was really to your advantage to get heavily involved with ADAPSO.

Crandall: Yes. And it was something that was attracting CEO level participation which is what made ADAPSO very exciting. CEOs would show up who had real problems and we were doing cooperative things to try to get these problems resolved.

Ceruzzi: Was that your primary reason for joining and for being active?

Crandall: Well, the other reason was networking, really getting to know a broader base of people. Personally I've always been an externally-focused member of the industry and did many things with the trade association. I started the strategic planning committee and chaired it for 12 years and was president of the association in 1978. I also chaired its image program for several years, shared that back and forth with John Imlay. Between the two of us (this is the subject of one of tomorrow's sessions) we really got the software industry acknowledged as a separate industry from hardware and that was really important.

Ceruzzi: The famous cover of *Business Week*.

Crandall: Right, and it was in 1980 that the *Business Week* cover happened and that really opened up the IPO opportunity for software companies. So I got active in a number of different places and I did it partly because it was an intellectual exercise and an individual networking effort as well as doing something for the good of my own company.

Ceruzzi: Some people talked of ADAPSO as a place where they would go to either find companies to acquire or get acquired themselves.

ACQUISITIONS

Crandall: That certainly was true. It was also a meat market like that and you know guys like Bernie Goldstein got to know everybody and then he and Gil Mintz started Broadview which became the most used M&A firm for software and services firms.

Ceruzzi: But were you a participant in that in either end?

Crandall: No, not so much. We did a few acquisitions but they didn't happen at ADAPSO and it was later. It had more to do with competitors of ours failing and us buying the competitors. But we didn't do a lot of that kind of thing so we were not so much in that kind of game. I was approached several times at ADAPSO meetings about acquisition. There were frequent conversations with Tom O'Rourke of Tymshare.

Ceruzzi: But they were acquired by McDonnell Douglas.

Crandall: They were acquired largely for their network assets. By that time they had created Tymnet which was a packet switched commercial network which in the final analysis became more valuable than the timesharing part did.

Ceruzzi: Were there any companies on the same scale as McDonnell Douglas that approached you to buy out your company?

Crandall: Let's see, there was a phone company. It was Continental Telephone at the time; I'm not sure who they folded into. And there was another. I think Continental Telephone did eventually acquire another timesharing firm, Scientific Timesharing. That later got divested at a disastrous price and morphed into Manugistics which is a successful software company in Rockville, Maryland. The CEO was Bill Gibson at the time; he's retired now.

COMSHARE TRANSITION TO SOFTWARE

Ceruzzi: This is a whole other theme. It's interesting that in other interviews that I've been doing they talk about acquisitions as a normal part of the business of how you grow or how you cash out your value. But here's your company, which is a model of a company that doesn't do that. It just grew internally by self-generated growth.

Crandall: Yes, it was stupid; I mean if I look back, if I would have done wealth optimization, there were several times when selling the company would have made the most sense. I was personally just oriented towards building a company. I never even thought about cashing out. And we were public early so that wasn't really an issue. There was a liquid market and, in fact, Comshare is I think unique, if I am not mistaken, in being the only timesharing company that actually 100% transitioned into a software products company. And that happened in the late 1970s, early 1980s and it was grueling. We had to replace 100% of our revenue and we had grown to $110 million by then which at the time was sizable.

Ceruzzi: Well I guess we can move to that topic then. You had to change from within and somebody in your company had to see this happening, the writing on the wall, or see that everything was changing, the world was changing and who had the vision to see that happening while you were making so much money with the old model?

Crandall: Somewhere around 1978, the year I was president of ADAPSO, I got kind of immersed in talking with the early software companies, and I observed the software products model. Prior to that I did not understand its economics, just could not figure out how that was going to make money and those firms were new. It was a friendship with John Imlay who at the time was CEO of MSA who would sit down with me and show me the maintenance part of the software

products model which was a continuous revenue stream which built revenue. That was the part that I was missing.

Ceruzzi: Was ADAPSO the facilitator of this?

