Oral History of Lawrence J. Schoenberg

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Lawrence J. (Larry) Schoenberg

Conducted by Burton Grad and Luanne Johnson

Abstract: Lawrence J. (Larry) Schoenberg reviews the early days of the software industry including the names of early software products, professional services and processing services companies and the names of many of the founders and influential pioneers. He discusses the effect of IBM's unbundling on professional services companies, software products companies, and user companies that had relied on IBM to provide training to their employees. He discusses the impact of the recession in the early 1970s on the growth of the software industry and projects the impact of future trends on the industry.

[Editors' Note: This interview was conducted in the office of AGS Computers in Mountainside, NJ.]

Early Software Companies

Luanne Johnson: We're trying to identify which were the earliest independent software companies.

Larry Schoenberg: CUC [Computer Usage Company] was formed in 1956.

Burton Grad: Yes, that would be right. I used them for projects when I was at GE in the 1950s.

Schoenberg: CUC was the first. The only company that preceded CUC was C-E-I-R [Corporation for Economic Industrial Research]. That was, I think, 1953. C-E-I-R, however, was not doing commercial work.

Grad: Mostly government.

Schoenberg: Charlie Cooper, the founder of Computer Applications, Inc [CAI], which was founded in 1959, came from C-E-I-R. He had been the branch manager.

Grad: I was down there at C-E-I-R in 1963. They had a big contract with IBM and they couldn't pay for the machines they had contracted to buy. IBM gave it a special name, Stretch, a name they were using for this set of advanced computers. C-E-I-R had a contract to buy ten of them and they couldn't execute the contract. I was there to try and find a way to settle that contract.

Schoenberg: You're not confusing it with Computer Applications?

Grad: No, it was C-E-I-R. And we got [William] Orchard-Hays to build LP codes for the 7090 as part of the settlement of that contract and to help us do them for the 7040. And when Orchard-Hays went over to CAI, he and his associates completed the contract while working for CAI which was part of the deal. Who else was out there?

Schoenberg: Three firms started in 1959. I have a vague memory that one of them was actually started in 1958.

Grad: One was Computer Sciences Corporation [CSC].

Schoenberg: Computer Sciences. And you had Computer Applications.

Grad: When does ADP come in?

Schoenberg: Oh, ADP was formed well before that. ADP was an old accounting services firm. It could have been formed in the early 1950s.

Grad: ADP was at $10 million in 1969. Can you believe that, Larry? In 1969.

Schoenberg: Well, sure. Because ten years ago, when we went to Mexico on that ADAPSO trip, one of the people we spent some time with in Mexico was a guy who had been at ADP and then went to run Stat Tab in Chicago. This was the year when Mike Carroll, Jr. ran the business. I don't remember the man's name, Dick something, but at that time Stat Tab was like the second biggest services company there was. And I don't know what they did, maybe $20 million.

Grad: So in 17 years ADP has gone from $10 million up to a billion dollars.

Schoenberg: Well, I think their average growth rate was between 15 and 20 percent per year.

Grad: It's got to be more than that to grow to 100 times in sixteen years. It looks to me like it’s about 30 percent.

Schoenberg: A tremendous amount. I mean, they did this brilliant matching with acquisitions all through the 1960s and 1970s. But it’s hard to differentiate between what was acquisition and what was internal growth.

Anyway, you had several streams that people came out of. One stream you had was the stream that came out from the C-E-I-R kind of company. You had Computer Applications. You had Aries. Remember Aries?

Grad: Was PRC around then?

Schoenberg: PRC was not in the business. They really weren't.

Johnson: What business were they in?

Schoenberg: Engineering, true engineering.

Grad: They switched over later on.

Schoenberg: But to give you an idea about Aries. You don't even think about them anymore. But among the companies that came out of Aries, for example, was Analysts International. Then you had the whole Charlie Cooper thing in New York. And there were all kinds of companies out of that.

Grad: What were they doing? What were these people doing to make money in the early 1960s? What kind of work did they do?

Schoenberg: Well, what happened was that in the late 1950s, you had the government business. Then you had some of the people who were able to get commercial customers.

Grad: Were they writing programs for the government?

Schoenberg: I thought they were. But they may have been doing linear programming, that kind of thing. Who the hell knows? Then remember what happened. I don't know why but it just accelerated. I know that the final acceleration was the announcement of the IBM System/360, of course. But what happened was you had all of this system software that had to be done. For example, at IBM, remember how they had parts of projects that were being run by people from GUIDE and SHARE. So you had a guy like Roy Nutt, for example, who was writing a Fortran [compiler]. Then when he went in 1959 to form CSC with Fletcher Jones their actual first contract was the FACT compiler for Honeywell.

The thing I always felt was a problem for Fletcher was that he always had this attitude that the only way to make money was fixed fee. That’s the same kind of attitude that's creeping back in again. Those of us in professional services know that if he had run his first contract on a fixed fee basis he would have been out of business before he started. Because he had like a 10,000% overrun.

Grad: Is that for FACT?

Schoenberg: Yes, FACT was years late coming out. But that wasn't necessarily their fault.

Grad: Marty [Goetz of ADR] tells me that the first business they were doing was writing language compiler programs for hardware companies

Schoenberg: That's right. Now, remember some of those guys were at Sperry. There was a fellow named Ken Clancy for example, who was the founder of two different companies located in the Philadelphia area. All these fellows started working for Univac.

Grad: So a lot of the original business was really not IBM.

Schoenberg: I, of course, mainly knew the IBM ones. But CSC was Honeywell. And many of those other companies started around RCA. And the next generation of companies, too. For example, when I first started in business on my own in 1963, our first work was for RCA. And when I went down to work on that project my job was to help design the overall structure of the architecture of the RCA software for a new product line.

Grad: Product software?

Schoenberg: System software. That product line became the Spectra but at the time it was not the Spectra. It was called the 280 series. There were two other people on the project. One was Larry something or other from ADR. He eventually went to work for another company. The second guy was Warren Spalding.

Johnson: When you said you started on your own, you mean when you started AGS?

Schoenberg: This was a predecessor to AGS. [It was called Automation Sciences]

Grad: Do you consider that part of the AGS history or not?

Schoenberg: No. It's a part of my personal history. So that was some of the background for the start of the independent software product business. Because out of that group, out of the result of our developing of this basic structure, was a contract that went to ADR for Autoflow. That was an RCA-funded project.

Grad: Marty said RCA never actually came through with the money.

Schoenberg: That could be.

Johnson: That's why they converted it to run on other hardware.

Schoenberg: My memory of it is slightly different. I remember at one point someone -- I don't know who it was, but it wasn't Marty.

Grad: He said they had bid $25,000.

Schoenberg: I remember the bid because I received the bid.

Grad: Oh, is that right?

