



Oral History of Syed Iftikar

Interviewed by:
Tom Gardner

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Tom Gardner: Good afternoon.

Syed Iftikar: Good afternoon, Tom. Nice to be here.

Gardner: Syed, good to see you again.

Iftikar: Good to see you, too.

Gardner: I'm Tom Gardner, and I'm with the Computer History Museum Storage Committee, and we're here today to conduct an oral interview of Syed Iftikar. Syed is a serial entrepreneur, and serial inventor. We will cover about 35 years of his career at a number of companies in the disk drive industry, and perhaps even one in his home country of India, not a disk drive company. In interests of full disclosure, Syed and I have worked together over the years. Early on, Syed worked for me. Later on I worked for Syed. With that, Syed, why don't you tell us a little bit about yourself?

Iftikar: Well, as Tom says, I'm Syed Iftikar. I was born in India. At a very young age I had the fortune of being the fortunate one to take over my dad's company. So when I was about 20 years old, I got to understand and experience a lot of things associated with running a business. Some of the things I did well. Some of the things not so well. But at the same time, I went to college full time. Got my college degree. Worked in a company in India called Binny & Company in textiles. And after about a year, I decided I would rather come to the U.S. and create something new, by becoming an entrepreneur. And I joined a company called Memorex in 1970. Prior to that, I went to UC Berkeley, and got a master's degree in mechanical engineering. And after I got my degree, my first job was at Memorex in 1970.

Gardner: There is a rumor, Syed, that you came to the U.S. on advice of a professor in India. Is there any truth to that rumor?

Iftikar: Yes. When I decided to go to the U.S., I wanted to specialize in mechanical engineering, mainly machine tools. And I went and asked my professor, Professor Doctor Modi, M O D I, what field should I specialize in, once I got to the U.S.? Professor Modi had great foresight. Back in 1967, he told me, "You know, young man, 20 years from now, computers will be everywhere, at home, on the desk top, everywhere you can imagine. So if I were you, I would take computer courses, everything you can lay your hands on at Berkeley, and then make sure you join a computer-related company." That was the best advice anyone can give you, looking back.

Gardner: Why don't you briefly tell us the companies you worked for, then I'll go back through each of the companies in a lot of detail. The one point I would make, which I forgot to make earlier, is Syed's already given an oral history with regard to the introduction of metallic media into the disk storage industry. So we won't cover that in much detail here, but we will cover the rest of his experiences. So a brief summary of the things, places you have been.

Iftikar: My first company was Memorex. Actually I applied to three companies right out of Berkeley. One was IBM. The second one was Memorex, and the third was Control Data Corporation. Those are the only three companies I applied to. And I did get admitted into the IBM Work Study Program, where I would be a part-time PhD student. And the other part-time I would work at IBM. Memorex was a full time job. So I went back to my professor, and I said, "You know, I had these two opportunities. Which would he recommend that I do?" So Professor Modi asked me, "If I enjoy being a teacher, where I could teach in a college? Or would I like being a business manager running a company?" I mentioned to Professor Modi that I would like to be a general manager. And then he said, "I don't see the point in you doing your PhD. Why don't you join Memorex?" And that's how I joined Memorex. At Memorex, I met one of the best, friendliest, creative people that I can ever imagine, that anyone can imagine. And they taught me a lot of things at work and at play that made it challenging, fun, and sort of like a family. So I worked at Memorex for 10 years, on just about every hard drive program.

And after Memorex, I decided I would go off and start my own company. And I remember the first time I tried that. I went to a venture capitalist that was investing in television industry. And there were three of us, and we talked to him. It wasn't a positive meeting. Basically he said, "Syed, you're a great mechanical engineer." And the other two people, one of them was a great electrical engineer, read-write. And the third one was a great servo guy. But he says, "You really don't have experience of running a company. You may be great in running a department, but you're not good as general manager. He didn't even spend too much time talking to us. That was a big let down. But that did not stop us. So we continued to talk to people. And then Al Shugart, who also used to work at Memorex, talked to me about joining a new venture called Shugart Technology. And I thought that was a pretty good business, because Shugart's technology business was to miniaturize the disk drive and to move the disk drive into a computer onto the desk or the desk top. And we figured the market was going to be very large compared to all the rest of the market, so I decided that was a great opportunity for me. I took a big salary cut with a family of two young children. My in-laws were against the move, but I chose it anyway, and Shugart Technology went on to become very successful.

And when Seagate became pretty big, and I still had the itching, the inclination to start something as an entrepreneur with my hands, so I decided to start a second company called "SyQuest", which follows my name "Syed's Quest." And at SyQuest, we decided to design for the first time, removable cartridge drive with a hard disk inside it. And nobody had done a removable cartridge in high volume before. When SyQuest went into the business, I believe there was a company called DMA and one other company, Iomega but SyQuest was the one that really made high volume product and made it successfully. I was at SyQuest for about 14 years. And we had some of the best times at the company, but due to a competitor's product, which was introduced in 1995, affected the complete SyQuest business. So I left SyQuest to start my third company. The third company was called Castlewood. Castlewood was also a removable drive company that focused more on the high capacity CD /DVD type of removable storage. This company stayed in business for about eight years. We started the company in 1996 and closed the company in the year 2004, I believe. So these were the three companies, Tom.

Gardner: Certainly a serial entrepreneur. I said serial inventor, because by my count, I found 27 patents in your name on the patent database and one of them is so old it didn't make the database. So 28 patents by my count. Does it agree with your account?

Iftikar: I haven't kept track of it, but I do believe what you say is true.

Gardner: It's as good as the databases are today. Let's talk about your 10 years at Memorex. The first product you worked on was the Memorex 3670?

Iftikar: Yes. My very first product was 3670, and it was an IBM compatible disk drive. And I was recruited into this new program to come up with some advanced concepts. At Berkeley I had specialized on computer programming and finite element math modeling. This made it easy for me to simulate all the mechanical components without actually fabricating those components. This was new to Memorex at that time. I would simulate most of the mechanical components, and predict the structural strength, the vibration, the weight and the cost. And so the 3670, at least from my side, had a lot of mechanical simulation. And my first component design was an aluminum base plate that I showed the management by simulation that for the new product this would be ideal. And it turns out when they did see the IBM base plate, it was very similar in width and depth and the structure of the base plate was very similar. So two designers had independently designed a very heavy, deep structure that would withstand the higher vibration and heavier loads.

Gardner: Are you sure about that, Syed?

Iftikar: Yes.

Gardner: My recollection is Memorex was a C beam, and the IBM was more like a flat plate.

Iftikar: IBM was six inches deep, similar to us. So we went from 3330, I believe, or 3310, that had two inch deep or thick base plate to a deeper section of base plate. So the IBM 3330 is very deep.

Gardner: Really.

Iftikar: Deeper than the Memorex base plate.

Gardner: The Memorex was sort of a C-beam approach.

Iftikar: Memorex was a box section. I designed the box section.

Gardner: Really.

Iftikar: It's a closed box section with thick beams on the top to raise the center of gravity of the base. The center core was a closed box section. And IBM was also a big box section. [Ed. note: As installed the beams faced upwards forming a channel into which the voice coil motor and carriage mechanism were mounted.]

Gardner: What other parts of the 3670 did you work on?

Iftikar: Well, I was always hungry to want to learn as much about the drive as possible. So from the base plate I nagged my boss to give me just about everything on the base plate, the entire HDA.

Gardner: That boss was Roy Applequist or Don Massaro?

Iftikar: No. The first boss was Roy Applequist, but when the program was organized as the 3670, my boss was Brent Nilson. And the program director was Don Massaro. So after the base plates, I got involved with the spindle, 'cause the spindle wasn't stable enough and would vibrate. I had to design a counter ballast to make the spindle more stable and reliable. Ironically IBM had a better spindle, and the ballast simulated the longer IBM spindle to make it more stable during vibration caused by seeking, so the data would be more reliable. After that, I got involved with the head design.

Gardner: So the IBM was stable because it was a taller spindle? It had the bearings further apart?

Iftikar: Yes. The spacing between the two bearings was further apart, and almost doubled the distance of the Memorex spindle. So I had to add a ballast on the counterweight on the bottom to balance the disk pack on the top of the spindle. This counter ballast effectively simulated the larger spacing of the bearing.

Gardner: As an aside, one of my first overseas trips for Memorex was installing that spindle, that counterweight, on some of the first production 3675s that were shipped to a company called BBC, Brown Boveri Corp, in Baden, Switzerland. I spent two weeks in Switzerland ripping out spindles and installing Syed Iftikar's counterweight on the bottom of those spindles. The product then worked fine. But it was on the 3675, which was the next generation double density product.

Iftikar: The 3675 was double density. Memorex was the first one to have a double density disk drive.

Gardner: Memorex was the first plug compatible company to ship, but IBM did ship the higher capacity version on that product, on the 3330 class.

Iftikar: Right. And I was involved in a major way in the head design. I made a flexure design, so the servo head is quite different from the read-write head, whereas the original designs on the Memorex drives and the IBM drives have very similar read-write heads and servo heads. Whereas in the Memorex design, we came up with a unique servo head in order to minimize the vibration -- head vibration. And I have a patent on that design.

Gardner: What did you do?

Iftikar: Well, the original flexure was mounted, on the arm at two points. And this would make the flexure a little unstable at certain vibrating frequencies. All we did was add a third point support, like the three legs of a chair, you see, would have three points, or a stool with three points. So we welded one pivot point in the front and two in the back. This would give the flexure a three-point support. It wasn't easy -- as easy as it sounds, because the vibration got worse. And so we had to work on the flexure

design, the thickness of the flexure, the shape of the flexure and the box section of the arm to finally get it to work the way we wanted. And I think that was our first achievement and for me it was my first patent at Memorex.

Gardner: After the 3675?

Iftikar: After the 3675, we were involved I believe in the 3652.

Gardner: 3650 I think was the first one. That was 317.5 megabytes in an HDA. But weren't you also involved in helping out the folks over in the disk pack group with their data modules?

Iftikar: Yes. While I was there, I was called on by different groups. In the data module group we had to work on the disk coating. At Memorex we had a fixed drive where the heads would land and take off from the disk, and we found that the particular composition of the coating had too much silicon, or silica, and this would damage the heads. After we did some start-stop tests and run the HDA for awhile, we noticed that the heads would be severely damaged. I worked with the media group to identify the cause of the problem, and was also able to show people at Memorex that Dysan disk had very little silica, and the ferric oxide paint that they used to coat the disk would be better and more reliable. Dysan supplied me some disks and I showed Memorex that disks with less silica would be more reliable. Tests again showed that they were better. I give myself credit for forcing the change. Based on those results the GM asked that the formulation of the disk media be changed to reflect the new specification.

Gardner: Get in any trouble for bringing Dysan disks into Memorex?

Iftikar: Yes, I did. So, you know, when you have this "not invented here" syndrome, and you bring some media from the outside, or any component from the outside, it does tend to ruffle the feathers of the people inside the company who are chartered to do that. We did give them time. We said, "You know, if Dysan Media can work so well, we will help you mimic the Dysan Media". And that is exactly what the Memorex group eventually did.

Gardner: That is on the 3650. The next one was the double density, the 3652, which shipped pretty much just before you left Memorex, actually. What was your involvement in that area?

Iftikar: Well, I was the design manager for the group. And all the components that went into the 3652.

Gardner: For the entire group or just the mechanical portion?

Iftikar: For the mechanical group, as well as approving the heads and the media. So I had the responsibility based on my prior experience that I had to approve the new media and the heads that would go into the 3652. And it turns out that the heads were also in a similar shape. The heads that were made by the in-house team were not reliable, so I had to go to NMI, outside, to purchase heads. I brought in NMI manganese zinc heads, that had a little different contour. The taper on those heads had a

60 degree angle, as opposed to the 45 degree angle that everybody was used to. That was unique, because they minimized the side fringing with the steeper 60 degree angle. Again, I also was the first one to bring in heads from the outside, from NMI and Panasonic later on.

Gardner: Again, get you in trouble?

Iftikar: Again, I got into trouble. But what came to my defense was I could show the skeptics that the heads brought from outside were more reliable, performed better, and that was what saved the day for me.

Gardner: It turns out the 3652, the Memorex product, the double density product, was never done by IBM. That is the one generation where IBM did not do it, and that product, for both Memorex and StorageTek, turned out to be an extremely successful product for both companies in part because IBM did not do it, and in part because IBM's follow on product, the 3380, slipped. So there was a window in the late '70s, early '80s, when that product, the 3652, and its equivalent from STC, dominated the market and made a lot of money for both StorageTek and Memorex. But you left. Why'd you leave?

Iftikar: Well, before I left, there's a little story on the 3652, Tom. I was a champion for the 3652. Nobody really wanted to do the 3652. And so I wrote up the specs, a simple write up on the 3652. And I presented it to the general manager of the group. There were many skeptics including the general manager, I recall the CEO....

Gardner: Do you recall the names of these people?

Iftikar: Yes. The CEO asked three people to attend a meeting and to interview me, and to determine if this product was viable. One was Frank Gibeau. The other one was a man from ISS, Frank Sordello. The third person could be you, Tom. I am not sure. I started to make the presentation. About 45 minutes into the meeting, (the presentation was supposed to be an hour and a half.) Frank Sordello gets up and says, "Look, let's stop. I think we are wasting Syed's time and our time. Syed has everything under his control. He knows what he is talking about. I think we should go ahead and do the program." And that's how the meeting ended. And Sordello talks about that once in awhile when he sees me.

Gardner: I don't recall that meeting.

Iftikar: It may have been somebody else, a third person.

Gardner: I would recall. I hired you both. I may have been at Stanford when that happened.

Iftikar: There was a third person.

Gardner: Or may have been on litigation.

Iftikar: My memory with you is vague. That's why I say I think it was you. There was a third person, but I don't recall who. It was Frank Gibeau, Sordello, and a third person I thought was you.

Gardner: Personally I have very vague recollections of the 3652 starting, which means I was out of engineering twice when you were there. Once I was off working in the lawsuit area, and once I was off at Stanford. So it could have been Ward Ellis? It could have been Al Wilson.

Iftikar: No.

Gardner: Big round later, but that would be too late.

Iftikar: That would be too late.

Gardner: Jack Clemens.

Iftikar: Could be Clemens.

Gardner: Jack Clemens or John Keivel.

Iftikar: Yeah. I don't recall exactly. But anyway, there were three.

Gardner: I am sure if I had been there I would have also said you were correct, Syed.

Iftikar: Yes. I am sure you would. But anyway, I did champion the 3652. Then coming back to the last question you asked, Tom, why did I leave Memorex? Looking back 10 years of my life at Memorex. During the early part we had a great team. Camaraderie was great. We worked very hard at the office. But we also had fun together with this group of guys and their families outside the office, we would go skiing -- water skiing, snow skiing, hiking and kayaking. These outings brought out the team spirit. And we worked well together as a team, such a team that I cannot imagine one could come across, at least I haven't. The second reason was management. The early managers were entrepreneurs. They knew that in order to come up with new ideas, new products, and time to market, you have to take some risk. So all it took was a presentation on my part, or even a conversation, and they would come back and say, "Syed, that sounds great. Let's do it." There was no trouble getting the requisitions signed and building the product. And if it worked, great; if it didn't, we would modify it until it worked. That was entrepreneurship. Later on, as the professional -- so-called professional managers came in, they became bureaucrats, and we had to justify every little idea or concept or a design that we wanted to work on. As a result, it got to be deflating for our enthusiasm when you get up with the idea and people tell you go back and justify why we have to spend this money. So we spent more time on the financial analysis of the product, and some of them are truly assumptions, 'cause we are not sure if the financial analysis was right. After maybe like six months some products or some ideas would still not be decided on. And that got to be frustrating, especially for people like me who like to create things quickly, even if you had to model something, as we call it Mickey Mouse something, to see it work, and then improve on it. These

ideas got stifled. So we decided it wasn't -- I decided it wasn't fun anymore to work at Memorex. So we started looking around to see if venture people could back us to start companies. So that's when I started talking to Al Shugart, and we started Shugart Technology.

Gardner: It was a controversy. A couple more follow up questions on Memorex. The CEO who called that meeting was Bob Wilson?

Iftikar: Bob Wilson called the meeting, but he did not attend the meeting. He delegated the three people to give him a recommendation whether to continue the 3652 or to cancel the program. And the cancellation was a question because IBM did not have the product. In the past Memorex used to follow IBM. This product was unique. Memorex proceeded on its own and, as you said, it turned out to make a lot of revenue and profit for the company.

Gardner: Oh, huge success for both Memorex and StorageTek. A lot of people made a lot of money on that project.

Iftikar: The third person could have been Fred Jackolat the marketing guy. I just recalled his name. But Jackolat, I think, was the marketing person.

Gardner: I have a pretty good memory. I honestly don't recall that sort of meeting. And I think I would have recalled it, particularly.

Iftikar: It's probably not your day.

Gardner: Frank Sordello was an impressive person.

Iftikar: Yes.

Gardner: He was an interesting and impressive guy. There was a controversy at Memorex over who would make HDAs. Were you involved in that?

Iftikar: Yes. That's about the time that Bob Wilson joined the company. And when Wilson joined the company, his first act as most CEOs do, was to reorganize the company. And in the reorganization, I found that the HAD, head disk assembly, was assigned to the media group. At Memorex we had many groups. We had the disk drive group that designed the drives, drives meaning from the base plate, the spindle, the actuator, the electronics, the enclosure, the packaging etc, all that came from the disk drive group. The media group, previously were chartered to do tape media and disk media, but their involvement would stop as soon as they built the finished product, which would be media, either tape in a cassette, or a disk which would come in disk caddies. But for the first time, the entire HDA or the module was given to the media group, and it became their responsibility. I thought that was a bad idea. Having worked with the media group when they could not formulate the proper silica content on the oxide, I felt taking it a step further, designing a spindle, designing the bearings, the base plate, the whole actuator,

and the packaging, would be beyond their capabilities and expertise. So I still remember writing a two-page letter to the CEO telling him that as much as I acknowledge and respect the right he has as CEO to reorganize, that he was making a mistake by assigning the HDA to the media group. I took the letter and handed it to the CEO's secretary thinking it probably would be thrown into the dust bin. But two days later, I got a call from the CEO, and he asked me to come see him. So I went and saw him. And this is the first time I have ever met the CEO of Memorex, let alone sit at a table and talk to him face to face. And I was really worried that he was going to fire me. But he put me at ease. He asked me about my oldest son, who had just been born, if he had gone past his 2:00 o'clock feeding time and other things that put me at ease. Then we discussed the subject that I had written about this HDA being transferred. And he informed me that his staff had strongly recommended this was the right thing to do, and he saw a conflict within his staff's recommendation and mine. And as a new CEO, and not knowing me, he had to follow the advice of his staff, but he promised me an interesting thing. He said, "You know, Syed, we'll try it for six months. At the end of six months, we'll review if my decision is right or wrong. If it's wrong, I'll make some adjustments." And six months later he did call me and said he made a mistake, but he couldn't change the setup. But, he said, "You have the authority to specify and change anything on the HDA, and you could go directly to the general manager, Bill Sousa, and talk to him, and Sousa will listen to whatever you have to say." So that's the change he made.