Crandall: Yes, ADAPSO was definitely the facilitator. And also there were other early software companies and by having been president in that year I was able to walk around and talk with anybody I wanted to. I also had chaired the research and statistics committee of ADAPSO where we were creating things like expense profiles of a typical company. What percent of revenues were spent on salaries and this and that and so forth and that too was teaching me these different models. And it was out of that year that I came to understand how it might be viable to be a software company economically and make money. How to get from here to there was a different issue.

After that year was over and I got my life back, we had some internal company planning meetings in early 1979 and I remember inside Comshare, there was a famous canoe trip that we, all the management, took somewhere outside of Cleveland – I can't remember exactly where it was. And we all sat around and we talked about how some of our customers were increasing their pressure on us. They loved our software but wanted to run it in-house not as a service and we were resisting that and at the same time I was learning how a software model could be profitable. So we made the decision at that meeting that we were going to create software versions of our products which meant we had to create IBM versions because nobody really had a Sigma 9. That's what caused us to take on IBM-based skills and to create software which eventually allowed us to bring in IBM equipment for our own timesharing operation. But we made that decision in early 1979. It took several years of development to create software product versions of our in-house programs.

In 1981, or maybe it was 1982, there was a very famous meeting with IBM that you'll hear others describe as the great software love-in. It was held by Sam Albert who is I'm sure here at this meeting tonight. At the time he was sort of the product manager at IBM who was in charge of software services and accounting firms and so on. And at that meeting IBM announced that it was changing its strategy and that it was going to start partnering with independent software companies. Most of the industry did not believe that. There were I think 75 CEOs invited to the meeting. Some were excluded because they were so competitive with IBM, like John Cullinane. But I decided to take them seriously. I had almost nothing to lose because we had no software business – we just freshly had software products and I think I even have a few examples here. But by 1982 I think it was, we announced the first enterprise software partnership with IBM that got a huge amount of press as an IBM joint venture; this was what was called decision support software at the time which was an outgrowth of financial modeling systems. *Fortune* magazine had an article, "How to Compete with IBM." It was everywhere, including *Business Week*.

Ceruzzi: Okay we are going to need to talk about decision support software so let's hold that.

IBM RELATIONSHIP

Crandall: At any rate, that allowed us to make a transition into becoming a software company much faster than would have otherwise been viable because we had no reputation as a software company and this got us a reputation in a hurry because IBM was doing a deal with a software company; they weren't doing a deal with a timesharing company.

Ceruzzi: And what was the reason for IBM doing this?

Crandall: They were convinced that they needed to. One of the categories of software that they needed to be strong in was decision support and they had no real products of their own. Well, they had some products but they were very old and they were not modern, not truly interactive. And so this seemed to be an area that they could venture forth and try out this partnering. I mean it was definitely an unnatural act for most of IBM, we just happened to find a few visionaries inside, that actually pushed it through and were very proud of themselves that they did it. You'll see in some of this material that I'm going to leave behind that they were bragging about those few people who made it happen and that we made it through the IBM gauntlet. It's not that the IBM sales force picked up on it so much but the press, the positioning, the promotion and the whole blessing of Comshare had a big impact and allowed us to beat up on competition who were already in decision support software. I remember Execucom being one that was just completely blindsided; who are these guys? So that was a major marketing coup that allowed us to make a transition, without which we might have failed as many others did who tried moving into software.

Ceruzzi: But at the time of that announcement you were already working on a preliminary version of this software.

Crandall: Oh, we had it. We had to demonstrate it to them. It was coincident with the commercial release of the software because the commercial release was something like early January of 1984.

Ceruzzi: So you had made a decision to develop that.

Crandall: It took us from 1979 until sometime in 1983 so that's almost four years to get skilled at IBM as a platform and then to create IBM versions of our software for in-house sale and then to go through the whole beta test and so on and so forth, without which we couldn't have done the deal with IBM. It took us all of 1983 to do the deal with IBM.

