

An Interview with
DONALD L. BITZER

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Conducted by Sheldon Hochheiser

on

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Champaign, IL

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Donald L. Bitzer Interview
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Abstract

Bitzer discusses his relationship with Control Data Corporation (CDC) during the development of PLATO, a computer based education system, at the University of Illinois' Control Systems Laboratory. He describes the interest in PLATO of Harold Brooks, a CDC salesman and his help in procuring a 1604 computer for Bitzer's use. Bitzer recalls the commercialization of PLATO by CDC and his perspective on CDC's marketing strategy and its creation of

courseware for PLATO.

DONALD L. BITZER INTERVIEW

DATE: 19 February 1988

INTERVIEWER: Sheldon Hochheiser

LOCATION: Champaign, IL

HOCHHEISER: This interview with Don Bitzer is occurring on Friday the 19th of February 1988 at the conclusion of a week spent in Professor Bitzer's laboratory at the University of Illinois campus. There are some topics that aren't being covered in the interview simply because the two of us have been having an on-going conversation for the entire week.

I've talked to six different people with a tape recorder and at least six more different people on a more casual basis. I guess one of the most interesting things was a comparison to what I've found elsewhere. Another part of it is to the extent to which the documentation to PLATO is on PLATO.

BITZER: We have most of the records for the PLATO Development. Keeping records was not necessarily planned at the very beginning. It just turned out that with people working at all hours on the computer, email notes were the easiest way of communicating. Soon it got to be pretty neat way of communicating for many applications.

HOCHHEISER: I have some questions. Some of these things you may have answered already and I've forgotten them. Some of the things other people may have answered. One thing I've found is different people have different perceptions of the same thing so sometimes I deliberately want to hear it from more than one person because everyone sees things from their own perspectives. What I want to do is talk about your relationship with Control Data. I guess the way to start is back at the beginning with the 1604?

BITZER: Let me go back and trace the history of PLATO. CSL (University of Illinois = Control Systems Laboratory) where PLATO started, was a defense laboratory in the early days and we used the ILLIAC I to a great extent for our research calculations. In fact PLATO I was programmed on the ILLIAC I. Peter Braunfeld did the coding. I did the engineering. PLATO I and, eventually PLATO II ran off ILLIAC I. ILLIAC I was located downstairs where the

classroom is now. Even then we knew we needed more powerful computers to expand. CSL had a need for its own full time computer. The laboratory had various vendors, including CDC, IBM, and NCR, and the laboratory talked with them about getting a computer. It turned out that the midwest salesman from CDC by the name of Harold Brooks visited CSL to show us the CDC computer. Before he joined CDC he used to sell heavy equipment -- cranes, or the like. What a salesman! He sold CSL the CDC 1604 machine. The PLATO group started using that machine a few hours a day. In fact, the first time we used it, we used a program called SIMILLIAC, which was a simulator for the ILLIAC. All of our programs in the laboratory and PLATO were written for the ILLIAC. SIMILLIAC was a program that made the 1604 simulate the ILLIAC and the simulation mode ran a roughly the same speed as ILLIAC, which was very slow. Nevertheless, the first thing we did was run PLATO in the SIMILLIAC mode in order to get more clock time than the one or two hours a day on the ILLIAC that was available for the whole laboratory. This way we got a few hours a day but sometimes that much computer time caused concern for the other users. People even suggested that we were taking more than our allotted two hours a day. We wanted to expand so I talked to Harold Brooks about it one day.

HOCHHEISER: How frequently was Brooks in here?

BITZER: My recollection is that he was here quite a bit. He got interested in the PLATO project and he'd come in every chance he'd get. One day Harold said, "I think I can get you a CDC machine. You see, we were getting some 1604's replaced. Don, I think I can get you a refurbished 1604, if you're interested. What we'll do is we'll just lease it to you on a zero lease basis. You will have to cool it and maintain it. " We decided to take him up on his offer. We installed that machine where those disk storage units are now located across from my office. The laboratory didn't have much in the way of resources. We were a really poor lab in those days. The other groups in the CSL had moved to a new building by then. We installed a wooden false floor for the machine which cost only a few hundred dollars instead of hundreds of thousands of dollars like the floor we later installed for our new machine. The wooden floors worked just as well. We trained a man by the name of Ernie Neff (who was incredible) to maintain the 1604, and we obtained the insurance on the CDC 1604 to protect it against fire and theft.

HOCHHEISER: So you did your own maintenance rather than use CDC's?

BITZER: We sent Neff to a CDC maintenance school for a few weeks. He did a fantastic job. He was a great maintenance man.

With a one page letter, we got that job (leasing the refurbished 1604) done. That was impressive. All the administrative work that is needed now for obtaining a new computer did not exist then. We actually had a one page letter signed by Harold Brooks, and signed off by a few others, that did the transfer and got that 1604 down here. We added a 160A later. That got PLATO III on the road.

We learned how to time share on the 1604 like we did on the ILLIAC I. The best we could do was to share 20 simultaneous ports distributed to 72 different terminals.

HOCHHEISER: Was that a limitation from the hardware, or the software?

