Oral History of Jesse I. Aweida

Interviewed by:
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Recorded October 10, 2017
Superior, CO

Transcript edited by:
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CHM Reference number: X8364.2018

Gardner: This is Tom Gardner, representing the Computer History Museum at the offices of Aweida Venture Capital. We're here to interview Jesse I. Aweida, who has a long and distinguished career in storage products, particularly in tape. Jesse started as a young engineer at IBM in the '50s, rose to a product manager, which is a distinguished managerial position in IBM, and then founded Storage Technology Corporation, which he led into the '80s. Since then, he's been in venture capital and dabbling in golf. Jesse, tell us a little bit about your background. Where you grew up, how you decided to get into engineering.

Aweida: Well, I was born in Palestine in a small village called Rafidya, and when I was about one year old, my family moved from that little village into Haifa, which was a bigger town, and I grew up actually in Haifa, and I was there up until 1948 when, you know, that part of the world was always troublesome. There's always something going on. Fighting here and fighting there. It was not a peaceful place, but then in '48 I left there, left Haifa, went to the area where I was born. We have some relatives there. Then I said, yeah, I was looking for something to do, and I got to add that I was still in high school, just finishing high school. Then I got a job. Was kind of interesting how I applied for a job with Aramco, Arabian-American Oil Company in Saudi Arabia, and I was lucky I got the job to do office work. Course, I was 19 years old. Just was a great adventure. But before I get too far, let me just mention that my parents were born in the Jerusalem-Nablus area. My father was from Nablus. My mother is from the Jerusalem area, and so the family goes back many generations, who lived in that part of the world. I am one out of four sons. My parents have only four boys, no daughters, and I'm the youngest of my brothers. So in '48 with the fighting going on there [between the Israelis and the Palestinian Arabs], we all, all the young people, left. We went, my two oldest brothers, went to Egypt. My third brother went to Jordan. Then I went to the Nablus area. But my parents stayed in Haifa. They didn't leave there until they decide that their kids are not going to come back there. So they went to live in, again, near Nablus, where, the area where I was born. So anyway, then I, as I was saying, I got a job at the Aramco doing clerical work. It was very enjoyable. I mean, I didn't do much of anything. I was just in school, and they were looking for people who are maybe young and aggressive and willing to do, to work in that environment where they live out in the desert. It was really a desert. Where we were the temperature gets up to about 120 degrees -- but it was good paying job. While I was there, I met two young engineers, who were working at the oil company doing petroleum type engineering work, and it sounded like really exciting stuff they were doing. I said, "Yeah. I really should go out and study engineering." So I applied to several colleges here in the United States and I was lucky enough I got accepted by all of them. They're all around the Philadelphia area. Then I decided I'd like to go to Swarthmore. I liked it because it's a small college and it kind of appealed to me. So I got a visa. I came to go to college at Swarthmore. Now, the reason I applied for colleges around Philadelphia are because I have an uncle who was living in Philadelphia, and he suggested those colleges to me, and so I came and I went to Swarthmore. Swarthmore's a small liberal arts college, but they do have an engineering program. So I decided engineering at Swarthmore … Actually, I got on the Dean's List, and because of that I was able to get a scholarship. So the money I had saved to go to college was good enough for one year, not for four years. So I had to -- which I did. I worked summers and with scholarship and I was able to pay for my education. I think in my second year another student and I got into making and selling submarine sandwiches to the students there. That was

the thing we did, and it's funny. Anybody who was at the college at that time and, you know, some really very important people still remember the fact that they enjoyed those submarines sandwiches <laughs> we were making and selling. The college had a snack bar and they gave it every year as a scholarship to two students to run and any profit they make is theirs. But in my senior year, they gave it to me, because a year before that the two guys were not too good. They couldn't get along. They did not make any money, so they gave it to one person. They gave it to me to run. I ran it very well. I helped pay part of the tuition and ended up actually graduating with cash in my pocket, which was very, very nice. Now, at that time, when I was at Swarthmore, I met this young lady and then after graduation we got married. Her name is Maria, and we're still married, and so this what, 61 years since.[1]

Gardner: Congratulations. That's quite an accomplishment.

Aweida: Well, thank you. Thank you. <laughs> Yeah. And she helped me in that snack bar, we call that Cracker-room.

Gardner: So you were an entrepreneur even then.

Aweida: Well, you know, I guess I was looking <laughs> for ways to make a buck, I guess, at that time. Then I joined IBM. After graduating, IBM offered me a job at Poughkeepsie, Maria's major was History – she got a job teaching. We lived in New Paltz, New York. I was commuting to Poughkeepsie to go to my job and Maria's job was on the other side of the Hudson in Milton, New York. So we were there for quite a while. Then we moved from New Paltz to Poughkeepsie, and we rented a place. Then we bought a house near where IBM was in Poughkeepsie. Let's see. I guess with time, we had four kids. Then we had one more, so five. Four in four years and then many years later we had the fifth one, and so we have five children right now, and we currently have 11 grandchildren. They're all growing up fast, you know. So at IBM, my first job was to do some mechanical work. I should backtrack little bit. At IBM, they're really hiring a lot of people because they're trying to kind of expand the operation.

Gardner: Let me back up a little bit further and just ask how'd you decided to get into mechanical engineering as opposed to other engineering choices? You started thinking petroleum, obviously, from the folks you met at Aramco.
[00:10:00]

Aweida: You know, that's a good question. Swarthmore is a small college with a small Engineering Department, the students studied either mechanical, electrical or civil. We studied the same classes for the first year or two. Then after that, you specialize, and somehow I didn't think that I wanted to do civil. Maybe I was thinking about petroleum, working for an oil company, and the nearest to that was

[1] [Editor's note] Items donated by Jesse I. Aweida have been received by the Computer History Museum under the lot number X8478.2018.

mechanical engineering, and that's maybe why I kind of focused on that. But again, it was very, you know, again, in a small college like that, you take the same classes everybody else takes -- if you're taking physics course, you take a physics class, with the Physics majors. Chemistry, likewise, with the Chemistry majors. You take class in economics with the Economics majors. They didn't have special classes for engineers. You got to be with everybody else. That's same thing in the Engineering School. You take the classes no matter what your discipline is, you take the same class until you specialize.

Gardner: So I interrupted you. You were talking about how IBM hired engineers in Poughkeepsie in that time period.

...

Aweida: Not only IBM, -- companies used to come to campus to interview students who are graduating -- I'm talking now about 1956, and somehow any graduate had multiple offers to choose from. Maybe things stayed that way for a long time. Maybe is still is that way, but at least it was that way at the time. So I had offers with different companies as well. I know Westinghouse offered me a job. A couple of other ones too. The way I decided on IBM, I kind of liked the computer business. I tried to get a job in an oil field but that wasn't really quite fit what I was looking for, so I didn't do it. So I took the job at IBM and we moved to Poughkeepsie, and one of the first assignments I had was low voltage contacts. If you remember, that was a time when transistorized computers were becoming popular. Up until that were tubes. Transistors have very low power and the lot of contacts you have on boards and in those machines and if the contacts failed, don't make a good contact, you have an open circuit, and the circuit doesn't work. So very often, if you remember, probably we all did that at home for the TV or for the radio, you bang it. So that if it stops working, you bang it, it will start to go again. That's what you're doing is making that contact make better contact. So that was my job. But how to? What do we have to do? And, you know, it was-- I did a lot of research. As a matter of fact, I was taking classes at night towards a master's degree and what I was doing at the job became my dissertation for the master's degree. <laughs> It was from Syracuse University and I graduated in 1960. But anyway, when you look back at all the things that require good contacts, it was very fascinating field, and very important to the company at the time. Then from that, being a mechanical engineer, and I, I guess my management liked what I did, so they offered me a good job in the tape business.

Gardner: This would be about 1954?

Aweida: No, no. More like in 1958.

Gardner: '58, okay.

Aweida: The project that we had going at the time in the tape area was what they called a loop program. It never saw the day of light, but it's something we developed and spent a lot of time doing where you

store basically loops of Mylar material with a recording surface on the outside where you can record on it and read back from it, and this is about maybe six to eight inches in diameter, and they're about four inches wide, and vacuum was used to pull these devices into their own pockets, so you have a machine with about, let's see, I think maybe, what, 64 pockets where each one of them has one of these loops and through vacuum you suck them out into the read/write station and you spin them and you read the information on it, you take them back. Now, we spent about, I think, about a year and a half or more on this project. It was a beautiful machine. Lot of things moving around and people love to see things moving. The only problem is that the recording surface was on the outside of this material and it rubs against things coming and going and it's highly questionable how reliable it could be. It was a question in the beginning of the program and it also killed the program at the end because you couldn't really make it very reliable.

Gardner: Quick question on that. Was it a head-per-track reader once you put the sausage on the spindle or the capstan?

Aweida: No, no, no.

Gardner: Was like a drum?

Aweida: It was head per track, each head has many tracks on it. You don't slide it back and forth.
…

Gardner: It's like a drum then.

Aweida: Like a drum, yeah, exactly.

Gardner: A drum with a replaceable surface.

Aweida: That's right.

Gardner: There was a program in San Jose, the strip file, which actually came as a product. Were you in competition with the strip file?

Aweida: No. No. I don't think so. I think that San Jose was doing a lot with flexible media in Mylar, flat pieces of Mylar -- this one was really more of how to store it and access it. The idea was like a library, and that's really what was driving the whole concept, library concept. But it did not-- it didn't last too long. Before very long was like, "It's not going to happen," so it was killed and the engineers who were working

on that moved on to “Hypertape” development, and, you know, that was an interesting program, because IBM had finished, in that time frame a product called Tractor. It’s a massive amount of information being stored on two-inch-wide tape and automated system. Very, very expensive. Very limited in applications, but the idea was trying to take that to the commercial market area, and that’s where the Hypertape concept came about. You go from two inches wide to, like, one-inch-wide tape and you go into a system with vacuum columns. Now, keep in mind, up until that time, or starting early, in the early ‘50s, there was a tape product at IBM. I guess was number, like, 727. Became 729. Different models of them. Those were all tape drives that used, like, pinch rollers to move the tape. They’re very successful but very low density, very low capacity, and they were-- that’s what they had. That’s what IBM had. That’s what IBM was selling. In that time frame there was competition to IBM from other tape manufacturers, and people who were showing that they have some technologies that may be better than what IBM has. So the Hypertape that we were trying to develop was to basically show that IBM has what the market needs. Very reliable, high capacity, high performance device. The only thing is that it’s a different media than what they had before. Up until that time, there is a tape, half-inch-wide tape, which was used on the 727, 729 products , and now you got to go to a different media, wider tape, and the market did not want to change. They wanted to have, want to be able to exchange tape from one machine to the next and that’s what they were able to do before with the 729, 727 products, and so it wasn’t a very successful-- even though it performed well, it wasn’t very successful, IBM started to see people compete in that market area, and as a matter of fact, there’s several manufacturers, Ampex, Potter, Telex and others came up with tape drives like what IBM has that can read the IBM nine half-inch tapes, and that became very worrisome for IBM. Now, I was involved in the tape head design, for the Hypertape, how to read and write, record on that surface correctly and properly. Now, I wasn’t involved in the recording technology. I was involved in how you move the tape and how you get very reliable motion. Fast, start, stop and so on. When it became clear that that product is not going to be a booming success. I was called in by my manager, Ray Barbeau, to go with him to see the lab manager. We go to see the lab manager. Sat down. He says, “Jess, I want you to develop a product to compete with everything that people are doing out to the marketplace.” A half-inch product. Say, “What kind of spec?” He says, “I want it to be better than anybody else’s.” That’s the spec. “Make it better than anything anybody else has that we’re going to build, and you’re going to develop that. You’re going to be the product manager for it.” So you select the engineers you want to have with you and go out and do it. So I was given that responsibility, very delighted, obviously, and so that, I’m talking here, about around 64, 65 timeframe.

Gardner: Before we get into the, I guess, this now becomes the 2400 series?

Aweida: That’s correct.

Gardner: Okay. So let’s talk a little bit more about Hypertape.

Aweida: Yes.

Gardner: And perhaps about some of the other people in the labs at that time. You worked on the--

Aweida: Mechanism.

Gardner: The mechanism. Were you involved with the capstan then?

Aweida: Capstan, yes.

Gardner: Who designed it -- whose idea was that capstan?

Aweida: Well, the capstan was designed before that. The Tractor has two capstans, I believe, and the Hypertape had one.

Gardner: That's right.

Aweida: I don't remember exactly who actually designed that initially, but to make it work is what I was involved in. You know, you got to test it, make sure that it can give me the speed, start/stop speed you're looking for. The vacuum columns can respond the correct way. That's the area I was involved in. I think that capstan, concept of the capstan, came from-- trying to think. I don't remember exactly who did it.