Ceruzzi: What made you pick that particular program to work on – financial modeling or whatever it was called before it was called decision support software?

Crandall: All through the 1970s we had a product called FCS – Financial Control System – which was a straight financial modeling product sold as a service that we did well with and we competed most often with a product called IFPS from Execucom. The two of us butted heads but we developed a lot of revenue and financial modeling was a very good interactive application. We added some facilities to do interactive reporting and that kind of thing. By the end of the 1970s there was also a product called Express out of a company called MDS, Management Decision Systems, that was later acquired by a company called IRI, Information Resources Inc., that came more from the marketing analysis end of things but still was kind of in the financial business modeling genre and the three of us kind of beat each other up in the market but participated in growing it.

By the end of the 1970s we had already been thinking of what a next generation financial modeler would look like and the things that financial modelers were trying to do and the programs didn't do very well. They were able to do hierarchical consolidations which clearly is what any company needs

to do in any financial system, but the idea of doing roll-ups in multiple dimensions so that I could genuinely have a multi-dimensional view of my enterprise, by products, by geography, by channel and so forth was exceedingly hard. It required a mess of coding and usually it got lots of professional services people involved in a very tangled kind of application. So it struck us that architecting a specialized database integrated with a modeler for multidimensional data ought to be the next generation. That was also being done by MDS but focused more on multidimensional marketing applications, and so then we released our product which was called System W. By the way, Systems W was released not only on IBM mainframes but we also created a little version on the PC which was just hitting the market and I think that was the reason why IBM got most interested because it was the first product of any kind that had a compatible mainframe and PC version which talked to each other. It wasn't really client/server in the sense that client/server eventually became, but they did communicate with each other and one was literally a clone of the other but running on PCs. And the idea of having a product that ran all the way from IBM mainframes clear through down to the PC was mind blowing to IBM. It became very, very popular in the market. That product was called System W and it grew like a rocket ship. That is what we defined as being a decision support system. It wasn't just financial modeling; it was financial modeling integrated with data management so that you could handle what was eventually called a data warehouse with analytical tools on top.

DECISION SUPPORT SYSTEMS

Ceruzzi: I think that the term itself – decision support software – is something that sticks in people's heads as being a new product, something potentially revolutionary and everybody has got to have one. Is that the picture?

Crandall: Yes, although there was a lot of confusion about the definition of it because the phrase actually had been used by others including IBM to mean slightly different things. So it took getting a consistent definition behind that phrase which eventually did happen but early-on the sales force was tearing their hair out trying to explain what is a DSS? We did lots of position papers. I know I did lots of speeches proselytizing what it was and I wasn't the only one, there were some other vendors doing the same thing.

Ceruzzi: Okay, were you still active in ADAPSO when this is happening?

Crandall: Yes, although I had finished with the tour of duty as chairman or president, whatever the title was at the time, but I continued in some other executive capacities. When Imlay came in as president the next year we were running a strong image program. We hadn't made progress yet in getting coverage. This was in 1979 then, but it felt like we were getting close. So he and I swapped. He became president and I became vice president of image and we went around every month to all the publications – *Business Week*, *Fortune*, *New York Times*, and so on and eventually we cracked *Business Week* on a platform cover story article, I think it was in early 1980 called "The Empty Computer" and once *Business Week* in those days did a platform article like that, they then enabled their reporters to go out and do individual stories that fed off of that. So, it was not just one article, there was a lot of other stuff and it got a lot easier to feed off of that. And then others picked up on it and we really got something going in software in the early 1980s. That, combined with IBM's moves with partnering in the early 1980s and IPOs happening, really got the software world lit up. You know the PC was breaking at the same time, it was another one of those sort of perfect storms.

Ceruzzi: Yes, and then *Time* had the PC on its cover as the man of the year in 1982, I think.

Crandall: It was 1982. It was around then.

Ceruzzi: So we've covered that you actually made this transition internally in the company. It was painful but you did it – you pulled it off.

