An Interview with

RICHARD A. ZEMLIN

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Conducted by Bruce Bruemmer

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Abstract

Zemlin worked for several computer firms before joining Control Data (CDC) to develop software for the CDC 1604. He discusses the establishment of a software group and the simultaneous development of a service bureau in the San Francisco Bay area. He mentions the software group under Seymour Cray that developed the FORTRAN compiler for the 1604 and the group built up by Richard Gunderson. Software development at CDC was originally under the direction of George Hanson. Later Frank Mullaney oversaw software development before Clair Miller was hired to head software development specifically. Zemlin points out that early software was conceived of as applications.

Zemlin considers CDC's attempts to limit their support to system software and compares the policies of CDC with those of International Business Machines. He discusses training a force of outside analysts that was developed to provide support for specific customers and subsequently became part of the marketing organization. Zemlin discusses a number of specific projects, including the development of the ALGOL compiler at Oak Ridge. He also discusses the development of two forms of documentation for CDC software: external specifications, and internal maintenance specifications.

RICHARD A. ZEMLIN INTERVIEW

DATE: May 16, 1988 INTERVIEWER: Bruce Bruemmer

LOCATION: Bloomington, MN

BRUEMMER: Before I get into the issues of documentation, I read that you started at ERA.

ZEMLIN: That's right.

BRUEMMER: Was that when it was a division of Remington Rand?

ZEMLIN: Actually, I worked at ERA as a summer employee while I was in graduate school before it became a division of Remington Rand.

BRUEMMER: In what capacity?

ZEMLIN: As a mathematician programmer.

BRUEMMER: And then you stayed with them until, I think it was, the late '50s or so.

ZEMLIN: Yes, '58, then I left Univac - by that time it had become Univac.

BRUEMMER: We had a huge 40th celebration of ERA, and I'm sorry we couldn't get in contact with you. We even had John Parker show up there. And then you went to Standard Oil of California after that. Was it the same type of work?

ZEMLIN: Well, there it was more operations research kind of activities. I was just there for a couple of years and

then joined Control Data.

BRUEMMER: We've gone through a lot of the records in the warehouse and, as you might imagine, most of them are from headquarters. Even documenting hardware developments at Arden Hills is somewhat a problem because they tend to keep all the records there. That's even more true of the Palo Alto operations. It's very fuzzy about the rise of Palo Alto and its history. I know Price was involved in that and Gunderson and those people. Can you describe how Palo Alto started and its organization?

ZEMLIN: Actually, the way it started was there was a contract with Lockheed, the satellite test center, and they were one of the very early 1604 customers. There was a contract to develop some special software for them. That required that Control Data build up a small group of people which amounted to six people. At the same time that that happened, they were striving to build up a software capability here in the Twin Cities and having a very hard time of it. When they noticed how easy it was to hire people to work on the Lockheed contract in the Bay area, they thought, "Well, maybe we can build up the capability there."

BRUEMMER: So, it was just that the supply was out there.

ZEMLIN: Yes, that was really the dominant factor. There was another idea. At that time, Mr. Norris was very interested in the service bureau business and wanted to expand in offering computer service, and so one idea that got into the pot very early on was to have a computer service bureau there as well. So those two things were what caused the real start of the Palo Alto operation.

BRUEMMER: I assume this was looking more at the 1604, at this time.

ZEMLIN: Oh yes.

BRUEMMER: Were they also interested in creating applications program or general utility?

ZEMLIN: At the time I don't think Control Data management understood very well about operating systems and utilities in a computer product, software product.

BRUEMMER: It was all software then?

ZEMLIN: Yes, and it was all "applications". For several years, the title of all of those organizations was not software and it wasn't programming it was applications.

BRUEMMER: I assume you needed some sort of operating system framework to work from and that you were aiding the supply application programs. You probably were attending to operating system and utilities first just to deal with that issue.

ZEMLIN: Right, and of course this was an especially tough problem in Control Data because they were coming from a position of wanting to sell pure hardware and let the customers do the software, and finding out that that just wasn't going to work. So they really did not appreciate what was involved in trying to broaden out and sell to a mass market.