Gardner: Now, did you work with Jim Weidenheimer?

Aweida: Well, no. Jim Weidenheimer was the second level manager.

Gardner: Okay.

Aweida: And he was more like overseeing the program, but he really was the guy who drove the Tractor and made that happen. Probably he was the one who specified and was behind doing the Hypertape as a more commercial product, as a spinoff from the Tractor. So he is making the big decisions, but as an engineer out of college just being there for a few years. I really did not interact with him much. But the one we did interact with was the fellow who was working for him, Ray Barbeau. He was the engineer in charge of making things happen.

Gardner: In IBM's term he would be the product manager for the Hypertape?

Aweida: Yes, that was Ray Barbeau. That's correct.

Gardner: That was because you became the product manager then for the next generation--

Aweida: The next product.

Gardner: The half inch product.

Aweida: That's correct.

Gardner: Okay.

Aweida: They had the half inch in 729, 727. They're all half inch, but of the half in new design was when I became the project manager.

Gardner: Right. Did you encounter a Walt Buslik in that environment?

Aweida: Walt worked there but I don't remember exactly what his responsibility was. I mean, the-- I remember very well, you know, and I think back about the people who are involved and I think about different individuals. When many of the younger upcoming people became part of the 2420 program project that I was involved in, and they all, we-- I don't want to be ahead of myself, but this project was started in Poughkeepsie. I'm talking about the, really, the best next tape drive, and we staffed it in Poughkeepsie. Then in '64, '65 time frame, IBM decided they're going to open a plant in Boulder, Colorado[2]. It's going to be the tape business. Manufacturing and engineering in Boulder, and so we were going to be moving sometime within this next year from Poughkeepsie to Boulder, and it was our job to make sure, actually, my job to make sure that I have the staff to come here with me. The ones who were involved in the development, because the product was under development, and we need to have people stay with it, and so we found out that some people did not want to move. Then others who were in other locations, San Jose or here or there, wanted to come to Boulder, so we had to make some swaps. Somebody who doesn't want to come, replace with somebody who can come. So we've gone through all that and in 1965 and early '66, the operation was moved to Boulder, and now I should expand a little bit about being a project manager. My responsibility was to have that product get to the market and meet all the specs and the requirements that IBM had, and, I mean they had a lot of demands. There's product test. The product has to pass product test. It has to pass some, what they used to call at the time, availability, reliability and serviceability requirements. These are things that are there to make sure when

[2] [Editor's note] IBM announced the opening of the Boulder manufacturing and engineering facilities on May 5, 1965; initially leasing 155,000 sq. ft. while constructing an approximately 400,000 sq. ft. new facility. Source: "IBM to Build Huge Plant in Colorado," Gazette Telegraph, Colorado Springs CO, March 7, 1965

the product is shipped to the customer, it's going to perform well. It's going to be serviced, it's going to be profitable. The recording part of the business was done under a different department. They controlled it at a different department, but my job was to integrate those into the drive and control the offering to the marketplace. So even though I wasn't responsible for the control unit, I was responsible for the integration, which is part of the subsystem. It became a subsystem to be offered. Now, I'm talking about in 1966, we were here in Boulder developing the product. We announced the product in … 1968, and we started shipping it in 1968. Now, that, those '66, '67, '68, those years we spent a lot of time making sure we have a product that meets the criteria, which was the best product on the market. So we made sure that it's reliable, made sure it has the specifications, the data rate, the speed. The storage capacity was established for us but the specs of it are to be met and I would say we looked at what's available, because by that time, several manufacturers, as I said earlier, were selling products in the marketplace plug-compatible to the IBM equipment. Plug-compatible means that you can unplug an IBM machine and plug in somebody else's machine into the same connection and you can run that machine because you have met all the spec requirements. We have evaluated all these many different machines and we want to make sure that what we have is better than what anybody else's has, and we felt pretty good about that.

Gardner: You actually bought their machines, brought them into the lab and tested them?

Aweida: You know, it's really funny. We have, we've done a little bit of that, but we did not buy all the machines. I mean, we bought some, but others we went to shows. We talked to customer who have them to see what they found good about them, what bad about them, and we used that knowledge trying to make sure that what we have is better than that. But, you know, when you develop a machine, any kind of product, you also know where the weaknesses are. I mean, even though we developed what we thought was a great product, we still, we knew there's certain things we could do better, and we knew that but we didn't have to do anything about it. Now, we had a strong team together in Boulder and a product is being manufactured and shipped, and about a year later, the beginning of 1969, or maybe late '68, IBM did a forecast of that product. Now, I should backtrack. The forecast that we were working with, where we had to justify the product's profitability, was based on being able to ship 5,000 units to the marketplace. That was what I was working with. … They were priced, at $82,000 apiece. That's like a four hundred million dollar business, for IBM was pretty lucrative. When they did a forecast after several months of shipping this product, a forecast showed the market can use not 5,000 but 45,000. Say, "Wow." I heard that, you know, when I saw that forecast, I said, "This is really something." I remember going home one day after I read that forecast and I told my wife, "You know, I'm going to start writing a business plan. I can leave here and start a new company, even if I get 10 percent of that market. That's be great business." I've always kind of wanted to do something on my own, but I didn't want to do something just anything. I want something really substantial. I thought, "Here's my chance to do something substantial." So I start to write a business plan. I'm talking about the first quarter of 1969, and obviously I needed the support of some of the key guys I had working with me at IBM. I know the first guy I approached was Juan Rodriguez. Juan was a little bit antsy to do something different. He actually accepted a job with another company. Then he was talked out of it. He was kind of ripe to do something different. Said, "Juan, I want to do such-and-such. Want to join me?" He said, "Absolutely." Now, the

business plan I was writing became a little more detailed because I knew the market. I was living that product, living that market. I know what's going on in the marketplace, but one thing that I wanted to make sure that we do right, since IBM is very strong in the marketplace. They have very strong sales with service organization. If we're going to build a product to compete with IBM, we want to make sure that we can sell it to the end user marketplace. Because many people say, "Okay. I can sell this on the OEM market. To Univac or somebody else." But that's very questionable -- you cannot really count on that in building a business. You know, whether you can, what kind of volume they can do and so on, but the end user you can build yourself. So from day one I was very conscious of the fact that we need to not only build a product but also build a sales and service organization as well. So again, in the April, May, June time frame, I got Zol Herger to join in, Tom Kavanagh to join in to-- then I was really looking to get a sales executive from IBM. I talked to some but I wasn't really excited about them. Still, we're working for IBM doing this on the side with the idea that IBM is doing very well with their product. We can go out and get, take, a piece of the market.

Gardner: Quick question. You gave me a copy of an early business plan dated June of '69

Aweida: Yes.

Gardner: Is that the first one?

Aweida: That's the first one.

Gardner: That's great. The museum really appreciates that.

Gardner: Let me, before you get into the formation of Storage Technology Corp, I'd like to talk a little bit more about the 2400 Series. Now, you were a product manager.

Aweida: Yes.

Gardner: Now, as I understand the IBM terminology, there are different development managers responsible. The product manager, is the business manager, am I-- was that your role as--

Aweida: No, no, no. I was a project manager.

Gardner: Project manager.

Aweida: Not product. Project Manager. Responsible for the whole product. Yeah.

Gardner: Were the folks developing the controller [your responsibility]?

Aweida: Let me explain that. There's product engineering and there's development engineering. That is when the product is developed by the development group, then in its manufacturing, if there's a problem the product engineers fix that problem and make sure the manufacturer, can build it and take it to the marketplace. There are no innovations there. They're more like taking care of the product after it's been done. But the job I had was the project itself before it got into product engineering. The development cycle of it is where the project engineering is involved.

Gardner: But were the development managers reporting directly to you or you--

Aweida: Oh, yeah. Directly to me.

Gardner: Directly to you.

Aweida: Yes.

Gardner: Okay. So you were in the development organization.

Aweida: That's right.
…

Gardner: Do you recall the names of the development managers doing the drive and the control unit?

Aweida: Well, the drive was divided it into two pieces. One was in the mechanical part and one electrical part. The mechanical part was headed by Zol Herger. Electrical was headed by Tom Kavanagh.

Gardner: Oh.

Aweida: Then the recording area did not report to me but was done through another organization but the fellow with the project, the management, or the manager of it, was Juan Rodriquez. He was-- I don't know exactly what his title actually was he a manager or what, but he did the development work. He was the brains behind the recording technology involved.
…

Gardner: Okay. And how about the tape control unit?

Aweida: They were separate. … We were only involved with the drive. But again, my job, being project manager, was that our engineers connected our drive to that controller and tested it as a subsystem. But we did not develop the controller. I was not responsible for the development of it.

Gardner: Mm-hm. Do you know who was head of development of the tape control unit?

Aweida: Yeah. As a matter of fact, one of the controller development managers was Barry Cunningham. Barry Cunningham later on, when we finished developing the drive, we wanted to get into development of controllers at Storage Tech. We hired him to come to Storage Tech to develop a controller for us. So he was, whether he-- I'm just trying to think back. The control unit for the 2420 at IBM was an upgrade of the controllers that they had for the 729. I would say, yeah, Barry Cunningham was the one or one of the managers of control unit development. Would throw in names in here, but I would say with him, when we hired him to come over to Storage, to Boulder, some of the people who came with him were Erik Ringkjob and Andy Anderson. He brought a team of guys who can build the control unit from scratch for us.

Gardner: One other thing. I believe, and correct me if I'm wrong, the 2400 Series (sic) introduced the Prolay as the mechanism for moving the tape?[3]

Aweida: Repeat that again.

Gardner: The Prolay as a device that controlled the motion of the tape -- well, the reason I mentioned it is when I was talking to Bill Phillips in Tucson, he thought that was the best invention he'd ever seen in his entire 50-year experience with tape. I'm sort of curious then as to [its origin]

Aweida: I think he was talking about the capstan and its control mechanism. Yeah, yeah. It didn't stick in my mind the way it stuck in Bill Phillips' mind.

… And how you can actually move that capstan at a very high speed, and keep in mind, we're talking about here a device which moved tape, start or stop the tape. Later on, people get away from starting and stopping by just moving continuously and storing the data. At that time, we were moving and stopping to get to the data, and so the mechanism was quite complex.

[3] [Editor's note] Prolay was introduced with IBM 729 Model III.

Gardner: There's actually several articles about it posted on the web and so I looked at them and it was an ingenious mechanism, but basically it, without ever contacting a recording surface [sic][4], it still allowed the tape to be stopped and accelerated in either direction at very high rates; it was introduced in 729 Model III.

Aweida: Yeah. It's a capstan drive mechanism.

Gardner: Which was different than, say, what was used in the Tractor or the Hypertape.

Aweida: That's correct.

Gardner: But different than was used in the earlier 72x series, which were pinch rollers, right? Pinch rollers cause problems with life of the tape, so ultimately the industry stopped stop and starting and that was significant.

Aweida: Well, the team and I had designed that. As a matter of fact, if you had a-- well, let's see. Let me think here. Oh. Dwight Johnson was one of the guys involved in the project. Zol Herger was the manager of it. You know, they're the guys who designed this thing,

Gardner: We're going to have lunch with Zol on Thursday.

Aweida: That's right. Thursday. Yes.

Gardner: Maybe I'll ask him [… about it]

Aweida: Yeah -- actually Zol is quite a guy. Zol came in from-- got to understand that this, this group of people who, the four of us who started Storage Tech, you know, I was driving it, but the people I brought I with me, Zol from Hungary, Juan from Cuba and then Tom Kavanagh is born here. A lot of foreign guys. But Zol is an excellent manager. I said, "Zol, we need to get this job done in a certain way by such and such time." It's done. We don't have to repeat it. He gets it done. In his mind, he was able to control the things and to make things happen and deliver on schedule. Very often, you talk to somebody about something you think, well, you have to repeat it again to make sure it's going to happen. Not with Zol. You

[4] [Editor's note] A Prolay minimizes contact with the tape. A description of the operation of a Prolay can be found in "IBM Customer Engineer Manual of Instruction, 729-II, 729-III, 729-IV Magnetic Tape Units"
© 1959, Form 223-6845, available at bitsavers.com

didn't have to do that with him.

…

Gardner: Okay, so we're now in the spring of '69. You've written a business plan.

Aweida: Yeah, and identified a few people, talked to them and they're ready to join.

Gardner: So in the June '69 business plan, I've looked at, actually, you and Zol and Juan are identified, but you're still at IBM?