BITZER: Speed of the machine. Now, you understand that the way PLATO's I, II, and III worked was the machine did all the calculations including all display calculations. The terminal was a dumb terminal, a TV set terminal. There was a storage tube for each terminal. That storage tube was used for scan conversion. It allowed the computer to write dot by dot and then scan information off with a TV raster for viewing on a TV screen. Those tubes were originally designed for scan conversion from radial to horizontal scan for the FAA radars. The Q-685 was the model made by Raytheon.

HOCHHEISER: And is it that limitation that got you into....

BITZER: There are two things that happened. Number one is we wanted to take the burden off communications. You

see, the output from those tubes is video. We had the first cable TV system in Champaign. We had a video cable that supported twelve TV channels which is all one could do in those days. Illinois Bell installed it. The cable went from here to the University High School, and in other directions went to the Biology Department at U of I. It went from University High School over to Mercy Hospital where my wife ran a computer instructed course in nursing. It went from there to Parkland Community College that (in those days) was located in downtown Champaign. We must have had a total of 70 to 72 terminals and we could run 20 at any one time, 12 remotely. So you had a classroom here and a classroom there; a half a classroom here, eight students here, twelve students there, rooms of no more than twenty terminals. The computer just couldn't support more than twenty terminals and do all the calculating. The 1064 was a million dollar machine. It was a wonderful machine in its day. Seymour Cray did a great job designing that machine. Now that got us connected and working with CDC. With that we were able to gather enough information with PLATO III to develop 5000 hours of lesson material. We taught 30 courses in different areas. We accumulated close to 100,000 student hours experience. Today we accumulate 5000 terminal hours per day. PLATO III was so useful that we didn't shut it down until after PLATO IV was running for about three or four years.

HOCHHEISER: Well, what if I was looking for documentation for PLATO I, II, and III from the 1604 era?

BITZER: We can find it.

HOCHHEISER: There are things still around here?

BITZER: You bet.

HOCHHEISER: Around the lab?

BITZER: We can still find the first terminal and many other pieces of the original equipment. We tried to throw the first terminal away enough times. The police kept bringing it back because they thought somebody was stealing the

TV set (laughs). It worked very well and proved that the teaching process was useful. We compiled the first statistics on the transmission rates between the computer and the students, such as, how much memory was needed, and so forth. When we had only a few terminals on line we got some distorted statistics. For example, with so few terminals all the students were studying in the same subject area. The number of students in one lesson was usually 10 to 20. It turns out now that typically each student is using a different lesson. Therefore, enough memory was needed to support a different program for each student. Well, we looked at the data and we said, AWhat we need is a machine that has lots of memory, which can transfer memory to the processor very quickly, has a high-speed executor running inside the processor, and then transfers the results back out again. Memory was very expensive in those days. ECS (extended core storage) was by a factor of ten less expensive than the high-speed memory and it had a large transfer rate. We sat down and we did a very careful study. Using the previous data and cueing theory, Dominic Skaperdas and I wrote a paper on how to effectively use the computer this way.

HOCHHEISER: Was this a paper for publication or something for internal use?

BITZER: Well for both. This paper describes how we designed the system so we could do this job. What you needed was something that would transfer data very quickly. We looked around and nobody had anything like that except CDC's 6000 series machine.

HOCHHEISER: It was not that you were used to working with CDC, but that you independently figured out what you needed and it turned out....

BITZER: It was natural that we would think of CDC but that was not the driving force. If it had turned out that CDC didn't have what we needed and IBM did, we would have had to go with IBM. I was pleased, of course, to see that CDC had the machine we needed. When we first talked to CDC about the way we planned to use their computer, they did not think that the method would work. CDC had been using the new ECM in a different way and had not realized how convenient ECM was for applications like ours. Dan Alpert and I went to CDC and persuaded Bill Norris and his

engineers that the idea was solid and would work, as well as being a good business opportunity for CDC. In parallel it was necessary to persuade NSF to help support the new system. In order to help NSF obtain funding to support us, we gave live demonstrations to various government groups in Washington, D.C. using our PLATO III system. We already knew what we needed technically to build our large new system but we needed money to support people. We promised NSF a 300 terminal system as a minimum. New terminals needed to be developed as well as software, lessonware, and communications. A few schools agreed to work with us including grade schools in Champaign and Urbana, the City Colleges of Chicago, and Parkland Community College in Champaign. The live demonstrations in Washington were very successful. We had a video and telephone line from Champaign to Washington. The grant from NSF, and later supplemented by a grant from ARPA, was to be used primarily to develop the system, terminals and large amounts of courseware. We needed support for the new computer system at the beginning until we could build up sufficient usage by outsiders to support the computer cost. Dan Alpert and I took this problem to Bill Norris (one of the finest men I've ever met). We said, ABill, what we have is a problem of wanting to pay zero up front, and the full rental rate at the end. Although this represents a large contribution by CDC, we think this participation in Computer Based Education will cost CDC less than attempting to go it alone and trying to develop their own system. We think it is a good deal for both of us≡

HOCHHEISER: How is it that you are able to get Norris' attention? By the late '60's CDC was a pretty large company with all sorts of administrative levels.