Crandall: Right and we were commercial in early 1984 with both IBM timesharing mainframe-based software products for internal consumption and a PC version.

Ceruzzi: And a PC version, so you made that transition too.

Crandall: Simultaneously. It was very complicated and we had to play around with all these business models – what do you charge for the PC versions and how do you support it.

Ceruzzi: But the classic history of computing which I've been involved in is that the PC world was a totally different culture of people. It was mostly kids, barefoot kids in garages and all that sort of thing.

Crandall: That's correct. What we did really is more a predecessor to what became client/server for enterprise applications and not so much the Excels and Lotus 1, 2, 3's and so forth that were standalone and very low priced. Not connected to any other software.

Ceruzzi: And what kind of connection did you require or did it use?

Crandall: Well, it was capable of running completely standalone; it could handle up to three dimensions on the PC, where it was up to nine dimensions on the mainframe and with more dimensions the storage requirements multiply, it's much bigger. Or the one could connect to the other and download sub-chunks and we had a way you could pick three dimensions out of a nine dimensional model and download it to the PC. So it was kind of a disconnected client/server in a way but there was a lot of integration and there was a lot of ease of use in doing that. We supported distributed population. For example, if you were in charge of the Washington sales district for somebody, you would get the Washington element of the geography dimension of all products and all line items and so forth and so we would bust up dimensions and ship sub-dimensional cubes out to the PC and that was the kind of architecture and it was obviously very innovative.

Ceruzzi: Did you do graphics on the PC?

Crandall: We did, but that's another generation that brings my exposure to Xerox PARC into view. Right around the time the Macintosh team was getting its exposure.

ADAPSO AND THE PC SOFTWARE VENDORS

Ceruzzi: Well we can go to that but let's make sure we're covering everything here. I guess this is an ADAPSO Reunion but is ADAPSO becoming less and less relevant as these kinds of things are happening around 1980-1984 timeframe?

Crandall: No, to the contrary. There was a PC-oriented trade association which we eventually talked into merging into ADAPSO. It was called, I can't even remember, Microprocessor – MP something something. But there were tremendous battles going on internally – they were really incompatible people and people were storming out of meetings.

Ceruzzi: And it's an age generation thing too.

Crandall: It was age generation and it was like the old stuff versus the new stuff.

Ceruzzi: Was there also a sense among the PC people that they didn't like networking because that reminded them of the old mainframe controls or something?

Crandall: I really think it had more to do with first of all, youth brashness, my way or the highway kind of attitude and completely being free from data processing, the IT department. The idea was that the PC could completely run separately from the IT department. These mainframe software guys have to live under the hammer of those guys – we don't, we're going to tear them apart; the PC is just going to be able to handle everything – you don't even need a mainframe. And their mindset was so strongly that way they just didn't acknowledge the need for mainframes because the dinosaur was going to die. So they certainly did not see the server and didn't want to see the mainframe.

Ceruzzi: So ADAPSO was very much aware of this and was attempting to keep these two groups at least talking to each other or bring them both in, keep them in the fold.

Crandall: Not only that but this was a time when I was still chairing the strategic planning committee, one of whose jobs it was to consider constituency and we debated that a lot. Eventually later, in the 1990s, some decisions caused me to say, I'm outta here, I'm gone. But that was a different issue. In the early to mid 1980s we were all very much in favor of making sure to rope in the microprocessor guys and because it was clear it was going to be at least a very significant component for the industry. It's why we worked so hard to do it and worked so hard to try and get to a point of harmony but it was very difficult to do. I mean I can remember an ADAPSO board meeting at which Mitch Kapor stormed out of the room after being insulted by a guy from GE, a lawyer, Dave Sherman was his name, called him something like a snot-nosed kid or whatever and that was it, that was the last we ever saw of Kapor and you know that kind of stuff was going on partly through frustration from the mainframers.

Ceruzzi: It's fascinating that an association founded in the mainframe era was at least trying to make the transition and with some success into PC.