Aweida: Yeah, yeah. I was still working at IBM. But that's the plan I was putting together. I'm putting a plan together to raise some money, to get some financing and that was the plan I put together. Great detail about the product. I knew the product, I knew the market, I knew what we wanted to be able to get the people I would need to bring into the company to do the job, and that business plan was designed with the idea that we liked to raise some money initially to get started, then a few months later we raise more money as we get the team together so the product becomes real rather than fiction in the minds of investors, and then somehow we'll be able to raise more money from different sources. So obviously we knew the needs we were looking for. We were looking for, in total, about $2 million. Again, you're talking about 1969. '69, venture capital is not that popular. Was not-- people were not doing it. Not too many people in the venture business, venture investing, venture deals. But J.H. Whitney company in New York City had invested in a company called Inforex in the Boston area, and it just so happens that one of my friends went to work for Inforex and he knew the guy from J.H. Whitney who made that investment. So he was my contact to somebody in the venture business. The guy's name was David Dunn. So with the business plan that I put together, I said, "You know, I would like to talk to this guy." So I called him up and I'm talking here about that June. I think it was in June 1969. I called him up and I was told he's traveling, but his assistant took the call. He said, "Hey, send us a business plan. We'll look at it." It just did not excite him too much. Lo and behold, three days later I got a call from Dave Dunn. His boss, said to me "I understand you talked to Mike Myers" - the name of his assistant. "And you guys have an idea for a company in the storage area." He said, "I'm really interested. I'd like to come and see you." He didn't even ask for a visit. He wanted to come and see me. So we set a time for him to come out. It just happened that he was in Florida sailing a boat up to New York and he stopped halfway up somewhere in the way, called his office, was I called them. He got really excited, so he called me. Now, I should backtrack a little bit. About a year before that, a company in San Jose[5] was established to build a disk drive by-- 12 people from IBM got together to build a disk drive. They call them the Dirty Dozen. And somehow, Dave Dunn heard about that and he felt bad about not participating in that deal. When he heard from me, he wants to come and talk. So he came over to Boulder with Mike Myers, his assistant. I had Zol and Tom and Juan with me. He met them. Afterwards, he and I sat down to talk to deal. I told him I was looking for a quarter million dollars. And they agreed. He said, "Will do it." And I believe they got 40 percent of the

[5] [Editor's note] ISS (International Storage Systems), founded in December 1967 by 12 ex-IBM San Jose employees. "IBM's 360 and Early 370 Systems," Pugh et. al,, © 1991, p. 490

company for a quarter million bucks. Again, we're talking about in 1969 … Anyway, when he said I should go to New York and meet Benno Schmidt, the top guy at J.H. Whitney & Co to get their commitment to the deal, which I did, once they approved it, I came back-- this is now-- I'm talking about the end of July. I came back, I said, "It's time to move forward. To quit IBM and start a business." Now, I should also add that [we had to consider tax implications of the investment timing. You know, when you have an investor and they buy stock let's say at $1 per share, we as insiders buy the stock at a penny per share, they want to make sure there's time between the two, so their money comes in after we put our money in, which we agreed. Even though were talking about the beginning of August, they said, "Let's delay there putting the money in for a couple of months." This is something that I put my own money in to run the company for the first couple of months until they put their money in, but I didn't necessarily tell this to the employees because they may get a bit nervous, "Are they going to do it? Are they not going to do it?" Because I was-- I had no question that this was going to happen. So I went to tell my IBM managers, "I'm quitting." The guy who is working for me, Zol Herger, Tom Kavanagh, they quit. Immediately, they quit, so I told my manager, "I'm going to quit and these two guys are also quitting." So IBM got a little bit excited about that. They want to talk me out of it. They want me to meet with top brass and this and that everything else. I said, "You guys have got to have respect for somebody. I've made up my mind. I want to do this. I think it's good. We're very straightforward about how we're going to do it. We're not going to try to do anything improper, and they should accept that. I'll tell you something, they did. They accepted that. They laid off of trying to kind of talk me out of it and said, "Good luck to you." My message to all the employees coming in to join us after that was, "I don't want any information coming from IBM. We want your brains that's all we want. If you feel you have to take some materials, some documents, don't even think about it, because that is not healthy for this business. It would give IBM a chance to come back and sue us for something that could kill the company altogether. We don't want any of that." So this led to some talented people-- I mean, I should say after we quit, we were out of IBM, almost every engineer in the department called up, they'd like to get a job. That's what I'm talking about. So we added a handful of people. So the engineering team was put together within about two weeks, we had the engineering team all staffed with people who came in from IBM. Going back, I felt it was very important, to really build the company, to have two other talented people added to the top execs. One is a guy heading sales and marketing and one heading finance. And so this is a kind of nice story. I said, "Who is the best sales guy to do that we can bring in?" The guy who's selling some competitive tape drives in the marketplace and succeeding at it to some degree. So I kind of felt that Telex had a guy named Jim MacGuire, So I put an ad in Tulsa Oklahoma, which is where Jim MacGuire was and said, "We're looking for a guy to head this operation" and somebody saw it and told him about it. Jim called me up and we end of the meeting. I said, "Jim, I always wanted to meet the guy who can sell that crap in the marketplace and make it stick. If you can sell that, we have a fantastic product that can really do well." So anyway, we added Jim at that stage of the game. I'm talking about a few months after. We had no product, but I wanted to have a sales guy who can build a sales and service organization. I keep saying that because service should really also report to him as well. Then at the same time, we also hired a VP of finance to assure the track of the finances of the business. So by year end, 1969, we had all the elements that you need to really build a strong business. The engineering team, marketing, the controls there with the financial people in place. About 14 months after we started, we actually showed a product at the computer show. It wasn't ready to ship to customers, but something that you could show operates, just performed. We had specs written. Actually, it was at Atlantic City. We had a tape drive out there, we showed it to people and of course Jim MacGuire

brought some of the people he'd known in the marketplace who were ready to buy a new product and do the stuff we were talking about. So basically, we were able to get people signed up to buy the product when we have it available 14 months after we got started.

Gardner: If you could just backup a little bit, were you aware in IBM San Jose, Shugart left IBM San Jose in the same time period, I think in April of '69.

Aweida: Yeah.

Gardner: He went and San Jose's reaction, as I understand, was not as benign as the Boulder management reaction. Any idea why?

Aweida: Well, the Boulder reaction was really very strong. These people work very hard trying to kind of convince me not to leave. They had one of their top VPs come over to Boulder and meet with me and I don't know exactly what Al Shugart's reaction was, but my point was very straightforward, its' that "I'm leaving." I mean, this is wrong that you're trying to kind of convince me otherwise when I've already made up my mind. You should have respect for me. I think they backed off. Maybe the same thing happened there, possibly. Al is a little more brash than I am, I think, possibly. Maybe he pissed them off.

Gardner: Well, … I was at Memorex as an engineer at the time, and his mantra was very much the same as yours. "I want your mind. I don't want any piece of paper. Don't even think about bringing it. I'm hiring you for your mind." Ultimately, there was a very nasty trade secret lawsuit -- IBM sued Memorex within a year or so and I don't think they ever sued Storage Tech in the same way.

Aweida: No, they never did. As a matter of fact..

Gardner: That's what I meant [by Boulder being] benign, ultimately, it got very nasty in San Jose.

Aweida: Again, I can say this about the relationship we had with IBM. After we left IBM and after a bunch of the engineers joined us and made it clear that whoever comes to us is going to come clean, not to have anything on there that looks like they've taken trade secrets. And we developed our product, we filed for several patents and maybe about a year or two later we had discussions with IBM about patents. IBM came to us and said, "Look, they think that we're infringing on some of their patents." And they said, "Well, we like some of the patents you guys have, too. Let's have a little discussion." We have a discussion about patents and they felt, and I vaguely remember this, but they said, "You know, you really got to pay us some money. We're not talking about too much, but pay us some money." "What are you talking about?" Said, "We'll give you the cross license to use the patents you have," and I think they gave us the cross license for a lot of patents. "And we want to use your patents, but you're going to pay us a

little bit of money." I said, "How much money?" Twenty thousand bucks over a year or so. So we said, "Okay." We paid them that money and we signed a cross license with them. I should add a little anecdote about that. The fellow who did the negotiations for IBM came in with a beautiful briefcase. I said, "Well, that's a really beautiful briefcase." Yeah. When we signed the document at another session and signed all the cross licenses, it came in every case it just like that one. After we signed it, he gives me the briefcase with the paper in it. I thought it was kind of a nice gesture on his part.

Gardner: That is a very classy gesture.

Aweida: Yeah, I would say so. I would say so. And with time, we talked to IBM about products and I think we tried to keep-- we kept the relationship with IBM clean as we went forward. We tried to sell IBM our Superdisk, but they wouldn't buy it. I talked to the president of IBM at the time, and he said to me, "Jesse, you know, our people think this is a really great innovation that you guys have but there is an NIH [Not Invented Here] factor. They're not going to buy it from you, so don't waste your time."

Gardner: It just may be that your relationship with the management, the senior management at Boulder, was better than the relationship that Shugart had with San Jose. It was not good. In fact, Shugart had been transferred out of San Jose and was sent to the East Coast to run an educational division in Connecticut, which precipitated his leaving because he was not going to leave California. … There was bad blood that apparently didn't exist at Boulder with your folks.

Aweida: Yeah. I'm just looking back about what could IBM have done? They could have sued us, but we tried everything possible so they have no grounds for suit. Secondly, I think later on it came about that maybe it's good for IBM to have a legitimate competitor out there. I heard that later on. Maybe it's not too bad to have somebody decent to compete with them in the tape business. But again, whatever the reasons were, I was very concerned that we may get sued by IBM, and if they did see was, we did not have the whereabouts to win. It would take time and money and resources that we could not afford. And so we did everything possible not to allow that to happen. So, all I can say.

Gardner: One point that I think it's a coincidence is Benno Schmidt [and JH Whitney], Schmidt was involved in Memorex [… joining the Memorex Board around 1971. Prior to that JH Whitney was represented on the Memorex Board by Fred M. van Eck].
…

Aweida: He could've been. The partner in that firm that I went to see was Dave Dunn, who afterwards became-- after Dave Dunn left that firm to do something on his own was Dick [Richard C.] Steadman became the partner involved. He was on our board and he sat on a report for forever.

Gardner: Yeah, I did find the prospectus when you went public which has a lot of that information.

Aweida: Yeah, yeah. You see the names there, yeah. Tom Horgan Was on the board in the early days. He was the president of Inforex, the company I mentioned earlier that Dave Dunn was on the board of.

Gardner: So now were in the second half of '69. You're funding the company out of your pocket.

Aweida: For the first couple of months.

Gardner: The first couple of months.

Aweida: And then after that, the money came in from J.H. Whitney.

Gardner: But that's not a lot of money.

Aweida: No, but to the idea, the whole concept was at the beginning there was only a plan and at least what we heard is that people with money, they wanted to see more than a plan before they fund the business. So the thought was the plan was good enough to be able to raise a quarter million bucks, but once we've done that, a few months after that, we would need more. I would say about four or five months later, we were in contact with other people. We raised $600,000 [then and more later that year, 1970].

Now I should mention that raising money for Storage Tech was one of the major and most involved things that we had throughout the history of the company.

We raised $3.2 million in an IPO in June 1971. In the same time , we arranged for a bank line with Citibank [as lead bank] for $4 million [later expanded to $10 million and then to $20 million]. [The IPO was followed by a secondary in May 1972 for $7.3 million].

We raised money through private entities three times; initial funding, second funding [totaling $4 million in 1970] and a third funding [of $2 million in 1971]. That took us to the point where we were able to arrange a bank line, and then after that we raised money in an IPO. A year later we had the secondary -- more money raised publicly, but we start shipping products.

Now, we were focusing on the end-user marketplace. We have had right from the beginning, as I mentioned earlier, hired Jim MacGuire as having sales and marketing to sell the product to users. And users who were buying product from IBM were leasing rather than buying, so we were in the leasing business. And the leases were two-year leases. IBM signs two-year leases, we have to sign a two-year

leases. A two-year lease is not enough revenue to finance the business. So we had to arrange a special kind of financing.

Gardner: I read your business plan, and that's not reflected in your business plan. So that must have been an eye-opener to you at some point.

Aweida: Yeah, in the business plan we started with building the product and having the right people there.

Gardner: And selling it.

Aweida: And selling it.

Gardner: And selling it-- when you deliver the product, you get the money.

Aweida: That's right, but as we got going it was, "Hey, yeah you can't sell it but you can get a two-year lease." That's not enough … [cash to run the business].