Gardner: In the end, it was transferred back.

Iftikar: Yes. By that time I had left the company.

Gardner: You joined Seagate in January, 1980. But on your resume you said December '79. I think in December '79 you were still working at Memorex.

Iftikar: Yes. And we cleared it with the lawyers. As long as I am not an officer I could consult with the product that was not in conflict. We cleared with the law firm of Wilson Sonsini. Technically I was recruited in 1979, and I started the design five days before Christmas, I mean, after Christmas. So between Christmas and New Years, when Memorex was closed for the holidays, the first ST-506 mechanics was completely designed under five days.

Gardner: Five days.

Iftikar: In five days. I woke up at 5:00 in the morning. I went to bed at 2:00. My wife had to turn the lights off at 2:00 o'clock in the morning. Anyway, on the first day at Seagate, I asked the founders to attend a design review. The day was January 2nd 1980. They came to the conference room and what they saw in the conference room was wall-to-wall blueprints. At that time I had a drafting board. We did not have the AutoCAD. I borrowed a drafting board and had all these drawing -- detailed drawings of all the mechanical components of the disk drive hanging from the wall. A surprised Al Shugart says, "My God, Syed, where did you steal these drawings from?" And that's how the Seagate ST-506 was born.

Gardner: And actually as I understand it, you were consulting even before you started doing the drawings.

Iftikar: Yes.

Gardner: Let me put on this tape something I shared with you a little earlier. Jack Harker, one of our committee members, who has a long, distinguished career at IBM, considered the ST-506 to be a breakthrough in cost and performance. When he saw it in the early 1980's he realized that IBM just couldn't duplicate it.

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Gardner: As we broke, we were starting into the design of the ST-506. I understand you worked on it actually in your spare time when you were at Memorex, and, since you came up with the design in five days after Christmas, 1979, what was your inspiration? How'd you come up with such a low-cost design?

Iftikar: When we started Shugart Technology which later on became Seagate Technology, we realized, as a group, that in order to be successful, we had to have a very low-cost, highly reliable disk drive that could function on the top of a table. At that time we felt there were maybe 5.5 billion people in the world. If everybody would get a computer, that'd be a lot of computers. And in order to do that, we had to make it affordable. I got to give credit to Finis Connor. He brought a floppy disk- a 5 1/4 floppy disk drive, and threw a challenge at me. He said, "Syed, you have to come close to the floppy disk cost. That's your challenge". In general, a floppy disk drives are technically not that sophisticated. They don't have the high performance, but they are low-cost. He gave me a floppy drive, and said, "See if you can match the cost of the floppy drive." With this in mind I started the analysis, design and drawing of the hard drive in November 1979. My stock certificates were issued in November, so I started to consult then. But I did not get any salary at that time. I looked at the SA 1000 hard drive, and evaluated each item by item. I started off again with the base plate. I looked at the floppy disk drive, and said, "There's really no reason why I could not match the floppy base plate." I look at the motor. The SA 1000 motor was a huge expensive AC motor that was running with a belt and I thought I could do better. Al Shugart had given me some brochures from Pabst and a few other brushless DC motors which I reviewed, and I said, "I think it's time to be the first ones to design a brushless DC motor." . I called Pabst, and Bernard Shuh came to see me. He gave me a large brushless DC motor and in order to simulate airflow, I said, "Hey, I need something quick. I cannot wait for a new design for a brushless DC motor." So, he dug in his satchel and pulled out a fan motor for me. I said, "That's good enough for a simulation." So, I used the fan motor from my calculation, airflow studies and even mocking-up the first prototype. My DC motor came in at much lower cost than the SA 1000 motor. One by one, I compared each floppy component with that of my drive and set a target cost of \$201. And when the design finally was done, and the parts were procured, we actually came in at exactly the same target price. What motivated us was obviously the market. The second was also a personal reason. Much against the wishes of my family, especially that of my father-in-law, I left a stable job at Memorex to go into a startup. Statistics say that maybe 9 out of 10 startups fail, and I didn't want to fail. All the five founders would do whatever it took. We wanted to make sure that our company would be successful with the limited money we had. Our initial funding was only half a million dollars from Dyan. We had to design and manufacture a prototype for the \$500,000. We had a lot of motivation, personal, marketing, and our own desire, to introduce a product that nobody could compete with, and that's what drove us.

Gardner: Were you familiar with the Memorex 101?

Iftikar: Yes, I was. I had not seen it while I was at Memorex. I think it was being worked by Dr. John Scott, but I did not see it because it was pretty much a secret project under John Scott. When I left Memorex and joined Seagate, we took our first product to Apple Computer. Apple Computers showed me the Memorex product, and that's the first time I saw the Memorex product. And I knew, just looking at it, there was no way we were going to fail even without testing the Memorex product. Just looking at the size and the way the Memorex product was designed, I knew that we would succeed at Apple.

Gardner: You said part of your concept came from a floppy. But a floppy is mostly a flat plate. You implemented a bowl for your disks. That's sort of un-floppy like.

Iftikar: Yes and no, Tom. The floppy that I received had a flat plate and three side walls. The floppy has a flat plate. However, look at the floppy. It has a base. We have a base. But the floppy also has two channels on either side and a load-unload mechanism and a cover. So, if you assemble Seagate's drive, okay, as an inverted dome and a cover, it was pretty much the same cost as a floppy. When I compared the two side plates of the floppy with the loading mechanism, and the cover, our costs are very comparable. In fact, we were lower cost than the floppy. My design didn't have all the mechanism that the floppy drive had.

Gardner: The floppy you looked at was the Shugart 400, the five and a quarter?

Iftikar: I don't recall exactly the model number, Tom, but it was a five and a quarter inch Shugart Associates' full height floppy -- exactly this height.

Gardner: That would be the Shugart 400 or 400L, but that doesn't matter.

Iftikar: Yes.

Gardner: As it turns out, the bowl gives you a certain rigidity that some of your competitors didn't have. Also, you adopted two rails, a two-rod system for the carriage. I have the patent picture here which I think basically you have a carriage riding on two rods. Where'd that idea come from?

Iftikar: As I compared the Shugart Associates hard drive with ours, we wanted our cost to be lower. Their carriage had six bearings- I'm sorry, the IBM Winchester drive had six bearings. I came up with a carriage with three bearings, but they are actually grooved bearings, so the outside raceway is not flat. It's grooved. Two cylindrical rails go between the two grooves on either side, one side faces two bearings and the other is spring-loaded with an opposing force. The idea is great. But anytime you come up with a creative idea, I think it is risky to design the product on time and could, probably, be the end of the company and for me to go look for another job. So it turns out that the carriage -- I learned later on it life that three points do define a circle, but that's when the three points are clean without contamination. However, if there is a particle of dust or dirt, contamination, or grease that gets embedded, then, the three

points now become three new points. Now the old circle defined by the three points is a different circle. This introduces all kinds of positioning problems. And so the three-bearing concept had that problem. This made the carriage very unstable. The carriage head stack is supposed to be perfectly vertical, as it traverses from the outside diameter to the inside diameter, it has to be perfectly vertical. Unfortunately, the carriage pitched forward as it went forward and pitched backward as it went backwards. The read/write heads would be miles away from the data. This created a joke in the company, relished by the co-founder in charge of manufacturing. He would say, "The carriage has an attitude problem, and, you know, it must come from the designer." I worked really long hours, most of the time, I would leave Seagate at two in the morning from the engineering lab to my house in Fremont. I worked until 2 AM in the morning almost every day. When I started leaving Seagate at 2 AM, my wife put a sleeping bag in the trunk of the car in case, she said, if I felt tired, I should sleep at the office. Most of the days I would be sitting in the lab, around 2 o'clock, in front of the laser system watching the carriage pitch forward and backward. And, try as I might to stabilize it with all my finite element theories and all my experiments, I couldn't get it to do it. One particular night, for some reason, I thought of my former manager at Memorex, Bill O'Sullivan. He had given me a personal file that had some of his experiences. I decided to read his file. In one particular project, he had some great advice. The bottom line is – "if you tried everything, and everything seems to fail, you stop, and do the exact opposite. You will find, it will work." So, at two in the morning, it flashed on me to try something opposite. I stepped back, and I asked myself, "What am I trying to do?" I realized that I was trying to prevent it from tipping back and forth. So, I said, "Okay. I'll do the opposite." Instead of trying to prevent it from tipping, I said, "Let's start off tipping it to begin with." I modeled a simple design that moved the central mass of the capstan so the carriage would always be biased tipped forward. I could either pick forward or backward. I said, "Heck, it's easier for me to tip it forward." So, I moved the capstan forward. Instead of being right in the center of the bearing spacing, I tipped it -- I biased it so it could never tip any other way but forward. This was done at two o'clock in the night. I was able to make this modification, and run the positioning laser. Normally, without this modification, we would be off by thirty tracks in each direction - forward and back. With the modification, the laser repeated within one micro inch, back and forth. Even after a million seek cycles, the carriage never moved more than one micro inch off-course. I used to like Tarzan movies when I was young. I got on top of the table - I don't have a big chest and pounded my chest, and let out a Tarzan cry. I knew I'd saved the company and also saved my job. That was the carriage design at Seagate.

Gardner: In the middle of 1980, early 1980?

Iftikar: 1980.

Gardner: You hadn't shipped yet.

Iftikar: No, we hadn't shipped yet. It was the middle of 1980 because we had prototypes.

Gardner: June or July of '80.

Iftikar: July was the first revenue month according to the prospectus.

Gardner: By the way, for the reference, we were looking at figures two and three of Syed's patent 4,323,939 and the actual ST506, which is from the museum's collection. Sounds like that was an exciting time. How about thermal? Do you have any interesting thermal experiences?

Iftikar: Yes. Tom, you seem to know all the details of the product's development. Yes. I remember every detail of this

Gardner: I know it's burned me in the past, Syed.

Iftikar: Yes. We had thermal problems. I looked up the catalogs to see which capstan material had the lowest coefficient of expansion, and we found out that Zirconium had the least coefficient of an expansion. So, when the rest of the industry had capstan made out of aluminum- all the floppy drives did not have such stringent requirement, Seagate drives had Zirconium capstans. In addition to the Zirconium capstan, the split band of the actuator was designed to compensate for the thermal expansion. In all the Seagate drives, you will find that the capstan is not made out of aluminum.

Gardner: Were you involved in the financing of Seagate?

Iftikar: No, it turns out we had a unique way to finance Seagate. When we first started, as I said, we were not known. Even Al Shugart, although he was the vice president at Memorex, he hadn't really run a company. So, when he went to the VC's, they saw that Al, Finis [Conner], and all of us lacked the experience to run an independently financed company. We had a tough time raising money. In fact, I remember Al Shugart going to Vegas and talking to people that I thought, had shady names. And I would tell Al, "Al, listen. If you're going to get money from Vegas from all these people with white shirts and white shoes, I'm not interested in joining the company." This is true. Al Shugart did go to Vegas because he showed me some of the business cards of some of the casino owners. In other words, it was tough to raise money back in those days. So we went to see Norm Dion of Dysan. One of the conditions that Norm had was that if Al had a good team, then Dysan would fund the initial money of half a million. Norm knew that prior to this, Al Shugart was forced to leave Shugart Associates. I'm not saying anything out of line, but Norm felt that Al had spent too much money at Shugart Associates, and the VC felt that Al over ran the budget. Norm wanted to make sure the team would develop the prototype within the budget although half a million was not that much money. He wanted to make sure we would have a prototype to show him. When Al Shugart hired me, Tom Mitchell and Doug Mahon, Norm said yes, he felt comfortable after talked to us. Our first funding came from Dysan for half a million. This was enough to develop a prototype but we still had a problem to raise additional money. Finis then came up with a very creative idea. He said, "Syed, if you can get the prototype done quickly, before we run out of money, I can use that prototype to show that the product is ready and try to get a license." And the deal was -- or the idea was, to find big corporations with money that had snarled management and bureaucratic problems that would prevent them from succeeding. Our main criterion was that we did not want competition. So, we went to Texas Instruments. We also went to Shugart Associates. And Shugart Associates told us, "I don't think Syed can design the product in six months or even a year." Even though they did see the product, they didn't think it was producible. Shugart Associates turned us down. I think Shugart Associates could have been a big competition to us had they acquired a license. But, luckily, we changed our strategy and went to Texas Instruments and received a \$5 million license fee. Then we went to Honeywell Bull in France and sold a license for \$5 million. So, technically, other than Dysan's half a

million, we did not need outside funding. We were able to do the whole project and began to ship the product. Just as we were shipping, and I believe maybe six months before the public offering, we raised two million for marketing, computer shows and all that. Frankly speaking, we did not need that money. That's how we were involved with the funding.

Gardner: The criterion was companies that had money but couldn't execute.

Iftikar: That's right.

Gardner: The product shipped in the summer of 1980. I'm sure there were exciting manufacturing ramp issues that occurred over the next year-and-a-half. Are there any you'd like to share with us?

Iftikar: Yes, Tom. This clearly highlights some of the entrepreneurial things that we would do. So, when the drawings were technically done in five days, and I presented the drawings on January 2nd, Tom Mitchell says, "You know, Syed, we should take this and get it tooled without even doing the modeling." So, he says, "How confident are you in your design?" In those days I was young and pretty egotistical about my performance and my capabilities, so I would shoot my mouth off and said, "Yeah. Look, Tom. I don't think you'll ever see a change, so let's go and hard tool the thing up." So, we go to Los Angeles to a die casting shop on the third day, which would be January 4th, or whatever that day was, with my drawings and started the tooling. But in order to speed up the process, the die caster suggested that we get the mold made locally in order to get the casting done in 4 to 6 weeks. I've never heard or seen anyone do that. He gave us the name of the mold maker. I give Tom Mitchell credit. The founders were all superstars. Tom says, "Yeah, we'll do it." The next day we drive to Los Gatos, to meet the mold maker. The guy was very good, but he had a problem; a drinking problem. And so, whenever he got drunk, the work did not get done. This put us in a bind. This was the best guy, but he had a problem. So what did Tom do every day? He'd get a six-pack every day with him. After 6 PM, Tom would jump in his car and go to Los Gatos, and tell the guy, "Look, after six, we'll drink together, but before that, I don't want you to touch anything." And he was able to talk him into it. The six-pack did the trick. So, the guy would be sober 'til six PM or later, and he got the mold done real fast. We'd go to Los Gatos every so often to make sure the mold was okay, and we took the mold over to the die caster to get it done. So, these little things -- special things that we did made things happen quickly. I remember another thing. I had to measure the particle count inside the drive for contamination. We had a Royco particle counter. I don't know what happened, but when the casting came in, and I had the air particles filter ready, the fan motor was spinning inside and I was ready to measure the contamination inside when I realized that the Royco particle counter was broken. I called the manufacturer who happened to be in San Jose to have it fixed, and the manufacturer tells me, "It'll take us two weeks. You're in the queue." Tom says, "Syed, let me take it to them." So Tom Mitchell, again, I give him a lot of credit, picks up the Royco particle counter, drives his 280Z, goes to the back door, talks to the people in the shipping area and tells them he has a real serious problem with his real, mean, ugly boss. That if he doesn't get it fixed, he'll get fired. There's probably nothing wrong with that particle counter, but if he doesn't fix it, he and his two kids will be out on the street. The sob story worked. The shipping clerk or whoever he was, opened the back door for him. Tom goes and talks to the people who repair it, and they found that all that was broken was the bulb, a laser bulb, so they put a new laser bulb. Tom was back in three hours. That's when I realized the power of being an entrepreneur. Never say no. Get things done. In a regular company, we would've waited two weeks as we moved up the queue. These are just a few examples of the things we got done. The third thing that comes to my mind when I said we raised the two million dollars -- the final one, we had to

create a good image for the venture capitalists. Finis had an artist's sketch made of a new building for Seagate which actually became the first Seagate building. I don't know how much Finis paid him. Tom's job was to hire a tractor driver for \$100 for one hour. We couldn't afford that much. So, when the VC's came in to the conference room, Tom would call the tractor driver to drive the tractor back and forth and create a lot of dust to show that the construction has started. And, boy, did he create a sandstorm in front of the venture capitalists! Tom told them that we had already started work on a new building. They saw that we were going to build a new building. We had no money for the building. In fact, the building wasn't being built, but we created an aura that we had the money and had started the work on the building. Our building owner actually financed the building. We had to do a few things like these during the early days.

Gardner: This was in Scotts Valley?

Iftikar: In Scotts Valley.

Gardner: Were you there when the 412 came out? The next generation is the ST412.

Iftikar: Yes, during the prototype phase.

Gardner: Any interesting challenges in doubling the capacity?

Iftikar: Yes, again, the carriage became a problem because of the longer stroke. We had biased the carriage, as I talked to you previously, off the center. Now, with the larger stroke, it came back into an unstable position and started to have the same problem. But, I still stuck to my three carriage design because it was inexpensive.

Gardner: Three bearing design.

Iftikar: Three bearing design -- Three point three bearing design. We had to go through this again. (I had left Seagate at this time and others completed the work on ST 412). Work was done on the base of the carriage to put low coefficient of expansion material. The stepper motor was changed to a micro stepper so it could step in between the teeth. So those are the enhancements, and, obviously, we had to change the heads. But, I think the biggest challenge was the ST506. In the case of the ST412 - At least, we knew what problems we would run into. So, in production, we never encountered serious problems similar to ST506.

Gardner: How'd you like getting sued by Xerox, or at least threatened to be sued?