Schoenberg: And the fellow who had to decide on the bid at RCA was a fellow named Boyd Friedman.

Grad: Were there any software products prior to that?

Schoenberg: I don't know.

Johnson: Was that the first real software product?

Schoenberg: I don't know. I'd have to think about that. But what I remember is that what happened is they wanted to build Autoflow and RCA was paying for it. At some point in this process, my memory is, a dispute arose as to the rights to resell it. ADR apparently at that time had come to realize it could be resold. RCA refused to allow them to do it. As a result ADR withdrew from the project and a new project to replace Autoflow went to NCA [National Computer Analysts]. That company's gone today. But RCA eventually came out with an Autoflow-like product with another name.

Grad: Marty said he marketed it to the RCA 501 users directly.

Schoenberg: But this would have been to the Spectra users. And so NCA got the contract. Now, I may have been very peripheral to it, but my memory was that it was a dispute over ownership. RCA refused to allow ADR to market it and ADR refused to deliver that software and kept it. I don't doubt that RCA never paid for it because they wanted to own it.

Johnson: They never got it.

Grad: So the best you can tell is that was the first software product other than those from IBM.

Schoenberg: And also I think C-E-I-R had a linear programming product.

Grad: They did on the 704.

Schoenberg: In fact, didn't they have SIMSCRIPT?

Grad: That had a simulation program, but not SIMSCRIPT. That was later.

Schoenberg: Both GE in Hanford and DuPont in Wilmington had report writers. They were really closer to an application generator.

Grad: [Dan] McCracken was out there in Hanford at GE at the time.

Schoenberg: I don't know if they ever sold it to anyone. I studied it for IBM on the basis of its possibly becoming an IBM product.

Grad: We saw Hugh Williams yesterday. We had lunch with him and chatted with him for a while. Tom Glans was also at lunch yesterday.

Schoenberg: Well, good. They were big buddies for a long time, Glans and Williams. There were three of them: Glans and Williams and [Roy] Goldfinger.

Grad: He died very young, in his early 30s. Hugh said he was not hired by you.

Schoenberg: No, Hugh would have been hired by Bill Burkhart. He was hired for the first training program. Frank Carnella was in that class. [Arthur Bisguier was also in that class and was at that time the US Chess Champion]

Grad: Yes, and Ted Climis.

Schoenberg: Bill Crowley was in that class. Well, those are the more notable people.

Grad: This is all 1956.

Schoenberg: This is 1956.

Grad: This was the group of people coming into IBM at that point.

Systems Software Development by Software Companies

Schoenberg: Anyway, there was a lot of systems software work going on.

Grad: IBM was distributing systems software to customers from Fortran on, from Autocoder on. They were giving away these programs.

Johnson: So you're saying that there were a lot of companies out there, but what they were doing was systems software work for the manufacturers.

Grad: Or in some cases for users. Kodak bought some systems software directly. Because I remember they wouldn't trust anybody.

Johnson: But that couldn't have been a very large segment.

Grad: Well, it wasn't. But CUC was a good size business by the late 1960s.

Schoenberg: I worked at CSC in 1961 to 1963 and we had over 100 people by that point.

Grad: Computer Usage was a bigger company then.

Schoenberg: Ascher Opler was there. This was a time when there was a tremendous number of new computers introduced. Once Philco introduced the Transac in 1957, you had a tremendous influx of small companies that no one even thinks about today. And they all needed systems software. I mean, there were people who just did assemblers.

Grad: You're saying operating systems weren't really a big thing.

Schoenberg: No, operating systems didn't exist.

Grad: But you needed something other than an assembler. You needed an Autocoder.

Schoenberg: You had other people doing the sorts. Sort was the biggest thing under the sun. You had the people doing assemblers, just assemblers. There weren't many people doing high level languages.

Grad: Well, Fortran was the first. And then IBM did Comtran.

Schoenberg: Yes, but they were all done internally. You had B-0 at Univac.

Grad: Anyway, your professional services companies got most of their business from government work and developing systems software.

Schoenberg: Right.

Grad: Was there any significant scientific work?

Schoenberg: I think there was. But it probably was highly related to the government side.

Demand for Application Programs Created by System 360

Grad: Were there any significant application programs?

Schoenberg: My memory is that application development came in after the S/360. Because what happened is we had all the conversion work. First of all, remember when the S/360 first came out they did not make very clear how you were going to run all the programs. At Computer Sciences we did a tremendous amount of development of simulators. We put in tremendous bids on conversion of programs to run on the S/360. I remember putting in a bid to Bache, for example, to convert all their programs.

Johnson: Which were in what?

Schoenberg: They were written at the time in Autocoder. And we never got a single one of those contracts to the best of my knowledge. Whether it was because the costs were ridiculous...

Grad: Or the emulators took their place.

Schoenberg: They didn't have emulators -- simulators.

Grad: But IBM came up with emulators.

Schoenberg: Eventually.

Grad: No, I think it was delivered with the machines in 1966, 1965.

Schoenberg: Well, the emulators they had weren't any good for these applications. Was the first one for the 1401?

Grad: Probably a 1401.

Schoenberg: Whatever it was. There wasn't a lot of 1401 code. It was mainly report writer code.

Grad: Weren't there a lot of conversions from the 7080?

Schoenberg: Well, that was my world. So, I knew a lot more of it. I'll give you an example. I remember some of the numbers. I remember that at the time it was costing four dollars per instruction to write a Cobol program. And we priced the conversion at a dollar per line of code. Now, of course, at the time professional services were probably going for $80 a day. Something like that.

Grad: Probably a tenth of what we're talking about today, a fifth.

Schoenberg: I remember at AGS in 1968, because I came across it not that long ago, our average billing rate was $96 a day.

Grad: Well, that's 18 years ago.

Schoenberg: Of course, we're talking about five years before that. I know at several points during the intervening years, I looked at the average cost per line of code and I found that the average cost per line of code had risen but not, of course, nearly as fast as inflation because you had some improvement to it. But when I attempted to adjust it for inflation, I found that a line of code still costs something between 20% and 50% of what writing a line of code cost then in comparable dollars. So all the improvement in tools in 20 years didn't produce much cost reduction.

Grad: I'm using figures like six bucks and hour, ten bucks an hour.

Schoenberg: Today.

Grad: Yes. Depends on how complex the code is and what language was used.

Schoenberg: So, I mean, even if you adjusted that ten for one, Burt, it doesn't have a dramatic impact. So I would say you had a 75% reduction in cost. Much less than people have been talking about.

Grad: Well, I think that's what we were saying, that the tools that had come about were not making the dramatic difference that was expected.

Schoenberg: I remember when Informatics came out with Mark IV and another company that's no longer in existence had a similar product. I don't remember the name. It was sort of a quasi-government organization. Anyway, we were bidding against them on fixed fee commercial business where they were using these report writers. And they'd come in and make a big presentation about how much money you'd save. Then they'd put in their price. And their price was higher than ours.