Crandall: "PC's Causing Revolution in Timesharing Strategy" was one sample article.

GRAPHICAL INTERFACES

Ceruzzi: Let's go back to the graphical interface. There's the IBM PC but then there's the Mac and Xerox PARC's client server model which is not from the PC, it sort of comes into the PC by way of Apple or something.

Crandall: In 1979, the year after I was president of ADAPSO, a woman reporter in Washington who worked for a computer magazine that I knew, called me and said, there is something going on at the White House with some new generation word processing system that you got to know about.

Ceruzzi: It was Jimmy Carter.

Crandall: She said it was developed by Xerox PARC. Well I didn't have the in into Washington but Bob Adams who headed this new technology stuff at Xerox came from Scientific Data Systems originally and that's how I knew him. I called him up and I made up a story. I said Comshare is working on a new generation graphics technology – PC-based – and I hear you've got some stuff going on and maybe we ought to collaborate. He says, well this is really confidential but I suppose on a non-disclosure you can have a look. So I remember flying out in February of 1979. It was right after a user group meeting that we had that Gerald Ford spoke at, who was the retired President. I went out to Xerox PARC and that is the first time I saw a mouse and the first time I saw the Altos system with a graphical interface. I was so incredibly impressed that literally I would act as though I had a bladder problem. Every ten minutes I got up and said I've got to go to the bathroom. And I would take out little sheets of paper and draw pictures of what I had just seen because I was so blown away by it.

Ceruzzi: But you weren't supposed to do that.

COMMANDER EIS

Crandall: Well, I didn't disclose it to anybody else. But what I did is I went back to Ann Arbor and I sat down and I roped all our guys together and I said, I have just seen the vision of the future. I said this is like the way I felt when I saw the Berkeley timesharing system in 1966 or 1965. At that time, partly because of the disclosure issue, I personally got involved in designing a completely new product for Comshare from scratch that was going to be the next generation of decision support that went beyond the multi-dimensional one that we were working on. Because the dream I had always had was how do you serve the executive? And I knew that the way the DOS PC interface was designed, executives weren't going to touch it with a ten-foot pole. It took us a lot of time because at first we were occupied with the whole System W thing, but then we got into it in earnest in 1982 and 1983 and we designed a product called Commander EIS – Executive Information System – and it became one of the two formative EISs; the other was from a company called Pilot Software. It was completely graphical. In fact it didn't even have a mouse, we went one step beyond that and we applied a touch screen to monitors with big icons, much bigger than Xerox was doing so I mean this wasn't copying Xerox but it was motivated by having seen the concept of a graphical interface. You literally could navigate through data by touching the screen and we always used to joke that executives like pointing fingers at people so pointing at a screen would be natural. We released Commander EIS in 1984 and it just hit the scene screaming. It was PC-based. It was sort of nearly client/server in that the back end is where the data was. We had some data integration software on the back end so you could connect to multiple host systems and it just hit, it exploded and we sold directly to senior executives at major corporations and it was like lightning bolt applications. They had to have it, they just mowed over IT and said, I don't care what you say, I want it. This is finally something that I can use and so forth. This was a component of popularizing the PC to the executive community in large companies and we grew very rapidly during the 1980s with that so we

not only hit well with DSS in the early 1980s but in the mid 1980s we hit again with EIS and it was motivated by the graphical interface. And it was itself certainly very graphical and of course it worked with a mouse as well, but it worked equally well with touch screens. There are a million stories about really high-powered executives using Commander EIS systems.

Ceruzzi: It ran on an IBM PC?

Crandall: It ran on an IBM PC. We did have a Macintosh version. We were forced into it by seven customers – the lead of which I remember was Dupont. And it was a big mistake. We spent way too much money and way too much effort and it was a significant drain on our profitability because once we did it we had to maintain it and I learned some real lessons about multi-platform support.

Ceruzzi: But you had been doing stuff for IBM and SDS earlier on.