Iftikar: Actually, you know, Tom, we anticipated it, and we planned for it. It's funny that I should say that. Remember, earlier I said that Shugart Technology did not have a name. Even though Shugart Associate did have a name, but Al Shugart, himself, technically, did not have a name. Prior to joining or forming

Seagate, Al Shugart lived in Aptos, I believe, and running a bar in Santa Cruz. He was managing a bar for his friend. And, for five years, he was out of the disk drive business.

Gardner: Rumor was always he sold fish at the end of a pier, but I never could validate it.

Iftikar: Yes, he was. He did have a bar. He was actually helping his friends manage the bar, I guess. So, when he started this, you know, people were kind of skeptical. Forgive me, I have lost the train of my thought.

Gardner: Seagate was originally Shugart Technology

Iftikar: Right.

Gardner: Shugart Associates was owned by Xerox; Xerox threatened a lawsuit.

Iftikar: Right. And, so, when we formed the company, Al Shugart and Finis said, "A little publicity won't hurt us." We knew they would sue us. So in order to create recognition we decided to start with the Shugart Technology name. Xerox had acquired Shugart Associates, and the names were very similar, as well as the products. They also had a hard-drive product, or they were working on one. We told ourselves it doesn't matter. If it gets too dangerous or uncomfortable, we'll change our name. Shugart Associates also felt that we would not succeed even after seeing the product. They didn't think we would ship in July since they felt they couldn't design one and ship so quickly. They had convinced themselves that we would not succeed. But when they saw us ship in July, they realized we are for real, and decided on a lawsuit. We got a letter threatening a lawsuit. We gladly changed the name. The new name was also interesting. At that time, Watergate was getting pretty negative publicity and was notorious. So Al comes up with the name and says, "Let us call it Seagate". We all looked at him like, "Hello, you must be out of your mind coming up with something that rhymes with Watergate". And then Al said, "Guys, it'll work on you, give it time. Initially, it doesn't sound good, but watch it, after awhile, it'll work on you." Seagate came from the letters in his name -- SGT, Shugart. That's how the name was created. Rita, his wife, was the first one to tell me. And just as he said, over time, the name became well recognized.

Gardner: Biggest disk drive company today.

Iftikar: Today, it's the largest, the biggest and most successful company. Yes.

Gardner: So, you left then in early '82. Why'd you leave?

Iftikar: In general, I don't like to work for a boss. This is because most of the time I think I am smarter than my boss. I mean, that's the demeanor I have. And, I think the boss felt that way too. But, in Seagate's case, it wasn't that case. Al Shugart was one of the best bosses I could ever have. He never questioned my actions. He had implicit faith in my design. During the startup phase, we had many design problems, and they were all mine. I did not have that many engineers to delegate, so most of the

mechanical design -- in fact, all the mechanical design, other than the side rails that David Reek did, I did myself. So, whenever there was a problem, it was my problem. Everyday, I would walk down the assembly line fixing these problems. In fact, I worked two shifts. During the first shift, I would do design. During the second shift, I went into the manufacturing floor and actually spend about five to six hours looking at every assembly station. I would sit there and watch the operator, or help the operator, through every station task. I looked at each station yields. My goal was to get every station yield over 99% and when the yields dipped below 60%, I stopped the line. This was in conflict with the manufacturing guy who had to idle all these people. Managing assembly cost was his responsibility, so when I said, "Stop the line," he refused to do it. I would say, "Okay then, let's go talk to the boss". As soon as I said, "Let's go talk to the boss," he'll get on the intercom system and stop the line because he knew that our boss would support me. We thought alike, you know, and he have implicit faith, so there's no point in talking to the boss 'cause the boss delegated that responsibility over to me. So, anyway, I stopped the line three different times. And each of those times, for a minimum for one week. There was a lot of concern - and rightly so, from the manufacturing vice president and founder that a week's production would be lost. How is he going to make this up? And I would assure him that with higher yields, by the end of the month, we would either equal or better the plan, with a better-quality product. Well, the first time, he was skeptical, but I proved that with the yields going from 60% to 99%, he easily make up the lost time. I actually stopped the line during the first three months of our production ramp up schedule. In fact, I stopped the line every month. I think the longest period was ten days. But, each time, we met the schedule. So those were the kind of things we went through during the startup ramp-up phase.

Gardner: The manufacturing guy is Tom Mitchell?

Iftikar: The manufacturing guy is my friend, Tom Mitchell

Gardner: Okay. Just for the record, earlier on, you talked about this group of advanced technology folks at Memorex.

Iftikar: Yes.

Gardner: Probably ought to name them all and say a little bit about what they did returning back to

Iftikar: You mean, people like Frank Sordello?

Gardner: No, I was thinking about the folks that worked with Roy

Iftikar: Oh, yes. Yes.

Gardner: That group. The one you partied with.

Iftikar: Yes. My first boss at Memorex was Roy Applequist, of course, and he was also a great boss. As I mentioned earlier, I don't like working for a boss. I guess I don't like working for bosses that breathe

down your neck and tell you what to do. Roy Applequist pretty much said, "I don't understand the concept of finite element in design but I am pleased with your design." Roy Applequist, of course, was a very experienced practical engineer from IBM that had very clever ideas. So, whenever my theory did not work, he was a good adviser to go talk to in his office. And he had a lot of suggestions-- He was involved with the IBM RAMAC actuator systems. He was an older man compared to us, and he regarded me like a son. I remember the time we went to Angels Camp one day during one of our trips, and I had beer for the first time. And I was feeling nauseous. It was dark and foggy that night. I started walking just to freshen up, clear my mind, in this one-horse town, on one-lane street in the dark. As I was walking, I could distinctly hear footsteps following me, but every time I turned in the darkness, I couldn't see anyone. I walked for awhile, turned around and came back, and ran right into Roy. Surprised, I asked Roy, "What are you doing, Roy?" And he said "Syed, you're like my son to me, and I want to make sure you are safe and give you the space you need to clear your head." The point I am making is that he really cared for me. The second person, not in that order, was Terry Johnson. Terry also came from IBM. Terry was in charge of the servo of the disk drive and the resonances. Because of this, I would get involved with Terry and ask him questions about how the velocity and position servos worked. In fact, my second patent on velocity servo, came about by Terry giving me a lot of feedback, pardon the pun, on how the position and velocity servos worked. With these concepts, I came up with a PID (Proportional, Integral and Derivative) servo scheme. He was a great friend with a great family that kind of adopted me like their son. So much so that his young kids thought I was one of their older brothers. That was Terry Johnson. I had a third friend called Bill Krajewski -- A brilliant and extremely hard-working person. He encouraged me to learn computer programming so that I could write device drivers to test the drive. I didn't have to go and ask other people to do the drive test for me anymore. I started to write my own test programs and drivers and had the results printed out. He encouraged me to write machine level programming. I was able to do system level testing of the drive before I handed the drive over to the system group. Of course, besides Roy there was also another practical engineer called George Toldi. He made all my harebrained ideas work. I give George a lot of credit, in fact, I would joke with George that the awards and accolades that I got really belonged to him because he made them work!

Gardner: Was Pat Mercer in that group?

Iftikar: Pat Mercer was also in the group, and he worked for Bill Krajewski.

Gardner: How about Steve Jackson.

Iftikar: Steve Jackson was a digital engineer that worked for Bill Krajewski. Yes, they're also my friends and were part of this 'family'.

Gardner: Okay. I think we're about to start on the SyQuest Technology part, so this may be a good time to take a break.

Iftikar: Okay. Thank you.

End of Iftikar_Syed_1.oral_history.2006.102657980_2.mp3

Gardner: So Seagate goes public in '81, and in '82 you feel the entrepreneurial spirits calling you, and you move on to form SyQuest?

Iftikar: That's right.

Gardner: What was it like having four walls and an empty building?

Iftikar: You know, it's a great feeling at times. When we first started SyQuest, we moved into a small building. There was nothing there. Six months later we moved into a 'spec' building. I got a sheet of paper and started drawing a sketch of where the different offices should be and the people that I was going to hire. I spent maybe a week or so doing the initial planning. Going back, I missed this at Seagate. We started Seagate with few people—my department had three people, including me. I had three mechanical engineers, and I was one of them. We grew from three. By the time I left we had like 60 people or so, in my group as well as in manufacturing engineering that I managed. I had three directors running their own different projects. I really missed the creative ideas and hands on design work. Therefore, starting SyQuest was great. As you say, it was an empty building, and we -- my wife and I had to actually clean the office, at least for one week until we got the janitor signed up. To do a lot of hands on work, and then watch it grow is exciting. You see a plan grow and bear fruit -- I missed that at Seagate. So that's why I started SyQuest.

Gardner: Self-funded? Or did you raise money?

Iftikar: I had an advantage at SyQuest. I did not need venture capital help on the funding. I initially funded \$3 million to get the prototype, which is a far cry from the Seagate's half a million-- but the product was more complicated and we had all kinds of problems.

Gardner: That's only two years later. I mean inflation doesn't move that fast.

Iftikar: More of that -- but we had -- I mean the product was more complex and we had to design the cartridge as well as a drive, because the concept was a removable cartridge drive; whereas, Seagate was a fixed hard drive. You are right, inflation did not take that much. But it did cost us about \$3 million. We also went to our first Comdex. You have some of the datasheets. At Comdex we made a very big impression with the removable product, we were the first in our class. So...

Gardner: Was this Comdex, Fall, '82?

Iftikar: Fall, '82. And a lot of venture capitalists came to knock on my doors, with the tables reverse, sort of. What's interesting -- at Seagate they asked us who we were, what experience did we have, etc. At SyQuest, well, those questions did not come up -- because I did have an officer's title. We had started a company called Seagate, which went public. We now had a name, a reputation and experience. So the VCs came to me, and they all wanted to invest-- I said I needed \$4 million to finish off the design and go into production. Each one of them offered \$4 million and wanted to be the sole investor in the company. I

said, "No. Just to be safe, I would rather have four investors in the company rather than one." I took a million dollars from Kramlich of N.E.A . I took a million dollars from Jean Deleage of Parabas Fund, I believe. And I took one million from Robinson Stevens and one million from Dicky Yujuico, who managed a Philippine's fund -- probably was Marcos's money. And I'm glad I did that, in hindsight. Because, as it turned out, by the time the company -- SyQuest went public, I had to raise a total of \$32 million. Out of the \$32 million, \$8.5 million came from my personal funds and my family's funds. The rest came from the venture capitalists. So having four venture capitalists did help me raise the additional money that I needed later on.

Gardner: Did all four stay with you through the period from the time you founded the company until you went public?

Iftikar: No. It turns out we had some very trying times as...

Gardner: We'll get into that.

Iftikar: Yes. So one of them left because I asked him to.

Gardner: I know Kramlich and N.E.A. stayed with you.

Iftikar: Yeah. The three of them stayed with me until the company went public.

Gardner: Okay. Another incredible time to market -- if I count the numbers, the company was founded, incorporated in January and demonstrated a product in July. That sounds like another six months. How'd you do it?

Iftikar: Well, Seagate itself took us six months. And we felt that starting a second company -- second time around -- things should be easier. Some of them were truly easy. For example, the spindle motor was already a brushless DC motor. I did not have to start from an AC motor fan going to a DC motor. The motor was available. The head assemblies were available. Since most of the items were common-- we used the common components -- we were able to go to Comdex with a working prototype. But we miscalculated -- Unfortunately, after the working prototype were subjected to long-term testing, we found we had a lot of contamination issues that we really had clean up and get the drive acceptable to the OEMs. Although we went to Comdex in the fall and we had drives that could read and write -- the drives did not have long-term reliability as published.

Gardner: How long until that was achieved?

Iftikar: It took us a long time. And at times it got to a point -- the board of directors did not feel that I had the technical capabilities or the management skills to manage their funds and get the product out in a reasonable enough time. We went through six rounds of financing until the product was fully approved

and qualified by OEMs. Although we made shipments and continued to make shipments, we did not get IBM, AT&T, Zenith Data Systems qualified until maybe three years later.

Gardner: This is the original product?

Iftikar: Yes.

Gardner: What I have here is a SyQuest SQ306R, ELC 04 [Ed. Note: Engineering Level Control] and a Q-pack. This is the cover of the Q-pack, and then this is the actual cartridge that goes in the SyQuest disk drive. Why removable?

Iftikar: When I left Seagate, one of Al's concerns was that the new company would compete with Seagate. One of the agreements -- a verbal one -- and a good faith one on my part was not to compete. Al Shugart said that since I owned 10 percent of the company's shares before the offering and five after the offering, that was a sizeable amount and that I should not start another company that would compete with the first company and my shares. He was right. I assured him that I wanted to design a product that the market wanted that would be complimentary to the Seagate products, as opposed to competing with it head-to-head. I went and talked to some of the customers that I knew, and they suggested it would be a great idea to have a removable cartridge drive as a backup to the primary drive. At that time the floppies were the backup drives. In fact, when we started Seagate our market plan said that floppies would be the main drive, and we would only be about 30 percent of all computers -- PCs. Our business plan said that we didn't expect the hard drives to grow to be 100 percent of the desktop computers. Well, it turned out the other way around. The hard drives are an inherent component of the computer. Most of the customers felt the floppy was too slow, and the capacity did not match up to the hard drive. So they suggested a removable hard drive. Customers such as Digital Equipment, Apple Computer, the division that I worked with at IBM, and especially the federal government thought that removability would be great, but I also realized the market would not be as big as Seagate's. I figured if I could get 10 to 20 percent of a complimentary market of Seagate that would be a great business for me. So I chose not to compete with Seagate but to create a new complimentary market.

Gardner: It has an unusually sized disk. This advertisement says its 100 millimeters. Some people call it 3.9 inch. Where'd that come from?

Iftikar: Well, back in 1982 the floppy drive was the removable drive. In order to compete with the floppy, I had to come up with a form factor similar to a floppy. That was the standard then. The floppies would be introduced first, just like the Shugart Associates floppy and this was followed by a hard drive like the Seagate's 5¼-inch hard drive that I designed. So when I started SyQuest, I looked for a floppy standard. I did not want to follow a 5¼-inch floppy form factor because that would not be an emerging market. I also wanted to look at a new form factor different than Seagate's. In 1982, if I recall, Dataquest had a storage conference in Carlsbad, and there they identified two standards. IBM had a floppy, which was 3.9" or 100 millimeter, and Sony also introduced a floppy, which was 3.5 inches. My dilemma was -- who would win? And as we know, back then, IBM was the standard in storage. And in fact, even Dataquest said that they would bet on IBM. So I bet on IBM. In fact, I went and talked to the lab manager of a division at IBM, and he assured me that -- and I don't see how he could have said anything else -- in the past IBM has always been the king, and a leader. He said, "Syed, our floppy will win. Sony is just getting into a hard drive -- or

a floppy drive -- business. They're just a tape audio company. We don't consider them competition." Therefore, I chose the 3.9 inch or 100 millimeter form factor to match the IBM floppy. It turns out, as time shows, IBM did not become the standard. Sony became the 3½-inch standard. As a startup company, we had already invested \$32 million into the company. Most of the money was spent probably because of our inability to get some of the problems resolved. Nonetheless, we had spent a total of \$32 million and did not want to make a switch to the new 3.5-inch format, which would cost us more money, and the VCs were not about to put more money into the company. So the plan was to achieve break even with what we had. I went after the government security market where form factor wasn't that important. And as long as it fit into a 5¼-inch slot with a front bezel, it was okay they told me. We shipped a lot of these products to IBM Federal Systems Division, to AT&T, and to Zenith Data Systems -- just to name a few. From the profits we made, we did have enough cash flow without raising any more money from the VCs to convert the form factor to the 5¼-inch product.

Gardner: I'd like to go through some of the technical innovations and challenges in this product and then talk a little bit about the market, and then go on to the 5¼. This is, I think, generally recognized as the first reliable metal media product -- because of the carbon over-coating that you folks pioneered at SyQuest. And that's covered in depth in Chris Bajorek's session on metal media. The one question Chris asked me to ask you was, could you elaborate a little bit more upon the Domain relationship? I understand you started by buying Ampex's media, sputtering your own carbon on it -- and that's how you shipped in '82. But then in '83 you sold your sputtering machines to Domain and switched. Could you tell us some more about that?

Iftikar: Well, when I started SyQuest, one of the important criteria was that I had to have a robust disk. You know, one that does not crash. And at that time all, including Seagate, were shipping what we call oxide media. I don't recall exactly, Tom, what the Mohr harness is. Diamond is supposed to be ten. And I think oxide media is three or four out of ten on a scale of ten. However, plated media -- metal media -- whether it's plated or sputtered is rated at six or seven out of ten. So I had no choice. In order to make a removable media drive reliable in an open office environment we needed a metal disk. Whenever the door in front of the disk drive is opened to load the cartridge in, dust particles can get inside the drive. The very act of picking up a cartridge from the desk results in dust adhering to the bottom of the cartridge. As you insert, you are actually contaminating the drive. Now, if you had oxide media, the disk won't last. As the head starts to fly onto the disk, the particles are so large that they crash heads and damage the media. The metallic media on the other hand is more forgiving, even though the same phenomena takes place and is more resistant to crashes compared to the oxide media. As you can see, I had no choice. I had to do it. I went around looking for suppliers who would give me the kind of media that I wanted. I got the idea, actually, by reading an IEEE Magazine report by Francis King. It talked about a metal media with a carbon coat that is very reliable. They had done a lot of start-stop tests and even scratch tests. I was impressed by that report. I talked to some disk suppliers. I went to Dyan. Dyan immediately showed me the door. Okay. They didn't want to talk about metal media. They didn't think that was the way to go. They said it would never succeed. I heard that Ampex was plating a metal media called Alar, so I went and talked to Ampex. Ampex said they would love to sell me their media, but without a carbon overcoat, which posed a problem to me. Unfortunately, there were no other suppliers, except a small startup called Polydisk that was struggling to make metallic media. I decided that the only choice I had was to buy carbon-sputtering machines -- it was a CPA machine -- that cost a startup company \$1 million each. We bought two machines. That is how we started. We bought Ampex media without the overcoat and sputtered carbon onto the media and then assembled into the cartridges that were shipped. Hence, SyQuest cartridges, since day one, had carbon-coated metal media. At that time it was plated metal disk.

And that did help us. However, we had other problems that we had to overcome to really get the drive to acceptable levels.

Gardner: Then you sold your sputtering machines to Domain.

Iftikar: Yes, we did.

Gardner: Do you know when?