Grad: Was the company Comress?

Schoenberg: No, I wasn't thinking of Comress. Comress is another interesting story because there's a whole different area. Comress started as a very different kind of software product business. Those guys came out of Univac if I remember right. I wouldn't be surprised if they also came from Aries. I believe the Aries people came from Univac.

Early Service Bureau Companies

Grad: Okay, so we have a sequence. There were service bureau companies, processing services type operations. That would be the earliest ones on up to ADP.

Schoenberg: Yes, but they weren't really originally in computer services. They were performing manual accounting services.

Grad: Right. The service bureaus were in business with punched cards in the 1950s.

Schoenberg: Well, IBM provided services to the census bureau before we were born. That was punched card stuff.

Grad: So I was trying to figure when the first computer service bureaus came into existence.

Schoenberg: Well, the one I remember was a New York firm that I believe was started and owned by Sperry Rand. One application I saw a lot of was market research statistical analysis stuff. We used to see a lot of that.

Grad: In 1960, I think ADAPSO was formed.

Schoenberg: Or 1961, something like that.

Grad: There were ten members or nine members.

Schoenberg: Yes.

Grad: ADP was one of those. SBC was one. I don't know who the other seven were. They were all service bureaus.

Apparently, in parallel in the mid-1950s, the professional services business starts up with people doing special programming, systems programming.

Schoenberg: The first I ever heard of was C-E-I-R.

Early Software Products Companies

Grad: Okay. Also in the mid-1950s IBM and the other manufacturers are starting to put out package programs for free particularly for compilers and other systems programs like sort.

Schoenberg: And they started to have the equivalent of the IBM Type III programs. And they started to have some customer-written programs. Those go back into the 1950s.

Grad: Some of the 650 programs and others were done on a joint basis. Guide or Share starts to come into existence somewhere along there.

Schoenberg: Share was started in 1955, I think.

Grad: Share was first. I'm into the 1960s, Larry. Some independent products are now starting to evolve by 1963, 1964.

Schoenberg: I remember SCERT was a very early one.

Grad: SCERT couldn't have been much before 1965, 1966.

Schoenberg: SCERT could not have been later than 1963.

Grad: That was strictly a performance analysis type program where you put in parameters and it would tell you what was going to happen.

Marty says that 1965 is when Autoflow was released. Was there anybody besides ADR who was in the software products business to your recollection in the 1960s? CACI brought out SIMSCRIPT in the mid-1960s. C-E-I-R had the LP code. Haverly was out with their LP codes around then.

Schoenberg: Well, when were the first sort programs? Marty had the patent on it, but Marty had the patent on it through Dave Ferguson I think.

Grad: He brought Programmatics. But that's the late 1960s.

Schoenberg: CSC developed many systems programs for Univac. They had the B series. So they had this whole set of separate systems software. They were selling compilers almost off the shelf. They were selling assemblers.

Grad: To whom?

Schoenberg: To small manufacturers. There was a whole stream of little manufacturers.

Grad: I've been viewing sales to end users as the basis for the software products business. That may be incorrect. I'm not viewing it as a program written for a manufacturer who in turn distributed it for free. Manufacturers were not charging for those packages.

Schoenberg: That's correct.

Grad: So it was just really another way of providing professional services.

Schoenberg: It may have been a part of a government contract. Because some of the people they wrote assemblers for were not companies that ever produced equipment.

Grad: We're defining the beginning of the software products business in terms of what?

Schoenberg: End user software?

Grad: Being sold to an end user. You are talking about a convenient way to develop the product for a manufacturer.

Schoenberg: Then you would say the system software companies are still not in the software business.

Grad: But they're selling to end users.

Schoenberg: Well, then why aren't these other people selling to end users in the same sense?

Grad: Well, they were selling to a manufacturer who gave it away for free. It got to the end user by way of the manufacturer who gave it away for nothing.

Schoenberg: So your question is resale. That's your definition of an end user. End user is someone who does not sell it.

Grad: But the manufacturers were. They were giving it away. Maybe it's an arbitrary distinction. We don't believe there was a significant software package business prior to unbundling.

Schoenberg: I've heard that said by everyone in the industry. I suspect that's as much nonsense as most other statements. Obviously there wasn't much of a business but it didn't change because of some flash of light. It's just that there were all kinds of trends that were simply producing areas of growth. Because it was a long time after unbundling before anyone could have recognized that that there was product business per se. Now, remember, ADR had products before unbundling. In fact, one of their arguments always was we can't sell the thing because they're giving it away.

Grad: What Marty says is that he was building other products. He was starting to build MetaCobol. He was building Roscoe and Librarian.

Schoenberg: But Marty had Autoflow.

Grad: Autoflow was the one that he had. And Programmatics had the sort program.

Schoenberg: I think that's right.

Grad: But there weren't a number of companies at that point that were offering products for sale to end users.

Schoenberg: Well, I don't know. I mean, I'm sure there weren't a lot of companies.

Grad: MSA probably existed with the accounting packages.

Schoenberg: No, MSA did not start then.

Grad: The old MSA went bankrupt.

Schoenberg: Yeah, I remember the old MSA.

Grad: They must have been in existence before 1969.

Schoenberg: Oh, before 1969. You can always tell when these companies start. There were stock promotions. So it had to be 1967 to 1968. All companies like that were all 1967, 1968 companies. I'll bet you that happened more because of the availability of easy public money in 1967 and 1968 than ever happened when IBM unbundled. You can say that the two maybe were related in some way.

Grad: Unbundling wasn't known until June of 1969.

Schoenberg: June of 1969 was the end of the market. In fact somewhere between June and August 1969 was the absolute end of the public market.

Grad: Was that because the recession hit? Or was that because of the IBM announcement?

Schoenberg: Well, the market disappeared so probably it was recession related. But I don't know which exactly.

Grad: There were arguments that companies took advantage. There was all kind of water on the books.

Schoenberg: Well, look at MSA. In essence, MSA came out of bankruptcy court taking over a set of assets which probably were of little value to anyone else but clearly were of a lot of value to them. They got a lot of code for nothing. MSA was an attempt to do all things at the same time. They didn't just enter the professional services business. They wanted to do everything.

Grad: They had accounting packages.

Schoenberg: They had everything. They were in everything. There were other companies. There were a whole group of people who spun off from CAI, a whole group of companies. Of the ones that are left in some form or another you have PMI which got acquired by Informatics. You had LAMBDA from the PMI people.

Grad: But PMI had no products at that point.

Schoenberg: No. All professional services. CAI was professional services.