Gardner: Actually some were on month-to-month [rental] even then. [… Until May 1971], IBM was strictly on 30-day rental [or selling at full price] but then began offering two year leases.[6]

Aweida: We were able to sell two-year leases, but not more. In a few cases, we were able to get, when we really wanted to have a full payout or something we can finance, we wanted more than two-year, more like a three-year. We got a few customers to sign a-- not really three years. That's 36 months. They signed a 28-month lease, which was the right amount to be able to fund it. Well, that's a very few of those. The majority were two-year leases. We were able to find leasing companies who were willing to buy the product from us, pay us the full price, sale price, and they collect the monthly revenue and then once they receive their money, once they get all their money out of it, we share in the residual, which was, I think a very lucrative business for them and it helped us quite a bit. We had several of those deals with leasing companies. I mean, as I mentioned, raising money became a very major thing for us because we needed to finance-- we were very successful at selling. The sales organization built up very rapidly. I think within about a year, by maybe the end of 2071, '72, that timeframe, we had about 100 people in the field. Like 15 sales people, the rest were all service people. I mean, there's a lot of people out there selling and servicing the product and they're succeeding in selling. As a matter of fact, the type of salesman we hired is more than just a guy selling. More like a businessman. Those guys have accounts that they really could

[6] [Editor's note] IBM announced its first lease plan, FTP (Fixed Term Plan), a two year lease for most tape products on May 27, 1971 [Source: US v. IBM Civil Action No. 72-344 (AGS), January 1969, Exhibit 14791, p. 979]

work with very hard. They're more like their accounts. They feel that it's important to make the customer happy, not only to sell them but to also make them happy. So they were very effective. They were very well-paid, too, because the commission plan was very lucrative. They could sell, they could do well. So here we are now in '71/'72, selling tape products and tape drives. Then we added a control unit in the '71 timeframe. As I mentioned earlier we said, "Now we need to have a whole subsystem; drive plus the control unit. So we went back to the people developing the control unit back in Poughkeepsie and one of the managers there was a Barry Cunningham. We hired Barry Cunningham to come out to Boulder to head the activity and he brought with him a bunch of people.

Gardner: I didn't realize that when the tape moved to Boulder, tape control units were made in Poughkeepsie. That's what you just said.

Aweida: I'm trying to think back about that statement. Eventually, it came to Boulder, too, but the team I'm talking about was still in Poughkeepsie. Why didn't they come to Boulder before then, -- I don't remember. But when we hired Barry and Erik [Ringkjob] and Anderson and so on, they were in Poughkeepsie. They came to Boulder to join us.

Gardner: Yeah. The [plug compatible] disk drive industry started in the same way. The very first disk drives shipped on IBM 2841 control units to IBM customers - 2311 class drives, but very quickly the disk drive industry started producing its own is storage control units; ISS, Memorex, everybody from the 2314 class of drives onwards. It sounds like it was later in the tape business you went longer on IBM control units. Was that the pricing of the IBM control units?

Aweida: … The business got started building only drives but once we started to build the drives and sell them [in volume], we said, "The next product is it to be the controller giving us a whole subsystem to sell."

Gardner: So the Telex wasn't selling control units?

Aweida: No, only selling drives.

Gardner: Telex was only selling drives?

Aweida: None of the competitors sold anything other than drives.
…

Gardner: All right, so you were the first tape company to move into the control unit space?

Aweida: That's right. You know, when you have your own control unit or subsystem, you can add some more things to give you better performance -- higher transfer rates and so on. You get more [functions] to offer the user.

Gardner: Tell me about your tape drive in comparison to the IBM drive you..

Aweida: Well, you know we have to be plug-compatible. It's the same data rate and using the same cartridge. You can read their cartridge. As a matter of fact, that's how we sold a lot of equipment in the beginning. The customer has IBM equipment installed and for whatever reason, he could not read certain tapes, he had written them on a different machine, he brings them here and we were able to read them.

Gardner: Interchangeability is hard.

Aweida: Yeah. We said to him, "Hey, we can read it. If you have tapes that you cannot read, we can read them for you."

Gardner: Really?

Aweida: Yeah. What happened is that we have a dynamic signal adjustment. That's the stuff that Juan Rodriguez worked out, by the way. If the signal is below a certain level you can't read it. We took it way down. If you can't read it, we start to play with the signal level to be able to read into the mud. We're able to do that. And so in many cases, we took some of those bad tapes and we read them and the customer says, "Hey, you're going to get our business."

Gardner: So dynamic signal adjustment was one of your features?

Aweida: That's right.

Gardner: Other things? Later on, when you had your control unit, you offered higher speeds, higher data rates.

Aweida: Right. We doubled the data rates. You know, you get more flexibility when you have a subsystem rather than just a drive. I would say the other competitors, other than IBM, I think they disappeared. When we hit the market, Potter and Telex and those guys, whatever they were doing, they dried up. They could not compete with us.

Gardner: Were there are other things in your mechanism that you thought were superior to IBM that you could sell to the customer?

Aweida: I remember somebody saying this is so special that they don't have, but what we were able to sell is that better reliability.

Gardner: Because?

Aweida: Better performance, because of the way we have designed the tape path and the way we control the tape motion. That's part of the area that I worked on even though I was still managing the whole operation. …

Gardner: Your heart was in that area?

Aweida: Yeah, yeah.

Gardner: Your mind was in finance, but your heart [was elsewhere].

Aweida: Well, before very long I became a salesman and a financier as well, but that's where I spent more time-- more of my time on, but that's as we went on. But you know, tape is kind of interesting. The tape subsystems we're offering to the market was really [good] -- we did a good job with it. It was very successful and we had a very reliable operation. And the thing about tape, it has long life. Part of it is because of the compatibility. You want to be able to read all the tapes on the device you have today, because people have these reels of tape, they have thousands of them stored, you want to be able to read them. So they tell them, "Look, you got to send me a machine or I can't read them." I don't want it. I want to be able to read all the stuff, and therefore the life of tape drives in the marketplace is really long. Normally, you'd say the machine would have a life of five years, six years, seven years, and tape, I think you're talking about at least 10, 15 years. People had them, they just kept them. Sometimes, some of the machines we sold to leasing companies, they recovered their investment, let's say in five years. Then, we are in a residual area with them. Then we said, "You know, we'd like to buy the machines back from them." So we actually paid them to buy the machines back from the leasing companies. We reconditioned them and sold them again. I mean, shipped them to customers and then sold them to the leasing company one more time. And they did have that life. They did not get replaced by something better that soon.

Gardner: In the disk drive market, where disk drives are constantly being turned into scrap metal because there's no additional use for them.

Aweida: That's true, that's true. Of course, they took many, many, many years before they got a different format tape and so on, but the 2420 of IBMs and what we had at Storage Tech, they stayed there for a long, long time. I'm sure there are many-- we're all over the place and still, now. Anytime you see a picture of a computer installation, you see tape drives in there because there's something moving in people like to see that.

Gardner: Right. Nine track tape drives as opposed to the more modern cartridge types..

Aweida: Nine track on half-inch reel-to-reel tape.

Gardner: Vacuum columns.

Aweida: Vacuum columns, that's correct, yeah.

Gardner: Some people, I'm told, think that's what a computer is because they've seen so many tape drives.

Aweida: Oh yeah.

Gardner: And that's what you think, that is the computer. No, that isn't the computer.

Aweida: Well, you know, it's a lot of things. Year after year, within the '70s, we were selling-- the growth of our sales activities was substantial. I think the first year we shipped product was, like, $3 million sales went up to-- the year after that, maybe about $10, $24, $64. These are millions of dollars' worth of sales annually and it was very rapid growth for the business. We kept thinking about, and again, we were started out as a tape company; tape drives and then the tape control units and tape subsystems. Then we said, "Hey, we have this sales and service organization. Why don't we just sell disks as well?" So we approached folks from ISS, I guess was the name of the company, who were making disk drives and selling. We had an OEM deal with them to buy their disk drive to sell to the same companies who are buying our tape drives. So we became a tape and disk supplier. A little bit later on, we developed our own disk drives, but that was the beginning of it.

Gardner: So before we leave the subject of your challenges in financing, do you recall when and how it became clear to you that you really were in the business of raising money because of its lease nature?

Aweida: Well, you know, that became very clear when we found out that of the private money was very limited. Now, we raised money from J.H. Whitney. We went back to six months later, Dave plus some

other executives, Trude Taylor and Milt Rosenberg who were executives of a computer company in the LA area. They invested in the company. And it's funny, I learned something from Rosenberg. He said, "You know, Mr. Aweida," or Jesse, whatever he said. He said, "You know, you can get money from any place you want to get it, but there's good money, there is better money. What you get from us is better money because we can also give you some advice that banks and others cannot give you, but we can maybe help in that area. So there's good money, there's better money." So I got to thinking about better money, which is kind of interesting. So anyway, so we raised money from private individuals. We also had venture firms invest money in our company other than J.H. Whitney. But there's a limit to that. Then we went into the IPO. You raise a little bit in the IPO, but you don't want to go over diluting the equity of the company, at least that's what insiders think. So you need to find a different way to raise money. And then that's when you start to work with the leasing companies. So before very long my involvement was more than half my time was where are we going to raise the money from?

Gardner: Now you were leasing the product to the end-user customer?

Aweida: Yes.

Gardner: You were getting money from private sources, but when you went to a leasing company, where you then selling them the equipment so that they could lease it?

Aweida: No, no, we lease it to a customer and then we sell the paper. [We sell] the lease to a leasing company, so now they're holding the paper, the lease paper and the lease money comes and goes into a lock box into their account from those customers. So they collect the lease revenue. They paid us-- let's say for the time being we leased equipment on a two-year lease to a customer. He's going to pay us, let's say, 1,000 bucks a month. In two years, it's $24,000. That's for a bunch of equipment. The leasing, he says, "Okay, we're going to pay you, let's say, $35,000 now, and when the lease money comes in [to you], it then goes right to us [the leasing company]."

Gardner: But it comes to you, it's an STK lease.

Aweida: Yes.

Gardner: And then the money flows through to the leasing company?

Aweida: That's correct. The money comes to us and we transfer that to them. Now, once they receive the two-year lease, and in most cases the customer will renew it, so if there's more money coming in, it goes to the leasing company. They recovered their investment, say, $35,000, plus a profit on top of that. And so we say, okay, at that time we start to split the money coming in. They get, let's say, 50 percent,

we get 50 percent of the balance after that. So that's one way -- we're selling the machine, basically, to a leasing company and that's how we get our money. We ran that way for quite a while. But we kept thinking, "Hey, we can now sell not only tape, we can sell disk."

Gardner: Sure.

Aweida: Then we developed an add-on memory product as well, which is very popular. We worked with Intel on it until they had their own. It was a really successful product. The people wanted to have high-speed cache for the data. You have a disk[and with a cache] you have a much higher data transfer rate [and much lower latency]. Then we also added a printer. Now, here it is every time I think back about that, I think that was maybe not a smart thing, but we actually bought a company in Florida in the printer business. So again, we sell the same printer to the same people who buy the tape and the disk from us and they buy printers.

Gardner: Sure. Was this a deliberate strategy that you sat down at some point and said, "Well, we're going to add these equipment." Or was this ad hoc, just opportunistic?

Aweida: No, the whole idea was we felt we had a very strong sales and service organization. We'd like to keep feeding the product that they can sell. That's where the idea of us having a computer, a medium-sized CPU, added to our products. And then we would be able to offer complete systems to customers.

Gardner: Did you look at your customer base? I have a quote from you here sometime around in the mid-'70s where you're saying, "We're not going to do a computer for at least the next two years."

Aweida: Well, we didn't do a computer up until it was '81 or thereabouts, in the '80s.

Gardner: So I mean was this early on your strategy was to ultimately get to the computer business? Or as you provided more things for your sales folks to sell you realized that well, the ultimate place we got to go was a total computer offering

Aweida: I think that's what happened. It wasn't like from day one, no.

Gardner: It wasn't? Oh.

Aweida: It developed with time. Now we have multiple products. We have a lot of customers out there. We can now sell a complete system.

Gardner: Yeah, I'd like to talk over some of the earlier products.

Aweida: Yeah.

Gardner: Let's talk about disk drives.

Aweida: First we were buying disk drives on OEM basis from ISS.

Gardner: Any interesting experiences?

Aweida: Not really. I mean I think we liked the product that they had. One thing really amazed me is that they were not very successful. You know, for some reason they had a great product but they did not do much with it. They were not able to expand the market significantly with what they had on their own.

Gardner: Well, they faced the same business problem that all plug compatible business hardware manufactures faced, it's the sales and service cost driven by the lease nature of the business.

Aweida: Yeah. Right.

Gardner: They chose to go the OEM route.

Aweida: Right.

Gardner: ITEL was their big marketing channel. ISS tried to sell OEM but their volume was through ITEL. And when you're in that relationship of one customer, one seller that's not too healthy.