Iftikar: I believe it's late '83 -- 1983, or maybe early '84. You know, we are disk drive people. I understand disk drives. My staff and my engineers were experienced in disk drives. Being inexperienced in plating media, we decided to start an entirely new operation with its own funding, knowing that we didn't have that much money. We did attempt to do our own plating right. We created a division called MicroDisk within the company, and hired people from Ampex and Data Point to develop the plating process. We tried, but we did not succeed. So we decided to stop the operation. The board strongly recommended, that I find somebody that could do the entire disk manufacturing for us so we could concentrate on the drive side. Just about this time, Domain came to me and offered to become a one-stop media supplier to us. They offered to buy the two CPA machines. They needed carbon sputtering machines, so they bought the two machines. I bought the completed media from Domain from then on.

Gardner: Now, was Domain already sputtering carbon onto their media and this was just additional capacity? Or did you put them into the carbon sputtering business?

Iftikar: I think, to the best of my recollection, we put them into the carbon business. Domain had a competitor called Ampex, and Ampex only sold plated media...

Gardner: Lubricated metal media.

Iftikar: Yes - lubricated metal media without the carbon coating. I think Domain set up very similar plans but when we said no, we could not live with that, they took our CPA on consignment. I think those were the first carbon sputtering machines. We put them into the business of carbon coating, I believe.

Gardner: Because they then continued selling plated media with carbon overcoat for about another year, and then they switched to sputtered, as I understand it.

Iftikar: I think so too, but I don't know the exact dates now.

Gardner: So that's one innovation. Is this the first time somebody loaded Winchester heads more than once?

Iftikar: Somebody pointed it out. I believe it was Terry Johnson. He's a friend of mine who started many drive companies. I recall that he made an observation that I had 14 different innovations. He brought that up to warn me that this was going to be a tough project. He said, "Normally, if you have one or two innovations that in itself is a handful. Syed, my God, you have 14 different new concepts! This is going to be a very risky and drawn out affair." He was right. Just about everything was an innovation. The size of the disk was 3.9 -- it was a non-standard disk because, by this time, most of people had gone to the 3½-inch or 5¼-inch size. 5¼-inch was the standard. People had a few 3½ inch disks, but 5¼ inch was the standard. SyQuest had a non-standard media that was expensive. If you looked at a removable drive, you would realize that sealing would become a problem. So we had to work on the concept of contamination control. Head loading was also a new innovation, because we were the first ones to load the head on a spinning disk. When we introduced this, people were really skeptical about how you could take a Winchester head that was designed to start and stop on the disk and load it on a spinning disk inside a removable cartridge. In this concept, when you took the cartridge off, the head has to be pre-positioned into a parking position and spread apart. Because the underside of the head is highly polished, probably better polished than glass -- if these two highly polished surfaces should touch each other or come into contact, they would stick. You cannot pry the heads apart without damaging the flexure. We had to come up with the load and unload feature and a parking position for the heads.

Gardner: I don't know if you can zoom in on this, but maybe put it at a slight angle. Can you zoom in on that? We can take a photograph later and maybe add it in. What you just described to me is this -- these heads are pried apart, clamshell-like when the cartridge is out -- door is open, no cartridge is in. And so when you insert the cartridge, what happens?

Iftikar: When you insert the cartridge, the heads will come closer. Okay?

Gardner: The cartridge door opens?

Iftikar: I was saying -- the operation. When you insert the cartridge -- we tried to keep the contamination out of the cartridge. So although it's not completely sealed, you can see that there's no access and it looks like it's enclosed. When you insert the cartridge, there's a pin -- the actuator pin that opens this sliding mechanism that opens the door. Now you see an opening and in the center you see the disk. And the heads, at this time, are positioned and they're separated. And as you load the cartridge in, the heads clear the disk so they do not scratch the disk.

Gardner: It's supposed to clear.

Iftikar: It's supposed to clear, but in the beginning we had all kinds of problems when it didn't clear -- and even the landing was not a soft landing. It's like somebody from space landing -- you need a parachute to have a soft landing. We had to design a similar concept -- not the parachute, but a device for a soft landing. We designed a little bellows or a damper -- I would say a balloon-shaped damper that's filled with oil-- or air. The damper facilitates the heads to have a soft landing on the disk.

Gardner: The disk is not spinning at this time?

Iftikar: The disk is not spinning at this time.

Gardner: So this is static loading on the disk.

Iftikar: Static loader. The product was a static loader on the disk. And then the disk would spin up with the heads loaded, and that was a first too. Because -- the previous heads that we had from Memorex would load on the fly. But this would start up from the...

Gardner: The Winchesters always loaded statically?

Iftikar: Winchester was. Yes. Winchester was. Yes.

Gardner: I understand this product dynamically unloaded? Or was it static? Did this land on the disk and then when you pressed the stop button did the heads then land on the disk?

Iftikar: Yes, the product statically loaded and unloaded.

Gardner: The cam dynamically unloaded them.

Iftikar: The cam would unload them and move them back into the parking position.

[Ed. note: To summarize the above, the SQ306 used static load and unload. On load, the heads are in a parked position lifted away from the disk, closing the door lowers the heads onto the stopped disk. Spinning the disk then caused the heads to fly in a conventional manner. Unloading was reverse; the disk stopped and as the door opened the heads were moved to their parked position. A solenoid prevented the door opening while the disk was spinning.]

Gardner: All right. So that's another first.

Iftikar: Yeah. It was a first. And we had to work on the loading, unloading, the velocity of either loading the heads and taking the heads out became a problem because if you jerked the heads the edges would act as knife edges during the jerking motion and would damage the disk. We spent months, a long effort, understanding and taking high-speed movies of the head-loading process. Well, that itself was a project in itself -- the loading process. And we were the first ones to do that.

Gardner: By the way, were those video movies or film movies?

Iftikar: They were high-speed camera movies -- video.

Gardner: Video. So let's see, we've talked about at least three of the innovations or four or five. How many have we talked about? What others do you want to talk about?

Iftikar: Well, we had contamination. How do you prevent particles from entering the drive during operation? We recognized that when we open the door we are opening it to the environment. But how do you seal it? We had to go step-by-step. Once the cabin, or the inside-- the clean room as we call it--door is closed, it's contaminated at the time of startup. We had to design a very efficient cleaning or purging cycle where the filtration is so efficient-- better than a hard-drive-- that within seconds we get to a 100-particle count. We start off at maybe 50 to 100 thousand particles at time T0, when the disk starts to spin. That's the initial particle count. And then within five-- because the spec was ten seconds-- within five to eight seconds we had to come down to about 100 particles. We frankly never made it to 100 particles, but we got well below 1,000 particles.

Gardner: Well, not until the 1990s did you make it to 100 particles.

Iftikar: Yes. But initially we did not. But we still had to work on it to get the particle count down, and the filtration. The filters were designed. The cartridge was designed in such a way that there is positive pressure built up by the spinning disk. And by designing the inside of the cartridge, the casing of the cartridge, we got a slightly positive pressure -- and that's very similar to all modern clean rooms. The pressure inside the clean room, compared to the outside -- the ambient pressure, is slightly higher. So we worked on pressurizing the so-called "cabin" inside. And that took us a while. Once we got the slight higher pressure, we felt confident that we could minimize and prevent further ingress of contaminants into the cartridge.

Gardner: I know another innovation was the single-sector servo.

Iftikar: Yes. The first drives that we introduced at SyQuest -- the 306, for example, had a stepper motor. A stepper motor works on a principle of steps. It takes one step at a time, there's no feedback. It takes one step and it assumes that the step is the right place to be. But with temperature changes we cannot guarantee that the heads will position over the track all the time in cold weather, hot weather or even normal weather -- or when you interchange a cartridge this becomes a problem. And our SyQuest first product would never work without some sort of a feedback. So we decided we would introduce a single-sector servo. We used a single sector servo because the controllers at that time could not handle sectored servos which are handled today. In those days, because everybody used a stepper motor or a dedicated servo, we did not have an embedded servo. We were the -- I thought we were the first ones to invent the single sector servo until I later on found out that Quantum had the patent. Anyway, we needed that single-burst servo to position the head on the track so at least we got it on the track at one sector location. And we just hoped during the rest of the track the head would stay on track. That was a challenge itself because it had to do with eccentricity. If you look at the bottom of the cartridge, you will find what we call locating fingers. When we first started the design, I started out with three fingers -- or three points of location, locating on the shaft- spindle shaft. Two of them were fixed by solid-machined V-angle. The third one was adjustable. We had this as one of the concepts. In the other concept we just had three fingers. Mathematically, three points defines a circle. And that's true. It works all the time. But every time you insert and remove the cartridge, and every time these fingers touch the shaft, you're actually burnishing the shaft -- and you see very fine particles of metal, under the microscope- it's like a filing

process. And so as these particles are generated, the three points are no longer -- the shaft is no longer true because the contaminants, on a microscopic scale add dimension to the shaft, and the three points now change. So every time we insert a cartridge, it could be a different third point. And as a result we had a lot of problems. So then we took a hard look at the concept, and realized that three points, mathematically, are good -- but not on a practical basis. Then we looked at our hands, and we figured, "Well, nature has given us five fingers. There must be redundancy." And mathematical simulation supported that. So if you have five fingers, if one of them is contaminated with dust, the other four will overpower it to try to center it as close to the original circle. So with five fingers, when you do repeated load/unload and you profile the circle -- the so-called true circle -- versus three fingers, you notice that the five-finger concept was much more stable. And that took almost six to eight months to figure out.

Gardner: So the summer of '82, when you first shipped, it had three fingers?

Iftikar: Three fingers.

Gardner: And there was a change that came along six or eight months later that went to five fingers?

Iftikar: Yes. We went to five fingers.

Gardner: So we've talked about centering, loading/unloading, contamination, media reliability, servoing -- that's five of the 14.

Iftikar: Well, I don't remember all the others besides the five -- but I do remember the heads. When we first started, after we fixed the contamination and with the metallic disk, we got the ruggedness and the hardness on the disk, but we forgot that the heads do take off from a rotating disk. They are touching the disk at the time of -- when we start to spin. And there's a sandpaper effect on the heads. We found that the manganese-zinc heads that we initially used would wear out. We had tremendous problem with that concept. We had to introduce ceramic heads. And we recalled- that was our first massive recall, as a company. We had to recall, at that time, 8,000 drives with Manganese Zinc heads from the field. And I would say that I was very concerned, and the board of directors was concerned too. We didn't think we could make it. But fortunately, most of the customers were willing to pay for the upgrade. So instead of a big loss -- as it was our mistake, and our fault -- it was interesting, they paid us for the upgrade so that they could have a reliable product. This helped the company a lot, because I do not believe the company had the cash to replace all the 8,000 drives -- 8,000-plus drives in the field at no charge.

Gardner: Are these ferrite heads?

Iftikar: No. Those are manganese-zinc ferrite heads.

Gardner: Those are manganese-zinc.

Iftikar: Yeah. The ferrite heads -- yeah -- we switched to ferrites.

Gardner: You switched to ceramic. So these are...

Iftikar: These are manganese-zinc ferrite -- old heads. You have an old drive.

Gardner: These are re-called drives.

Iftikar: Yes. All the drives we shipped early on.

Gardner: Oh. So these are real -- okay.

Iftikar: Yeah. The ceramic heads look white. They look like this [pointing to the white plastic air filter].

Gardner: Yeah. No, I -- that's why I looked at it. So that's a...

Iftikar: Uh-huh. These are white. We shipped a lot of the black manganese-zinc ferrite heads. We had 8,000 of them in the field, plus.

Gardner: Well, two of them are here.

Iftikar: Yes. Note: The drive in front of me has black monolithic ferrite heads. These heads were replaced by a head having a white ceramic slider body and an inserted manganese zinc core .

Gardner: I recall, in '82, huge, huge market excitement over SyQuest and the removable cartridge concept.

Iftikar: Yes.

Gardner: So is it these technical issues we just talked about, the solution to them over the next year or two, that -- you know, then SyQuest sort of went quiet and didn't reappear again until the late '80s. Is it these technical problems that accounted for that? We didn't talk about the DOS problems.

Iftikar: Yes. Yes, well you're right Tom. When we introduced -- the concept was very good -- to have a removable hard-drive that matches the capacity of a fixed drive. Seagate had the ST506. We had the SQ306. It was great. The customers just loved the concept, even though they were skeptical. And the OEMs came to us to test the drives. So we did create a lot of -- in fact, I think one of the magazines said at that time we were the most popular and well-known disk drive with the amount of publicity we were creating. You're right. And then we got, by not having a proper design, into all kinds of problems. We had to make the massive recall. Then we had to cut -- downsize the company -- because we had to do a massive re-design of the product and I couldn't afford to have as many people. So the company

downsized, and we made a restart for the next two or three years, like you said. We went into restart mode. We laid off all the manufacturing people. We said we had no business producing the product if it was not reliable, even though I had pressure from the venture capitalists to get to break even-- to ship the product. I said, "No. I have to get it -- to fix it." Finally we did fix it, and went back again to the OEMs.

Gardner: Okay, I think this is probably a good time to take a break. And then we will finish the 306 and then start into the next generation.

Iftikar: Okay. All right.

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Gardner: So as I understand it, after this quiet period while you were fixing the products, still shipping but not in volume, you then came back and attacked the government market?

Iftikar: Yes. We had to get the product obviously reliable and our biggest market segment was the government security market, and I heard a lot about it in one of our computer shows in San Francisco. One of the investment bankers called John Valentine said there was a big Navy contract with Zenith and the drive company that won the contract would survive in the removable business. At that time we have three companies in the removal business. One was Iomega with Bernoulli. The other one was a company called DMA and the third company was SyQuest. So when he mentioned that only one would survive, I literally took that to heart. We went on a crash program to really get the product to the standard we felt was needed, and we took the samples to Zenith Data Systems to have them qualified. Zenith evaluated our product against competition and they did find that our product was better and our service was good. I had stationed the key team members in St. Joe, Benton Harbor, to be available on the customer site, 24 hours a day. We had there shifts going, and when Zenith saw that our product was better and the customer service was good, although they had decided to go with DMA, in the last minute they switched to SyQuest, so SyQuest did survive and DMA went out of business.

Gardner: The rumors are you personally went out there and sold him on that deal.

Iftikar: Yes, I did too. I decided to station myself at Zenith Data System. Being an entrepreneur, and I asked to meet Carl Michelotti, the general manager, and he didn't want to see me so I sat in the lobby for three days. At Zenith they had this big television set where a soap opera was playing all day long, and I would sit there and watch the soaps and I would tell the receptionist and the secretary that I needed two minutes of the general manager's time. I spent sat in the lobby for eight hours doing nothing but watching soaps. This is a true story on the soap operas. The receptionist felt sorry for me and talked to the secretary of the general manager, Carl Michelotti. The secretary said, " Syed. I will get you ten minutes to talk to the CEO," which she did, and I talked him into trying out our drives, yes. C-A-R-L Michelotti.

Gardner: Now even though you got the contract, I seem to recall you had some problems with Microsoft's and IBM's operating systems because the system didn't do know what to do with removal of media. Care to tell us how you solved that?

Iftikar: Yeah. You're telling it exactly right. When Microsoft designed their operating system, they were thinking in terms of fixed drives, hard drives, where the media always stays with the drive. We came up with a removal media so all the directories are loaded on to the cartridge. The moment you remove them, they're gone, yet the operating system of the computer, in layman's term, still thinks the directories are there. So when you put a second cartridge in, the addresses are all wrong and the entire data gets corrupted and you lose the data. So in order to overcome this problem, we went and talked to Microsoft and Microsoft said, "Look, you guys are small. The market is not big enough for our business so we're not interested in that." So we had to add a patch to the device driver that tells the system that the cartridge has changed so it can refresh it and say okay, this is a new cartridge. Now we had an engineer in-house whom we thought was familiar with it but it turns out we had all kinds of problems in the field, let alone the fact that we had mechanical problems, head-loading problems and contamination problems. On top of that we had operating issues and system problems where the cartridges could not be read. So thanks to Tom Gardner, I was able to get some consultants in from outside and John Navas helped me with the device driver. He wrote the patch for the operating system which we presented to the OEMs and they found that was satisfactory. It solved this cartridge incompatible problem where the data in the cartridge was being clobbered. Yes, we lived through that too.

Gardner: This guy, John Navas, you mentioned.

Iftikar: Yes.

Gardner: He's a strange and wonderful person and he just figured out how to disconnect the driver that Microsoft provides after it boots and replace it with one that then worked for SyQuest, and it was an elegant solution and you should mention Francis King actually did a lot of the implementation.

Iftikar: Yes.

Gardner: Those two guys, I think, did an excellent job for SyQuest, and that was in '85 or '86.

Iftikar: I think the '85 or '86 timeframe, yes. That's so. Francis and John Navas did that.

Gardner: Two good guys. Which then brings us to the next generation of products. Tell us how that came into existence.

Iftikar: Well, the 3.9" was a non-standard and we had difficulty with some of the OEMs other than the government OEMs that had no choice. We had the only removal product that could pass their specifications. In order to grow the business we had to go with a standard drive. SyQuest, at that time, did not have a good reputation, so we fundamentally made two major steps to make the company

successful. We were considered by the venture capitalists as the 'living dead'. Looking at the first six years of the company's operations, we achieved revenues about 30 million and we stayed at about 30 million, plus or minus a few million, for almost six years. Maybe in the second or third year we had 30 million, but we never exceeded 30 million. Then in '86 - '87 timeframe, we decided to make a change. First change was the form factor. We went to a five-and-a-quarter inch form factor and the first product was 40 megabyte. At this time IBM introduced the PS2, with a 44 megabyte drive. So we increased the capacity to get up to 44MB, in a five-and-a-quarter inch drive which was an industry standard at that time so we did not have any form factor issues. Our disk was a standard by this time, other than the carbon overcoat sputtering. The interface was standard but we had what we call an A.T. interface at that time and with the DOS issues, Tom Gardner recommended that I focus on SCSI and the Apple aftermarket. This was a new interface and this new drive could have a better introduction into this Apple aftermarket, and it turns out that around the same time, Apple was getting started into desktop publishing, and desktop publishing, like the government security market, needed a removable cartridge because that's how publishing artists/ people or the graphic designers would design their stuff on the cartridge, and they had to literally transport the cartridge to the service bureaus that had the expensive machines to print or to edit and do whatever else they had to do. So transportability became a very important feature for desktop publishing, and we became the standard. People would say, at that time, give me a "SyQuest". Desktop publishing, and all the desktop publishing machines, even the printer- RR Donnelly used to have printing machines that had built-in SyQuest drives. I give two examples of the things that made this happen. Going back to the standard form factor, increasing the capacity, the SCSI interface and Tom Gardner's suggestion to focus on the Apple market with the SCSI drive were the key actions that made the company really successful. That's my opinion.