BRUEMMER: Now, who headed up this nascent group?

ZEMLIN: Well, when I joined it was to head up that group. Prior to that it had been purely the Lockheed contract group.

BRUEMMER: At that point, there were no really significant software groups in the Control Data system.

ZEMLIN: Actually there were. There was a small group under Seymour Cray's operation that did the initial FORTRAN compiler for the 1604. And then there was another group being built up by Dick Gunderson.

BRUEMMER: And that was at the same time?

ZEMLIN: Yes. In fact, Dick had in the neighborhood of 30 people, I think.

BRUEMMER: What was that called, do you remember?

ZEMLIN: Well, just as a guess I would say it was probably called "applications development".

BRUEMMER: So, you have these people from Lockheed, you also had some notion of being just the data center for the Bay area. I assume it wasn't a national type of mission. What did you attend to first?

ZEMLIN: It was a very hectic time for a period of half a year or something like that. It was a matter of getting things sorted out and hiring, just hiring like crazy. We had, I guess our first development responsibility as an R and D operation would have been for the 160. I'm unsure about the timing of this thing, but one of the things we got into very early on was FORTRAN for the 160. Then at about that time we had an extended negotiation going on with the users group, CO-OP was the 1604 users group, and out of that came a plan for a whole new operating system and a set of compilers, an assembler and all to go with it. It was called the CO-OP Monitor. At that point, the west coast group pretty much took over the responsibility for developing that.

BRUEMMER: Had it been in Minneapolis, under Cray?

ZEMLIN: No, it hadn't existed at all.

BRUEMMER: How did you manage that? You started with six people and I imagine it grew pretty rapidly. You probably had applications orders in for particular sites as well?

ZEMLIN: Well, actually the minute I realized what we were getting into, I tried to play down the applications side of it because I knew we were going to have our hands full. I think I had some battles with the local sales people about that. They wanted us to piddle away our energy in taking care of a specific customer.

BRUEMMER: Was that also true of the data center service as well?

ZEMLIN: No, no that was a totally different deal. That was a matter of building up a staff and trying to generate business.

BRUEMMER: Were those two groups separated then? The data services people.

ZEMLIN: They were separated organizationally. We had a continuing problem which went on in Control Data for a long time about providing hardware for the software developers to check out on. The theory had been that there will be a 1604 there, so what's the problem. And it turned out that it wasn't all that much of a problem but there was a great deal of tension between the data center people and the software development people.

BRUEMMER: Now did you report to Mullaney?

ZEMLIN: Originally, I reported to George Hanson. Somewhere in that period of time, by the time the CO-OP Monitor thing came along, Clair Miller had been hired. I believe when he started he reported to George Hanson and then I reported to Clair. I couldn't tell you the timing of when Frank Mullaney took it on directly.

BRUEMMER: Reporting to Hanson would suggest that they intended you to get into the applications area since he was at that time in charge of sales.

ZEMLIN: Yes.

BRUEMMER: What precipitated the move? Was that something from above or something that you were pushing for?

ZEMLIN: Well, it was not anything that I was pushing for. I was out there on the end of a very long string and just scrambling trying to keep my head above water. I'm sure Clair Miller could give you a much better picture of what the thinking was here because he was here at that time.

BRUEMMER: By the time he got here how was the organization structured?

ZEMLIN: He was, basically, in charge of all the what we would now call software development. It was initially under Hanson and then subsequently under Mullaney. Basically my group, Dick Gunderson's group and perhaps a few smaller things were under Clair.

BRUEMMER: Did you do any classified work?

ZEMLIN: No.

BRUEMMER: Because there were a lot of Navy machines being produced here.

ZEMLIN: Yes.