Aweida: They were at the mercy of ITEL.

Gardner: They absolutely were.

Aweida: So they had a great product, good team.

Gardner: Oh yeah, it was. It was.

Aweida: I don't know why we said we could not see ourselves doing a lot more with them. We decided that we would do the next product ourselves.

Gardner: You invested in and then acquired SuperDisk?

Aweida: No, we actually developed it ourselves.

Gardner: SuperDisk?

Aweida: It's four spindles.

Gardner: Yeah. -- we have mutual friends at that company. Terry Johnson, of course. Roy Applequist, Al Wilson. There are a bunch of folks went there.

Aweida: Yeah.

Gardner: They all worked with me at Memorex.

Aweida: It was a great product. I mean very massive amount of product. And, you know, we had some success with it but it was really tough to sell too. I mean it's sort of like it's a major piece of hardware. We decided while we're doing that, even though we sold some, but I wouldn't say it was a booming success. It was fine, but so we said we really need to do a regular disk drive, which we developed. It's a 8380 or something like that. And it was a very competitive product in the marketplace. We're talking about the late '70s now.

Gardner: And you moved the folks—I thought the Disk Systems Corp[7] folks were in California, and moved to Boulder? Or did they come right out to Boulder from the beginning?

Aweida: [We set it up in California to attract talented disk development individuals but within a short time after that we moved it to Colorado. Completion of product development and manufacturing took place in Colorado.]

[7] Disk Systems Corp (DSC) a 1973 start-up in Santa Clara Valley, CA, was funded by StorageTek to develop what became the SuperDisk. StorageTek acquired DSC in June 1974 and merged it into the wholly owned subsidiary, Storage Disk Corporation, Louisville, CO. Most DSC employees moved from California to Colorado. See: "Life After Memorex," S. Russell, Venture, Aug 1984, p. 44, and "StorageTek-25 Years," Storage Technology Corp., 1994, p. 20

Gardner: Well, they were in California where many had worked for Memorex, so somehow they made the move.

Aweida: We developed CPU in California but not disk. Disk development was [finished] in Boulder[7].

Gardner: Okay.

Aweida: Then, even though we still selling the SuperDisk but, you know, again we thought we need something more like the tape products, more bigger volume that people are used to and accept, which was I believe there were 8350 product.

I remember like something about that. We were trying to find some major customers to buy the product initially to get it accepted and give it some leverage in the marketplace. So one of the customers we were working with I think was Chase Manhattan Bank. They were going to be one of the early customers who'd taken the product from us. The senior VP in charge of their data processing wanted to talk to me. So I go to New York with the salesman and the sales manager to see him. We got to his office. He says to me, "Jesse, come to my office." He told the other two guys, "You stay here," because he wanted to talk to me alone. So I go in there to talk to him. He says to me, "Jesse, even though we committed to buying 36 of these boxes from you right now and you gave us the right price, we're happy with it, but I'm not going to give you the order." He said, "I'm in the midst of trying to get upgrades being done by IBM for me. And if I buy your disks instead of buying it from IBM they're going to slow that activity and I can't afford it. But I owe you one." That's about right. He said, "But I owe you one. So thank you." I left kind of disappointed but he owes me one.

Now within 24 months we had four times the size of that order placed with him. When he said, "I owe you one," he actually after he got his software taken care of he was happy, all the orders after that came to us. So business people are people you can trust. You can really trust them. They say something, they do it. We were in '80, '81, we were starting to ship that product and IBM … had manufacturing problems and failed to ship on schedule. They were about a year behind schedule. I remember in '81 our sales guy saying, "Wow, this is a chance we have to really hit this market very hard and really do well because IBM cannot do it, we can do it."

Gardner: I think that was the 8650.

Aweida: 8650, you're probably right.

Gardner: The double density 3350 for its product.

Aweida: That's correct.

Gardner: 635 megabytes per spindle. That was a huge product for StorageTek.

Aweida: It was. It was huge. Absolutely, it was. And we thought we have an opportunity here to really hit the market hard with that. And again, there is a lot. IBM could not deliver. We were delivering. We thought we could really grow.

Gardner: Actually it was one of the few times IBM did not do a double density version of their product.

Aweida: Yeah.

Gardner: Historically IBM produced one or two or sometimes three generations of a hard disk drive family, but the 3350 was an exception -- they never did a double density 3350. StorageTek did one. Most everybody did one. IBM tried to go to the 3380 and as you just told me it was delayed.

Aweida: But the timeframe I'm talking about IBM did fall behind in shipping products.

Gardner: … You've got it exactly right.

Aweida: And we were attacking the market hard and maybe that caused us problems. That caused us a problem in the fact that our [8650] product did not perform as well as it should have[8] and we had a little setback in that one. And I think that was the first time this company, which was growing rapidly, like 40 percent annually in revenues lost money. Now that was very disheartening but we thought we could pull out of that. But then we found ourselves in the same bind at that same time where we're behind schedule in our CPU development. Even though we raised a lot of money to get that project going and moving forward … we were behind schedule. And now money became a little bit tight. Up until that time we were managing things by different ways of funding, the IPO and leasing companies, then we had what you may call a private placement to fund specific projects. We have private placement to do the CPU. We had private placement to do the optical disc drive. And those placements where we raised money for that project but it wasn't really enough to fund the complete the project. We had to invest our money as well. So we found ourselves in a bind and in a 2,000 and-- not 2,000. When in the 1983 timeframe we lost money and we found that we were running out of cash to fund these projects. Now keep in mind we were

[8] [Editor's note]: "To capture the market before IBM caught up, 8650s were shipped fast and furiously — no matter what. The unhappy result was that failed 8650s began coming back at an alarming rate. "At one point, I had 10,000 returned HDAs sitting up there in Bldg. 10," Rodriguez said. Most of them were smashed with bulldozers and junked as scrap." Source: StorageTek – 25 Years, Storage Technology Corp. © 1994, p.16

shipping tape and disk drives to the marketplace. Tape was always the never the problem. We have never really had any problem in shipping tape equipment, tape was a success.

Gardner: Some of your alumni like to say tape made money and disks spent it.

Aweida: Well, disk did really good too. All these product they did. But I think what happened in the 8650, the snag we had there that costs us.

Gardner: It was?

Aweida: The money we spent on the CPU and the Optical Disk programs got us in a bind financially. We had a banking syndicate headed by Citibank. We also had loans from other organizations for the purpose of financing specific projects. Our financial people were very innovative by identifying and using all types of sources to raise money for the different things we were doing. So when we lost money that year for the first time in the history of the company the lenders became very concerned.

With the lack of funds along with product delays, we could not afford to continue the CPU development. So I shut it down and took the financial loss to the bottom line. This resulted in really bad financials. Shutting down the CPU helped us reduce the cash burn. But weak financials resulted in several of our small lenders calling their loans. Unfortunately, we were not successful in expanding our bank line with our banking syndicate even though we were strong financially with assets of over $750 million.

We hired consultants to help us raise the needed funds. The plan was developed by the consultants which was modeled after a successful plan used by Continental Airlines. The way the plan worked was to get a financial commitment from a banking institution that would commit to lending the company the needed funds, provided the company filed for Chapter 11 protection. It was estimated that the protection cycle would only take 2 to 3 months to complete because of the company's strong asset position. That was the plan we followed: after obtaining a $150 million commitment from Chemical Bank of New York we filed for Chapter 11 protection.

A week after filing for Chapter 11 protection, Chemical Bank came back to us and cancelled the commitment. Needless to say that was very disappointing. It resulted in delaying the process. Being in Chapter 11 we were not obligated to pay our debts and the cash generated from our sales activities allowed us to run the business. One of the biggest concerns we had was: is this going to make our customers unhappy? Are we going to be able to sell? Can we get new customers? In reality, nothing negative affected our product sales and our customer stayed with us.

To exit Chapter 11 we had to work closely with our banker, Citibank. They were very unhappy with me which was surprising since the whole process of filing for Chapter 11 would have been eliminated if they agreed to work with us to solve our cash crunch. Anyway, they insisted that they could not work with me, the guy who went around them. They insisted on having the Company bring in a new CEO to run the business.[9]

Gardner: New face.

Aweida: New face. Get some new face in here. You know, looking at it at the time I thought r I got to where I could take it out of Chapter 11, but I like to build businesses. I don't like to massage them afterwards or just bench things I'd been actually in the process of trying to get a chief operating officer for a while. We actually hired a guy from GE, did not work out too good. Then I had Naim, my brother, who was actually in the sales organization. Naim is a great negotiator. He did a lot of the negotiating the some of the OEM deals we have done. So the board thought he would be a great guy to be the chief operating officer … -- the timing was wrong for anybody to do anything there. So they wanted somebody else to come in. I said, "Okay, I would-- look, I would stay as chairman of the board. Get somebody else in." One of the people I knew and was available was Ryal Poppa. I said, "You know, Ryal would be a good guy to come." Because really the biggest drama I had was with these bankers. I mean they're really all over us. They were trying to control everything. I said, "Ryal is the kind of guy who speaks only to God and these bankers are not going to have much effect on him." So I-- the board interviewed him plus many others. He wasn't really the number one choice for everybody but they bought the idea he'd be good. So he came in to run the company and I became just the chairman. Now for a guy who's been running the company making all the decisions and building it from scratch, I was [could not see myself in an advisory position], I didn't want to second-guess the guy. I don't want to be there, let him do it; I'll be out of there. So a couple of months later I resigned my position as a chairman
…

Gardner: I don't know how much further you want to go with the Storage Technology story. You've talked about recruiting Poppa, your resignation from the board. Is one of the questions that comes up is one of the key successes under Poppa was the library product, the 4400.

Aweida: You know, I saw that in the documents that I was against it and it really wasn't a true statement. We could not afford to build a library project of that type was being proposed by the engineering. My take was put that off to the side because with what we have going on we could not afford it.

Gardner: Given the current situation.

[9] [Editor's note] This answer was in part rewrote by Jesse Aweida during the review process. You can access the original answer by looking at the video on the Computer History Museum's YouTube channel.

Aweida: Right. I'm talking about in '83, '84 timeframe. It was people were say we can do a library like this kind of library. And it's going to, you know, project like that is going to take certain amount of resources. We were pretty tight cash wise. We didn't have the resources to have another major product. So I was going to say put that off; worry about it later. So when he got there under Chapter 11 we were generating cash from the current business to do things with.

Gardner: As I understand it there was a lot of cash available.

Aweida: Yeah, because we were collecting revenues from customers and not paying the loans to the leasing company. …

Gardner: Oh yeah, as I understand it because of the way your leases were set up the money flowed into a Storage Technology account and then flowed out to a leasing company.

Aweida: You are correct.

Gardner: -- Once you filed for Chapter 11 those payments to the leasing companies stopped.-

Aweida: Yes, we just received them and we kept them.

Gardner: You kept them.

Aweida: That's right.

Gardner: So you had an enormous positive cash flow.

Aweida: So the resources were there..... I should add, but also at that time there's no optical disk program and no CPU program which we were developing before the Chapter 11. They were gone because we killed both of those and therefore, there's-- the engineering people are available to build something different. That's how the library came about.

Gardner: Okay. Now there was also a microelectronics project or company set up separate from the computer company. At least from what I read in the literature there was a microelectronics development organization which was set up as a separate entity which was also shut down. Does that ring a bell or am I confused?

Aweida: We had bought a small company in New York City or in New Jersey that is developing some microelectronics.

Gardner: High density microelectronics

Aweida: It was a very small little entity. We shut it. But that was very insignificant.

Gardner: Okay.

Aweida: So we didn't have any of these things going on -- no CPU, no optical disc. We … only had our basic products, the disk drives and tape drives. And the printer was still there but we somehow did something with it afterwards. So there were available resources and people to develop something more in the peripheral area. And I think that's when the library came about.

Gardner: Tell me about the optical project.[10]

Aweida: You know, looking at storage medium for both tape and disk, we concluded that we're taking tape to higher and higher densities. We can take a step up like a factor of maybe 10 by going to optical recording rather than magnetic recording. So we analyzed that market area got excited about the potential. So we set the operation up in Longmont, Colorado here, had Juan Rodriguez in charge of it to build an optical product. One of the problems was there's no media available, so we had to also manufacture the media for the optical product. We worked out a relationship with DuPont. They actually invested in the optical program because they liked what we were doing and the media needs could be quite substantial. So it was our next Storage product to be much higher capacity. And I think probably we thought of it as a tape follow on products. Not necessarily a disk product but a tape type product with large capacity. That was the concept behind it. We have the tape drives we were building they have doubled their capacity and now we can go a factor of 10 rather than double and we thought was really appealing. Now for whatever reason the product was being tested, it was performing but not quite ready to ship at that timeframe. And it was a little bit behind schedule also. So we found ourselves short of money. We could not finance it. And that's when we decided time to end it. Now just about the same time when we're having difficulty in trying to get the banks to extend the loans we have with them. It's money and resources that said to us, "You can't do it." The one that was heading it was a Juan Rodriguez. And probably if you interview with Juan probably he would told you more about what the technology was and what he was going on. It was a good product but it never really got close enough to being a shippable product. It needed a little more, well, more time and more money to make it happen and we were on alimony.