Crandall: No, the SDS was really in maintenance mode at that point. We were going beyond that with the IBM stuff. This was truly multi-platform support and not only that, because of our deal with IBM, we were also committed to support OS2; so we were OS2, Windows and Macintosh. And it was a nightmare being on those three systems. It was a mistake. It was my decision – it was a mistake.

Ceruzzi: What kind of relations did you have with Microsoft at this time?

Crandall: Excellent at the time. It was with Mike Maples who is here today. He set up all the support we needed, all the help that we needed and advised me carefully that it was a mistake continuing with OS2 naturally. But we had this relationship with IBM, there was no choice. If we were going to have that relationship we had to support OS2.

Ceruzzi: Was Microsoft ever approached to join ADAPSO?

Crandall: Oh sure, and they did.

Ceruzzi: I didn't know that. So what role did they play in ADAPSO?

Crandall: The representative was Mike Maples and Mike was originally an IBMer. Mike was the best ambassador that Microsoft ever had and did a great job of representing Microsoft at ADAPSO and also attempted to kind of harmonize relationships. He was a good guy. The industry really missed him when he took off.

Ceruzzi: So you didn't replicate this business with Mitch Kapor?

Crandall: No, Mike was not a brash young kid, he was mature.

Ceruzzi: Okay, so you made this transition.

ADAPSO MERGERS

Crandall: This is just some of the transitions of Comshare. During the course of this time if we want to get back to ADAPSO, ADAPSO was enjoying tremendous surges in membership growth, lots of things going on, a lot of committees, a lot of budget and so forth. On the strategic planning committee which I was still chairing there was increasing pressure to broaden the constituency of the association, to just grow infinitely. I was becoming increasingly opposed to that because I felt it would defuse our focus. However, just parenthetically, there was a theory that I bought into, in fact was part author of, that we ought to explore combining with the Information Industry Association because content and software I felt were going to be a combined entity at some point. This still was not so much because the Internet was in our minds because it wasn't then, but it felt that way and we held some joint meetings with IIA and I remember one fellow from their side being Carl Valenti who at the time was with Dow Jones. I got along really well with that effort. There were three representatives from ADAPSO, three from IIA and I came out of those meetings even more convinced that this would be a good thing. We attempted to get a merger to happen but too many of the membership, particularly on the IIA side and some on the ADAPSO side just didn't see the connection between the two product sets. In fact a lot of IIA's membership didn't even think they were in the computer industry even though they were delivering the content that way. However, out of that, because Comshare was doing EIS, Valenti and I decided let's do a deal together and highly publicize it to kind of show everybody there is a relationship between content and software. That's when we started delivering Dow Jones data through the EIS executive systems graphical interface in a well-publicized partnership that happened around 1986. Anyway, despite that good example, the ADAPSO/IIA merger didn't happen and that would have been an expansion constituency. But the one that I started becoming very opposed to was the push to expand into hardware companies and common carriers, telephone companies and so on. I said at that point we're going to blow up, we're just going to blow up. You're not going to be able to come up with any objective that you'll get everybody to agree on and that means we'll turn into a nothing organization.

Ceruzzi: And at that point you left ADAPSO?

Crandall: It was somewhere around 1988 or 1989. Of course I was just one member but I was chair of the committee but it didn't matter, I was out voted. The board of ADAPSO made a decision to expand its membership and at that point I got fed up. I mean I wrote some vitriolic memos to the board and I said, I'm out of here, and I did and I just focused on Comshare. That may have partly been because I was starting to get tired as a CEO. By 1990 I had been at Comshare for 24 years.

LEAVING COMSHARE

Ceruzzi: So you left Comshare also?

Crandall: In 1994 I did.

Ceruzzi: And did you leave the company completely?

Crandall: No, well I became its non-executive chairman for three years and I'm still on its board but I mean I really wanted to leave in 1992. I remember Walter Bauer, the Informatics ex-CEO, called me. He was chairing the Charles Babbage Institute, the history organization.

Ceruzzi: Right, co-sponsored it.