BRUEMMER: I'm interested in how you parceled out the jobs in Palo Alto, back to the question how do you manage something like that. The talk around these days, we were looking at some NATO software engineering conferences and such and I think software people in general would like to believe that what they do is development and production. That the hope is that you can construct software in a modular fashion and then assemble it later on. That there is something more than just a custom development job in software. As we look at it pragmatically just to understand the routine of software, it just seems to me that it's a number of custom jobs and that it closely follows

the steps that you might follow with hardware development. You do a series of testing and development and then when you have your job done the only thing is to load it on a tape or disk or whatever you have there. We know basically how you break your job out for hardware development but not being as conversant in software, I'm not as comfortable with understanding how it's done in software or how much has changed since the 1604 days.

ZEMLIN: A lot. At that time there really was no notion of software engineering or any kinds of principles of software development. You just got a bunch of programmers and threw them in a room and didn't let them out until the job was done, basically. We organized in terms of projects which were typically an R&D project; the CO-OP Monitor itself was a project, the FORTRAN compiler under the CO-OP Monitor was a project, and so on.

BRUEMMER: And then a team was formed?

ZEMLIN: A team was formed and they went ahead and did their thing. Now it quickly became apparent that we needed more than that. Right about the time after the CO-OP Monitor thing, I suggested to Clair that we create a quality assurance group. That became a part of the thing. We toyed a little bit with the idea of doing quality assurance within the individual development projects but very quickly decided it had to be a separate function of reporting.

BRUEMMER: It was a broadly mandated group that looked at all of the output of each of the teams?

ZEMLIN: Right and they were specifically chartered to test a product, when the project said it was ready, to verify the specifications.

BRUEMMER: And there is where you butt heads with the data services people, I would imagine.

ZEMLIN: Yes and from the beginning we actually had separate projects for the testing function. So for each development project we would have another project which was a companion project that would do the testing of that

thing.

BRUEMMER: What sort of documents would have been created throughout this whole process, very early on.

ZEMLIN: Very early on, not much. Documentation tended to be something that was written after the fact.

BRUEMMER: Did software people do anything akin to the hardware people: log books and that type of thing?

ZEMLIN: No.

BRUEMMER: And there was no concern, I guess, at that time about patentability or copyright on software. Flow charts, maybe?

ZEMLIN: In some cases, flow charts. We experimented with requiring flow charts and decided this didn't really give much payoff.

BRUEMMER: Was there a critical number of people that would seem to be the most useful per project? Say the monitor, how many people would have been working on that?

ZEMLIN: Let's see. The maximum it got up to be was about 12 people. By the time we had gotten into the 3600 machine, things were getting larger.

BRUEMMER: With those 12 people, one would be assigned a certain segment of the program?

ZEMLIN: The project managers were left pretty free to structure it as they wished. Usually there was a rather natural breakdown of a piece of the thing and they'd assign that to the guy who seemed to have the best talent in that area. Then there would be a lot of routine work that had to be done and you'd have some junior people and you just had to

parcel that out to them. Writing little utilities and things were needed but were not part of the main core of the design of the thing.

BRUEMMER: Was it pretty much up to the project manager to just bring this all together or would it be normal to have constant meetings, blaming somebody or doing something?

ZEMLIN: I can't recall the dates exactly but certainly by the time we were into the 3600 work we were having quite frequent meetings. There was a problem, a cultural problem I guess you would call it. I remember vividly at one point having to tell the guy who was heading up the operating system project and the guy who was heading up the COBOL project that I was going to lock both of their projects into a common room and I was not going to let any of them out until they had come up with an agreed upon specification for how the COBOL compiler was going to use the operating systems input/output system. I was met with disbelief when I said this because neither group seemed to feel that the other group should know or care what they were doing.

BRUEMMER: Unfathomable today.

ZEMLIN: Yes.

BRUEMMER: Who would decide what Palo Alto was going to expend its energies on? What would dictate to you that would tell you what you had to get done?

ZEMLIN: Mostly marketing and that came in the form of, you know, whatever we needed to do to get the next contract.

BRUEMMER: So it was computer-by-computer directed?

ZEMLIN: Certainly in the earliest days it was.

BRUEMMER: I would think a lot of applications orders would come through in that way. Or were the customers more sophisticated than that?