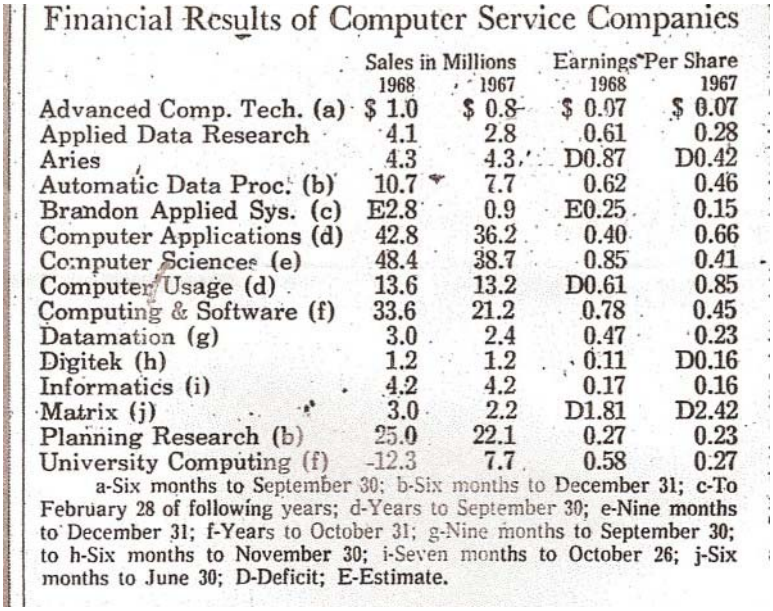
Grad: Well, my argument was going to be that during the 1960s the processing services business grew quite rapidly using computers and performing more and more services. Professional services had done quite well during the 1960s. We had some substantial companies by the end of the 1960s. A couple of companies were doing over $40 million in 1969.

Schoenberg: CAI would be the biggest company.

Professional Services Companies in the Late 1960's

Grad: CAI was $42 million. CSC was $48 million. Luanne researched hundreds of articles during that period of time, Larry.

Johnson: This table is from an article in *Barrons*, April 1969. [*Hands Schoenberg a copy of the table reproduced below.*]



Financial Results of Computer Service Companies

	Sales in Millions		Earnings Per Share	
	1968	1967	1968	1967
Advanced Comp. Tech. (a)	$ 1.0	$ 0.8	$ 0.07	$ 0.07
Applied Data Research	4.1	2.8	0.61	0.28
Aries	4.3	4.3	D0.87	D0.42
Automatic Data Proc. (b)	10.7	7.7	0.62	0.46
Brandon Applied Sys. (c)	E2.8	0.9	E0.25	0.15
Computer Applications (d)	42.8	36.2	0.40	0.66
Computer Sciences (e)	48.4	38.7	0.85	0.41
Computer Usage (d)	13.6	13.2	D0.61	0.85
Computing & Software (f)	33.6	21.2	0.78	0.45
Datamation (g)	3.0	2.4	0.47	0.23
Digitek (h)	1.2	1.2	0.11	D0.16
Informatics (i)	4.2	4.2	0.17	0.16
Matrix (j)	3.0	2.2	D1.81	D2.42
Planning Research (b)	25.0	22.1	0.27	0.23
University Computing (f)	-12.3	7.7	0.58	0.27

a-Six months to September 30; b-Six months to December 31; c-To February 28 of following years; d-Years to September 30; e-Nine months to December 31; f-Years to October 31; g-Nine months to September 30; to h-Six months to November 30; i-Seven months to October 26; j-Six months to June 30; D-Deficit; E-Estimate.

Schoenberg: It mentions Dick Brandon. He went to his grave cursing me. I sent him a letter after their stock went down to two cents a share. He had always told me his goal was to pass Computer Applications. At the time it went to two cents a share, theirs was down to zero. I said, “Dick, you finally achieved your goal.” Actually now, Dick Brandon, was a very important person in this industry. Dick Brandon left IBM in probably 1957 or 1958 after working there for about four months in software.

Grad: Is that right?

Schoenberg: Brandon really was a dynamic person of the first order. Dick went to form a programming group and later got Roy Goldfinger to join him. Dick started that in the 1950s. It's got to be one of the earliest ones. Then Dick went to do the same thing for John Diebold. I don't know when but I guess 1961, 1962.

That reminds me of some other guys. All those guys who started up little businesses like that. Many were mainly scientific. Why can't we find some of these people? This article might even trigger some of their memories.

Johnson: There are some other names. They're not all familiar.

Schoenberg: Computing and Software was the company I was trying to think of earlier. Norman Friedman was the head of that. There's only one company here I don't know. I don't know what Matrix was.

Grad: They did work for the government.

Schoenberg: Digitek was the company that was doing Fortran compilers. They were doing the cheapo Fortran compilers. Datamation?

Johnson: Datamation Services.

Schoenberg: I remember the company. There were two guys.

Grad: It wasn't related to *Datamation* magazine?

Schoenberg: No. I don't remember their names anymore.

Grad: The point I was trying to get at is that by the end of the 1960s, you have a substantial number of professional services firms with reasonable revenue numbers.

Schoenberg: But take the companies that are there. You have Computer Sciences, Computer Applications, Computing and Software. But with Computer Applications, a big chunk of the revenue came from NASA, facility management and that sort of activity.

Grad: Was Computer Sciences in government business by then? I just don't remember.

Schoenberg: They almost had to have been.

Grad: They hired John Luke from IBM. They had to have already been big.

Let me refocus you, Larry. There were two subjects I wanted to make sure you looked at. One is the transition that took place from professional services into software products. There seems to have been a number of companies who turned themselves from one to another.

Schoenberg: I think that's exactly what happened.

Grad: ADR is a perfect example.

Schoenberg: ADR is the best example.

Grad: I can't think of any others of the significant companies.

Schoenberg: Well, I think Comress is another one. I think that they were professional services to start with.

Grad: But the major firms today like Pansophic didn't come that way.

Schoenberg: You could say that MSA did. I don't know.

Grad: I was going to argue the following: unbundling opened the door and then a bunch of people came in. And you bothered me by saying that there was no financial market. Where did they get their money from to start up these companies then?

Schoenberg: I have doubts. That, I suspect, is one of these after-the-fact rationalizations.

[Refers to the *Worldwide Directory of Computer Companies.*] This list divides the line of the bankrupt companies. Because this is the year in which a tremendous number of them ended. It says 1973, 1974. But the chances are it's 1971 data.

Grad: Was this directory published for other years?

Schoenberg: I don't think it was ever published again.

Grad: I see. It went bankrupt, too.

Johnson: Was it published by McGraw Hill?

Schoenberg: No, by Academic Media. I never heard of it. I have a feeling that this is what I was left by Dick Brandon. I'm probably the only person in the world who has a copy of this book. It says it's a complete revision of the 1970 *World Directory of Computer Companies* implying that there was a 1970 one.