Crandall: He probably doesn't even know this but he called me some Christmas, I think it was 1992, and he said, you know according to my records you're the longest standing CEO of a software company because at the time I think is was like 26 or 28 years and I'm sure he meant it as a compliment of some kind, but I got very depressed by that and it kind of pulled me up short. What am I doing because I mean it's a killer job in a very competitive industry, you're in it for a long, long time and we'd gone through transitions like nobody had ever seen and I even saw some more coming.

Ceruzzi: The Internet?

Crandall: The Internet was certainly among them and that's when I went back to my board and I said, I've had it and they didn't want to hear about it and it took us two years, I mean they wanted to put me through psychological, psychiatric assistance and mid-life crises whatever and this and that and eventually we sorted out how I was going to separate from the company.

Ceruzzi: But you do have this track record of longevity, which nobody else can match.

Crandall: Well by now I think there have been some that have been CEOs for longer than that but at that point it was a long time. And so I left Comshare mostly and then went on boards of some companies and got into venture capital and did what a lot of other guys have done. I mean you don't want to leave this industry – it's too much fun. But it's a killer being in the CEO's seat.

Ceruzzi: I can imagine. Did you remain on friendly terms with ADAPSO or did they change their name at this point?

ADAPSO EXPANSION

Crandall: That was part of this broadening of constituency to become the information technology industry, which meant everything. So that happened at the same time in the early 1990s. No, it's not that I hated anybody or whatever, I just thought that it was not going to work. What actually happened is, somewhere around 1993 membership did start dropping dramatically and there were a lot of issues depending on who you talked to, about the future and focus and so forth. And in early 1994, Mike Maples, who by that point was executive VP of Microsoft, became chair of the software section of ITAA, and he called me up when he saw the little blurb in the Wall St. Journal that I had retired as CEO of Comshare in April of 1994. And he says look, things are a mess around here. Gates is telling me this thing isn't going to fail with Microsoft at the helm. I mean it just can't happen. And Mike says, I've just dug up the memo you wrote back in 1990 and I figure if you knew this thing was going to tank you probably knew why – help me fix it. And I remember saying to him, well, I do have a solution, but I don't think you're going to like it though. My solution is to pull back on the definition of constituency and suffer the membership loss of those who have come in recently and then build from there. But that was too much re-architecting.

Ceruzzi: So who are the associations today that are the most influential and the most important for software companies?

Crandall: Well, there has been a resurgence at ITAA. It was around that time that Harris Miller was brought in and he did an excellent job of bringing the association back. But I can't even tell you

today because I have sort of an interesting relationship with ITAA. When Maples called me up and said I got to do something, I eventually came up with an idea. I said, Mike, one way of trying to put this thing back together is to have the industry itself conclude that it needs a trade association.

CEO ROUNDTABLE

I said, the way I'd do that is to get the CEOs of the 30 largest software companies in a room and have a planning meeting for the industry. I had been used to conducting planning sessions and I said I certainly would do it and I have some time. So he and I put together a list. We met at the Spring Comdex, 1994. We put together a list and we invited something like 30 or 35 CEOs. Twenty-five of them showed up. It was at the Brown Palace Hotel in Denver in the summer of 1994 and we did this two-day planning session about do we need a trade association given what's going on in the industry. The conclusion of which was, yes we do need a trade association. They concluded they needed to support it better but that it was not really the place that a CEO wants to come to. And whatever this meeting was for the last two days – we like it. So we said, well it's sort of like a roundtable but it sort of isn't because every competitor that you can think of is in the room and since I was the one that had more time than anybody else in the room, they said, you chair it and let's keep it going. It is still going today. There are 35 members. It's called the Enterprise Software Roundtable. Of course there has been a lot of turnover over the years but it is where the CEOs get together at least for the software component of the industry. So that was a spin-off but it's not a trade association and it doesn't compete with a trade association at all. In fact at times it's cooperative in the sense that there is some feedback that can happen between the groups. But when Harris Miller came in he was a very professional guy and did a lot of good things to stop the bleeding at ITAA and to help it grow. But if you had asked me the question today – what is the degree of influence ITAA has today, I just simply don't know. I don't run a company any more and this roundtable again doesn't compete with anybody and I just do it because it's a great way to stay connected to the industry. We meet twice a year and it's got high attendance. We have guests come in, who are typically customers, CIOs or industry analysts and so it's its own thing. So I really don't know what is going on at ITAA. I mean ITAA tends to be much more influential in the advocacy side of things.