Gardner: But the product was a fair bit better than the previous generation. You guys learned a bit. Some of the things you did differently or better, would you like to share them with us?

Iftikar: Yes. With every new product we cannot be at standstill. Whenever there was a problem, we would work on it and improve the design. So when you look at, for example, the old head loading method, now we introduced a ramp loading. Again, we believe we are the first ones to introduce ramp-loaded heads. In other words, the process was this way with each new design. When the drive door opens, the heads are positioned onto a ramp, the heads are separated and there's no disk in it. When you insert the disk and close the door, the disk spins up. The heads are still in a parking position. Then while the disk is running at full speed, or operating speed, the heads slowly load onto the disk, and that's a first. People thought we'll never make this thing happen.

Gardner: This is dynamic loading as opposed to...

Iftikar: It's dynamically loaded.

Gardner: - static loading in the prior product.

Iftikar: Yes. The prior 306 was a static-loaded process, just like the hard drives. This was the first time we dynamically loaded the heads on to a spinning disk. Needless to say, we spent a lot of effort and time perfecting this and we found that it was much more reliable. I'm also happy to say that today all the two-

and-a-half inch drives that are transportable all have dynamic head-loading concept. I look back at the innovations that we created are same innovations that people use, even in the hard drives today.

Gardner: Now this ramp, however, moves as I recall.

Iftikar: Right.

Gardner: It's got a complex mechanism that sort of moves the heads over the disk and then moves the ramp over the disk and then loads...

Iftikar: Yes.

Gardner: ...allows the heads to slide down the ramp onto the disk.

Iftikar: Yes, that's right. When you load the head onto the disk, they travel over a gap, I would say. The heads have to come off the ramp onto the disk and at that point, if you don't design it properly, the heads could fall off the disk by not positioning properly or hit the edge of the disk. We have to always guarantee that the heads land in the landing zone, and that's difficult to do with a stationary, we call it fork or head-loading cam. We cannot do that. So we came up with the idea that as the heads go towards the disk, the ramp that spaces the heads out on the fork also travels with the head. It guarantees that the heads will not fall off the disk. It guarantees the head would land in the parking area, I mean, in the landing area. Once the heads are landed, the fork is retracted because it's spring loaded, and so as the heads come off, there's no bias pressure. The forks are spring loaded for them to retract, and so this way it's guaranteed that the heads don't have this problem.

Gardner: By using the fork you did not have to stick the disks between the heads, as you did in 306. That took a lot of tolerancing out of the cartridge design?

Iftikar: Yes. It took up a lot of valuable real estate -- the outside diameter has the most data on the disk. It takes up valuable space and also the cartridge opening becomes difficult. If you look at the 306 cartridge the opening of the cartridge is not just in front. It has the top, the bottom, and the front cleared so the heads can be lowered-spaced out, whereas in the 555 cartridge only the front opens up. There's a door -- a swiveling door that swivels, and then the entry is only between the top and the bottom cartridge plastics. So this way it gives you better sealing. With this enhancement, comes better sealing to the drive than we had before, yes.

Gardner: You also went to an embedded servo early in that area too.

Iftikar: So we went from the 306, which had a single sector servo to a chip set that could handle embedded servo. This was a special chip, because during the reading, writing process the chip is interrupted during the servo time so the chip has to shut off read and write and then turn it back on during the sector time and those chips were available at the time we designed the SQ555. We capitalized on this

chip and so did the other people. But we absolutely needed this to improve our reliability from a single, once-around correction to multiple corrections on the disk. That made the product much more reliable. That added to reliability.

Gardner: This product, the 5110 is actually the next generation. This is an 88 megabyte but it looks very much like the 44 megabyte.

Iftikar: Yes.

Gardner: This is the 5110, which had an 88 megabyte cartridge. The 555 shipped in the third quarter of '88 and as you pointed out, became a huge success in the Apple market. People used to say the baud rate of a SyQuest cartridge in a FedEx envelope was very high. Much higher than you could send it over telephones in those days.

Iftikar: That's right.

Gardner: And 88 megabytes overnight was pretty darned fast. The second generation of this product, the one here on the table, shipped in 1991 and it was 88 megabytes, and it had an 88 megabyte cartridge. Now you were so successful, as a famous CEO once said, "Competition reared its ugly head," and you were selling cartridges through...

Iftikar: System integrators and OEM's.

Gardner: ...the SyQuest cartridge private labeled to another company who then resold it into your customer base.

Iftikar: Right.

Gardner: You had your 88 megabyte cartridge; this is how it looked like it was sold on the SyQuest label.

Iftikar: Yes.

Gardner: And then there came this cartridge by a company called Iomega, which I think was made by a company called Nomai.

Iftikar: Nomai, yes.

Gardner: That's not a SyQuest cartridge is it?

Iftikar: No, it's not.

Gardner: It fits in a SyQuest drive.

Iftikar: Yes.

Gardner: Would you care to talk about it?

Iftikar: Yeah, I believe, I'm not too sure, but it was around 1995, I think early part of 1995, we got a call from a person called Marc Frouin saying that he had an important business discussion about our cartridges. He came over and talked to us and said that he has set up a manufacturing production line in France to clone our cartridges, that they were really SyQuest compatible, and said that we should consider buying his cartridges and if we did not, he threatened that he would go to Iomega if we did not. This was a big shock to us because we thought we were covered by patents, and then we found out that the door latch, the one patent we did think we were covered, was not being used in actual operation, so we were not really using the patent, and the rest of the features were not patentable according to our patent lawyers. Anyway to make the story short, we went to France to Rennes, to see his factory, like a reluctant bride. We really didn't want to be there. We didn't want to talk to him, but we had no choice. They showed us the cartridge assembly and informed us that they plan to sell the cartridges at half the price. In our business, we may say we are a disk drive company, but actually we are a cartridge company with follow-on repeat business, unlike the fixed drives that have one set of disks, whatever the number may be, that goes with the drive and that's it, for the life of the product. In our case, people after they either fill it up fully or partially or de-segment the data, then buy additional cartridges. During the first year they may buy 1 and up to 3. Our analysis indicated that every subsequent year they would buy one more. So over the life of the product, I believe we've reached about 8 cartridges to 1 drive.

Gardner: You might show that chart.

Iftikar: This chart shows you the ratio progressively from the shipping date. I think this shows about 6.2, but I recall that we achieved about 8 and Tom feels we probably went beyond that. But 8 cartridges is a great business, because we made over 50% margin - a 55% margin on the cartridge, and so we got to a point, it became, like, selling light bulbs. You give the socket away free, which would be the drive, and we made money on the bulb - cartridges. We would sell the drive at 10% below our cost, and even with that, the net-net gross margins would be, like, 38-40%.

Gardner: Let me just explain for the chart. This actually is out of your prospectus in 1991, and it was updated in '93. It shows the annual shipment of drives on the lower line, cartridges on the upper line, and it shows the ratio in any quarter of the number of cartridges shipped per drive. So early on you're shipping three cartridges for every drive. Pretty much what the customer might buy in the first year. About here in '93 they were shipping 6 cartridges for every drive, meaning if the original drive customer bought 3, old drive customers were driving 3, collectively. At SyQuest in the late 90s, we did a lot of analysis and the numbers look like, cumulatively you'd expect anywhere from 8-12 cartridges per drive, which is a heck of business.

Iftikar: It was a great business. It was a great repeat business. All we had to do was sell the cartridges to the service bureaus. So the business model was great, you know. Sell multiple cartridges, maximize the cartridge sales to a drive, and even sell the drive at cost if you can afford the total gross margins. Anyway, that was a great business model as long as you didn't have a competitor. We did not consider that an illegal competitor would come in and lower the price. So when Nomai announced that they would market the SyQuest clone cartridges, our stock went from a \$30 high immediately to \$22 on that announcement and within months to \$15 -- half the price. I think the investment community thought that our bread and butter were the cartridges. Once the gross margin was under pressure, they felt that we really didn't have as profitable a company. So Nomai was the first stake driven into the heart of SyQuest.

Gardner: The moral of the story, right, is make sure you have good patents.

Iftikar: Yes. That is truly the moral.

Gardner: In the subsequent products, SyQuest made a strong effort to make sure it had its patents in line on the products.

Iftikar: That's right.

Gardner: So in '91 the 88 megabyte is introduced. All of a sudden you started diversifying your product line through subsidiaries. I think that was in anticipation of your IPO, but I'm not sure whether they were related.

Iftikar: No, they were not related. The 88 megabyte, SQ5110 came out after the SQ555 and became the next product. That was IPO related because the investment bankers felt we needed a second product. That was the only criteria. However, the company's goal was to become a billion dollar company and we wanted to cover as many hard drive formats as possible. When the hard drives became popular with the 3.5 form factor, we felt we needed a companion backup product for that format. When the three-and-a-half inch, I think at that time, Connor started to ship a whole lot of three-and-a-half-inch drives, we felt we did not want to be second to another company, in case it came up with a three-and-a-half inch drive. So the company expanded into other format or footprints. But it turns out we had limited resources in the company in Fremont, so we looked in other areas or other people to create these new footprint or new formats. For example, a three-and-a-half-inch form factor could be a standalone drive with a design that did not have to rely on the five-and-a-quarter inch drive, except to understand all the innovations we made on a five-and-a-quarter and to implement that in the different formats. So we established a group in Colorado under Scott Robidart, who came from Connor. That was a three-and-a-half inch removable product with a capacity of 100 megabytes, I believe, and then subsequently we created a third group, under Joe Davis, for a two-and-a-half inch drive product, also removable, and finally we created a fifth group in Fremont for the 1.8 inch removal product. By this time the company had five different teams, which most companies do with different products. We had the smallest size product which is 1.8 inch. I believe it achieved 100 megabytes, even though this says 80.

Gardner: It was announced as 80 and then shipped as 100.

Iftikar: So this is a 1.8 inch cartridge, and this is the 1.8 inch drive. They were the smallest form factor products. This is a two-and-a-half inch cartridge designed by a wholly owned division called Iota under Joe Davis. This is a two-and-a-half inch cartridge- removable cartridge -- I'm sorry, drive, then we have the three-and-a-half inch drive. It was designed in Colorado and a three-and-a-half inch cartridge. At this time, the company had the various form factors in order to fulfill our quest to be a billion dollar company and to be the market leader, which we already were. When we look back, in 1995, SyQuest completed a three hundred million dollar sales year. By comparison, I think, Iomega was about 120 million. So we were almost three times, bigger than Iomega. I really wanted to continue the domination in removable storage by implementing or introducing these various products.

Q: You IPO'ed in December 1991. Care to share with us any of your experiences of taking the company public? Road shows? Great fun?

Iftikar: Well, this was a great experience I might as well tell you about the good and the bad. Well, we thought we were ready for the IPO when the SQ555 was doing so well. This was before the five-and-a-quarter inch second generation SQ 5110. We brought in a bunch of investment bankers and started the regular due diligence. They told me that my team was not strong enough. To be frank, they were right. Looking back, you really don't like to have your team criticized. They said that some of the managers, I don't care to mention the names at this point, were not professional and experienced to run a billion dollar company, and wanted me to change some of the managers before they would take the company IPO. And obviously, I stayed loyal to my staff and said no, so that was the end of that. But one of the conditions they did say would be nice to have, was the next generation or second generation, five-and-a-quarter inch drive, the SQ5110. So we started work on that. When the product was ready to ship we brought in a new set of investment bankers. By this time the company had also grown bigger and more profitable and they said that they would take us public. We spent a month and a half writing the prospectus, going to the road shows. It was grueling. We had many early breakfast meetings. We'd fly from San Francisco to New York to London. I recall a meeting in London. I believe we had breakfast and lunch meetings in London and had dinner in New York! It was fun taking the Concorde.

Gardner: You took the Concorde?

Iftikar: We took the Concorde, but I made it clear that the investment banker had to pay. So my CFO and I flew on the Concorde to have these meetings on the same day at two different locations. It was fun, in the sense; it was nice to tell your story. It was great, and I love telling the company's story, as any entrepreneur would. Our first meeting in London was at a hotel by the Thames. We had the breakfast room all set up for six investors and we were all prepared. We had everything prepared, the protector was on for the invitees to see, and we waited, and we waited, and nobody showed up. And so my CFO, Mike Perez turns to me and says, "Syed, this is a bad omen. If this is a sign of the things to come, we're in trouble." Well, then we had a 10:00 meeting and that was good news because the room was packed. The lunch meeting was interesting. It was a smaller meeting, and I was bothered by an investor who kept looking down at the presentation materials that were handed to him. This person, who actually invested a lot of money in the company, asked me a lot of questions without lifting his head to look at me. He kept talking to me and I felt, wow, he's probably not interested. Anyway, at the end of the day he subscribed to a lot of shares. At the end of the road show, the investment bankers told us that we were oversubscribed. Before the pricing meeting, we were 22 times over subscribed. We were going for 2,000,000 shares. We were 22 times overbooked, and so we went out at a higher price. The share price

increased quickly. That was the good news. Even though we started in London with nobody showing up- no shows.

Gardner: Actually, you sold 2,800,000 and then the stock went up for the next several years.

Iftikar: Oh -- it kept on going. And then three months later we went for a secondary offering and raised another \$20 million.

Gardner: Well you sold the IPO at \$10.50. So that's not bad in three months.

Iftikar: Yeah, well they were priced like, \$9 something.

Gardner: Now, right, some of the improvements that were made in these products again to improve reliability. Any of them you like to talk about? Why don't you tell us about contamination?

Iftikar: Well, obviously contamination played the biggest part, you know, in every respect. Removable drives have unique contamination problems but the basic solution was to try to seal the drive when the disk was spinning. We would tell them to test the drive in a smoke chamber. We had to design a smoke chamber, so we would create smoke actually...

Gardner: I want the truth now, Syed.

Iftikar: We would run a drive in the smoke chamber to see if the heads would crash and things like that. We had different variations of the smoke chamber, but people criticized the smoke test because that's not what realistically happens. For example, one guy said, "You know, I smoke all day long and while I'm smoking, I open the drive door to eject the cartridge, how do you simulate that?" Inside the smoke chamber the door is closed and the drive is sealed, you know. He made us simulate the cartridge removal inside the smoke chamber. We designed a door opening mechanism that would open the door for a few seconds, then inserts the cartridge, while the chamber's running with smoke and then closes the drive door. This cycle repeats for many hours. These were some of the changes to the smoke test.

Gardner: I thought you were the guy that told me about Ben Alaimo smoking a cigarette over spinning disks and dropping ashes on it. So contamination... does not matter?

Iftikar: No, that was Al Michaels, of Convergent Technology. He's a cigar smoker. So while we were giving him a tour, he saw a drive running outside with the cover open. I wanted to impress on him that without the cover, the drive was still robust enough. So he walks over to the drive with his cigar and drops the ashes right on top of the head. This is a true story.

Gardner: How about the other story I've heard of the moving to your new building and all the heads crashing?

Iftikar: That is a good story but at the same time something else happened. I lowered the flying height of heads. When we lowered the heads, we did not burnish the disk low enough so that was one factor. What you heard is also true. When we moved into the new building, somebody used a jackhammer upstairs and filled up all the air conditioning system and the vents with dust. The new building was filled with microscopic dust. So during the tests in the lab some of the dust got in, and did cause some trouble.

Gardner: The story I had heard is when SyQuest moved into its new building, because you had insisted all your personal computers in the company have SyQuest drives.

Iftikar: Yes.

Gardner: We've got to use our own equipment, that when you moved into the new building, you had massive crashes and people traced it back to the sanding of the wall board and the resulting talcum dust.

This box, which you then showed at a Comdex or an NCC, I believe came out of Bill Ho's work in simulating the environment, and that caused major redesigns of these three products. It's a better seal so they passed the better talcum powder box.

Iftikar: That's so.

Gardner: True story?

Iftikar: That is a true story. Like I said, each design group brought their own innovation. Moving into a new building, the sanding of the walls, the dust and all that, did create a lot of problems, Tom. This reminds me of one of the best statement made by, Steve Jobs I think. When he's selling Ipods, people asked him, "Well do you think this will last a long time?" and his answer was, "You know, if people enjoy using it and everybody talks good about it and their reliability is good, I don't see why it should stop." The same thing is true of removable drives. If the reliability is good, then people will continue to buy it. But if it's not good, then something else will take over. So when we encountered this problem, I did get Bill Ho to simulate the problem and he came up with this dust box. Different contaminants were chosen. Talcum powder's one. We tested it also with smoke. Arizona dust was the third of different things that were tried. But if you wanted to simulate every environment, and based on what we found, that even the best selling product could not withstand the dust test, so I made it a rule that every product had to pass the dust box test. So the three-and-a-half inch in drive had to pass the dust box test. The lota two-and-a-half-inch drive had to pass the dust box test. The 1.8 inch had to pass the dust box test. This is because of a call from a user in Chicago. He called me directly, and said, "You know, I love your product. It's great, but not reliable". At this time we were using talcum powder in the dust box.. He said, "I love the product, it's the greatest thing since sliced bread, but you know what? Every month I have to replace your drives and cartridges. I keep sending it back to you. I'm sick and tired of that but I would love to have you guys fix it or understand it". So I told him, "Look, we know, you have a different environment in your office. We probably don't simulate the same environment, so I'm going to send somebody over with my technical support guy to see what you do. I'll go and talk to the technical support guy." My technical support guy told me that the user was a pain in you-know-what, and that he was the only one with this unique problem, so why bother listening to him. I said, "No I disagree, if we can listen to him and fix the problem,

that'll help millions of other customers." Reluctantly, I ordered the guy to go there. He came back and explained to us that we needed a smoke test. We again had Bill Ho simulate a smoke chamber test. All the design groups had to make changes to their drives to pass the smoke test and make them more reliable. That's the best part about customer feedback.

Gardner: My recollection is when you first introduced this test, conventional products lasted minutes and by the time these products shipped they lasted over 100 hours, which I think was your standard.