Grad: The Charles Babbage Institute may have copies of them.

Impact of IBM Unbundling on the Software Product Market

Johnson: So, you really don't think that unbundling had that much to do with software product companies growth?

Schoenberg: Oh, look. I mean, clearly it was a highly encouraging event. But I have doubts that many decisions were predicated on it. First of all, I really do think there was a lot more software product development on the systems side going on at the time.

Grad: Being sold to the manufacturers.

Schoenberg: That's right, because the manufacturers were unable to do it. As you look at the early software products companies, that's the environment they came out of. Nobody could make or build a business based on applications. Maybe there were programs like Crosstabs. One of the big advertising agencies in New York had a product that they were selling. Those are the kind of applications that had a generalized use. Who the heck was using computers? It had to be somebody who put through a lot of data. So it was market research, the census bureau. I bet you would find that there was somebody selling something for analysis of census bureau information. But I wouldn't know who they were.

Grad: So you're saying that there must have been some companies around but on a size basis they had to be very small.

Schoenberg: You know what might be interesting. I wonder if the old Yellow Pages are available. You could look to see what kind of information services were being offered by companies. The public library may have those things on microfiche.

Johnson: I don't know. It wasn't that long ago that they even knew what section to list those companies under. I was trying to look for the earliest pure applications package.

Schoenberg: What does pure mean to you? Commercial?

Grad: Accounting packages, payroll packages, personnel packages. IBM was offering in 1967, 1968, probably a thousand programs we would deliver to you for free.

Schoenberg: Sure.

Grad: For all these different machines doing all kinds of functions.

Schoenberg: Did anyone ever use them?

Grad: Oh, yes, lots were installed and used. But I don't remember anything being sold during that period. Everyone sort of viewed it as a service, an exchange service. That's what sticks in my mind, Larry.

Schoenberg: Well, sure. And the reason they did it was because nobody believed anyone would pay for it.

Grad: Therefore, as soon as IBM said you've got to pay for it, that legitimizes the whole thing, Larry.

Schoenberg: It changed the mental set. No question about changing the mental set. I told you my belief about its impact on education.

Grad: It's my view that the creation of all the software products companies pretty much comes about after the IBM unbundling.

Schoenberg: Sure, that's true. It's a fact. You're trying to say that unbundling caused it.

Grad: Yes, I'm saying that it caused it. You were going to say something, Luanne.

Johnson: I was trying to get back to when Alltax started.

Schoenberg: All right. I remember Conway very well.

Johnson: When I started Argonaut Information Systems in 1971, one of the first decisions I made was that rather than support the tax routines, I was going to provide links so that my

customers could use Alltax. I got frantic calls from some of my customers because Alltax was involved in a legal dispute. He ended up selling to MSA. My customers said, “Don't do that to us. We don't want to be dependent on Alltax.” So I made the decision to stay with our own tax routines and provide the support which turned out to be a good decision in the long run. But he had obviously been around for a couple of years by 1971, because the basis for my decision to switch over to Alltax was that he was established.

Grad: Where can we find a list of software product companies prior to 1968? I think when we find it, it's going to prove my point because there were so few products prior to 1968.

Schoenberg: Of course, it's going to tell you there were very few products before 1968, but it doesn’t prove that unbundling was the defining event. It's also true of professional services.

Grad: No, no, no. Not professional services.

Schoenberg: How about time-sharing? You going to prove time-sharing was connected to it too? There was no time-sharing before?

Grad: No, because that was a technological thing.

Schoenberg: I'm telling you there was no market. There was nobody out there using these kind of applications.

Grad: There was a market out there, but they were getting the products for free, Larry. They were certainly using systems programs like crazy.

Schoenberg: Burt, I’m telling that you even assemblers, even sort programs, people were writing their own. All right, yes, there were a lot of people using the ones from IBM. But there were plenty of these programs being written by individual companies, plenty of them.

Grad: He's rejected all my conclusions. I guess that’s the end of the interview.

Johnson: Larry, let's talk about your views of the impact of unbundling on education.

Schoenberg: I mean, let's face it. It must be true that unbundling would create an opportunity for products. I mean, that's patently obvious.

Grad: Yes.

Schoenberg: So who can deny it? The question is: was that recognized at the time? And was it what triggered it? We know it created the opportunity. What we don't know is how many people recognized it that way as opposed to people who got there as a natural outgrowth of other things they were doing. Every schmuck I've ever known in this business has said to me, “How come you fellows haven't figured out how to pull out parts of your code and reuse them?” They weren't even thinking about products.

Grad: No, they were thinking about reuse.

Schoenberg: They were thinking about reuse. So anybody who wrote code had to think about reuse.

Grad: But the whole mental set was different.

Schoenberg: You can ask Marty Goetz. Try to find more out about the history of Autoflow. Because if my perception is right, then my argument is closer to supporting you. Because if, in fact, the reason why RCA didn't end up with it is because ADR wanted to maintain the rights to it, that was a very sophisticated concept at the time.

Grad: I think it was.

Schoenberg: That's my memory of it. I must admit.

Grad: Well, the mechanics of how it got there isn't the issue.

Schoenberg: Oh, yes, it is. There's a big difference if a person thought that that was his motive.

Grad: I see. If they did it consciously.

Schoenberg: Right. That's a big difference. To give up $25,000, which was the price, $25,000 revenue in those days on an argument as to exclusive ownership rights would have seemed a little crazy. I was really amazed.

Impact of IBM Unbundling on the Professional Services Market

Grad: Okay. I'd like to talk about professional services, what happened to them after IBM started to price its services. My original reaction was as soon as IBM started to charge for its systems engineers that that opened up the door to professional services.

Schoenberg: Well, you didn't have a helluva lot of effect. There was a set of customers for whom IBM did free programming. But I don't know what percentage of the customers it was. I suspect it wasn't large. And since it was clearly done in a marketing perceived environment whether or not it was really marketing, clearly the guy who squawked the loudest, the guy who was a more key account, the guy who had applications they were interested in got more. So it still left a lot of people who were not able to get their programming done by IBM. And the idea that it was free, I don't know how overwhelming an issue that was. It was an opportunity, of course, just as it is today.

Grad: Were there professional services companies in the late 1960s doing significant application programming for customers? That's my question.

Schoenberg: In the late 1960s?

Grad: 1967, 1968, 1969.

Schoenberg: They had better be because they weren't doing anything else. The systems programming thing ended pretty much in that era. I mean, what the heck else was there? At AGS, we didn't do any systems program support.

Grad: You started writing programs in the applications area?

Schoenberg: Well yes, with just a few exceptions.

Grad: How about SDA, CGA, companies like that?

Schoenberg: I don't know about CGA. I know SDA's history. Same thing.

Grad: They were into applications programs?

