Interview of Art Carr

Interviewed by:
James Pelkey

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James Pelkey: Thank you for your valuable time.

Art Carr: The early days of the data com business -- the data com business as it was known in the '70s was preceded by a relatively small number of companies that did business with the security agencies and the military, and that business benefited from DOD budgeting and from black budgets in the security agencies in a way that advanced technology, but the problem was that it came and went. It was a pulse business. You had a year of a lot of contracts; you had two years of no contracts, that kind of thing, so nobody felt at that time that they could build a really stable business.

Pelkey: Stelma was an example of that kind of company,

Carr: Stelma was an example. Codex was an example. Milgo, Rixon, sold into those applications, and people could not see commercial markets because the kind of things they sold were too sophisticated and too expensive for a commercial need, and besides, only in a very special circumstance could the customer acquire it from anybody other than AT&T up until Carterphone.

Pelkey: Why did AT&T not push the state of the art? They were the logical ones --

Carr: Well, there's an awful lot of talk about how great Bell Labs is and you almost think it's the nervous system of the whole country, but the fact of the matter is that they may be the epitome of somebody being in a business and not expanding to other areas, not taking the basic technology and doing anything with it. When you look at the patents that were filed 10, 15 years later, very often whenever the question of prior art came up, you would find something buried somewhere in the archives of Bell Labs that appeared to be an interesting phenomena, or some guy worked on, but didn't really reduce it to practice, because he was doing research and went off to other things, and none of that stuff was commercialized. In a way it's a pity, but on the other hand, if it had been, if they had been truly efficient, you might make the case that there wouldn't have been a data com industry, because they could have had the properties that people on Wall Street always thought they had, which was at any moment, if they chose, they would just decimate the land of competition. The fact of the matter is that AT&T was, and probably it today, the easiest target that you could hope for in your wildest dreams. It's pretty sad. But when Carterphone was coming along, for all the reasons that came to be, and if you look at it from the vantage point of Codex, the people that were running Codex on the board said: "There is arriving an opportunity to have real commercial markets."

Pelkey: So you were aware -- were you at Codex at this point?

Carr: No, I was at Computer Control Company, which was in the minicomputer business, which was involved in a fair number of communications related uses of minicomputers. They made concentrators, for example, special program minicomputers, but none at Codex. As time went on, we began to see the possibility of Carterphone being real, and we began to see the possibility of expanding communications applications, as we called them. There's an entirely different vantage point, or viewpoint, from the old line, so called, communicators, as they were called, compared to the computer jocks as they were called. The computer folks saw communications as a necessary evil, or a pain in the ass, or perhaps a way to dream up a new application. Then you move more iron. The communicators thought of computers more from a -- as a bunch of guys that just clobber things together. They're not really scientific or mathematical about it. It happens to be on the end of what they do, but not really interesting, and a great chasm existed between them in the '60s. We, in fact, proposed at Computer Control, which had been a division of Honeywell for three or four years at the time of the Carterphone decision, that Honeywell be very active in communications, and that was shot down. It was just not recognized at that time as an interesting potential market. When I left Computer Control, which I did for a number of reasons, but one of the reasons I went to Codex was because it seemed to me they were poised to have the opportunity in this market that was just opening that very year. I went to Codex in the summer of '68. The board of Codex had decided to take the company into commercial markets, and it began to hire these experts from over the horizon. They hired Story, who was a financial guy, and they hired me because I had marketed in the commercial world, and they had only sold to the military. I had them hire [Rolf] Soderstrom, who came out of Foxboro, who was a manufacturing executive, because at the time, Codex -- and it's been said,

Codex had as much technology in this field as Bell Labs had, but it couldn't make anything. It couldn't count and they couldn't sell anything.

Pelkey: Were they publicly held at that point?