BITZER: Well several reasons, I believe. One is that in the early days Harold Brooks got the attention of Bill. Bill has a natural inclination for things that affect society and paid particular attention to corporate responsibility to society. One day we went up there for a meeting with CDC. I had Jack Stifle, our Engineer, with me. We had taken a small private twin-engine C45 plane, and it was bad weather. I had to push Jack onto the plane. We get there, get out, and when we arrived at CDC we ask for Harold Brooks. They said, AWe have bad news. Yesterday Harold Brooks was flying his private plane, and he and his family were killed≡ The plane was blown apart in a storm over Anoka, MN. Holy mackerel, I thought I was never going to get Jack back on that plane to fly home.

At that point, we had talked to a few vice presidents as well. In those days, I think CDC had 15 vice presidents. Bill asked every one of them to sign off on the project, and I think, without exception, they all made a trip to Champaign. I met every one of them, not all together, but usually one or two at a time. I took them through the laboratory, showed them what we were doing, what we planned to do, and what we needed to do. They signed off on it and said, "Let's go."

HOCHHEISER: By this point we are talking about now about '68 or '69?

BITZER: This would have been 1968 or '69.

HOCHHEISER: So at that point, then, the entire top management at Control Data was aware of who you were and what you were up to.

BITZER: Absolutely, and had signed off on it.

Let me give you an idea of how complex negotiations became at the University. The University was negotiating different royalty rates for various patents and contracts related to PLATO. Jim Costello, the University legal counsel, was getting involved in all these negotiations when the second CDC machine was to be negotiated. We had to change some things. But there were a lot more people involved than before. This wasn't something that just happened, mind you, because we had to acquire NSF money at the same time. We had the government money, CDC's signatures, our signatures, letters were coming in from the schools, etc. It was all quite a task and I would say that if I had to put my finger on the key person who brought it all together it was Daniel Alpert. The person who politically put it together was Dan. He was good at that. I was the key person that they trusted for getting the right people to make the technology work.

I can remember that I wanted to retire. Dan said, "No you can't!" He tried to get the University to have me sign a statement that I would not leave or retire. They said they couldn't do that (laughs). They were awfully nervous about it because it was true that I always liked to think of retiring early rather than keep working forever. It never works out that way. Every time that CDC would get nervous about my retiring Dan would come down and say, "No you can't retire." All of the vice presidents would visit Champaign. We traveled to Minnesota and presented live demonstrations to the whole CDC board.

HOCHHEISER: This was during the PLATO IV development?

BITZER: Yes, I think we were getting ready to begin the contract for a new machine.

HOCHHEISER: There was an agreement signed in 1970. It ran til the end of '75.

BITZER: We signed another contract in 1975.

HOCHHEISER: Well, it wasn't until '76 that it was signed. It was supposed to be five years. Jim Costello was showing me a report to the board of directors saying that, "While negotiations are underway..." Well, there's a series of agreements. The very first signed agreement that I've come across was in 1970. There's seven different agreements?

BITZER: Okay, you see we started with one machine, we added a second machine processor, we added more memory, and then we got a new kind of machine. Our present machine we acquired in 1983.

HOCHHEISER: Right. There's an agreement in '76, and that '76 agreement was seven years, not five. There's an '83 agreement that I've not looked at because that's my cutoff date.

BITZER: I understand. There was the Harold Brooks 1604 agreement and then three other major agreements since

then. How time flies!

HOCHHEISER: What I'm particularly interested in is Control Data's commercialization of PLATO in the mid and late '70's. Apart from machines, did Control Data seem to develop a real interest in what you were doing in terms of something with commercial potential?

BITZER: That happened with the PLATO IV right off. They involved a significant number of people on the project. They had engineers looking at terminal designs. Others were integrating the computers into the system. How will the machines fit together? Some were involved in software development with us. That started almost as soon as PLATO IV was in operation using several hundred terminals.

HOCHHEISER: Which would have been when, about '73?

BITZER: 1973 or '74. Then they gradually started building up their staff. You saw the list of departments and salesmen involved and somewhere I've got pictures where I'd gone up to CDC and given talks to 500 salesmen and developers all gathered together in a large room. They made a serious sales effort but probably some of the people were not the best people for this product.

HOCHHEISER: The wrong people in what respect?

BITZER: Many of the salesmen didn't understand how to sell an educational product as compared to a large computer product. It's hard to say why or how they were chosen. A lot of it had to do with choosing people who were already on staff. A lot of people got chosen simply because they probably weren't productive in what they were doing before and were available. In 1977 or '78 a lot of my staff from the laboratory, particularly towards the end of the NSF grant, went to work at CDC. They went to help transfer the technology and assisted in setting up the learning centers. Some still work for them. Bob Bohn, I think, still works for them in corporate planning. Probably 15 or 20

people went to CDC. It's >77 and '78 I think, that represents a rather rapid expansion of commercialization for CDC and the PLATO effort.