Schoenberg: They were into applications; they were doing the same thing.

Grad: So the programming of applications was a significant business by the late 1960s.

Schoenberg: They were back office applications. They were for big companies that were in the big cities.

Grad: Batch applications essentially.

Schoenberg: Batch. Actually, our first big one here at AGS was not batch at all. It was an online system for U.S. Lines for container control.

Grad: IBM equipment?

Schoenberg: It was all IBM. It was small stuff.

Grad: It was on a mainframe though, a S/360?

Schoenberg: Well, you've got to remember that the terminals were local. So they probably didn't have their own computer.

Grad: So you built the communications interface yourself. BTAM was used?

Schoenberg: Yeah, BTAM.

Grad: Basic terminal access.

Schoenberg: Exactly.

Grad: So that's where you used your interface. You actually wrote the code.

Schoenberg: Oh, sure. I remember designing this table driven little system. I remember the first one I did was for what you might call the batch functions although it was online. And then one day the guy said to me, “How about doing inquiry?” I said, “That's an interesting idea.” I told him I thought it would take me about two months. That night I sat down and realized it was all there. There was nothing to it.

Johnson: Did you charge him for two months?

Schoenberg: I gave it to him the next day and that's what happened. He asked us to stay on the project for a couple more months.

Grad: That's terrific. So, at that point professional services companies were doing a lot of application code.

Schoenberg: You know the only systems programming work that was around? IBM started to give out the maintenance of the compilers at that time. There was a lot of that stuff going out.

Grad: TSS was out at that time. That was a helluva big contract for a couple of companies. CUC worked on that.

Schoenberg: Yes, a lot of people. Informatics worked on that too.

Grad: Some big contracts there.

Schoenberg: Yes, that's right for that one particular one. I don't know too many others.

Grad: They had no way to do it in-house. They didn't have the skills.

Schoenberg: Almost all of the compilers, Fortran, Cobol.

Grad: Those were in-house. They were doing that in the Time Life Building.

Schoenberg: Yes, but the maintenance was given out.

Grad: OK, so IBM started charging for SEs. They created a professional services group called CCS, Custom Contract Services. Cecil Webb headed that up. My view was that those changes provided the opportunity for further growth for the professional services companies. Your argument was a very different one. Could you describe that to me?

Schoenberg: Well, in the first place the attitude of the companies in the business at the time was not that this was an opportunity. There was actually tremendous fear.

Grad: Why?

Schoenberg: Because nobody knew how aggressive and how comprehensive IBM's efforts to recapture their customers in this area would be. So there was a tremendous fear that the business that we then had would disappear. Remember, a good part of that business came to us when the customers truly needed systems engineering support since they needed to know DOS.

Grad: Well, I never knew that.

Schoenberg: So everybody hired someone from IBM so they had DOS support. A lot of it really started from the very traditional systems engineering approach – operating system knowledge, knowledge of compilers, things of that sort. You also had all this conversion work. You still had a tremendous amount of conversion work going on. You had to start at the conversion level. These were projects where we could see why IBM might want to recapture the business. I don't think most of us were as concerned about what you might call new applications development. It was more the tie to the past. Conversion, compilers, systems engineering support. I don't think that this whole concept of thinking of vertical markets or applications, that was not an idea that was prevalent.

Grad: We were. In IBM we were thinking that way.

Schoenberg: You could afford to. We had to earn our keep.

Grad: As a matter of fact, one of the things that we haven't mentioned yet was that IBM assumed, in the analysis done by the unbundling task force, that one-half of the application programming was going to be produced by non-IBM companies, by third parties. And we were depending on that, because we weren't staffing to provide enough applications coders to cover the requirements.

Schoenberg: When was the time that Vin Learson got up and made this incredible statement about how they were going to get rid of the programmer in five years. When was that?

Grad: That's got to be 1968, 1969 timeframe. It was stupid. All of us said that he didn't know what he was talking about.

Schoenberg: Well, it scared the wits out of everyone. Not that we believed it, but we wondered what the effect would be if we started to believe it.

Grad: Okay. Now, the recession hits in late 1969, early 1970.

Impact of IBM Unbundling on Computer Training

Schoenberg: Education is interesting to me for two reasons. Number one, I always felt that the reason why there was a shortage of trained people is related to comments like Learson's. We would talk to many directors of information processing at the time, and they would tell us that, yes, there was this immediate shortage. But we have all these new tools coming out. The function is going to be performed, but it's not going to be performed by a programmer. The end user's going to write the code.

Johnson: This was in the late 1960s, right?

Schoenberg: Well, I think it's been going on pretty much ever since. So what happened was if you were a large company and someone portrayed this to your top management, their response would be to perceive the programmer shortage problem as a short-term problem. Naturally, as long as you think of the problem as a short-term problem, it's going to be a long-term problem because no one's solving it. Doesn't it seem awfully odd? When management perceives a shortage, it always seems to be 50,000 people. Since the average training program is three to six months, it wouldn't take very long to train that number of people. Why do we never get there? And I think it's not that the demand keeps increasing faster than we train, it's that nobody really trains consistently with [the objective of] making up that gap. And that's because they always think it's a short-term problem.

Today you can still sit out there and hear, why buy the training program? A year and a half ago *Computerworld* had an article on the front page which shows this chart of the number of people entering a computer science curriculum and the demand in the field. Well, in the first place it was stupid because there's no connection between the number of people entering the field and the number of people entering the curriculum. There's just no connection. But even if there was, it again conveyed the sense that it's a short-term problem. And there's no surer thing than making the problem long term, than if you think it's short term.

I always felt that if 50 of the largest companies got together and said, "This is a long-term problem, we are going to start a school," the problem would be over. Then they would be proven to be fools. Because in two years it would no longer be a long-term problem. And they'd say, "See how stupid you were." But it was only because they did that, that the problem was solved. So they can't do it even if they know it's true, because they're going to look like a fool either way. So you know they'll never do it.

Grad: That's what we've got to explain to the analysts.

Schoenberg: I think there was an old Greek who would have liked this. He had some problems similar to this.

Grad: Okay, what happens now with the IBM announcement?

Schoenberg: What happened with the IBM announcement is IBM told people what they were going to do. But if I remember right the unbundling took place in the first half of the year.

Grad: June of 1969.

Schoenberg: Everything led up to that. So in June of 1969 companies suddenly discovered that they were going to have to pay for services. They didn't have money in the budgets. So they stopped training, all training. At that time if you knew someone who was a lost soul who was looking for a job, where did you send them? You sent them to the insurance company, the bank. They got a job as a programmer. They got paid a great deal.

Johnson: As a programmer trainee.

Schoenberg: But unbundling is the end of story. Companies dropped training. They had no money in the budgets. They didn't spend for the training.