ZEMLIN: Typically they were. They were generally pretty much prepared to do their own applications. It was the systems software that they knew they didn't want to mess with. Now there were some exceptions. In fact we had, actually it was when Bob Price joined the group out there, they created a separate section for application code. One of the things I remember was that to get a sale at Argonne Labs - we had to commit to the development of a specific reactor code and we actually went to an outside firm. Contracted with them to do the development of this code. It was an outfit down in San Diego and Ward Sangren was the head scientist of that group. At some point, a little bit later, we decided that we really needed to offer an APT (Automatically Programmed Tool) compiler for numerically controlled milling machines, and we actually did our own in-house development of that. I'm trying to think of what other applications we had. In general we managed to make it stick. We didn't do things just for one customer, although another group was formed to do that.

BRUEMMER: This will be pushing your memory quite a bit, but if I wanted to understand the range of activities that Palo Alto was involved in would the best way, assuming it exists somewhere, just be correspondence between you and marketing people or the specific order forms they would send out?

ZEMLIN: You could certainly get a lot of the flavor of what life was like from looking at that correspondence. To find out what we were actually doing you could probably read the R and D project reports but they tended not to say why we were doing this. By the time we had an R and D project and were going we were committed to something or other.

BRUEMMER: Were those unique to Palo Alto or was that company wide?

ZEMLIN: No that was company wide.

BRUEMMER: That would be reviewed by Mullaney or whatever executive?

ZEMLIN: Yes.

BRUEMMER: I haven't run across any.

ZEMLIN: Somewhere in the early '60s, we set up a rather elaborate management structure for software activities which included weekly meetings and which also included a small group of people who were what we called software mangers. They would probably now be called program managers, and it was their job to maintain a written plan for what had been done and what was going to be done in their particular product area. We had one guy for the 3000 series, one for the 6000 series and expanded that as time went by and as the product line ramified.

BRUEMMER: Did you have the project or product specifications

ZEMLIN: By the time those meetings were going on, we had PERT charts on every project. We had a unified PERT for a product line. We tended, still, not to have detail specs until quite late and in fact that's still true today. We would have something that I forget what we called it then but it would now be called a design requirements document.

TAPE 1/SIDE 2

I had a small group whose function it was to constantly review our process and make recommendations and implement changes in our development processes. All of the software managers, for instance, were in that department. They developed a formal procedure and a set of document classes which we still use with some modifications. For each product there's a series of documents of increasing depth of detail starting with the project authorization and going through design objectives, design requirements.

BRUEMMER: It's still very much like the hardware process.

ZEMLIN: Yes.

BRUEMMER: Before I forget to ask, is the Palo Alto facility, the original one, still being used?

ZEMLIN: The thing started out, actually, in Sunnyvale. There was a very small rental space that we had there which held us for about a year or so and during that time the facility in Palo Alto was built. It's still there. I don't really know what it's being used for now. That was the first building they had in Palo Alto. Then we expanded into another building a couple of doors up the street and then finally built a whole complex about a quarter of mile from there. All those buildings are still there. I haven't been by in some time and I don't know who is using them. In the late '60s, Control Data decided the cost of being in the Stanford Industrial Park was just too high and so they moved everything to Sunnyvale.

BRUEMMER: Do you know if Sunnyvale has a record storage center? I'm trying to see if there's any chance that something from the '60's, early '60's, would have survived.

ZEMLIN: I doubt it very much.

BRUEMMER: For the move in the late '60's, that probably put the death knell on any records.

ZEMLIN: I would guess that that's true. I left Control Data in '68 before that move took place, so I don't really know what happened there, but I would bet a healthy sum that most of the records were thrown away.

BRUEMMER: In your other interview, you said that the problem with the Seymour Cray's FORTRAN compiler was that it was a closed system.

ZEMLIN: That was the problem as our customers perceived it. That is, some of them were perfectly happy with it. But there was a growing set of customers who were not.

BRUEMMER: How do you mean closed?