HOCHHEISER: To what extent, if any, did people at Control Data call on you, yourself, to provide them assistance in these efforts?

BITZER: Personally they called me quite a bit. I always left the door open. I told CDC that they should bring in customers. We would be happy to show them what's going on since we had operating systems and classrooms delivering real computer based education. They did that for a substantial number of potential customers, unless they thought they may become our customers instead. All of us got a little nervous about that sometimes. I went on many trips for CDC, and did demonstrations throughout the United States for Control Data Institutes. I also toured South Africa, Australia, Russia, Germany, and Caracas, Venezuela working with foreign subsidiaries of Control Data. In fact some of those people are still my favorite customers. They were tempted to go it alone sometimes. A lot of the original people are still around. Some of the management at the CDC subsidiaries experienced less turnover than the central corporation, so some of those people are still around. Yes, I spent a lot of time working with CDC's foreign subsidiaries.

HOCHHEISER: What sorts of things would you do for CDC when you went to Caracas, say?

BITZER: Well, in Caracas we ran live. We had a direct phone line back to Champaign and we gave live demonstrations to the school districts, usually in some large meeting where the government brought in educators. We would tell them what PLATO was about and show it to them. I think we had four terminals running on one telephone line. They could experience PLATO first hand. We introduced it to the country.

I gave talks all across Australia, starting at Sydney, then traveled through Canberra, Melbourne, Adelaide, and finally to Perth. At the Western Australia University in Perth they had a CDC computer center and they installed a PLATO

system there. While we were in Perth, we attended an International Conference on Computer Education. I gave live demonstrations at the Perth Concert Hall. The first talk was in the afternoon to five or six hundred delegates, and the second one that evening to the general public. Both of those shows were taped live by ABC Australia. These tapes were merged together and made into one program for Australian television and other sites around the world. We still have movies made from that tape. The gentleman who narrated the show -- the Master of Ceremonies -- was one of the International Vice Presidents of IBM (laughs). He had to introduce me, but he did it very graciously. It was great.

South Africa already had some PLATO systems. They wanted to take me out to Zululand where they were using PLATO in various schools. They wanted to let the students and leaders meet the person who had developed the system they were using.

HOCHHEISER: So one of the things that you did in working with CDC during these years was you went around doing promotion for the system?

BITZER: That's correct.

HOCHHEISER: Are there other aspects in terms of substantive development work as well as promotion, or was that pretty much done by that time?

BITZER: By this time, most of the substantial work had been completed. It was an evolutionary process. It still continues, but most of the work had been completed. What was really left to do was advanced terminal designs. The first PLATO IV terminal did not have a microprocessor. It was a hard-wired terminal and is still being used today on our system. The new PLATO terminal, which is what we call PLATO V -- the plasma display terminal -- had an 8088 microprocessor on board. Jack Stifle was the key person on both of these terminal designs.

HOCHHEISER: There are a lot of plasma display terminals in use in this building. Which are those?

BITZER: All the plasma display terminals are either PLATO IV or PLATO V.

HOCHHEISER: You are using a mixture of both of these two generations of terminals today?

BITZER: Yes, the whole classroom that you saw downstairs is PLATO IV.

HOCHHEISER: The dumb terminals?

BITZER: Dumb, heavy terminals, but beautiful displays. Can't get rid of them. Someday we'll have to retire them.

Although every time we try to remove them, we find the user objects and wants to keep them.

HOCHHEISER: I guess as long as they're working, why not keep using them?

BITZER: Those displays are easy to read and won't damage the eye. You're right, it's just hard to get rid of them.

HOCHHEISER: Except for terminals, there wasn't much hardware development work that was needed here by Control Data during these years?

BITZER: No, not really. Before CDC was involved with us we had already developed much of the hardware. One of my students, Paul Tucker, did the NIU (Network Interface Unit).

Attached to the NIU are site controllers which were designed by Jack Stifle. I discussed with him the characteristics that we needed, laid out the format for the data structure, how to synchronize the clock, etc. Jack's a very good engineer, but a very skeptical one. His first reaction was, "It can't be done!" His second one was, "Well, okay." His third one was, "Gee, guess what, I can even make it reliable, too!" Jack did a great job on the communication

equipment and the site controller. The NIU was done very well also. All of these designs were turned over to CDC, and for some time, CDC manufactured those devices changing only those things necessary to meet their manufacturing standards. Then CDC suddenly decided to convert the communication equipment and terminals to another CDC standard product line which was not optimized for PLATO. That caused all kinds of problems, particularly at first. Some still exist today.

HOCHHEISER: Is that when they stopped using special designed hardware?

BITZER: Correct. When we first designed communications for PLATO there were no standards. We designed the system to provide the most efficient transmissions. Characters were six bits long. The word length was twenty bits. The twenty bits were divided into eighteen bits of information, one bit of parity for error detection, and one bit to indicate if those eighteen bits of data were for display or what we called control information. The eighteen bit package was nice because the display was a 512 by 512. So you needed nine bits of x and nine bits of y to specify a point or one random point per word. If you are at a location and you want to address one of the neighboring dots, you can specify which dot you are using by using 3 bits because there are only eight directions to move. Three bits went into eighteen bits six times so we could specify six neighboring points in each word. Character selections were six bits long so three characters per word could be specified. It all worked out nicely to fit into the twenty bit format. We wanted to deliver this data via TV signals where the field rates are 60 per second. Sending one word to each terminal gave a 1200 bit per second, just what we needed for the telephone connection. You know sometimes numerology helps in making a decision. This was the standard for years until ASCII became a standard which turns out to be only about 70% as efficient.