[10] [Editor's note] This project was announced on September 1983 as 7600 Optical Storage Subsystem for end users and Model 7640 Optical Storage Unit for OEMs.

Gardner: Was there an attempt to spin it out as a separate entity?

Aweida: Yes. we tried that. As a matter of fact, we-- several of the people that we have talked to about trying to fund it, I'm just trying to think back about two people I know we've talked about, they were interested but not interested enough to put to say $10, $20 million in it, so it didn't happen. As a matter of fact, I should add other people have tried optical devices like that and they say they always end up dying maybe for the same reason. The technology is good, you can show it, it's exciting, but it’s difficult to make it as a reliable product with the capacities needed to make it meaningful. I mean it has to have a certain capacity and performance to compete with magnetic tape. To go to optical you got to see at least maybe four times tape performance -- we were not quite there. We couldn't do it; other people couldn't do it either. There are actually optical disc device; they're people working on that now, but they still can't make it so that economically it makes sense. If you can really prove that it can perform at the much higher capacities for the cost of the product it makes sense. But when you start degrading the capacity and the performance to make it reliable you lose the advantage. And that's where we were.

Gardner: That seems to be always the story of optical. They're always 10 times better, but not this year, five years from now. And five years from now it doesn't work.

Aweida: Absolutely. Always it's got to be 10 times better and so exciting. Yeah. But then are you there? Well, no, we're not there. We're going to get there. You don't get there.

Gardner: No, absolutely.

Aweida: Team of guys doing it, they were very good, they could have performed, but they probably needed a lot more time, a lot more money to be spent to make it happen.

Gardner: Right in the middle of your difficulties--

Aweida: Yeah.

Gardner: -- I guess rumors about what became the 3480 start circulating. I know you started a MR head program in Storage Technology before the 3480 was announced. How was the 3480 and its potential introduction a factor in all and some of the problems that you were having? Not at all?

Aweida: Well, you know, we got into the making the read-and-write head operation in Boulder -- we had a little facility where we could manufacture [a portion of our requirements].

Gardner: Richard Dee, at that time had to share the clean room with the optical folks because there wasn't money to build a separate clean room for the head program which, of course, was the future of the tape business, which sort of an indication of the financial challenges that you were going.

Aweida: [Yes]

Gardner: I think Richard joined StorageTek in '82.

Aweida: Yeah, about that timeframe. … We decided to make heads rather than early on when we were got into the tape business we did not make the tape head; we bought them. It was a very good relationship we had with the manufacturer of the heads. As you get into the disk drive area you start making those heads and it becomes very, very demanding technology. We decided that we would like to do it ourselves rather than give it to somebody else to do it and it was very, very difficult, very difficult. I don't think we were very successful at it.

Gardner: Did you ever make a conventional nine track heads? I don't think so.

Aweida: No, nine tracks, no. I'm talking about we did the disk, the tape. Never made any tape heads.

Gardner: Until the MR head.

Aweida: That's right.

Gardner: But the work started early, even before IBM had announced.

Aweida: You know, I'm just trying to think back about that. You're very versed in the disk part of the business. <laughs> It did-- we started long before because that was the product we were doing. Our first disk product developed by StorageTek was that product. And so we took it and we tried to get into the double density quickly as we could possibly do.

Gardner: But that first disk product just used conventional heads, the MR head was first introduced in tape drives and only much later got introduced in disk. The first MR head commercially shipped was the IBM 3480, which I think was announced in '84, shipped in '85.

Aweida: Yeah.

Gardner: And so you were working on MR, 18 track MR heads in '82.

Aweida: Yeah, but I don't-- I can't recall if we had any of those drives in the '82, '83 time period.

Gardner: No.

Aweida: I don't think so.

Gardner: You were developing the MR head anticipating that that was the It was going to happen

Aweida: Yes, we were developing them thinking that it's going to be happening.

Gardner:. And ultimately after you left I guess STK manufactured its MR heads, all of its products starting in the late '80s.

Aweida: Yeah.

Gardner: You said the computer project was a mid-range target--

Aweida: It was mid-range computer.

Gardner: Sort of in the class of what, a [System/370 Model] 148 or a what -- can you tell me a little bit more about the target in the market? And how far you got when you had to shut it down?

Aweida: You have the large mainframe, you have the small computers, then you have middle size. We're in that middle range is what we were trying to build. And, you know, it's a good question. We were about two years into the project and we thought we'll have a product to send to the market as initial customer ship in that timeframe. But we were still about a year away from having it available for the market. And the problem, in fact, it was just basic problems. You build a computer, you got to make sure it's debugged. The functions perform as specified. They have to integrate all the peripherals and test the all the combinations., … You can test the functions fairly quickly. But testing all the interactions with the different parts of the system was it was not happening. I would say we were about a year from having a prototype to show to anybody. And that is about a year behind schedule.

Gardner: Mm-hm. Was it your own operating system was going to be IBM compatible?

Aweida: IBM compatible. Yes.

Gardner: But by that point IBM was unbundled. I'm not sure [but I think they] were making it hard to make a computer to run their operating systems. That was my recollection. Maybe I'm maybe confused.

Aweida: Well, the guys we have on the job they felt that they could do it.

Gardner: Okay.

Aweida: It just didn't happen. I mean or they're slow getting there.

Gardner: Okay.

Aweida: Now the question becomes why did we try to invent some measure things with that CPU? The answer is no. We just wanted to have a CPU in a middle range that we add all the peripherals to it and ship it to the same customers that were buying our peripherals. It was more like complementary type product. You know, as a matter of fact, thinking back we did have a product we developed and we killed it, a tape product. The low-end tape drive, kind of low-cost, low performance, this is tape, not disk now, in a '78, '79 timeframe, we could not get that product built at a reasonable cost.

Gardner: Are you talking about the 1900 series?

Aweida: -- Well, it could have been. I don't remember the name of the series. But it was a low cost tape drive, very simple machine, no vacuum columns but a reel-to-reel type product. We were trying to build something that could be used with other CPUs other than IBM CPUs.

Gardner: Yeah, but my notes show a product which had that number shelved as an IBM product.

Aweida: Yeah. And that we killed it because we could not make it at the cost-- required cost. You can build it; it works but it cost too much money.

Gardner: Any recollections about the [8890] Sybercache?

Aweida: No. I know the name is familiar to me but I don't remember exactly what it was.

Gardner: It's sort of it's one of the first, if not the first pure caching storage device.

Aweida: Oh yeah, that's probably what I called the solid-state disk.

Gardner: There were two [STK] products, the [8890] Sybercache and the 4305.. The 4305 was replacement for the 2305, the IBM fixed head disk. So it was a disk drive but it was a multiple fixed heads with eight tracks per head, read in parallel for a very high data rate.

Aweida: I don't think we did that.

Gardner: No you didn't do that at all. Nobody did that. Only IBM could do that.

Aweida: Yeah.

Gardner: But what you did was a called a 4305, which was a solid-state device, which looked like a 2305 [to the] operating system.

Aweida: Yes we did that. We upgraded the basic solid-state disk -- you're talking about, the Sybercache. And those were successful products actually. But the only problem with that is we're buying all the semiconductor devices from Intel – we were at their mercy from a cost point of view. So it was very tough for us to make it competitive.

Gardner: Yeah, it was a small market too.

Aweida: Yeah.

Gardner: Mainly on the very high-end mainframes where they put paging files and stuff on the 2305. Your product was much faster and essentially no access delay at all so it really helped those systems.

Aweida: Yes it did. But we kind of always thought that as solid-state disk is a good thing to have-- to add to the product line because if you can make it cheaply enough it could fit a gap in the marketplace.

Gardner: Okay.

Aweida: But again, the pricing-- chip pricing was the obstacle there.

Gardner: Okay.

Aweida: Intel was doing it themselves. They're making the chips and they're making the product, so they're tough to compete with them. So that's why that project did not continue to grow.

Gardner: It turned out it was better to put a cache in a control unit at the head of a string of tape or disk rather than have a separate, a high-performing device.

Aweida: Yeah, that's probably true. So there was no need to have a separate box.

Gardner: … The function disappeared in the '80s. By the end of the '70s it was going away.

Aweida: Yeah.

Gardner: And today we just don't do that anymore. We just don't build computers that way. It was a niche market and the niche disappeared.

Aweida: I don't know if completely. We did a lot with that. There were two models of it and they sold, they were kind of easy to maintain but we didn't make any money out of it.

Gardner: <laughs>

Aweida: You know, it just we have to buy those chips and you're at the mercy of the manufacturer. Yeah.

Gardner: Right. [most] of the cost of goods sold were the chips.

Aweida: Exactly

Gardner: And, of course, the IBM 2305 was priced quite high but, you know, there's just not that much margin.

Aweida: That's right. Yeah.

Gardner: Okay. So is there anything else you would like to talk about from the product or market or finance from some sort of technical point of view?

Aweida: Broad sort of view.

Aweida: Yeah. One thing I didn't mention in here that, you know, we did actually make OEM sales.

Gardner: Yes.

Aweida: After we had the product working and being sold to the users we found ourselves talking to UNIVAC and others about buying product from us on an [OEM] basis, and we did sell them. It wasn't the primary part of the business but it was complimentary business -- the success we had was in fact as an end-user supplier. We were very good with the end users. The OEM business was like gravy added to what we were doing [with end users]. So that was good.

Gardner: And it [OEM] was a net 30 day business.

Aweida: Exactly.

Gardner: Well, sometimes they may not pay net 30.

Aweida: Also I talk about we have built a strong sales service organization. Now we did that worldwide. I mean domestically we had sales all over, the major locations. Then we went into Europe and Japan. So we were selling products all over. Because we're in manufacturing, today people don't manufacture but at the time we were manufacturing, and we had about the highest number of employment. We had about 16,000 employees. About 10,000 of those were here in here in [Louisville] Colorado. So we had a lot of employees working at the company, which is kind of nice. I still like the idea of manufacturing products. It's unfortunate [that now most companies moved their manufacturing to China, Mexico and other places taking away American jobs]. I remember going to-- where was it? It wasn't China. It was Singapore. I watched the Seagate Technology building products over there, Singapore. I went to the plant. It's an automated facility. They had maybe about 10 people. I said "You know, why do you manufacture in Singapore? Why not do it [in the U.S.A? It's only 10 people [running the operation because you automate]." What's going on in China right now is the same thing. They automate everything. You could say well, we could do the same thing here. For some reason people have it in their mind that, hey, go over there. Those guys will pay you off in the beginning. You don't have to set us up. You don't have to pay for tooling. They take care of it. They're smart people. They're taking the business away that way.

Gardner: Which is actually another subject we can talk about, but we talked about financing essentially dominating your role.

Aweida: That's right.

Gardner: **[**Financing was] not in the business plan, you got into it and obviously got very good at. The other thing not in the business plan, and you've talked about it, is this sales and service organization's requirement.

Aweida: Yes.

Gardner: In the OEM business you sell a product to a customer. He maintains it. It's his to sell to his customer. When you're selling to the IBM compatible market you need a major investment in sales and service.

Aweida: Right.

Gardner: How quickly does that become a challenge for you in growing your business?

Aweida: You know, as I mentioned earlier that we hired a capable guy to head that activity.

Gardner: Right.

Aweida: Right at the beginning. So he actually was involved with engineering in making sure the product is tested, checked out, working before it shipped to the marketplace. He brought in some sales people, brought in some service people. It became very clear to us that we're on the right track and we can build products in volume because we have customers. Now, the biggest problem with that is when you're selling it to an end user customer normally you get paid. **… [**But our end user customers were leasing the equipment on two year leases, so] we found ourselves spending a lot of time in finding ways to finance the business, raising money, working with leasing companies, and doing whatever it takes to finance this growth.

Gardner: As I understand the market, one of the problems is that when you want to sell to a Ford or Bank of America you have a salesman fly into Ford or fly into Bank of America, but they're going to want service people in [many] different locations.

Aweida: Yep.

Gardner: So right from the beginning when you're growing your company a challenge is, how do I have a physical presence where my customers demand it? I mean you hire a salesman. Fine. A salesman will cover a territory but an installation needs a service person close by. So all of a sudden you need 24 hour per day service support.