Grad: You raise an issue. By then, didn't most companies train their own people on how to use IBM equipment? Didn't they have their own training staffs, their own training programs?

Schoenberg: To the best of my knowledge no one had their own training programs. I never heard of them. I think the confusion might be, yes, they did their own training in that they paid for it. They paid for it because these people were on their payroll. Remember another thing that happened. Remember the first big surge was companies went out and got the greatest people in the country. The second thing that happened is they all went out and formed software companies.

Grad: The third thing that happened is they hired dummies.

Schoenberg: Exactly right. Do you know that less than ten years ago we had a major bank in New York that told us when we were selecting the people for their entry level training program that they purposely did not choose the best people because they were going to lose them. That's when they started to go to doing all their training inside. So not only did these companies stop training new people from the outside, they made another decision at the same time. They made the decision that they would retrain their own clerks and IBM supported it. IBM said, “Oh, sure. We'll help you select those people.” So in addition to not training new competent people, they probably trained a whole class of incompetent people. So you had a poor quality of people being trained and many fewer people being trained. And then, pow, along came the recession starting in the fall of 1969.

Impact of the Early 1970s Recession on the Software Industry

Grad: Is that where the recession begins?

Schoenberg: Well, I know this. The stock market growth ended in the summer of 1969. I don't remember that it was a recession. But certainly by the end of 1969 we were in a recession.

Grad: Which says to companies to cut back further.

Schoenberg: Cut back. And it was 1972 before we started to come out of the recession.

Grad: These were the two years in which Buck Rogers, who was the President of DPD [Data Processing Division] at that time, had a zero NPRI [net product revenue increase] for the first time.

Schoenberg: 1970 would probably be the year.

Grad: One of those two years they got an NPRI of zero. The next year was also bad. The two years were very poor and that cost Buck Rogers his job.

Schoenberg: So what a set of circumstances. A perception of a short-term problem, a sudden increase in cost no one's prepared for. A change in perception of the kind of person who should be hired. And a recession that falls on top of it.

Grad: Now, what happens to the professional services companies in 1969, 1970 and 1971? What takes place?

Schoenberg: Well, many of them disappear. Take CAI as an example. Here was the leading company. What happened to CAI? CAI thought they could do other work. The market turned bad. They thought they had all this reusable code. I don't honestly remember that they were thinking about software products. But I certainly remember the famous Speedata. They were busted by going into another business. The company that I had started [prior to AGS] went bust a couple of years later for a different reason. I was already gone. But they got the rights to market a Japanese computer. In other words, everyone thought the grass was greener somewhere outside. They saw all these other possibilities. They reached for them. They spent huge sums of money. The investment bankers were the same, whatever they are, then as they are now. And they told them no problem. Money is available. And they spent it. Then the investment banker was gone before they were. End of story. So if you went to the companies, all the ones that went down, you'll find they tried other businesses. I do not know of a true failure of a professional services company.

Grad: The ones that stayed in that business.

Schoenberg: That's right. But volume went down. It was a tougher business.

Grad: It had to really run tight.

Schoenberg: But nobody was in the business. By that time everybody was in everything else.

Grad: When does it start to open up again?

Schoenberg: Well, it opened up in 1972 in some markets. But it was really 1973. Then remember 1975 and 1976 there was a blue collar recession in this country, if I remember right. It did not affect the white collar worker. It was a bad blue collar recession. You didn't have a heck of a big window. Everyone was just trying to stay in business. You actually had the collapse of CAI. You should have had the collapse of CSC. The government just sort of kept it going. Computer Usage really did collapse.

Grad: It did collapse. They were down to a tiny company. A good part of the companies on this [*Barrons*] list don't exist anymore.

Schoenberg: Yes, ACT which was a company there and of course had some good years, after that went nowhere. Aries doesn't exist. ADR, of course, did well. Aries disappeared. Brandon disappeared. Computer Applications disappeared. Computer Science is still around. Computer Usage basically disappeared. Computing & Software still exists. It has a different name and it's not in the computer business anymore. The company still exists. Datamation Services doesn't exist. Digitek is gone. Informatics exists. Matrix, I don't know who it was.

Grad: Informatics doesn't really exist anymore in a sense.

Schoenberg: Planning Research exists. And University Computing exists.

Grad: Again, a very different company than it was before.

Schoenberg: Very different company. The only company on this list that one would say is in the same business is probably ACT.

Johnson: Not ADR?

Schoenberg: No, ADR is not in the same business.

Grad: How much of their business was professional services then and how much was product sales?

Schoenberg: I assumed all of it was professional services.

Grad: In 1969?

Schoenberg: In 1968. I would say it was all.

Grad: You say the Autoflow business was peanuts.

Schoenberg: It would have to be very small.

Grad: Were there any long term trends in the professional services area as a result of IBM's unbundling in terms of either pricing or other practices? I couldn't think of any.

Schoenberg: I can't remember.

Grad: IBM provided umbrella pricing to some extent on an hourly rate basis.

Schoenberg: Yes, they did, but they didn't really matter. IBM just didn't perceive that as a business.

Grad: The CCS thing was never significant.

Schoenberg: No.

Grad: So it really didn't effect much after that.

Schoenberg: No, it isn't the unbundling itself. It's just that IBM's selling more hardware created the opportunity. See, in some ways SBC did professional services. Now, I think they only did it to support sales volume [of their processing services]. But they may have done it independently.

Grad: But IBM got rid of SBC. When did they sell it to CDC? 1972? Selling to CDC was early. It's got to be. Because remember we had the debate of whether IBM could get back into the service bureau business when they started the information systems network.

Schoenberg: I guess you're right. But, in a way everybody sort of competed with SBC in some sense. SBC was a real competitor.

Future Trends

Grad: OK, let's look ahead from here now. What do you see in the way of trends looking forward? IBM's finally in the business fully. All software is priced including operating systems, everything today, right?

Schoenberg: They were always a competitor.

Grad: Yes. They always were, actually, within definitions. The pressures were to do it the other way. But as a practical matter the intention was to make money on everything. You didn't try to get any of your revenue, any of your profit out of the drag. The numbers on the drag were always so significant that if you were allowed to include them you could have priced this stuff at one third the prices we were charging. But there was a fairly honest line attempted.

Practically speaking, an awful lot of products lost money, particularly in the applications area. IBM was consistently unsuccessful except in the systems area. Marty was quoting numbers claiming that 60% of the total software products business was IBM's. But somehow that 60% doesn't give them the same kind of dominance that they had in the hardware when they were at the 60-70% level. For whatever reason, it doesn't set it up the same way as the hardware standard.

The question is going forward. Either in professional services or in software products, do you see dramatic changes in the environments or the way of doing business?

Schoenberg: Well, I don't like the word dramatic change. But it's hard for me to understand why some things haven't changed more than they have. Therefore, I still assume they will change.