Iftikar: Our standard was 100 hours.

Gardner: It was an enormous improvement.

Iftikar: It went anywhere from 5 minutes, to 100. One hundred hours became the new specification..

Gardner: Was that always the sort of requirement?

Iftikar: It became a requirement, yes. We had to do it.

Gardner: And the folks did do it.

Iftikar: Yeah, we did achieve it, and we were successful at one time when we had the various form factor products -- mainly the five-and-a-quarter inch and the three-and-a-half inch products. We were shipping, 28,000 drives in a month and in a quarter, we shipped 1.25 million cartridges. That's huge business, and we achieved \$100 million a quarter in sales.

Session 2: December 14, 2006

Tom Gardner: Good morning. This is Tom Gardner with the Computer History Museum's Oral History project. It is Thursday, December 14, 2006, and I'm here with Syed Iftikar to continue his interview regarding his career in the storage industry. A tragic loss to our industry happened a couple of days ago. Al Shugart, who both Syed and I know, died after complications from heart surgery on Tuesday. It sure has caused me to have a number of recollections of Al. Syed, is there anything you'd like to add to your comments? I know we talked about Al and Seagate and Al and Memorex.

Syed Iftikar: Good morning, Tom. Yes, it is a sad time today. I talked very highly of Al. I have a lot of good memories of Al Shugart. We are the five founders of Seagate. Al was the one that recruited me, and I have always been close to Al. During the early part of Seagate, when he saw me working seven days a week, he would invite me and my family to his house for tacos and he made the best tacos. So I spent many Sundays in his house eating his tacos. Besides running a great company, his greatest talent was hiring the best people. I have never seen anyone who can hire the right people and delegate to them with total confidence that Al showed us. So I would miss him.

Gardner: I'd just add that at Memorex I saw Al's ability to keep some very, very good people could have otherwise been at odds working together, and that was part of his skills. There were some very strong personalities. You and I were little folks at Memorex, but there were some very strong personalities and Al had the rare ability to keep those strong personalities working together. Unusual man. He'll be missed.

Iftikar: He'll be missed. I remember also at Seagate he was a little concerned about my relationship with my peer and colleague, Doug Mahon. I was in charge of mechanical engineering and Doug Mann was in charge of electrical engineering. Doug was a huge mountain man, and Al wasn't sure if we would get along. So he watched us closely for about a month. He then came to my office and said, "Syed, you can get along with anyone. There's no problem between the two of you." He was good at making sure that people got along.

Gardner: Special, special guy. So turning now to SyQuest, I think we are about 1991, that was quite a memorable year for SyQuest. Tell us about 1991.

Iftikar: Yes, 1991 was a special year for SyQuest and for me. After I left Seagate I started SyQuest in 1982. Since the founding in 1982, it was a big struggle for me. A lot of times we didn't think we would make it. In fact, in 1986 the Board of Directors had given up on SyQuest. We had raised, I believe, seven rounds of financing and that amounted to about 32 million total. When things were not going good, the Board finally described SyQuest as a 'living dead' company. In other words, we were zombies back in those days. However, starting in 1987, the company did a major turnaround. We bought out the right products in 1991. It was really a major achievement for the management, for me, and to the Board of Directors who stuck with the company to see the company turn around and go public. I think that was one of the greatest moments of my life.

Gardner: That was December of '91 that the company actually closed the IPO.

Iftikar: That's right.

Gardner: During '91 you announced and introduced a number of additional products. Could you talk about those?

Iftikar: Well the company went public by having the 44 megabyte removable drive and the 88 megabyte removable drives actually shipping, and that's what was making the revenues for the company. The investment bankers thought that we should also disclose to the public the new products that we are working on so that the public would get a feel for the products of the future. So we introduced the 3.5 inch drive, the 2.5 inch drive, I believe, and also the 1.8 inch drive. The 3.5 inch drive, I believe the first one was 105, I'm sorry I think it was 270 megabytes.

Gardner: I think you're correct, Syed. It was the SQ 3105, 105 megabytes.

Iftikar: The 3.5 inch was the 105 megabytes. The 2.5 was 40 megabytes?

Gardner: 42. 2542.

Iftikar: 42 megabytes.

Gardner: Actually you have a 2542 there.

Iftikar: Yes.

Gardner: In that one there. And the cartridges.

Iftikar: Yes, it's 2542 and we had started a new division called Iota, and it was their charter to design this 2.5 inch drive. The 1.8 inch was designed by the group in Fremont. We had an engineering group in Fremont. Actually two engineering groups in Fremont. One was designing the 5.25 inch platform, and the second one was designing the 1.8 inch platform, and the 1.8 inch that we introduced had 80 megabyte, but I think ultimately it went to a 100 megabyte.

Gardner: Why didn't you go on to 110?

Iftikar: It may have gone to 110.

Gardner: It was announced at 80 and I believe the actual production shipments were at least 100.

Iftikar: Yes. It probably was 110 unformatted, with a formatted 100. I'm not sure, though. My memory is not so clear. But anyway, we had two platforms in Fremont, the headquarters. The 3.5 inch drive was designed in Colorado. We had our own division in Colorado. But these products were not shipping at that time when we went public.

Gardner: Why separate divisions?

Iftikar: A lot of times in engineering, people get set in their ways and maybe with the complexities of problems, there is always a resistance to design a new product quickly. They always look at it and say well, the first product took three years to do, so the new product would take about three years again. So there was always this discussion of maybe bringing new people and new ideas, and since they come from hard drive companies that have better resources than a smaller company like SyQuest, they are privy to more technology or new technology and so we thought by integrating those people with the SyQuest team, we would get the products out quicker, and also having simultaneous R&D projects definitely brings products quicker to the market. So that was the reason why we set up the R&D team in Colorado, and there was also the R&D team I believe in Santa Clara. That was the Iota team. And so

these teams could independently come up with product without too many constraints from the head office. Also, we wanted to create an entrepreneurial spirit for these individual teams. Small teams make quick decisions and come up with a products in shorter time. That was the idea.

Gardner: I think the Colorado team called itself Syco?

Iftikar: Yes, they did.

Gardner: And it was headed by?

Iftikar: It was headed by -- I forget his name.

Gardner: Scott Robidart?

Iftikar: Scott Robidort, yes. And he came from Connor, I believe.

Gardner: Did he then recruit the folks in Colorado?

Iftikar: Yes. He had his own team that he recruited from Colorado and I think we sent two people from Fremont that wanted to go to Colorado to join his team.

Gardner: Do you recall any of the other interesting or maybe not so interesting folks in Syco?

Iftikar: Well, as the name implies -- I don't know why they chose the name Syco -- but they did bring in new ideas and so we did get the product quicker than we would have otherwise got from the main group in Fremont.

Gardner: Now the Santa Clara group was Iota.

Iftikar: Yes. Because Iota thought the drive was small and at that time that was the smallest drive when they embarked on that program, and so they wanted to call the drive "Iota" to emphasize the fact that it was small. We formed another group later on, a system integration group we created in Florida, that was called SyDOS, because they focused on the DOS aftermarket.

Gardner: I'll segue into that in a little bit. Like Colorado, how about some of the folks at Iota that were interesting and maybe not so interesting?

Iftikar: Well Iota people came from Maxtor, and they also were very dedicated, you know. They believed in what they were designing. It was a small group and I think they eventually came up with a product, the

2.5-inch product, and they were the first ones I believe that met some of our reliability standards in terms of contamination and dust resistance. So they paved the way for other groups to match their reliability standards. We did benefit from Iota.

Gardner: That was originally headed by Joe Davis?

Iftikar: Yes, it was.

Gardner: Some of the key guys there, actually as you know when Joe left I took over Iota. There are some really good folks at Iota. In particular, Don Adams, who headed engineering for the most part, and Art Wagner who did the motor design. It's really a good team.

Iftikar: Yeah, they're were good team. In fact, after you left, Tom, they were so good we brought them into the SyQuest team in Fremont. So, Joe Davis became the head of engineering.

Gardner: Don Adams I think became the head of engineering.

Iftikar: I'm sorry, Don Adams became the head of engineering in Fremont.

Gardner: That was your experience at managing a herd of cats.

Iftikar: Well, it's difficult, so this is why I think I give a lot of credit to Al Shugart, because once you hire these people, managing them is really difficult if they don't get along. Now if they get along and they produce a product on time, then I think management becomes easy. The test for management is to manage people, great minds, and to make them work together. How do you come up with a consensus when each one has a very strong opinion? That's a challenge. And frankly, Tom, I don't think I managed them that well.

Gardner: They were strong personalities. Yeah, as you know, I came in the middle of that and actually I was impressed at the amount of cooperation that was going on, notwithstanding the strong personalities and the geographical separation. I mean, part of the challenge was, I mean, you think Santa Clara and Fremont are close, but sometimes 100 meters creates a barrier to communication.

Iftikar: That's right.

Gardner: And certainly Colorado made communications even harder.

Iftikar: Harder. Communications became harder and also when the products were designed, as much as we pushed commonality, they all ended up with their own firmware and they were not compatible and so each had to go through the same problems that other groups previously had, whereas if you had one

common firmware that was the basis for all the products, life would have been a lot easier. So that was a negative of having different groups design their own platforms, because when there's a problem, solving them becomes a lot difficult.

Gardner: According to the IPO, the revenues in '91 were approximately 115 million dollars. That was mainly in the Mac market, and you were selling through folks called AMOS. What are AMOS?

Iftikar: Tom, actually the company really became a success when we switched to the SCSI interface, and the person that helped me make that decision is you -- Tom Gardner. After we made that decision and all the products from then onwards became SCSI drives, we focused on the Apple aftermarket. At that time, the time we went public, we had 80% of the Apple aftermarket, mainly desktop publishing, graphics and backup. But we sold through a channel called 'The AMOS', that somebody coined. I think Vice President of Sales, Leon Malmed, coined the name. What it meant was "After Market OEMs". And we called it AMOS. In reality they were just system integrators. So when we shipped our disk drive, it was not a plug-and-play device. So the AMOS would package it into a mechanical enclosure, bundle it with software, a power supply for the drive, and they would ship it as a total solution. So 80% of our product was sold through these AMOS. For example, if you sold a product for \$200, I believe at that time the average selling price of our products was in the neighborhood of about \$200.

Gardner: For the disk drive?

Iftikar: For the disk drive. By the time the AMOS packaged it solely to their distributors, and the end-user bought it from the distributors or the retail stores, they would pay double the price. So SyQuest products were actually being sold to the end-users around \$400. That was a great market for us and we used to talk about the fact that SyQuest had very few sales personnel, but that each one of these AMOS became a salesman for the company, because we had all these AMOS selling our product. So our sales budget compared to a company like Iomega was a fraction, and that was our strength at that time.

Gardner: Iomega sold directly to the end-user rather than through an aftermarket channel.

Iftikar: Yes, Iomega had packaged the drive into a plug-and-play device and they sold it directly to retail stores and the retail stores, in turn, sold it to the end-users directly. So they skipped the system integration channel.

Gardner: With the economics of \$200 for a drive, SyQuest price, \$400 for a subsystem end-user price, didn't apply to the cartridge business, did it?

Iftikar: No. The cartridge we decided would be sold without the help of the AMOS. We did sell them to the AMOS too for bundling software, but there was nothing to integrate on the cartridge. The cartridge was packaged for the end-user. So we decided to sell the cartridges directly to the retail stores so that we would bypass the AMOS business. The cartridges were repeat business and we wanted to keep the high gross margins of the cartridges to ourselves. In fact, our business plan reflected the high gross margins of selling the cartridges directly to the end-users.

Gardner: Could you give us round numbers, like the 200-400?

Iftikar: Yes, the cartridges were sold at about \$29.95, at the low end, and the high end we sold it as high as \$80.00, and the margins for the cartridges were over 50% during the time we of the IPO, and the combined margins, combined meaning the drive and the cartridges together would be in the range of about 38%-40% and this was unusual because the hard drive companies like Seagate, Maxtor, Western Digital, would eke out a 12%-20% gross margin whereas SyQuest was getting 40% plus margins very easily by selling the cartridges. So cartridge was our business. It's like a light bulb and the socket. We would talk about giving the socket - which would be a disk drive, away free. Selling the drive at a very low price and making the money on the cartridges, and in fact the 5.25 inch drives were sold at a price below their cost.

Gardner: So you were basically zero gross, the \$200 drive cost you \$200.

Iftikar: The \$200 drive cost us about \$190, in fact.

Gardner: And then with a warranty and stuff like that, you were essentially--

Iftikar: It became a zero cost.

Gardner: If you had a good month you would break even.

Iftikar: Yes. Frankly, we did not make money on the drives.

Gardner: The IPO papers show at that time in the September quarter of 1991, you were shipping 4.5 cartridges per drive in the 44 megabyte space. That number actually increased with time, didn't it?

Iftikar: Yes. Since we were technically a cartridge company, we spent all our efforts in increasing the number of cartridges sold per drive, so our goal was to increase the cartridge ratio. In other words, the cartridge-to-drive ratio to about 10, and if I can recall, I believe we achieved about 8 on the 5.25 inch platforms.

Gardner: My recollection is SyQuest studied that pretty heavily in the mid '90s and the conclusion was it was something ultimately between 8-10 is what the average would be over a program life, because some drives get retired and never buy another cartridge, but some other people buy many cartridges per drive, and I think SyQuest found examples, particularly in the Mac graphics business, people bought 100 cartridges per drive because they were using it as an interchange medium.

Iftikar: Yes. There was also another interesting phenomenon, Tom. The 44 did reach very high numbers and then when we went to the double capacity, the 88, we saw that the ratio was not as high as the 44 megabyte. The marketing people then said that it was pretty obvious, with the higher the capacity,

people did not need 8-10 cartridges, because they could pack more on an 80 megabyte cartridge. Actually it's megabytes.

Gardner: I don't think that held up though. You know, we went from 8-bit images to 24-bit images. The question is did the size of the file increase faster than the capacity of the cartridges. You know, as time evolved, I think ultimately the data showed that the 88 did track the 44, but delayed by several years because it was several years later.

Iftikar: Maybe that was the reason, because when we first looked at it, the 44 had a higher ratio. You're probably right that the 88 probably was delayed, but it didn't last that long because of competitive pressures later on.

Gardner: Which actually, backing up a bit, most of these were sold in the aftermarket.

Iftikar: Yes.

Gardner: But in '91 you set up this company in Florida, SyDOS, and a person who just had something happen in their life. Tell us about SyDOS and Tim Mahoney.

Iftikar: Well, you know, Tom, SyDOS was started actually based on a recommendation by my friend, Tom Gardner. He may not have realized that. In the meeting where we decided to go with SCSI, you said that we should focus on the Apple aftermarket, build a company up to a \$100 million company, and when we were as strong as Iomega, because at that time Iomega was a \$100 million company, you then said we could flex our muscles and go after the DOS market. And so that's exactly what I did. When the company was doing well in the Mac market and we were over \$100 million, I decided to refocus on the DOS and go after the Iomega business because we now had the resources, we had better quality now, and the time was right to expand into the DOS market, because we dominated the Apple aftermarket. So with that in mind, we hired Tim Mahoney. Actually, Tim Mahoney was one of our system integrators, an AMOS in the beginning, and then we talked about joining SyQuest and forming a division in Florida called SyDOS to try to penetrate the IBM PC aftermarket and that's how SyDOS came into existence.

Gardner: This, by the way, is the same Tim Mahoney who was recently elected a congressman in Florida, I believe in Catherine Harris's old congressional district.

Iftikar: Yes. You sent me the link to this Florida congressman and I was surprised when I opened the link. It was Tim Mahoney. Tim left SyQuest and went into a venture business. He told me at that time he was consulting with a venture capitalist in the Florida area. Then we saw, just lately, he's gone into politics and he has won a seat as a representative in Congress.

Gardner: Now back to our herding cats subject. Joel Levine, who is a friend of ours and was your marketing VP responsible to Mac market, has told me that he had some memorable disagreements with

Tim over what was the DOS market and what was the Mac market. Could you elaborate on what was going on there?

Iftikar: Well Joel Levine was the Vice President of marketing for the corporation, because at that time we were a Mac aftermarket company. When we created SyDOS for the PC market, this caused a little confusion in the company. Who would be the marketing person for the DOS market? And Tim convinced the management and the Board of Directors that he and his team would be the ones to work on the marketing side and the product positioning side of the PC aftermarket, and this did not sit well with Joel. But we asked these two to work together and try to reach a consensus. Whenever there was a disagreement, we encouraged both of them to try to find a common ground, and at times it was very difficult to get them to see eye-to-eye.

Gardner: Lots of reasons for disagreement but the big one was over the cartridge channel because, as you said, a cartridge was essentially suitable for an end user even though perhaps the format might be different between a DOS cartridge and a Mac cartridge; the same cartridge could be used in either system and, therefore, who sold which cartridge and which channel became a bone of contention.

Iftikar: Yes. Tim Mahoney realized that his division's profits and gross margins depended heavily on the sales of the cartridges, and since the cartridges were being sold directly to the end user, his sales of cartridges were not sufficient to make the division profitable because the drives are being sold at below cost. So he came up with this idea of having two sets of cartridges. One called the DOS cartridge and the other the Mac cartridge, to which Joel, rightly so, objected, and we objected because we did not want a customer that has Mac and PC to have to identify the cartridges, and this would cause confusion and a lot of returns as people thought the cartridge was not working on the PC. So we insisted that we only wanted to have one cartridge that would work on both the platforms, and Joel talked to a lot of software third-party integrators to make sure that the DOS and the Mac cartridges could work on the same platform.

END OF TAPE ONE

Gardner: That was an interesting business, the cartridge business. It attracted competition, which you didn't expect. Nomai and then Iomega could you tell us something about that?