Aweida: Yeah.

Gardner: The growth of your sales and your service force is just a big expense and a big recruitment challenge right up front.

Aweida: It was. As a matter of fact, as I mentioned, we had a limited number of sales people.

Gardner: Right.

Aweida: Very effective and very good, but when they sold something you have to have servicemen service it. So the service organization was much larger than the sales organization, and by the way, I'm just trying to think about how to put that. Service was a very profitable business for the company. You know? But you charge for servicing the product, was very profitable and we had to be in locations all over the place. So anytime you have a sales office, maybe you have a salesman, but you probably have 10 service people. I don't think we had any service locations where there are no sales coverage. They all have sales coverage but they are usually many sales-- many more service people in the field than sales people, and that-- you're right. You find yourself no longer in a building products business. You are in a selling and servicing products, and as I've described so far is that our second product we bought from somebody else just to add to what we have because we can sell it. It's funny. You see that today [it's an environment of] people who don't manufacture anything but they sell. So in a way we're doing that in the computer business.

Gardner: And they don't service it either. You throw it out.

Aweida: That's true, too. Let me think here.

Gardner: Well I think the mainframe business today, for IBM I think it's still a $10 billion a year business. It's the same thing.

Aweida: It doesn't change much.

Gardner: They have to service their room full of equipment and there are now many people servicing these environments.

Aweida: Well, you need service and, you know, people really did pay for it. Howard Derby who was heading our service organization. He's quite a dynamo. He says "Hey, we make money in service. We've got to supply the service but we can make money, a lot at it." You know, it's maybe a couple of little things, maybe anecdotes in here but one of the early customers we had was Ford Motor Company and I'm talking about within the first six months of shipments we had Ford Motor Company. So they want to come and see us before they bought -- they were sold that we can do the job for them. So they fly six of their executives to come to Boulder to see our 2,600 square foot facility where we manufacturer the product. They placed an order and before very long we had a lot of business with Ford Motor Company. EDS, Ross Perot's company, they're proud of the fact that they know computers. They know what they're doing. They can service customers. They were one of our early customers as well, and I remember how we got that business. They had some tapes they could not read on IBM equipment and our sales people said "We can read it for you." So they gave us the tapes, and we read them …. They said " Fine. We'll buy it. We'll buy a bunch of your drives," and that was the beginning of that. So we had a lot of successes because the product was working well, but that was again, it's interesting. If you take a look at tape and disk, primarily really tape then disk was added later. The other things we tried to do did not work out too good. Printer was no good. The CPU never happened. Optical did not happen, but disk continued to be a success and tape continued to be a success.

Gardner: Into this century actually.

Aweida: That's right. That's right. Even right now, today, I just heard recently about IBM technologists are storing so much data on tape that what, like, on a small little cartridge. You have as much as you had in a whole library.

Gardner: They may be cheating a bit there though.

Aweida: Well, maybe they are but the fact is the whole idea of the optical disk was instead of having to have huge stacks of wheels of tape, maybe you'll have two, three, or four optical disks and maybe you'll reduce the size significantly, you know.

Gardner: But the problem with optics has been lasers are difficult and optics is old.

Aweida: Yeah.

Gardner: And so, you know, they can't produce an X-wave ray laser, which they'd have to produce to produce a spot size small enough to match the density that those IBM guys were demonstrating.

Aweida: Yeah.

Gardner: The reality is magnetic density is higher than optical density by an order of magnitude or two.

Aweida: Yeah.

Gardner: So it's just read or write it on tape or disk. Who needs optics? I mean that's the dilemma of optics...

Aweida: Yeah. That's true. Somehow, you know, you overstate optical recording is the way to go. It isn't it. It isn't. It has not been proven to be that way.

Gardner: Traveling way back in time just to make sure the record is complete, you're a golfer and a skier. Thirty days of skiing last winter.

Aweida: That's right

Gardner: Any other avocations besides your grandchildren, golfing, and skiing?

Aweida: Well, I'll tell you in my schedule now is also running. I run, golf, and ski. Of course, you don't ski in the summer but you ski in the winter and you can golf year-round if you go someplace where they do have golf. You go to Hawaii. You go someplace that's warm. I do like to run and I don't run that much, but we have a race here in town, the Boulder Boulder Race, 10K. I do that every year.

Gardner: And you win it many years.

Aweida: And competing in my age group, it goes by the year, I win that every year because of whatever reason. I guess some people drop out as you get older. If you stay in there eventually you'll win. Yeah. Now, I've been winning that for many, many years now. Yeah. I train for it though. It doesn't just happen. I train for it.

Gardner: And the younger limit in your age group is 70, 75?

Aweida: No, no. Actually that is my age.

Gardner: Oh, your age.

Aweida: My age group is 86. So year by year.

Gardner: So it's a year by year. Oh.

Aweida: Yeah. We have one race at Martha's Vineyard where we have a summer house. We go there. There it's 80 and over. It's kind of interesting. This year I went there and I ran that. It's a 5K and all these guys who just turned 80, they thought they could really win it.

Gardner: Yes.

Aweida: No, I won it. <laughs>

Gardner: You won.

Aweida: Yeah. That one is 80 and over. But anyways, so the main thing is really it's fun to do but also it gives you something to motivate you to actually do-- run periodically to, you know, it's good for you do it. It's good for me to stay in shape. Yeah, and skiing the same thing.

Gardner: Yeah. That's-- good luck on your next 10K.

Aweida: Thank you. Thank you.

Gardner: So we had pretty much covered Storage Technology in the morning session.

Aweida: I think so.

Gardner: Any other key players we didn't talk about that you'd like to mention who've made major contributions at STC? We talked about Zol [Herger].

Aweida: Well, I'll tell you one guy we haven't really talked much about who headed the service organization, Howard Derby. I think he did an awesome job in making sure a product worked well in the factory worked fine, and in the field. If there's a field problem, he took it upon himself. He lead that whole organization group. I don't know, maybe a couple of thousand people. He goes there himself sometimes. He worked hard to make sure the product worked reliably -- especially early on when we were still trying to build up the business. He was a very key employee.

I mentioned my brother, Naim, came in there early on to help us negotiate deals. He did a lot of negotiating deals with OEMs— not with the end user, but with OEMs and also with supplies and things like that. He did it. He did a very good job there, and he lives here in Colorado, by the way. [His responsibilities were expanded and for a while he was COO.]

Let me see. Who else? I know the initial technical team very well because they're the ones who came with me from IBM right in the beginning, and we talked about some of those, other than Juan and Zol, I think of Barry Cunningham and Erik Ringkjob -- many of them are still around here. Very few went to Arizona but they're still here, most of them.
…

[The company grew rapidly with thousands of employees – a large number of individuals did outstanding jobs in making the company successful: Juan, Zol, Tom Kavanaugh, Barry Cunningham and Erik Ringkjob managed the development of the initial products. Sales, marketing and service organizations were managed by Jim MacGuire, Roy Wissinton, Wayne Bren, John Hill, Howard Derby and Fred Moore. Operations was run and expanded through the efforts of Norm Premo, Disk Ralstron and many others. Controls and finance operations were managed by Chuck Siefert, Roy Livingston and John Mehalchin.

Gardner: You mentioned twice talking to Memorex about relationships.

Aweida: Yeah.

Gardner: First with Larry Spitters. He's very early, and then later on I suspect with Bob Wilson.

Aweida: With Bob Wilson and myself the discussion was that it will be fantastic if we get the two companies together, make basically have a merger of the two companies, and we talked about that and as a matter of fact, you even have it with-- we put a graph together for that motion. Frankly, looking back at it right now, it's hard for me to imagine why it did not go through. It did not happen. Whether it was they backed out or we did, I think maybe it could have been us rather than him. I don't know but the way he put it is this would've been-- this would be a major business combination if it happens but it didn't happen. Probably the timing of that of that must have been the 1980 time frame.

Gardner: I think Wilson retired around '80 or '81.[11]

Aweida: It must have been just before that.
…

Aweida: It was maybe he was looking for something to do at Memorex before he retired. Maybe that's the timing but it wasn't-- yeah. I don't think it was before '78. Maybe as late as '80, '81 but in that time frame. Yeah.

Gardner: Personally, I agree with you. Had it gone over I think it would have been a merger made it heaven.

Aweida: Yeah.

Gardner: Hindsight is --

Aweida: Well just a little maybe something else. Boulder here, this area here has a lot of startups that came out from StorageTek, before it filed for Chapter 11 and after. Like we talked about, we talked about different people in here but what I was leading into is that many people left StorageTek to start businesses in the Boulder area, and the number was 32. The 32 businesses were started out in this area by ex-StorageTek employees. Many of them actually started their business while StorageTek was still going, big guns, and I was over there. We really encouraged people to be independent. If they wanted to do something on their own, more power to them. … We really never said you're taking company secrets and going here and then tried to get them to stop. We didn't stop anybody. Do it. Good luck to you. And from all kinds of different kinds of fields, too. Not all developing products. Some in the leasing business, some of the component development business, …

Gardner: As an aside, Juan Rodriguez gave me a box full of clippings that he had collected over the years, mainly of local newspapers

Aweida: Yeah. That probably includes the Boulder paper.

Gardner: Yeah, [Daily Camera], Rocky Mountain News.

Aweida: Yeah.

[11] [Editor's note: Clancy Spangle replaced Robert C. Wilson as Memorex President and CEO on March 1, 1980.]

Gardner: A couple of Denver papers and I was struck as I went through it by the entrepreneurial nature in the Boulder area.

Aweida: Oh yeah.

Gardner: There are several articles about companies in a variety of areas that started up here, and obviously the number 32, it was clear in the articles that I read that many startups had spun out of Storage Technology.

Aweida: Yeah. Quite a few.

Gardner: And had been fairly successful.

Aweida: Yeah.

Gardner: Was Terry Johnson and Mini Scribe one of those?

Aweida: Yeah. He was one of the guys who left. Yeah.

Gardner: Were you aware of it when he left?

Aweida: Terry, when he left Storage he said he had the job [he was working on] done. There's not much to do, not exciting anymore, wants to go out and see if he can do something exciting, and this was back--the story. I had a chitchat with him on "Why are you leaving, Terry," and that was his story. "I'm getting bored here. I want to go do something more exciting."

Gardner: Even though that was probably the time that the double density 3350 Class Product was having a lot of field problems.

Aweida: Yeah. That could have been the time. Yeah. Yeah, but he was essentially bored with that.

Gardner: Oh.

Aweida: Unfortunately.

Gardner: So he wanted to do something more exciting?

Aweida: Yeah.

Aweida: Tom Cavanagh left early on to start a company. That was probably in the mid-70s. He thought he'd be happier doing something on his own. Let me see. You know, it just, if you look at maybe there's definitely-- you'll find a lot of people who left to do something while the company's still moving forward and growing, but they felt that they could do something on their own, and we kind of encouraged that. We-- I'm just trying to think. Storage Technology, I left StorageTek in '85, 1985 and I mentioned to you earlier that one of the motivation why I resigned off the board because I was going to get into the disk drive business by acquiring the CDC's disk drive operation and figured McGuire was going to be with me. He would build up the sales and service and sell that service into the marketplace. It did not happen. I mean we could not make the deal because somehow it seemed they kept on changing what they want for the business. You get to the point it didn't make any sense. We did not do it. But we did invest in a tape drive company. We actually merged my operation with a small tape drive company.

Gardner: This is Aspen Peripherals?

Aweida: Yes, and we sold that to Storage after that. We invested in a leasing company, leasing corporation here in town and we sold that to a major banking institution. So we've been-- I've been fairly active in the venture business after that, not many in the storage area. Somehow one of the ones I discussed, they've been more-- some of the venture investments we made were in medical devices. We have some, some in software. We have some in services, you know, different kinds of businesses.

Gardner: Now this is as Aweida Venture Capital.

Aweida: Yeah. That's right.

Gardner: You set that up in '85 after resigning from the board?

Aweida: Yes, after resigning from the board.

Gardner: And we're sitting in your offices today.

Aweida: Still going. Yeah, and we've done some real estate development. So, you know, it's a little like you can't just sit idle. I'm not retiring. I don't believe in retirement. I keep doing things. So I keep on doing that. I look back at the StorageTek days, a phenomenal time we've had over there, and thinking

about sometimes how things could have turned out a bit differently, but you know, that's history. That's history.

Gardner: So could you talk a bit about your Aspen Peripherals investment? You had said earlier Storage Technology couldn't make a low cost OEM drive.