HOCHHEISER: I suppose it becomes a tradeoff of efficiency versus standardization?

BITZER: Absolutely. The question is, are you willing to pay 30% more in communications costs to be standard. I was unwilling to do it when communication costs were \$300 per month per terminal. Then we got the communication costs

down to ten or fifteen dollars per month per terminal, another 30% wasn't a big deal.

HOCHHEISER: On the new system, you're using the ASCII code?

BITZER: Yes, by then new equipment from CDC's standpoint on PLATO IV was just terminals, in which Jack Stifle played a major role.

HOCHHEISER: I talked to Jack about that the other morning.

BITZER: While the standard systems were being produced, some of us were working on new plasma display terminals, new kinds of communication devices, etc. We concentrated on looking into the future for improved performance. I have a chart that shows where we first put one terminal on one phone line; then eight terminals on one phone line; and finally we got up pretty close to the limit--sixteen terminals on one phone line. Those developments took place over that period of time.

HOCHHEISER: Did CDC pick up on any of these developments from you?

BITZER: Actually CDC never picked up on the sixteen terminal communication equipment until the very end. CDC utilized the eight, but never the sixteen. Some of the overseas subsidiaries, like in South Africa, were concerned about CDC not going to the sixteen terminal line because the phone lines were very expensive there, and they wanted to use our boxes so they could double the number of terminals on their phone lines. CDC said, "Well, you can use only what we supply," since it was a CDC project. CDC in South Africa was unable to obtain the sixteen terminal modem and they lost some business opportunities. There were some disagreements between CDC and its subsidiaries over getting access directly from us to some of our products. We produced a cluster PLATO system that CDC Germany would have liked to have.

HOCHHEISER: I don't know what you mean by cluster systems.

BITZER: That's where a classroom set of terminals are controlled by a mini computer with much of the processing done at the terminal itself. The record keeping and delivery of the lessons is done by minicomputer, and the execution of the lesson and display functions are done at the terminal.

HOCHHEISER: Then there is no large computer?

BITZER: No large computer doing the lesson processing. That's done in microprocessors inside the terminal. As I said, we did a decent job with cluster PLATO and CDC Germany, for example, had some customers that wanted to use it. CDC Minneapolis said, "Well, we're going to develop our own cluster." They sent a person down here to study with us. These types of problems still exist today. The subsidiary is willing to go directly to us for help but CDC central objects. We have discussions going on now over the programming of their new 900 series machines for PLATO. CDC Germany wants to give us a machine on contract and have us quickly write the program for it. CDC's office (in Minneapolis) wants to do the programming themselves over a longer period of time. My position is I'd rather not do it at all because we wouldn't use it. But we would anyway if it would help CDC. To this day I get calls from CDC concerning these interCDC problems.

HOCHHEISER: Were there conflicts between you and Control Data in certain areas?

BITZER: Yes, but not a whole lot of them. There were some. I think the University of Hawaii was the first example. They had been connected to us by a phone line at the cost of \$50,000 per year. They wanted to connect as many terminals as they could. We wanted to go to sixteen. CDC didn't want to go to sixteen. They wanted to force them to buy a system. The university said, "We're not going to buy a system until we prove it out with a classroom size of sixteen." CDC knew that they were sincere, and finally, after some negotiations, CDC let us go ahead and connect sixteen terminals for a year or so. Sure enough, they bought their own PLATO system, just as we thought they

would.

HOCHHEISER: There was a limitation in the contract?

BITZER: At the beginning there were no limitations, and we had built up a base of users. Some places had 20 terminals, some had 40. The government had over a hundred. They were grandfathered into the new agreement.

HOCHHEISER: Whatever terminals were in place at the time the agreements were signed in '76 were grandfathered in?

BITZER: Yes, plus the fact that any new site, or the old site, could have no more than four additional terminals connected if they were located outside of the state of Illinois. We could add as many as we needed to educational institutions inside the state of Illinois. So we could connect as many terminals as needed to educational systems in the state of Illinois, but anywhere else it had to be four or less terminals for services. There was one other exception. We could connect as many terminals as necessary for experimental purposes. Under those conditions we were to notify CDC of the experiment. For example, if we received a government contract for an experimental program for the teaching of drop-out students using forty terminals in a prison outside the state of Illinois, we were to notify CDC and let them comment on it. They would not stop us, but they would comment on it and make their suggestions. Then we could go ahead and do it on an experimental basis. The need for notification to CDC was waived if the amount of the research cost exceeded the usual service cost by a factor of two. This usually was the case for the federal research grants for programs in computer-based education.