Iftikar: With all the struggle that we had to go through at SyQuest, it was really euphoric to go public in '91. Then after going public, the stock did well within the first two or three months and doubled in price. Soon after that we went for a secondary offering at over \$20.00 a share. Unfortunately, our favorable times and our good times, did not last too long. When the company was doing well, it created other competitors that tried to exploit our "razor blade" business model. The first such company was established in France by two brothers. The president of the company was Mark Frouin and he decided to clone the SQ500 cartridge. Since cartridges made the most money, he thought he could create a decent business selling clone cartridges that were compatible to SyQuest. As soon as he announced that he intended to second source our cartridges, by actually cloning our cartridges, the price of our stock

dropped from about \$30.00 to about \$20.00. Having a second source became a negative perception to a lot of investors. With competition, they felt that SyQuest could not hold the margins as high, and they were right. This was also a big shock to the management and the board of directors at the company. However, Nomai -- the company that was started in France -- invited us to visit their plant and also offered to manufacture their cartridges for SyQuest. I visited the plant and I did see them manufacturing what we call, SyQuest clone cartridges, but when I asked them "What would it take to acquire them", Nomai informed us that the price would be forty million dollars, four zero. We decided that acquiring a startup company for \$40 million that barely had a small manufacturing plant, was not a good idea. We told them that we were going to take legal action against them and that we had no intention of acquiring the company. Nomai then informed us that they intended to take the product to lomega, who was our archenemy, and try to market it through lomega. In the end, that is exactly what they did. So lomega started to market the product as SyQuest cartridges, or SyQuest compatible cartridges and we then sued lomega as well as Nomai, to prevent them from doing what we considered were illegal acts.

Gardner: There's an lomega/Nomai cartridge, I don't know if you want to handle it or not, but...

Iftikar: Probably not.

Iftikar: <holding cartridge> You can see that when you make it compatible, just about everything other than the label is the same. The packaging is the same; they went to the same packaging company. They went to the people who manufactured our servo writers. They went to the same suppliers that manufactured our disks. Their suppliers were the same as our suppliers, however, the cartridges were manufactured in France. Also, the French government had subsidized them, by giving them buildings with free rent and R&D grants, which made their cartridges lower cost. In addition, Nomai was not interested in selling their cartridges at a higher gross margin in order to compete. They undercut our price and this caused our gross margins to come down.

Gardner: The cartridges themselves are quite similar too, if you open the cases.

Iftikar: Yes, the inside is very similar.

Gardner: I like that warning label in the SyQuest.

Iftikar: If you look at both the cartridges, the plastics look the same and in their legal defense they said this was, what do you call, reverse engineering. So they measured all the dimensions of the SyQuest cartridge and made an exact copy, at least a functional copy of the cartridge. In order to prevent the Nomai cartridges from working in the SyQuest drives, I came up with the idea of imbedding a detector in the firmware of the drive. This firmware would detect a special bit that was willfully written on the SyQuest cartridge, to verify the authenticity of the cartridge. In other words, the firmware was smart enough to recognize if the cartridge was a SyQuest cartridge or if it was a Nomai cartridge or an lomega clone. When it detected that, the firmware would then shut the drive down. And so we felt, we had a safety feature built into the cartridge, which would prevent Nomai and lomega from selling a lot of cartridges into our market. However, very quickly we got a call from the European Union Commission, informing SyQuest that putting this detector was anti-competitive measure and they asked SyQuest to remove that

if we intend to sell the cartridges into Europe. That was another disappointment on top of the fact that Nomai and Iomega were selling low priced cartridges. We had to remove that detector in the firmware, which made Nomai and Iomega cartridges work on the SyQuest drives.

Gardner: You didn't have any patents on the cartridges?

Iftikar: We had copyrighted software and trademarks, and I believe we did have one patent on the door latching mechanism. But somewhere along the line, we must have fallen asleep. Our Singapore manufacturing plant decided that the latch caused a lot of manufacturing problems and defeated the latch although the feature was incorporated into the cartridges, but it was not being used. So the one patent, mechanical patent, that we had was ineffective. In other words, Nomai could design a cartridge without the latch and it would work.

Gardner: And you couldn't design a latch detector because you weren't using it either?

Iftikar: Since we were not using the latch, we couldn't add the latch back, because that would make all the cartridges in the field not compatible with the drives that we were shipping..

Gardner: You had mentioned SyDOS was an attempt for SyQuest to go compete with Iomega, do you think Iomega's attack at your cartridge business was a willful response or coincidence or?

Iftikar: Iomega, since SyQuest turned around, became a very small company. When SyQuest was first founded, Iomega was already a hundred million dollar company. And SyQuest had just started its operations. But over time, SyQuest became a much bigger company. In fact, SyQuest sales were three hundred million, whereas Iomega's sales were in the hundred and twenty million range. So they had to look at ways to undermine our business and also increase their business. SyQuest's venture into the DOS market did not affect Iomega; they were experts in DOS. I don't think we achieved our objectives of becoming a hundred million dollar division with SyDOS. Whereas Iomega was already a hundred million dollar company in the DOS market, but I think at that time, Iomega looked at every opportunity to derail SyQuest and to take over whatever business they could. When Nomai presented the cartridge, Iomega realized that our profits were in the cartridge. So by undercutting the cartridge sales, they effectively would cause serious damage to SyQuest. I think that was their motivation to go after SyQuest.

Gardner: The real challenge for SyQuest against Iomega wasn't the competition of cartridges was it?

Iftikar: No it turns out the ultimate challenge wasn't the cartridge. However, the cartridge did do the damage when the valuation of a company got cut in half. When we were the sole supplier of cartridges and drives, SyQuest was valued at about five hundred million. And when the cartridge price went below \$20.00 our market capitalization was about half. So in a sense it did do a lot of damage. However, ultimately, that did not cause the demise of SyQuest.

Gardner: Do you want to tell us about lomega's products and SyQuest's response? I'm thinking of course, of Zip, which began shipping in March of 1995.

Iftikar: I believe it was in 1993, or early part of 1994, Fuji approached SyQuest and they talked about – 'they' meaning Fuji, they talked to SyQuest about designing a floppy disk with 100 megabytes, using the Fuji media. I sent my Vice President of R&D, Eugene Berti to Japan to talk to Fuji. Eugene came back and was very clear about what the company's next product should be and that was a 100-megabyte floppy drive. So we brought it up to our marketing group and the then Vice President of Marketing, Joe Levine, said that the floppy was not going to be successful. At that time SyQuest was a high performance product company and we always looked at the floppy or the Bernoulli drives as inferior low performing storage devices. Our marketing was very adamant, that we don't even waste our time thinking about this 100 megabyte floppy. Well I remember the day when Eugene came to my office really upset and said if we didn't do the floppy, the chances of our company surviving would be questionable. And then six months later lomega made the announcement of the Zip drive before shipping their zip drive and detailed out the specifications of the floppy. I remember three of my key or major AMOS came to me personally and had a meeting with me and insisted that I should look into a response for lomega. I then convened a worldwide marketing meeting with all the marketing managers from all over the world. I remember it was a three-day meeting, chaired by Joe Levine. At the end of the three days, they gave me a summary of what they'd decided and I saw a slide on the screen that said lomega's Zip will be a zippo, that kind of summed it. And when the three customers of mine were so adamant about the possibility that Zip may destroy our business, I told my marketing team that I did not accept their recommendation. Their recommendation was not to worry about the Zip and that we should focus on the 600 megabyte drive, 5 1/4 inch drive that we were designing. So right after that, the VP of sales and marketing came to my office and said, "You know Syed, if you overrule us, then why do you have these 22 people from all over the world working in the company if you cannot listen to what they have to say?"

Gardner: This is Leon?

Iftikar: This was Everett,

Gardner: Oh, Dave Everett.

Iftikar: Dave Everett. Dave Everett asked me to give him six months to prove that the marketing people were right.

Gardner: This would be late '94 early '95?

Iftikar: It would be late '94. That's one of my many regrets that I have. The management books they say, a good manager listens to all of his people, but ultimately he has to make his own decision. Well I did make my decision and that was to follow the recommendations of my marketing team. At the end of six months, lomega started to ship the Zip drive and it really took the market we were in by storm. They did a great job of product positioning and marketing and SyQuest now found itself in a catch up mode. But we still thought as big as we were; we were three times bigger than lomega, that we could still catch up with the product that they had, or at least with a compatible product. But instead of using a floppy drive, we

tried to use a hard disk in order to cut the cost to match the lomega cost. We had to remove one head and use a single sided disk drive. We then went into a crash program of cost reduction. This time I went to Al Shugart of Seagate and he was kind enough to sell me disks that were good on one side for \$3.00.

Gardner: Which then were \$12.00 to \$15.00?

Iftikar: At that time we were buying for \$10.00 to \$12.00.

Gardner: So that's a substantial cost reduction.

Iftikar: This was a great cost benefit and I have to give credit to Al, he helped me there. So the disks were now priced at \$3.00 single sided. The heads used to cost in the same range of \$10.00 to \$12.00. By going with only one read/write head, we also lowered the cost by about \$12.00. But this was in desperation. We tried get this drive out in the market as quickly as we could. But we couldn't overcome the lomega marketing momentum. It was not just SyQuest there were other people besides lomega who were designing floppy drives with 100 megabytes. I think there was a start up company; I believe called Insite that was headed by an ex-Memorex general manager called Bill Sousa that was designing a floppy too. They introduced a 100-megabyte, that I believe was a better drive which later on Imation acquired and marketed. But even Imation and Insight couldn't stop lomega. lomega's drives completely took over our market. It was another shock to the company and the management. We always thought once you establish a standard, and we were the standard in the removable cartridge, it would take a longer time for a standard to be destroyed. So the company thought we had at least two years before we would really see the impact of lomega, we felt that two years was sufficient to design other drives that would save the company. But to our surprise, we must not have been a good standard, because within six months our revenue dropped from 100 million a quarter to 20 million. The company could not survive such a drastic change in revenue and profit. We had at that time over \$50 million in the bank that got quickly depleted with the massive losses.

Gardner: This would be '96 we're talking now or?

Iftikar: It started in late '95 and by the first quarter of '96, the company's cash reserve were pretty much depleted.

Gardner: The one head product you responded with was the EZ 135. It was in production for about a year.

Iftikar: I believe so.

Gardner: According to the research, it began shipping in August '95 and was replaced by a double capacity version in the third quarter of '96 calendar. And according to the 10K issued, the product lost money its entire life. So the cost reductions simply were not enough to match.

Iftikar: Not enough to match lomega because they had a fundamentally different model. We were still selling to the AMOS and not directly to the retailers whereas, lomega could go directly to the retailers. So phasing the AMOS out took a lot of time and we couldn't bring the price down to the end user as quickly as we could because we were losing money on the single-headed disk drive.

Gardner: My recollection is the Zip came out at \$199.99 for the drive and SyQuest's retail – This is Fry's price -- and at the same time the SyQuest drives were in the \$300.00 to \$500.00 price range. But more importantly the media price, Zip 100 megabyte for \$10.99.

Iftikar: No it's \$19.99.

Gardner: Was it \$19.99?

Iftikar: \$20.00.

Gardner: \$20.00. And again SyQuest's cartridges were at that point about \$30.00.

Iftikar: \$40.00.

Gardner: Even a \$100.00 for some of those.

Iftikar: Yes. The low end was about \$40.00.

Gardner: By the way, my disagreement with Tim Mahoney was when he priced the Iota cartridge at \$100.00. When he tried to introduce that in the DOS market, \$100.00 for a 42MB cartridge, that in retrospect was probably not a good pricing decision.

Iftikar: Why's that? Especially with no competition.

Gardner: Well, competition did come along; who knows what would have happened if he'd priced it at \$39.99 or something.

Iftikar: You know Tom, when you dominate the market and there's no competition, you could pretty much price it as high as you could go until the customers start to balk at the high prices. That's why they say that competition is good for the end user. As soon as there's a competitor, you have no choice but to lower the price. So, I guess that, when Tim Mahoney was quoting a \$100.00 price, there was no competition at that time.

Gardner: There's another theory though that says eat your own children, because if you don't the competition will eat them.

Iftikar: That's right. It's hard to make that decision when you're doing well and you're dominating the market and that's what happened to a lot of companies. Look at IBM, Control Data, Imprimis, they were all in the storage business, but they're not here today.

Gardner: I think SyQuest decided that the lomega cartridge cost \$3.00. The folks there spent a lot of time reverse engineering and cost analysis on the Zip product and my recollection was the folks concluded the zip cartridge cost \$3.00 or something like that.

Iftikar: Well I think SyQuest did come up with the higher cost estimate, but I heard from Nomai that lomega's cartridges actually cost like \$1.20.

Gardner: Oh, okay.

Iftikar: They had low cost because they were vertically integrated, that was one thing that lomega always had done, even from the Bernoulli days. They would cut the cookies for the floppy drive. They had plastic molding machines. I saw plastic molding machines in their manufacturing plants. They were truly vertically integrated on the cartridges. So when Nomai tried to clone lomega's Zip cartridges, they realized that they had to come as low as a \$1.20 to match lomega's cost.

Gardner: So they must of bought the sheet material from Fuji.

Iftikar: They bought the sheet rolls from Fuji.

Gardner: When Fuji approached SyQuest, was the drive, did they have a drive concept or was it strictly a media approach.

Iftikar: No, Fuji wanted us, SyQuest, to design the drive and then Fuji would then supply the floppy for us. That's how Eugene Berti had worked out an understanding with Fuji.

Gardner: Now the Zip drive in my opinion was a breakthrough in low cost drive design. For most of us disk drive guys looked at it as a terrible design; it broke all our rules. But I mean they were selling them for \$199.99 retail and I think again we concluded the cost, their manufacturing cost was substantially lower and they actually had some margin in that product. Do you recall any of that analysis?

Iftikar: Yes. When lomega positioned the product, they really positioned it as a very low cost device. They integrated the housing with the drive. There were no two housings like SyQuest. In the SyQuest case we had the drive, base plate, the cover and the front bezel, that itself was a housing enclosure. And we would take that drive and install it inside another metal or plastic enclosure. So the additional

enclosure itself would cost money. lomega did away with that. They looked at every component in the drive and they really did a good job of positioning the product at a very low price.

Gardner: As I recall, I mean, they didn't use any ball bearings in the actuator. They didn't even use metal sleeve bearings. They had plastic sleeve bearings on rods, which bent if you actually looked at the drive, the carriage, the rod actually bent. Which as a mechanical engineer I think you would say is a risky design?

Iftikar: Well when you look at it, we have to find things wrong with them and yes we did say that most of the design was done cheaply and it would not hold up to the rigors of a disk drive. But we forgot that for years lomega has been a floppy drive company, and we also forgot the fact that we were not a floppy drive company, we -- SyQuest, we're not a floppy drive company. So lomega exploited their knowledge of ball bearings, of cartridges and of plastics. They were really and truly experts in that field. And so when we looked at it, Tom, we looked at it through a different set of eyes. We are used to great ball bearings, very high precision, very reliable ball bearings which cost a lot of money and so we looked down at the design of the Zip drive. But as history would prove that low cost design was very reliable and people -- customers, immediately started switching to that design. So much so that lomega became a billion dollar company very quickly after that. Actually they achieved 1.8 billion. At SyQuest for ten years we wanted to become a billion dollar company, but never did.

Gardner: Yeah I remember they had some terrible reliability problems. There was a famous clack clack problem, which is all over the Internet. But every place you looked in that drive, and the head load mechanism was, and SyQuest was expert in head loading, and it bled a lot to get it reliable and I remember the engineers at SyQuest looking at that saying "My God", but it worked it was reliable enough. I think that's the, the disk drive guys had a certain expectation in design reliability that was beyond what the market needed. And lomega was sufficient, not elegant, but sufficient.

Iftikar: You know, like many new products they went through many reliability problems, but they resolved them. It wasn't bad enough to destroy the company. They had enough resources and enough cash flow to fix problems on the fly.

Gardner: Oh I think they got up to about 12 Zip disks per disk drive. I think.

Iftikar: I think they did sell a lot more drives, cartridges than SyQuest ever did.

Gardner: Yeah, no it was, after I left SyQuest I tracked that for intellectual curiosity and the number was astounding. But it's not very far from what we thought we were going to achieve at SyQuest, but it was an impressive business; they were a cartridge company like SyQuest.

Iftikar: Yeah, with a cost of a \$1.20 and they sold it for \$20.00, that's great marketing.

Gardner: I think they sold at \$10.00 retail.

Iftikar: Eventually yeah.

Gardner: But still I mean the margin opportunity there is great. Actually let's cut right now and we'll continue after break.

Iftikar: Okay.

END OF TAPE TWO

Gardner: So at the low end SyQuest's low-end businesses were impacted by the 100-megabyte Zip. lomega also came out with a high-end product. Tell me about SyQuest's experience with the high-end market segment.

Iftikar: I think within a year of introducing the Zip drive lomega came up with a high-end 1-gigabyte JAZ drive-- called a JAZ drive, and that also caught us by surprise. Because at that time SyQuest was designing a 600-megabyte single-disk five and a quarter-inch drive, or 3½-inch -- I don't recall which size it was. But it was 600 megabytes. And as soon as we saw that lomega had leapfrogged us, there was no point in going with the 600 megabyte. We cancelled that program and came up with the SyJet that was a 1.5-gigabyte drive. And again by the time the product came to the market we were, I believe, more than a year, behind lomega.

Gardner: My research suggested that the JAZ began shipping in December '95, and the SyJet 1.3 -- which became 1.5 when it shipped -- was announced in MacWorld in January '96 and began shipping at the end of '96. So that would put first units to first units, but I think lomega's volume showed SyQuest's ramp was not as fast as lomega even. So it was in effect more than a year late but 50 percent higher capacity.

Iftikar: Yes. But I think lomega's JAZ -- I'm not sure -- peaked in 1995. They sold the highest volumes in 1995. So if SyQuest sold our product after 1995, lomega was already in very high volume. And again, we played catch up with a company that was hemorrhaging. We did not have enough money for marketing and things like that. So it was very difficult to catch up.

Gardner: The real question is -- if there was a space that SyQuest owned, it was the space that JAZ came in. How did they beat you by a year?

Iftikar: Well, we had the misfortune of demonstrating a prototype two-disk version in one of COMDEX' computer shows as a future technology. And I believe it was either 1993 or '94 when we demonstrated a two-disk drive -- 3½-inch or 5¼-inch; I don't really remember the size of the platform, but I do remember the two-disk version. And we had no intentions of introducing that product right immediately afterwards. Usually the norm for disk-drive companies -- when you make the announcement, you're either shipping it

around that time or within three months. But this was not really an announcement. It was more like a technology path for the company. And in hindsight that was a mistake, because lomega saw it and immediately embarked on a program called JAZ while we had no programs for the two-disk at that time. And that was a mistake in hindsight -- letting the competitor know what you are thinking.

Gardner: At that time, state-of-the-art '95 was probably about 500 megabytes per 3½-inch disk.