Aweida: Yeah. Aspen did their own drive. At StorageTek we killed the project because somehow we could not see it go down to a manufacturing cost that we could sell it profitably. Aspen had a product that they were developing that looked like it could meet the marketplace needs. I know Siemens was one of the customers of theirs. I don't know who else. They've had several customers. Siemens made an offer to buy the company. Then StorageTek decided "Hey, why should Siemens have it? We'd like to buy it." So they ended up buying it instead, which was fine with me.

Gardner: Why do you think Aspen could make the cost objective and Storage Technology couldn't?

Aweida: Well it's different. You know, it's funny. Storage could have done it too except the mental state of the people involved with the program was one of you've got to have all these bells and whistles in there to make it just like the other product, and you start adding all that stuff, hardware to it, it's not going to [be cost effective] -- do you need it? The Aspen design was simple,, just the reel-to-reel with read/write head, - did not cost much to build but did the job. So you don't have to have all the performance functions that you have in the major tape disk system in a small drive. You can cut out some of that stuff. It's not needed, and I think at Storage we did not cut anything out. We had a spec too rich with features. Aspen on the other hand said "Hey, look. We don't need all that stuff." That design that would [be enough]. I want to be able to sell this and make a profit, and maybe they learned from what we did at Storage. You know? Some of those guys were the same people. Yeah.

Gardner: Give us a feel of what sort of cost objective we're talking about. Are we talking manufacturing cost of a few hundred dollars, a few thousand dollars?

Aweida: We're talking about manufacturing costs the way I remember it in the maybe $800 range.

Gardner: This was [low enough cost] to be a successful OEM product?

Aweida: That's correct. Yeah.

Gardner: In the late '80s?

Aweida: Yeah, and the one that Storage would build, it was what, it cost twice as much as that. Now we did not-- maybe part of it, we did not take the effort to say "Okay, now we have it. It costs so much. How can you cut that cost in half?" We didn't go through this step for whatever reason. We just said "Look, forget about it."

Gardner: At StorageTek?

Aweida: At StorageTek. Yeah.

Gardner: Okay. That's not unlike the story I heard at IBM San Jose with regard to small disk drives. Jack Harker who was a senior guy at San Jose for many years.

Aweida: Yeah.

Gardner: When he saw the Shugart ST506 he said "We could never do that at IBM."

Aweida: Oh, really?

Gardner: But it was the guys who did it were..

Aweida: The same guys. They're from IBM.

Gardner: Not quite [the same guys] but it's certainly the same situation.

Aweida: It's the same thing. I don't think it was the fact we could not do it, but what we did was over-designed and we did not take this step to reduce the cost down.

Gardner: Right.

Aweida: Maybe part of that is analyzing who's going to buy it from us, what are they willing to pay for it, and it was an effort involved. So I mean I don't-- it wasn't a big thing in the scheme of things at the time when that happened, you know, but we're thinking "Hey, let's take it down. They have something good. Let's take it down," and looking back I don't think we gave it a chance to succeed in a down market. We could have succeeded but we didn't give it a chance.

Gardner: Yeah. Putting it into perspective, in that same time period I think the big disk drives at IBM was building cost in thousands of dollars.

Aweida: Yeah.

Gardner: And the Shugart drive had a manufacturing cost under $100.

Aweida: So you've got to sell hundreds of thousands of these. They'll be happy with a few thousand of those, you know, but it's a different market and the market moved into that direction.

Gardner: Well, and fortunate for Shugart the personal computer took off.

Aweida: That's right. That's right.

Gardner: Because you would not sell a hundred dollar disk drive into the mainframe market.

Aweida: That's right. Sure.

Gardner: Today you do though.

Aweida: The same thing in the tape business.

Gardner: But somehow the tape business never scaled the way the disk business did.

Aweida: No it did not. It did not.

Gardner: Is there anything else about Aspen?

Aweida: No, not really.

Gardner: You merged with them which is quite an endorsement.

Aweida: Yeah. It's sort of like we felt here's something worthwhile. Let's join up horses with them, which we did that, and I'm just trying to think. At the time it was right for us to do and I was looking for some

complimentary type product to get involved in, and that was tape, it fit and it was nearby, right here. We knew the people. It was the right thing to do. So we started with trying to do market somebody else's disk drives. It did not happen. We got into this one. We built it up. After a while we sold it to StorageTek.

Gardner: I think you told me offline that your leasing investments were very profitable.

Aweida: Yeah. We made an investment early on in leasing and as a matter of fact it was-- how should I put it? Financially was probably the best deal we have done. We paid back the investment, then sold it several years later for an excellent profit, a multi-hundred million dollar business, and with our share initially about 50% of that company. So it was a very lucrative business for us.

Gardner: Any particular leasing or just general leasing?

Aweida: No. It just started out by leasing the same devices we manufactured at StorageTek.

Gardner: Okay.

Aweida: Tape drives, disk drives, any kind of peripheral.

Gardner: Now, how did you service those? I mean as you know, leasing peripherals is a service intensive business.

Aweida: No. This is a leasing company that did not servicing. All they did, they bought the equipment, [from the manufacturer who leased it], installed it at a customer's location and serviced it.

Gardner: Okay.

Aweida: So take an example of a disk drive installed at Bank of America.

Gardner: On lease.

Aweida: On a two year lease.

Gardner: On lease to either a Memorex or a StorageTek or an IBM.

Aweida: Whatever it is. We [the leasing company] buys the equipment from the manufacturer. not from IBM but from Memorex or StorageTek or whoever it is. The leasing company bought the product and paid cash for it. They collected their money plus a percentage of their residual. They owned the machine basically but the life was long enough for them to make a profit out of it.

[The agreement between a Memorex or STK and the leasing company is strictly a financial transaction. The equipment is leased and installed at the customers location by a Memorex or STK. The customer signs a 2 year lease. As part of the sale agreement between Memorex of STK and the leasing company Memorex or STK commits to both servicing the equipment for a fee and releasing the equipment after the initial lease expiration. The leasing company buys the equipment, but the purchase agreement includes a sharing of lease revenues after the leasing company collects their cost and an agreed to profit.]

And so, they expanded it to many different areas, product areas, and the volume became very significant. I think before we sold it they purchased about two to three billion dollars worth of equipment. It was done well.

Gardner: And they key was the equipment had been installed by the original seller who had to provide service.

Aweida: That's right.

Gardner: So they kept a service contract on it.

Aweida: Oh, absolutely. Essentially all we did just collect the rental, kept collecting rental from it as far as it was on lease. If it comes off lease the manufacturer tries to lease it again. It's basically not involved in servicing of a product, strictly in funding the lease on it.

Gardner: But that requires the goodwill of the original lessor or the original manufacturer to continue the service and to provide the refurbishment and re-marketing when it comes off lease if it's..

Aweida: They have interest in it. Manufacturer has interest in the residual.

Gardner: Oh.

Aweida: Once you recover your investment they share in the amount of money coming out of that, and it's part of the agreement that they service it. So you don't distinguish owned by the leasing company from one owned by the company itself or by a third party. So the manufacturer services all the equipment equally. Yeah, leasing, it's kind of interesting. It was very I say profitable business. It was profitable and

it played a part in selling products or leasing products to end users who were willing to sign a two year lease but no more than that, and by the way, they also-- this leasing company also leased products to the medical devices to hospitals to dentists and the likes. It's the same kind of arrangement. It doesn't have to be computer equipment but they had a lot of computer equipment in their portfolio.

Gardner: Any other investments as a venture capitalist that you'd like to share with us?

Aweida: [We recently had two successful exits. The first was a company in the e-commerce market area. It was sold to Google and became the basis for Google Shopping. The second company developed a low cost low performance tape drive with cartridge loaders. One of their major customers was Dell and the company was sold to Quantum Corporation.]

We have active right now a couple of investments in medical devices.

There's one for people who have spine problems, there's growth around the spine that makes it very painful. [The usual treatment is a surgeon open ups their back, cut out all the excess tissue around the spinal cord, that whole area, and it's a major operation. What these guys do is they go in there with a big needle into the back and inside the needle they have like a little cutter. It cuts that material, take it out, all like in an outpatient department. You don't have to go out to surgery, and they clip the excess tissue. Then they take this needle out, it's kind of a big needle and they put a band-aid on it. The patient goes home and their back feels pretty good. That company is going still now, going big guns.[12]

Gardner: And then with our aging population, there's a lot of back problems.

Aweida: That's part of it. That is part of it. That's exactly, yeah. That's part of it.

Gardner: Okay. Quite a bit of marketing study.

Aweida: Yeah. Yeah. We have one investment in IOT, internet of things business and one in support software. They're kind of new technologies that are trying to penetrate the market but they're not hardware -- they're more like services and software rather than hardware. Not every deal we made was a good deal. In a venture business you always hope that if 1 out of 10 investments you make hits it big, you can make up for all the losers, but in reality if you make 10 investments, normally maybe one or two really do well. About maybe four or five do okay. The rest you shut down … . So we've had our share of shutting down as well as <laughs> all those categories.

[12] [Editor's note] The sinus company developed a tool that allows medication to flow efficiently through the tear ducts to the sinuses.

Gardner: So you started it as a requester for venture capital, very successful. You ran the company. Now you're sitting on the other side.

Aweida: That's right.

Gardner: People coming now to you. Would you like-- can you share some advice about what you've learned and what you try to do?

Aweida: Well, you know, you're always learning.

Aweida: You always say the following. If you have a good idea, a good team, and the money to execute, you get the business going. Very often you have maybe a good idea but you question if the team is strong enough or not. So we want to make sure that we're investing in the right idea and the right team. And so, when people come to us with an idea, we very often compare it with the plan I put together many, many years ago for STK. It's got a detail about what it's going to take to make this happen. I see many deals where some of the guys have a good idea and but they really don't have more than a good idea. A good idea by itself doesn't take you any place. If you find a real good idea and you like it, like going back to the leasing business, you work in bringing to the company talented people who can help execute if they don't. So you really got to have all those three pieces together. When somebody comes over says "Look, I have this fantastic idea. I want to build this product to do such-and-such with it." You ask them some question. "Well, who are you going to compete with? Why do you think you can succeed? How much is it going to take you to do this job? Who else you got with you?" I mean, so people have to really think about the whole thing to make a venture a success. Very often they [get carried away with their ideas], "I want to do such-and-such. It's a big market. I like it." Who's going to do it with you? How are you going to achieve it? How much money do you need? I find very often very few ideas that can pass that stage. They end up falling apart because they're not well-thought out. Obviously there are some good ideas. Today's you hear these companies. Before you know it they have successes. They've sold for a huge amount of money. Say "Well, how did they get those ideas and who actually came up with this?" They do exist obviously. There are a lot of venture companies out there, a lot of people with ideas. Everybody becomes an entrepreneur nowadays. I mean my-- every college, every community, any place, they have entrepreneurs all over the place. How do you get the right ideas and try to make something out of them? That's not easy. We just talked about if you make 10 investments. Nowadays maybe you need to make many more than that to get a few good ones, and that's tough. That's a tough business. There are too many losers out there is <laughs> what I was trying to say.

Gardner: Are you an early investor in your investment strategy?

Aweida: Yes, we are. We put the initial funding in.

Gardner: Okay.

Aweida: Yeah, but it doesn't stop there. You put the initial funding and then six months later, a year later, they need more money. You either participate or you're expected to participate. What I mean by that is you get somebody else from the outside to invest. So how about the insiders? Are they going to invest also or not? So you can't just say "I put the initial money in." They have a name for the ones who only do that – “angel investors”. They put some money in there. That's all the money they're going to put in. Then venture firms have to come in later when the company needs more money. Very often they don't. We find ourselves doing the initial money, the second money, and maybe third. Sometimes more than that which is a mistake but <laughs> we've done that, too. Yeah.

Gardner: Okay.

Aweida: It's kind of fun but it's not easy.

Gardner: But you're not retired so why not do it?

Aweida: Oh, yeah, yeah. I'm doing it. I'm doing it, but I keep looking for [good ideas to invest in]. At one time we had 12 investments going concurrently. Now we have five, which is fine. Somehow you often hear about the venture folks in the Bay Area. It seems like they love to invest in the Bay Area. They don't go outside the Bay Area to invest. So you find local people here and other places, local venture people who invest in these little different locations. But I think you're going to see more good ventures, more good companies being built by people who do a good job in going after a market, and you're always thinking about what is the next growth area that's worthwhile pursuing? You know, there's always something. I mean we've talked about electric cars. Now you hear about the Chinese saying a few years from now they're going to have 50% of their cars to be electric. What goes in electric car? Batteries. Who's doing what in the batteries? I mean you start thinking about those kind of ideas. I'm saying "Well, what could happen in this area or that area," and so on. That's simply applies to other fields as well.

END OF THE INTERVIEW