HOCHHEISER: How did that work out in practice?

BITZER: Generally, it worked out fine in practice. There were a number of locations which wanted services where you could get more than four terminals. However, we honored the agreement and would not give regular services for more than four terminals if they did not have an important research application. Most of our research applications were

concerned with testing educational ideas. Now we are in the process of using our present computer system to develop important new hardware for the next system so hardware is being tested not some new pedagogy. Again the question is what part of the CDC agreement applies. It was my interpretation that since the cost of the service was effectively zero compared to the cost of the experiment, we could proceed. I verbally notified the CDC representative in our district. Later it was rumored that CDC might sue the university. The university officials suggested that I write CDC and inform them of the details of the experiment that we were doing, so I did. They (the same people that were already verbally informed) never made any comment about it so we went ahead. That experiment ended and we reduced the number of terminals. CDC finally did write us and gave us permission to go ahead. They asked us to keep them better informed in the future.

There are some sites where we'd like to expand. Washington University needs more than four terminals because they use the system for business games applications. That's where interactive business games are played between them, the University of Arizona and Indiana University. They need more terminals to play the games effectively.

Washington University is two miles from Illinois. They would need to have a post office address in Illinois to qualify for an exemption. We could probably terminate the line in Illinois. We could get around our agreement with CDC but I won't do it. I wrote to CDC and said "Here's what the problem is. We hope you'll go ahead and say okay, at least for a few hours a day for the experiment. If you don't, we'll just have to figure out how to complete the experiment without violating our agreements." It has been clumsy in some cases. Remote locations have the largest phone line costs, yet they share only four terminals in a line which could support sixteen terminals. The communication costs could be reduced considerably by connecting sixteen terminals. It was difficult for the school to understand why we would not allow them to expand.

HOCHHEISER: Providing they're going to use 16 terminals.

BITZER: I would say that after you use four terminals successfully that you need sixteen to be productive and cost-effective. It just didn't make any sense. There were only a few sites with that problem. We were servicing the

University of Delaware and Florida State before the limitations went into effect. Eventually these universities got to the point where they needed their own system, and that's how CDC sold systems. Control Data should be asking us to help potential customers who are not ready for a full system. Usually it was a concern between the CDC salesmen and the district managers. I think they probably lost a significant amount of progress in sales and operations that they would have had if they relaxed the four terminal limitation. The arrangement with UCI is different. The university is guaranteed all the service it can handle. There's no competition between the University and UCI.

HOCHHEISER: Did Control Data themselves then try to do this sort of thing in working customers up from a limited number of terminals to the point of buying a system? You're suggesting that this would have been an excellent strategy. Did they attempt that strategy themselves?

BITZER: I think that they tried, but it caused several problems for CDC. At the four terminal level for an educational institution, CDC couldn't afford to run the experiments to nourish the new institutions. Many CDC salesmen did not know what PLATO could do. Small sites needed special care to expand. Thus, small sites like two terminals didn't survive long on the CDC system. CDC went to other strategies. One was to establish learning centers--lots of learning centers-- which they did, and provided special services at the learning centers. That worked fine for professional testing, training for banks, and some industrial training. In some cases they made grants to schools for sixteen terminals or so. Bill Norris would do that free for a year, but then the price after the first year was so high that many schools could no longer afford to participate. This created hard feelings with some clients in the long run. Our costs and price was much lower than CDC's and we particularly knew how to help educational institutions. We knew how to hold their hands. We knew what their problems were administratively and educationally. We could do a better job than CDC at the beginning but we could not expand the service indefinitely. Sixteen to thirty terminals was the limit we could support at one place. We couldn't expand to very large numbers and CDC didn't know how to handle small users. Sometimes in desperation a few schools bought their own machine and ran their own centers.

HOCHHEISER: Either that or decided that it's nice, but we simply can't afford it which, I know, happened at a number

of places.

BITZER: That's right. In some places, CDC would make promises to them. They would give them the machine and promise to buy back sufficient services. When CDC failed to do that, the institutions got upset. I heard that the University of Maryland were really upset. I just purchased equipment from Maryland at ten cents on the dollar because they were so angry that they closed down their center. So there were a number of problems. There were a lot of successes too and the number of problems were not that numerous. I don't know of any hard feelings between CDC and me that resulted over any of these problems.

HOCHHEISER: Are there other areas in the relationship in these years that seemed particularly problematical?