ZEMLIN: Closed in the sense that the compiler itself and the operating system were intertwined, it was a FORTRAN system, and for instance if you wanted to write something in COBOL you had no operating system at all or you had to do some kind of a kluge to force it into the FORTRAN system. There were other limitations on the system. It was the easiest way to get something going but architecturally it just wouldn't stand under all of the things that had to be added to it as time went by.

BRUEMMER: Is that about the time where the CO-OP people come into the scene?

ZEMLIN: Yes.

BRUEMMER: And I assume for a while there Control Data was actively supporting the group in whatever way it could?

ZEMLIN: Yes.

BRUEMMER: Was there any financial support?

ZEMLIN: Dick Gunderson could tell you better than I but I believe that Control Data paid the cost of the meetings.

BRUEMMER: That would be typical of that period.

ZEMLIN: To my knowledge, that's all that they did.

BRUEMMER: And how did you interact with those people?

ZEMLIN: We went to every meeting and spent a lot of time working with the committees and trying to adjust our plans to meet what seemed to be whatever common thread you could find among the various complaints and wish lists and so on.

BRUEMMER: Probably the most outstanding problem with the group was that it had a too large and diverse wish list?

ZEMLIN: Yes.

BRUEMMER: In one of Price's interviews, he recalled that you were sent to de-emphasize the role of the CO-OP user group. Do you remember it that way?

ZEMLIN: That I was sent?

BRUEMMER: Yes, or that he thought you had largely the responsibility, it seemed, to lessen that activity and just internalize more CO-OP interest.

ZEMLIN: Well yes, certainly that was part of the picture to try and get an internal product strategy and influence CO-OP to go along with it. The way CO-OP started out they were just going to call all the shots and this was clearly not going to work to Control Data's advantage. Just eat up resources and satisfy one customer at a time.

BRUEMMER: Were they very similar to say Share or Use in that respect? What was the difference? Why did Share and Use continue on?

ZEMLIN: I don't know that there was all that much difference. I think that the CO-OP group was a considerably more homogeneous group than Share. I had some experience with Share and of course Share was, by our standards at the time, a vast group: hundreds and hundreds of people with different ideas of about how things should be done. The CO-OP group, on average, was more sophisticated than Share members. Although some of the most sophisticated computer users in the world were in the Share group, the average across CO-OP was much higher than at Share.

BRUEMMER: Did you point out the difference between IBM's, were there differences between IBM's attitude towards Share and CDC's towards CO-OP?

ZEMLIN: Of course I never was privy to IBM's thinking but from the point of view of a Share member, it appeared that IBM used this primarily as a vehicle for announcing new products and if you had anything you would like to see done they would listen to you and go away and ignore it.

BRUEMMER: Were there a few that were really prominent in the CO-OP group?

ZEMLIN: Certainly one of the influential ones was Oak Ridge. They pretty much were the driving force behind our doing a ALGOL compiler. There were a lot of people who wanted ALGOL and they all wanted a different ALGOL and we managed with the help of Oak Ridge to get them all to agree on one ALGOL. That was primarily the work of Art Downing. Lockheed was, of course, quite influential. Although their interests were different from most other people's. They had a real time system that they needed to work.

BRUEMMER: Someone pointed to 1961 as being sort of a turning point for software for the 1604. With regard to the University of Texas, they said that at that time there was the Three Phase Automo nitor, Cray FORTRAN 60 and the CODAP library that was developed. Does that ring any bells?

ZEMLIN: Well, the Three Phase Automonitor was one of those ideas that kept cropping up and never really went

anywhere. Basically it was the idea of using one or more 160s as satellites to the 1604 to do input and print output spooling. There were at least a couple of cracks taken at this and I guess basically the configuration never caught on. A few people were very interested and wanted to do that and I recall that the University of Texas wanted that. I'm blanking out now on how that finally resolved itself.

BRUEMMER: So it was a benchmark in one person's mind, possibly?

ZEMLIN: Yes.

BRUEMMER: Did the definition of the data centers then become more defined as time went on and that was just another group that was doing stuff.