Iftikar: Yes.

Gardner: So, you know, if you wanted gigabytes or the capacity you had to go to two disks. So you think lomega took your idea and ran with it and used it then to seal the fate of SyQuest?

Iftikar: It's not a matter of what we think. We had already displayed the product, you know, Tom -- and any competitor when he sees a new product -- and especially from a competitor who is much larger than lomega-- why wouldn't lomega work on that? And they also had a new CEO at that time that was hired to turn the company around. And he focused on both the Zip and the JAZ -- actually, he focused first on the Zip and immediately started on the JAZ program at the same time.

Gardner: And he really changed the market -- did the AMOSs disappear as a consequence of lomega marketing approach?

Iftikar: The good news about lomega was that the consumers benefited. The bad news about the Zip is that the entire AMOS companies -- and there were lots of companies -- and there were a lot of employees working in the AMOS companies that along with SyQuest pretty much disappeared. Right after we introduced products that were plug-and-play like lomega, the AMOS had no other business, and one-by-one they all disappeared.

Gardner: That EZ135 announcement was a first for SyQuest, wasn't it? In the sense of being retail-oriented?

Iftikar: Yes. In order to compete with lomega and to get the company back into a profitable mode, we desperately looked at various options. And one was to hire Rod Braidó, who was one of the AMOS that got affected. We asked him to put together a team and a marketing plan and a product that would compete with the low-end lomega products. And that's when Mr. Braidó came up with this EZ 135 disk drive. That was sold directly to the end-users.

Gardner: And you launched in a whole different way than the way SyQuest had traditionally done a product launch. I mean it was a different channel and a different marketing?

Iftikar: Yes. Because the product did not go to the AMOS channel. We pretty much did what lomega was used to doing. So we got a big space at COMDEX, as big as lomega, and we had the booth designed to show that we were an end-user company. And the marketing literature, the brochures and the

presentations were pretty much like what Iomega would have done. Even the posters pretty much looked similar to Iomega in terms of the average person endorsing the drive. That was a big thing with Iomega, how they used their stuff. And so we came up with a similar marketing. So we tried to copy Iomega in what they did best in their marketing.

Gardner: I forgot "stuff." That was their word wasn't it?

Iftikar: Yes. Protect your stuff.

Gardner: So shortly thereafter you left SyQuest -- you resigned on June 13th, 1996. Anything about leaving you'd like to share?

Iftikar: Well, after 14 years of running the company, having both good times and bad -- towards the end having very good times after we went public -- then we were caught off guard. Even though there were enough warning signals, I felt as a CEO that I should leave the company. So in the December meeting of the board in 1995, I turned in my resignation to the board and I told the board that we should hire a new CEO to run the company. Well, by this time a lot of investors who had invested in the company at a higher price saw their stock go from \$30 down to about \$6, especially one little old lady from the Midwest called me and said she had invested \$10,000 of her savings, her life savings, into the company -- only to watch it go down to almost nothing. That made a big impact on me, and I said that it was time for me to leave the company. Anyway, in the board meeting the board convinced me that I was the technical architect and asked me to stay on and not leave the company. But at the same time, we talked about bringing in some new managers to help the company in the turnaround. We had those discussions for about like three months. And so around the March timeframe of the following year we hired -- I wouldn't say we hired. We brought in a new board member, Ed Marinaro, and around the March timeframe we talked about making him the chairman. I was opposed to the idea of bringing a new man in as management while I was still in the company. And I mentioned to the board I didn't think it was a good idea. Either I would turn the company around or we'll bring in new management to turn the company around. I didn't see any point in me being in the company. And once again the board talked me into staying with the company but bringing in new management to see how it works. So in the June timeframe of 1996 we had a chairman, a CEO -- that's myself -- and a president of the company. I decided to give it a try, but after one week I realized that I was only a figurehead -- and I didn't think it was in the company's interest to have three high-paid executives running the company when one happens to just sit there as a figurehead. So Tom you're right, I resigned on June 13th I believe.

Gardner: The president was?

Iftikar: Ed Marinaro was the chairman, Harper -- Ed Harper was the president. I guess he ran a tape drive company for Hewlett-Packard in Colorado.

Gardner: Yeah. I'd forgotten about Ed. And so you left, but you didn't get out of the cartridge business did you?

Iftikar: No. I'm -- like I said, you'd mentioned a while back I'm a serial entrepreneur, and I can't just stay home and do nothing. So after I left SyQuest I started my third company called Castlewood Systems. And again, it was a removable drive. Ever since I left Seagate I focused on designing removable drives. Because I always felt that there was a market for backup and other functions that the fixed drive is really not suited-- is not well suited for. So at Castlewood we wanted to introduce a removable drive that could play a full-length movie. My initial goal was to design a 4.7-gigabyte minimum capacity removable drive and to focus on the video applications -- not so much data. So Castlewood -- the name in itself kind of implies the same. I coined the name Castlewood from two companies. In Hollywood there's a studio called Castle Rock Enterprises, and that's a film studio. And the "wood" came from an audio company called Kenwood Stereo Systems. So we said, "We will design a drive with audio in mind and video in mind." And that's how the name Castlewood was coined. And so we targeted this product for VCRs and movie applications.

Gardner: The 4.7 gig capacity coming from the DVD space?

Iftikar: Well, the DVD had just made announcement, and the 4.7 came from the DVD -- but they were very high priced. And at that time the DVDs were selling for over \$1,000, and we thought that Castlewood would come up with a product, again, in the \$200 range that could easily overcome the cost barrier that the DVDs had. And we would do well by signing up a lot of OEMs. But when we got the technical team together, we realized that the head/media combination at that time could not-- the head/media could not produce a product that would give us a capacity of 4.7 gigabytes. At that time, on a single disk the hard drive companies like Seagate, Maxtor had two gigabytes of capacity. So we had no choice at that time to either wait until the magneto-resistive heads were available to design a 4.7 gigabyte drive, or put two disks inside a cartridge, or to go with a half-capacity 2.3 gigabyte or 2.2 gigabyte drive that we came up with. So in order to generate some income, our marketing guys at Castlewood did a market study and said that there was no competitor with the 2-gigabyte product. Iomega did not have a 2-gigabyte product, SyQuest did not have a 2-gigabyte product. So we would introduce a 2-gigabyte product as a stepping-stone towards a 4.7 or 5-gigabyte removable product. So that's how Castlewood got started.

Gardner: Just backing up for a second, you were involved early on in PVR, personal video recorder, while still at SyQuest. Wasn't there an arrangement with a Japanese company to do a -- this now predates TIVO -- to do a PVR with a removable cartridge device? Or was that at Castlewood?

Iftikar: No. I don't recall any PVR at SyQuest with a Japanese company.

Gardner: Maybe -- did you do that at Castlewood?

Iftikar: At Castlewood, yes.

Gardner: Okay. **Iftikar:** That's okay. You're doing great compared to what I can remember.

Gardner: But I remember -- I have strong recollection of Syed Iftikar with a removable media personal video recorder. And I guess I moved that, but that was a Castlewood experience?

Iftikar: Yes. The only Japanese company that I was involved with at SyQuest was Hoya Glass. We were thinking about introducing glass. So I met the CEO of Hoya Glass. In fact, Hoya invested in SyQuest. But that's the only Japanese company at SyQuest. However, at Castlewood the whole company strategy was to go raise the money from OEMs. I approached some venture capitalists about starting Castlewood, and one of them was Floyd Kvamme of Apple fame. And I mentioned to Floyd that, since this will be my last company, meaning Castlewood, that I would like the employees to retain 50 percent of the company when it went public. And Floyd's advice was that in order to do that he said I would be better off to raise the money through OEMs and not the VCs. Because ultimately, in a typical company, the VCs end up controlling 80 percent and the employees end up with 20 percent. So based on his recommendation, I went to Japan. And I did sign up quite a few Japanese companies-- one of them was Sanyo -- Aiwa, Sony -- most of them became investors in the company. I was able to raise the initial money through corporate investors in addition to me personally putting some money in. So Castlewood was funded mainly by corporate investors-- and most of them were Japanese.

Gardner: And I have a strong recollection of a personal video recorder a -- I guess a Castlewood cartridge built in, which was shown at some show?

Iftikar: Yes.

Gardner: When? What? Who was the company?

Iftikar: Well, we had Sanyo.

Gardner: Sanyo?

Iftikar: Sanyo had a video recorder. Sony had -- I'm sorry -- Aiwa had a video recorder. But the one we displayed was a Sanyo recorder, PVR.

Gardner: That was pre-TiVo right? I mean it was... ?

Iftikar: That was before TiVo.

Gardner: So I mean it looked -- well TiVo hasn't done well financially, but they certainly have a market name.

Iftikar: They have a market name. People are using TiVo. I have two TiVos at home. Yeah, that was before DVD became ubiquitous, before DVR like TiVo became popular. And that was, I believe, the interest from the OEMs to finance Castlewood.

Gardner: By the way, saying we have -- I have two TiVos also -- and saying that we have two TiVos make us sound leading edge. But I know at least one person who has six TiVos in his house. TiVo hasn't

made a nickel, but they certainly established the brand. Now, unlike your previous companies, Castlewood was not vertically integrated. You contracted most of your manufacturing.

Iftikar: Yes. We could have raised a lot more money to build a manufacturing plant, but the contacts I had were the OEM investors -- they gave me some insight into not doing manufacturing. They suggested that in order not to raise a whole lot of money I would be better off to subcontract the product. So Castlewood's strategy after that was very clear. We would try to market to major OEMs for the video applications, for the DVRs. That would be a major focus. If it happens to go into the PC and the data, that was okay, but our major focus was DVRs. And the second strategy we had was not to do our own manufacturing. So we would subcontract, and the subcontractors would build the factory at their cost. And they would even finance the product for 90 days for Castlewood. So this way our cash flow requirement would be much less. And that's exactly what we did. We...

Gardner: I bet you had a patent on the cartridge -- several.

Iftikar: We had several patents on the cartridge and drives. We also had good subcontractors. We had three subcontractors, one in Thailand and two in Malaysia, manufacturing the product. And they would finance -- and they did finance -- the product with 90-day terms for the company.

Gardner: Now you designed a product here in the States and built it in Thailand and other Malaysian--

Iftikar: Overseas.

Gardner: Overseas. How did that work out? How was the quality, how was the production ramp?

Iftikar: Any time you go overseas, communication becomes a big problem. So this becomes a major obstacle when trying to ramp up the product. We also found that most of the engineers would rather design here and did not want to go and live overseas for weeks on end. They would prefer to go there for a week, look around the place, teach the subcontractors how to manufacture the product, and come back home the next week. And this became a major problem for ramp up, for quality; although the subcontractors were very hard working, they really wanted to build the product well, but that was one problem we had to constantly overcome.

Gardner: And you did right? I mean as I understand it you had a fairly successful ramp and then ran into problems -- if I understand that.

Iftikar: Yes. We had three manufacturers manufacturing the product.

Gardner: All three manufacturing drives and cartridges or...?

Iftikar: All manufacturing drives and cartridges. And we had ramped up to 80,000 drives a month.

Gardner: That's -- you know -- a million a year. That's probably exceeding JAZ.

Iftikar: Oh, yeah. At that time we exceeded JAZ for a couple of months.

Gardner: Even JAZ's peak rate I don't think -- I don't think JAZ got to a million a year-- annualized. That's a huge volume. [Ed. note: According to Iomega's 1998 10K peak JAZ production of 818k units in FY97]

Iftikar: Well, one advantage was we had all these OEMs. And we had people like Sony, Sanyo and the after market too. And then Philips had come in from Europe. And Philips expressed interest to buy 80,000 drives a month from us. They were already evaluating the drives.

Gardner: The application at Philips was?

Iftikar: DVR.

Gardner: DVR again?

Iftikar: All DVRs. So I guess we were on the top of the peak at just that moment. And then we were at that time -- we were shipping, or at least we were manufacturing, 80,000 drives ramping up. That particular month I remember -- it was February -- I don't know exactly which year. It was probably 2001 or 2000. We had just shipped 40,000 drives that month, and I was in Germany at the Hanover Fair when my technical support manager called me and said that we had problems. And he went on to explain that a majority of the customers and OEMs were finding a lot of problems with the drives in the field -- drive and cartridge in the field and that a lot of product was coming back. So from Germany I had to call all the subcontractors to stop production when they were already ramped up to 80,000. They had actually built 80,000 that month. And then we flew back home to figure out what was going wrong with the drives. And when we physically looked at the drive and the cartridge, we could not detect or discern anything wrong.

Gardner: What were the failure symptoms? What sort of problems were the...?

Iftikar: The failure was the drive would not read the cartridge. And that was a death knell. If you cannot read the cartridge -- and they would put a second cartridge in -- it will read the second cartridge. And after a couple of days the second cartridge will become ineffective. They'll...

Gardner: So the cartridges -- and like if you moved the cartridge to another drive it would not work?

Iftikar: It would not work.

Gardner: The cartridges were becoming...

Iftikar: Yes. The cartridges were bad.

Gardner: Bad. Okay. But the drive survived? It wasn't like the head had been destroyed? It was...

Iftikar: At that no -- this is what we got the feedback from the field. The feedback from the field was the drives were okay, but the cartridges were bad.

Gardner: So we have cartridges appear to be dying, drives appear to be okay. And you go back to California or Malaysia or...?

Iftikar: No. I come back to the R&D center in Milpitas, California. And it took us a long time to figure out what was going on. We sent the drive and cartridge to IBM Laboratory in Minnesota, I believe, to find out by chemical analysis what was wrong with the heads and the media. And after about a month of testing at IBM the IBM lab informed us that the glue that we're using to install a motor into the base plate was out-gassing or evaporating over time. And this glue that evaporated from the base plate would then condense onto the disk and the heads, which would thereby mean that the heads are flying higher and the data is no longer detectable by the electronics of the drive.

Gardner: And it was both on the disk and the head.

Iftikar: It was both on the head and the disk.

Gardner: So if you put a clean cartridge in the head was flying lower...

Iftikar: A little lower and we were barely able to read.

Gardner: But as it, this then accumulated and it would fail.

Iftikar: It would fail.

Gardner: That's a tough problem.

Iftikar: That was a really tough problem because you could never rework the drive. Once the glue settled onto the inside of the drive, which is the base plate, the roof and all the components-- you could not remove the glue. The glue would set...

Gardner: And it continued to out-gas? Or did it...

Iftikar: And it continued to out-gas as long as the drive stayed in the field. And it only happened on about 10 percent of the drives. Not every drive had that problem. But 10 percent was large enough for us to recall the drives.

Gardner: A hundred percent?

Iftikar: I told the board in order to save the company's reputation I had to recall all the drives, 100 percent. Because the inherent problem was still there -- and the problem was when we applied this glue to hold the motor in place, you have to cure it. That's called ultraviolet curing -- UV curing cycle. And so in the UV curing process we only ran the drive through the conveyor system on one side. And we should have done both sides to cure the spindle onto the base plate. And the business side of the drive was not cured.

Gardner: You mean the side that faced the cartridge was not cured?

Iftikar: We would turn the drive upside down, the spindle motor up, run it through the UV machine and as a result the side that faced the disk was not cured.

Gardner: And we all know that you can't seal a cartridge. You do a good job, but you can't seal it. So there's going to be some contamination.

Iftikar: That's right. So when the disk would spin, the center of the motor would have negative pressure. Physics went against us. It would suck the glue into the airflow and swirl it around and coat all the components inside. So we had over 350,000 drives in the field, and two-thirds of them were within warranty. The other one-third were out of warranty. But when a company has an inherent problem -- I decided to recall all of them because the customer did pay \$200 a drive. But when you recall 350,000 drives at one time, and to stop production, we needed more money. So I talked to the OEMs about raising another \$30 million. And that's probably the difference between OEMs, corporate investors and venture capitalists. The corporate investors said they didn't want to invest \$30 million again into the company, and that pretty much sealed the company. Although, 90 percent of the drives in the field were still working. And my CFO was totally against making the recall, because he had a USB drive that's on the table, the blue colored USB drive -- and he carried the drive along with him in every meeting we went to with me. And that drive had no problems whatsoever. So I guess it just depends how the glue would cure and the intensity of the ultraviolet light may have penetrated deeper into the drive he had so the glue was cured.

Gardner: Or application inconsistencies or dimensional inconsistencies...

Iftikar: Yeah, would affect it.

Gardner: ...would affect it. So Castlewood then shut down?

Iftikar: Yes. Not immediately. We tried, without the money -- I tried to sell the product that the OEMs had - I'm sorry -- that were manufactured or rebuilt that were in various stages of completion because these products did not have the glue that out-gassed. So we reworked the drives. We removed the spindle; we introduced a new glue and with a new process of using the ultraviolet on both sides of the bowl or the base plate we rebuilt the drives. But we just couldn't overcome the negative reputation of the company.

Gardner: Since Castlewood there's been no removable media product. There have been some pluggable drives. I think Iomega's trying to do one. The capacity today of the disks -- 200 gigabytes, 150 gigabytes - - something in that range. Is there a future for removable-disk media, or has it finally reached the end?

Iftikar: When IBM went from a disk pack to a hard drive, they had poor margins on the removable drive. The mechanical tolerances for interchangeability and the electrical tolerances for the head actuator to position itself on a track made the product un-economical. That's what IBM said. But at SyQuest we found a way to make it economical for a while. But now the drive capacity or the track per inch is so dense that I truly believe we have reached the limit of it not being economical. To put a 200-gigabyte onto a single disk and have the heads track it with temperature and dust and contamination I think is going to be very difficult. Therefore I think the days of removable drives that we are used to are pretty much gone. People are now going to a removable HDA or removable hard drive for transportability and backup. And at the lower end flash memory is coming in at a low enough cost that it doesn't make sense to have a removable drive.

Gardner: I was thinking of the high end and the archival -- I mean there's always been a high-end JAZ, SyJet. That's now filled -- that capacity point is filled by DVD R/W, but you know there is an opportunity for a 100-gigabyte. But just not worth doing anymore? Is that -- in the last 30 seconds we have on this tape?

Iftikar: Yeah. Because now the capacity of the drives are in the terabyte range. Seagate has already introduced, or announced, a terabyte disk drive. It's very difficult to get terabyte capacity and make it removable.

Gardner: And end of an era. Thank you very much for the time you've given us. The Museum really appreciates it.

Iftikar: Thank you.

END OF INTERVIEW