BITZER: Not for me. There have been problems for others in the laboratory, but I have a different viewpoint than others. Many people in the lab thought that CDC should be at our beckoning every time we called. If one felt that way, then you could find a lot of things that CDC did differently than we would have liked them to. I think that most of the things that CDC did were predictable and responsible from their viewpoint. I think from the hardware standpoint, everything went magnificently well. Maybe that's partly because I'm more of a hardware man than I am a courseware man. But the courseware agreements had several problems. CDC decided to go into competition with the University of Illinois authors. They opened their own courseware development in similar areas, and they wanted exclusive rights to the courseware developed at the University. The University of Illinois authors questioned whether CDC would market their lessons just as hard as their own, in which CDC had made a considerable investment. No way! Many UI authors pointed out that their lessons got noted in a book while the CDC lessons were promoted hard with literature. UI authors got very upset. In addition, CDC would try to force authors into certain standardizations to fit into CDC standard. The UI authors said, "You don't understand anything about education. If you do that you will ruin the educational content or pedagogy." They got into some fights over certain standardizations. Some authors became completely uncooperative. CDC made some serious mistakes. For example, they wanted to create a physics curriculum for some undergraduate science courses. UI had already done an excellent job of producing physics

curriculum. It is still in use today. We've run a thousand students a year through it. It's very successful. The people who did that would have been very happy with just a few dollars in royalties. They didn't write the lessons to make money. They would have been delighted to help CDC modify these lessons for a very small amount of money. Well, CDC went to outside authors. They signed up with authors who had no experience in the area at all, paid them more than they would have ever had to pay the people whose courses they were using already and who had the experience. That really irritated them! CDC was not very successful at it. In fact, they told me, "This course cost us \$300,000. If we charge \$20 per hour for all the people that would use this course in the country and if everybody available decided to use it, we still would not do more than recover our money in ten years." I said, "Of course. Your problem was not in sales it was your cost, and you made the people that could help you angry." I also said, "You could have done it for \$20,000. It cost you 15 times as much and you can't even make a profit." Yes there was some problems of that type. There was never anything on the personal level with me because I wasn't personally involved in that, but they would call me all the time and ask, "What can we do, Don?" I would get pretty nasty about it and say, "You better start paying attention to the authors down here." They never seemed to learn that lesson. They should have just taken our courseware directly. They had a license for all of the lessons. They would have worked out better than the way it was done. We had a much better remedial program for adult education than CDC had. In my opinion, they produced an inferior program at a very high cost because they had an organization that needed the work. They made an authoring deal with a professor from Penn State. His agreement produced more royalties than the sum of all the royalties for the UI authors. That didn't go over very well with the UI authors. The hardware development program went smoothly and is still going smoothly today.

HOCHHEISER: Can you compare your experience working with Control Data, now I realize it's a much greater experience than with any other company, with your relations with, say, IBM. I know they licensed your plasma display work.

BITZER: TDK: the cluster system, Fujitsu: the plasma panel.

HOCHHEISER: All right, there are things that are generally true about this kind of technology transfer, as opposed to things that seem particular to this situation. You see what I'm getting at?

BITZER: The only thing that I can generalize on is that the transfer of technology is a lot harder and more work than one might think. It's like a marriage. If you think it isn't going to require work, you're mistaken. The relationships are all different with each corporation. For example, IBM is so big that once they got started they asked very little of us. They just had the lab facilities and people do it all themselves. They also made some mistakes in the process. At the very beginning IBM kept finding a reason why the panel wouldn't work. We usually had solved that problem a few weeks before they thought about it. That is where we helped the most. But after they got started they just took off on their own without us interfering very much. However, both my graduate student and I worked hundreds of hours with Gandalf, a smaller communications company which licensed our new intelligent modem. We transferred the technology and helped solve problems that occurred in the production line. We put in a great deal of work. But then after they put it into production they promoted and sold it very nicely. Even though TDK is a large company, we had to work very closely with them in transferring cluster technology.

HOCHHEISER: In looking at the various trips you've made and the various discussions you've had when CDC would call and claim that something wasn't working in courseware, were there any sources of written records that can throw light on this documentation study or were these things handled over the phone?

BITZER: My guess is that all of the final resolutions are in document form. My strategy, when possible, was to have all problems resolved by telephone before anything was put into writing. So it depends on when you view it. The documents would probably indicate a problem, a little discussion, and then a resolution.

HOCHHEISER: What it would not document is the process of resolution when you got there.

BITZER: That's right, because the process of resolution was, "Let's get on the phone and talk about this before we

get ourselves caught in a corner." That's the way I do things. It doesn't leave a very good process record.

HOCHHEISER: Yes, it creates a problem for people like me (laughs).

BITZER: I can tell you a lot of problems wouldn't exist today if people had first gotten on the phone before shooting off a letter.

HOCHHEISER: Yes, of course, historians say how much easier it is to do research of things in the days before telephone became second nature to people, because the body of correspondence sits there. People had to do the correspondence. I've gone through cases of two people having a working relationship where they would be writing each other letters daily.

BITZER: Yes, about what was going on. It's a good record of what was going on.

HOCHHEISER: And for constructing what happened--the ongoing process--it's available.

BITZER: CDC's relationship with us by the late 1970's reached a point of benign neglect. CDC did their own thing, and we were doing ours.

HOCHHEISER: So this happened gradually? At first you had the people transferring the hardware technology, the system software, and the tutor, and once that happens....

BITZER: We also helped create the state of benign neglect. One of the first tasks we started before designing the new system was to reestablish close communication again with CDC.

HOCHHEISER: About when was that when you started the project?

BITZER: That was probably '81, about a year, or a year and a half before the last agreement was signed.

HOCHHEISER: Were there changes in the '83 agreement as a result?