ZEMLIN: Yes.

BRUEMMER: And did you oversee that part of things?

ZEMLIN: Yes. Well, I did actually until when Clair Miller came I suggested to Clair that he should probably manage that because it really was a separate function.

BRUEMMER: Did they have their own sales force or did they use the existing one in the area?

ZEMLIN: They tended to use the existing one. They fooled around a little bit with doing their own sales work and it never seemed to pay off very much.

BRUEMMER: How large a group was this by the time Miller took over?

ZEMLIN: The data center was probably a group of about half a dozen people. Chuck Atcheson managed it, there

were a couple of operators and one woman who did data entry stuff - keypunch.

BRUEMMER: Was it a money maker?

ZEMLIN: It was not a big money maker, certainly. At that time there was a lot of confusion about how to allocate charges. I would say from the corporate bottom line on the thing it probably was negative. For a long time they played different accounting games to try to figure out how to make this thing profitable. It wasn't until the 6600 came along that they started to get a profit.

BRUEMMER: That brings up the other issue. How did you manage things to get any sort of handle on the costs involved, the labor and resources in developing any sort of one software package, and how did you (probably frustratingly) try to communicate that to management in Minneapolis?

ZEMLIN: Basically, I found that to get my job done the primary issue was head count and a secondary issue was availability of hardware to check out on. I had very little difficulty on the head count stuff because that's about as simple as things can get, and I just broke my pick on the hardware availability. It took a long time for that message to get through and we had a major disaster on the 3600 program because of this.

BRUEMMER: Did you ever make a pitch to get another 1604 in Palo Alto?

ZEMLIN: I might have mentioned this in a meeting one day but I'm sure that's as far as it would have gotten. It would have gone out of my mouth and fallen on the floor to be ignored by everybody.

BRUEMMER: Would the situation have changed by the time the 3600 was rolling out?

ZEMLIN: No. In fact, at the worst in the 3600 program we had. . . I took my development teams and moved them all to Michigan State University where there was a 3600. They stayed there for over six months.

BRUEMMER: That must have been popular.

ZEMLIN: Yes, they all loved living in motels for six months.

BRUEMMER: So at that time you were just sitting on a 1604 and the data services didn't move into a 3600 right away.

ZEMLIN: No.

BRUEMMER: Did it eventually?

ZEMLIN: My recollection is that it did. Yes.

BRUEMMER: I would think you would be pushing to have one on site.

ZEMLIN: Screaming.

BRUEMMER: And they as well?

ZEMLIN: It wouldn't matter that much to them.

BRUEMMER: How did you deal with the sales people. I assume you probably were called on site or your people were called on site whenever a sale was around. Did you try to take any particular stand? I know with the hardware people it was always a danger of salesmen promising the moon and getting an engineer out there and saying we can do that - no real big problem - and not really being able to factor the cost of doing that.

ZEMLIN: The situation is worse in software.

BRUEMMER: How did you keep salesmen in check, or could you?

ZEMLIN: Within limits you could keep them in check. Generally, I was able to have pretty good relations with the sales people. There were some guys who were just, in my view, crooked and who would listen to what you said and go out and sell what they thought they needed to sell anyway. There were some major flaps over that, but in general we got very good support. If we dug our heels in and said we are not going to do that, the corporate management would support us rather than the marketing people.

BRUEMMER: It seemed to me from Hanson's descriptions that every time you sold a system you added to the sales force, at least early on. That usually one salesman almost, in the early 1604 period, would be assigned to a site just on continued activity and that type of thing.

ZEMLIN: They certainly put a lot of stress on follow up. I had nothing to do with the thinking on that but I would just conjecture that they recognized that repeat business was going to be very important. Their potential customer base was much smaller than IBM's.

BRUEMMER: Did some of your people often get put on site for a while?

ZEMLIN: Oh yes, many times. Often it was a condition of the contract that one of our people would go there for a period of time, a stated period of some sort.

BRUEMMER: Did you have a pool of people who would do that site work or did you?