SUMMARY OF PRINCIPLES

Ceruzzi: I think we've covered everything unless there is something you'd like to add or include, sum up or anything that we might have missed.

Crandall: We didn't mention anything about how cyclical this industry seems in that for example the concept of application service providers and hosters really are sort of rebirths in a way of the original timesharing principle with different economic models. But from 30,000 feet, this industry has a services alternative and you have a products alternative. Within products I think we've won the battle in the minds of the market that the value is largely stored in the software as opposed to the hardware. In fact I've seem some recent statistics that project further declines in total IT budget coming from hardware versus software, but services have now become very relevant.

Ceruzzi: Well, that is certainly what is coming out with this HP-Compaq merger. They say that's not where the value is in the future although there are some other details which are irrelevant to that.

Crandall: There are a lot of services in Compaq.

Ceruzzi: They bought Digital Equipment Corporation. Is that where they came from?

Crandall: I mean this whole industry. While there's the growth frontier there is a lot of consolidation yet to happen in the established sectors. And we are going through a very tough period now that is accelerating some of that trend. But we are nowhere near done. And I think that from an overview perspective, I think what has shown in the 1990s is that while perhaps motivated by fear of the new economy and fear of the year 2000 problem, if you invest a lot of money in IT you actually get productivity benefits out of it. That was only a belief in the 1980s whereas it became more tangible in the 1990s. Now IT is clearly indispensable.

Ceruzzi: There were these books out – *The Productivity Paradox*, or something like that –and I think those have been dispelled because there are real things like Wal-Mart where they have this incredible network where you buy a big tube of toothpaste and they immediately make another tube in Hong Kong or someplace.

Crandall: I think one of the reasons for this effort to capture history is that what you're doing is to sort of open up the awareness and restore the history of the industry and that it dates well before the PC. As one who has gone through all the cycles intimately, the PC looked just like a timesharing terminal to us. I mean the fact that there was more intelligence in the client and the Teletype was dumb and so forth, in one sense didn't really matter to the user, that was just an issue of response time. I mean it really didn't matter. The fact is you do things on a keyboard or the mouse came along, but to me the mouse was not fundamental. The issue is, you input some things and you get some immediate response and the interactivity is what the issue is and the interactivity of the PC was nothing new. It was merely a new platform for what had already been fully developed with teletypes.

Ceruzzi: It was just a way of optimizing or taking advantage of the microprocessor.

Crandall: Right and I think it was amusing that all of a sudden the industry was going to go back to thin clients, you know, everything is back to the server which is even more like timesharing.

Ceruzzi: Or the idea of downloads of software from the Internet. You run it and then when you are done with it you don't have it anymore.

Crandall: You throw it away, the whole object thing, the JAVA thing and so forth and so to me one of the things that you really learn from all of this is that basic principles don't change very often. It's just the architectures and the implementations of them that do. You can pretty much maintain an understanding of what's going on by staying at the architecture level and not getting so passionate and drilled into a specific implementation.

Ceruzzi: I think that's useful because a lot of people are overwhelmed or confused by the hype and everything else in the newspaper they don't know what to believe but there are these constants that are bedrock of fundamentals that are underneath the whole evolution.

Crandall: Right, so none of us should be so cocky as to think that the thing we're currently nailed into is the one that is going to win forever because it doesn't in this industry.

Ceruzzi: Okay, thanks a lot.

Crandall: I'm going to leave you with these papers in case you want to look at them.