BITZER: Yes, they said, "Well Don, what can we do? What are your limitations? You know we can't give you a free machine when you're out selling services, and in some ways, providing competition." I said, "Well, I have constraints too. My constraint is that I am paying \$300,000 this year for the maintenance of the old machine. I can't continue to pay this much. Please take this constraint back to your management. Perhaps between making a gift of the machine and an arrangement with your maintenance division, you can make the computer affordable for me." They went back to CDC and worked out a solution that allowed me to continue to use the CDC machine. Presently we are looking at obtaining a new 900 series machine. The lab will own this old machine in December '88. We could keep it and try to keep it maintained. This summer I will start discussions about getting a new machine and a maintenance agreement. I don't have the money to continue paying at the same rate. I will need CDC's help. I don't know how CDC will solve the problem. I can only tell them the boundary conditions and let them use their own creativity. CDC people are very smart. After I relate our boundary conditions to them, CDC is capable of coming back with proposals to try to meet the condition. Sometimes we would compromise on the conditions. That is the way CDC and UI worked out the other agreements. I have no complaints and I don't think CDC has any either. We're both still alive and still having a great time.

HOCHHEISER: Well, they've had some major problems in the last few years.

BITZER: Yes. We would have liked to help them solve those problems. We would have solved them for a lot less cost than they did.

HOCHHEISER: In the way they handled PLATO you mean?

BITZER: Other things too, but PLATO in particular. It didn't make sense to me. Then of course I view it from a different perspective.

HOCHHEISER: That's the fundamental difference. In the end they may not have done that well for all that they do for trying to serve a social need. They've got to make a profit.

BITZER: They've got to be profit motivated. I don't have to be profit-motivated, but I have financial limitations too.

HOCHHEISER: No, you have to appropriately manage your resources.

BITZER: Yes, I think by different expansion routes, more careful planning, more careful choosing of the people who are involved, by being willing to use courseware that already existed, and having less fear of us while making more use of us for supporting startup sites, they probably could have expanded at a much higher rate for fewer dollars.

HOCHHEISER: Because essentially, that's what you're trying to do?

BITZER: Sure. They came down and we were going to join in with them until they ran out of money. I think they understood finally. They asked, "What makes you think you can succeed where we have failed?" And I said, "Well, there are a number of reasons." My strategy is to start small and spend money carefully. Quit worrying about trying to control all aspects of the products. Have lots of people and universities involved in the process so that you have many active partners contributing their talents and their capital. If they feel like they have an investment in the product, they'll help make it succeed. Don't try to do the job yourself. CDC had too tight of control on the product. Sometimes a company has to be in sole control of their product to maintain their position in the market, but education isn't one of those markets.

HOCHHEISER: Yes I think that part of the reasons they didn't get where they wanted to go was that they didn't ever really understand the nature of the education market place.

BITZER: I think that's right. I don't feel threatened by the Universities of Maine, Delaware, Arizona or Missouri, or any others who work with us. If they ended up with bigger systems at all those institutions than we have at the U. of Illinois I would say "God bless you folks. I love you. You're doing the right thing." In fact it's very possible in the next year we will have more terminals in the state of Arizona than we have in the state of Illinois. Now some people worried about that. They said, "Gee, we are located in the state of Illinois. After investing in all this research we don't have as much return as the state of Arizona." I said, "No. That's their choice at the time. If Arizona wants to be the leader, we'll let them. If California wants to be the leader, that's fine (laughs)." We don't care who helps us. If they get the credit for solving the truancy problem in California I say, "Let them do it. Let them get the credit. They deserve it. There's plenty of educational problems (that need solutions) to go around."

HOCHHEISER: I think that's a good bit of flavor of things on tape. Is there anything that you think I should know about that hasn't come in our discussions over the week?

BITZER: You got the flavor of what this laboratory is like. What the relationship between us and CDC was like. I think the people at CDC (with whom I had contact with) were great. Not everyone agrees with me but I thought all of them were great. I think that was true from Bill Norris all the way down the ranks. I think that we have one of the finest staffs here as well. I plan on keeping it that way, too. One of the things that would please and excite me the most would be to have CDC call and join us on the next system. Maybe say something like, "Don, have you still room for us to come down? Can you make room for us to work together again?"

HOCHHEISER: Well, part of the problem at CDC, as I'm sure you're aware, is their financial health in general is not so good. Besides everything else, they're just hard pressed to find capital.

BITZER: Unfortunately they used capital to start some PLATO projects we could have done for them. They found out that was a mistake and backed off. If they ever decided again to start some new PLATO activity, they could spend a lot less money working with the University. This is the way we started originally. I think that they could do better and it could be an exciting relationship again. Nothing would make me happier. Meanwhile, this laboratory is open to them. Everything we create until December 1988 they have a license for already. All they have to do is send someone down to help transfer the technology. If they wanted to use or build our recently designed processors, they have a license. All they have to do is ask and we will be here to help.

HOCHHEISER: Especially on that, I'm quite sure they won't.

BITZER: But yet they can't afford to design and build one on their own. It's crazy.

END OF INTERVIEW