Grad: What sort of things?

Schoenberg: Well, for example, I don't understand why some software is segregated from the hardware. Why it isn't physically packaged in with the hardware.

Grad: By the use of some kind of chips?

Schoenberg: There are some functions where it strikes me that would be appropriate, sort being one of the most obvious ones. There are so many of them that I don't understand why that hasn't happened today. I've always felt that more software would be incorporated in the hardware because of the economics of hardware versus labor cost. Part of the reason for putting functions in software was the theory it was cheaper. Now, do you really believe it's cheaper?

Grad: It's easier to maintain and change, Larry. Come on. I can't modify software if I've got to go inside the damn machine. Of course, the technology today of replacing a card is a helluva lot different than technology than we faced in the mainframes. We're not going to let Joe go into that machine and change a mainframe part.

Schoenberg: When we went to talk to IBM about being a distributor, we said we'd set up service locations. And they said why. They're throwing them away. Why aren't we throwing them away? I believe that the biggest thing that increased the software marketplace was the decrease in the price of the hardware more than anything else. I mean, decreasing the price of the hardware made opportunity. That and a kind of what they call in foreign countries infrastructure. You need a certain amount of infrastructure to be able to build things. You need a certain number of people who know something. So the combination of a tremendous decrease in price and a tremendous increase in what you might call the potential subculture or infrastructure made opportunities and continues to make opportunities.

If you want to look for changes now, I think the industry's got a problem nobody seems to face up to. Everybody talks about leverage. To me leverage is another way of saying commodity. You don't get leverage without commodity. When you've commodity, you're got margin problems. So everyone's going to have to choose between either being a very efficient purveyor of commodities. Or they have to change to be a value-added business. Value-added means it can't come off the shelf. There's no way.

Grad: The argument you made about the customization issue.

Schoenberg: Yes, so my attitude is you've got two choices. Either become the most efficient or become the highest value-added. Highest value-added will not be pure product, will not have leverage, will have high margins.

Grad: You've argued that as a distributor, you've really hit both sides to a certain extent.

Schoenberg: Well, we always are trying to hit both sides. Always trying to be an efficient provider at the same time we have a value-added service. So what does it mean? How are you going to provide value-added service? And what the hell does it mean? What else can it mean but integration? What else can it mean? Whether it means we integrate the hardware with the software, whether it means we integrate systems software with applications, whether it means we integrate a package with customization, whether it means we provide processing with it, I don't know. It could mean all those things. But system integration, whatever the word may mean, is what has to happen. We must keep raising the packaging to a customized level. My answer is you'll only make money as long as it is customized unless you are the most efficient provider. Now, the most efficient provider would seem to be IBM. So from my view IBM should dominate the commodity market.

Grad: Which they claim they're doing in the hardware area.

Schoenberg: And that forces everybody else to play to EDS. I think EDS understands the game. I tell everybody. Listen to that EDS tape from the ADAPSO conference. It tells you the whole game. The enemy in that tape is not software companies. It is not the government. It is IBM. That tape is directly aimed at IBM. That is the competitor that they are talking about. They're not talking about anybody else. Why, if you want a solution, would you buy hardware from IBM? That's what they're saying. And what they are really saying is, we can't compete with IBM on the hardware side. We can't compete in the commodities. So we keep upping the ante. We're the biggest player. We'll up that ante. We'll knock everyone else out. And then hopefully we can get margins. And if we don't, what was our choice?

Grad: One more question. With maybe the exception of Computer Associates, none of the significant mainframe software companies are a significant player in the micro software business.

Schoenberg: Right. Nor were any of the mainframe manufacturers significant players in the mini market. Nor were any mini manufacturers major players in the micro market.

Grad: I'm sorry. That's not a correct statement. IBM is now a major player in the micro market.

Schoenberg: Fine, okay. But it's a fair statement, right?

Grad: IBM has been a significant player in the mini market.

Schoenberg: Even if it's overstated, it's a fair statement.

Grad: Except for IBM, the fact that none of the others are is a correct statement.

Schoenberg: It's a fair statement. What does it say? It says that people who are successful in one business area are not mentally prepared to enter the next progression. I could present it

from my own company. What happened with the micro project management system? You're going to tell me we shouldn't have dominated that?

Grad: Of course.

Schoenberg: Of course, we should have dominated. We were unprepared. No matter how many times we discussed what to do it was not in their mental set. They couldn't figure out how they'd sell it. It changed the way they delivered the services. So they didn't do it.

Grad: In retrospect, obviously what they had to do was to sell it the way micro programs got sold.

Schoenberg: Of course.

Grad: Not through their own channel.

Schoenberg: Of course, of course. To view yourself not as a company that was there to support your sales force but as a company that was there to sell the product.

Grad: That's right.

Schoenberg: But that's the same thing you're talking about now. It's the same problem. It would have been absolutely predictable that a mainframe company would not be successful in the micro market. The problem is that that's not so terrifying as long as there's still a market for them. It would be all right not to go into the new as long as the old one still exists. The BUNCH companies may be in trouble, but they're in a happy trouble. I mean, we'd all like to be in a $7 billion a year trouble. So, I mean, they're in trouble all right, but they're not being put out of business. And I think that could easily happen to the mainframe software products businesses. They won't be put out of business but their whole future's being eaten up. The whole future lunch is gone.

Grad: One of the questions we asked Hugh [Williams] yesterday is did he think that the shape of the micro software business had been influenced by unbundling. He couldn't see any direct connections at all.

Schoenberg: Oh, not from unbundling. Well, I mean, even if it was, it was not clearly direct.

Grad: It wouldn't have been direct. But the fact is that it did shape the mainframe software business which in turn shaped the micro software business. He says that the micro software was not shaped by mainframe software.

Schoenberg: Well, I'll give you an argument of how it could be related. To the extent that unbundling said that we are not going to be totally vertically integrated, it created an atmosphere in which ultimately the micro world could exist. For example, as unlikely as it was

for IBM to do what it did with the PC, it would have been even more unlikely in a world prior to unbundling.

Grad: That's the same point he made. And he agreed from an environmental standpoint that to the extent that IBM had been doing it that way, it provided a framework.

Schoenberg: Right. And if they hadn't been doing it that way, it would not have provided a framework.

I guess the other thing you could argue is that the PC software world required a third party world. Now, the question is could we now demonstrate that the third party world in itself would not have really existed without unbundling. I don't know if we can argue that or not. But you might. For example, take the whole service side. Suppose you argued that part of the mental set which allowed the third party world to come in was the third party maintenance which clearly was created by unbundling. We haven't even talked about that. But from my memory, at the time, I don't remember focusing on the unbundling of education. I don't remember focusing on the software. I remember the equipment maintenance.

Grad: It was separately priced. My recollection was that it was part of the unbundling announcement.