ZEMLIN: As time went by, yes, we did develop a pool. One of the things we did was we developed a separate training group. One of the things that the on-site man was always supposed to do was train the customer's personnel in the use of the software and so we decided that it was far better to have a group of people who just went

around doing that. So quite early on we developed two or three specialists trained that way. We tried to get our customers to specify what it was they wanted the Control Data analyst to do for them. That was to give the guy something worthwhile to do and hopefully to try and influence them to do something that might be of value to other people as well. We were only marginally successful at that. In fact at some point, I would say in the mid '60s, they finally decided that what they ought to do is have the on-site analyst be part of the marketing organization, which was a very good move.

BRUEMMER: Was there a C-E-I-R facility in the Bay area?

ZEMLIN: I don't recall, there might have been one but to me C-E-I-R was always Washington, D.C.

BRUEMMER: So if there was one, it wasn't a big - there was one in L.A. which had a 1604 actually, now that I recall. And promptly got rid of it. That was an odd story.

ZEMLIN: Yes, now that you say it, I do remember that there was a Los Angeles office, too.

BRUEMMER: I think there was a head guy there that just hated Control Data for some reason and made it his task just to get rid of the 1604 after it had been brought on. I don't know, maybe an old IBMer. In your other interview, you stated that one of the things that you were proudest of was your contributions to software management research at Control Data. Can you elaborate on that?

ZEMLIN: Well, as I mentioned earlier about having a department that produced our development process and basically out of that came all of our documentation standards which still are used today with some modifications. The whole notion of program managers, the use of PERT. We were starting from a black art, really, and had gotten to the point where we ran it as a pretty businesslike operation. We still made mistakes and had horrendous cost overruns and schedule overruns and those things but we had much better control over the thing than we had when the thing started.

BRUEMMER: Given the changes that occurred by the time you had left, would it be a lot easier for me to try and document software development. Is there more documentation on the front end done?

ZEMLIN: Oh yes, and certainly there was just much more documentation generally throughout the entire process. If you're asking about where would you find copies of that stuff now, I have to say that I doubt that you would unless you happen to stumble across somebody who never throws anything away.

BRUEMMER: Is there an equivalent of a field manual? In hardware, there's the manual that the customer gets. There's a field manual for hardware which really tells more about the hardware than any other source for a computer. Is there an equivalent on the software side?

ZEMLIN: A field manual. Now I've never seen one of those so I'm not sure what it would be like.

BRUEMMER: They actually describe the boards, the parts numbers, the intricate logic of the computer and that would be reflected a little bit in the manuals. What I'm getting at, is there a key document that if a customer had a bug or some sort of problem running software that people would routinely refer to.

ZEMLIN: There were two key documents. One was called the general external design, now it's called the external reference specification, and the other was the internal maintenance specification. The external said what we're committed to, what this product does, and the internal said here's how it's put together. So it was intended, primarily, as a guide to people who were trying to maintain the software, find bugs, or add customer's specific mods to the thing.

BRUEMMER: And were those generally shared with customers if they requested them?

ZEMLIN: Well, certainly the external reference specification was, that really was part of the contract. I don't think

they made any real provision about the internal spec. We didn't make it available to customers as a general rule. I'm sure we did in specific circumstances. Strictly speaking it was not part of our commitment to the customer.

BRUEMMER: There wasn't any proprietary problems?

ZEMLIN: No, not really. We were very, what's the word I want, we simply ignored questions of copyright and patentability and all that sort of thing and it never became an issue. We would give source codes to customers.

BRUEMMER: What's the situation now? Do people keep log books so they can claim a patent? There are some cases where you can claim patentability of unique processes in software.

ZEMLIN: I'm not sure of that. I believe the answer is no. I don't know of anybody who actually keeps a log book, except as a personal diary sort of thing of his own, in the software area. There may be people who do that but I sure haven't heard of it.

BRUEMMER: Well I think I've about exhausted my questions for you.

ZEMLIN: Okay. Well, I wish you good luck.

END OF INTERVIEW