Carr: In 1968, Codex went public in the September or October time frame of '68. I had started here in July. It was a company that was six years old, and doing one to two million dollars, but some years it did two, some years it did one, some years it did 500. In fact, they had acquired Holsinger and his little company prior to my coming there, and the theory that was held in Codex was that by acquiring Holsinger, they got into the modem business, and with Carterphone, they could sell modems. Since this was a technology-driven company, that was the sexiest way to get into the modem business. It would have been nice to say that there was this great written strategy where the concept was that if you had the high end you could easily work toward the low end, rather than from the bottom up. The fact of the matter is the technology intrigued the founders, and it was kind of a credo at Codex that if it wasn't sexy, if it wasn't technically difficult, if you didn't advance the art, you just didn't bother with it. Now, Holsinger, which this was going on, had been funded to create a 9600 bit per second modem for encrypted speech. A couple of problems with that were the going rate of speed in those days was 1800 baud, and it turns out that his concept was workable, but passing encrypted speech, and passing digital data were absolutely two different things, and nobody knew that, or nobody grasped that at the time. Further, Holsinger's design was a breadboard. It wasn't a prototype. It wasn't a beta. It was literally a breadboard, and he had been in the company. He came in in about '67, if my recollection is correct, with his acquisition. The acquisition was plain and simple to enter, to give a basis for entering commercial markets which they anticipated would become available, and they had this great sexy technology that turned everybody on, and they had gone from hundreds of thousands to one or two million on the basis of a single government contract. So the combination of that government contract and the belief that Holsinger would very quickly, late in '68, complete his 9600 and we would have the only one in the whole world, was the basis for going public, and to raise the capital for me to create a marketing department, which was non-existent, and a sales force, which was non- existent, and take over the world.

Pelkey: Do you have a copy of that prospectus?

Carr: I don't think I do. You could inquiry of Goodwin, Proctor and Horn in Boston. They were the attorneys on that. Kuhn, Loeb was the banker, but Kuhn, Loeb has been merged two or three times, and the partner's name there, by the way, that you're wondering about is a fellow named Jerry Katzin, and he lives in La Jolla, CA now. He works for whomever owns Kuhn, Loeb part time.

Jerry may, if he's a pack rat, he may have a copy of some of this stuff. I have later ones somewhere, but I don't believe I have a copy of the '68 prospectus. So here you are in '68, Carterphone dawned --

Pelkey: One question: Some people say that they weren't aware of Carterphone. Carterphone was this little radio thing and they really didn't understand the impact of it. You're implying that the people at Codex really were appreciative of that Carterphone was a significant issue.

Carr: My recollection is that that was a factor that we watched carefully at Honeywell. Jim Cryer, the founding president of Codex, was a fine man, but he was the world's greatest optimist. It's just beyond my ability to describe it to you, but I can give you an example. I started at the end of July at Codex. All of the orders that had ever been received in Codex in its corporate history, which then was about six years, were on three or four typed sheets of paper, because, as I said, they were strictly in the military business, and some years would get an order, and some years you wouldn't. Some years you would get three or four, whatever it was. He had a memorandum waiting for me the day I started that was about four or five pages long that added up to six or seven million dollars of business that was about to close, and the very first thing -- now this is a company that had just done a million dollars, ok, the very first thing I did was take a two week vacation. I said to him: "Christ, if you've got all this business lined up, I was going to go down to the Cape this year. I might as well go," and he said: "Oh, yeah, no problem."

And he believe that this 9600 that Jerry made was only having manufacturing problems, and in fact, they were much more serious than that. So, in effect, when I interviewed with him, I told him at Honeywell, we looked at the high speed segment and we thought it was about a one or two million dollar market that would grow, but that there weren't any applications. He told me that was typical of computer jocks that weren't communicators, that did understand the nature of the business, and it was a $20 million market and promptly convinced me that I was off by a digit, and I joined the company. And it turned out it was maybe a zero million or a $150,000 market, not a $2 million market, because in fact, in 1968, if the machine worked, there was not application that had to, nor could, pass data at 9600 bits per second. In fact, there was no software that could tolerate it. People, for example, when they coded a computer, they would know that a Bell modem running at 1800 or 2000 bits per second, would have to turn around and took a second to do this, so they would take that interval and go off and do all kinds of housecleaning and clearing registers and things like that, and you put a machine in there that quickly equalized and the whole computer went bananas. Nobody knew why for the longest time. So we had this very strange -- we used to say: "We had the medicine that there was no disease for." We ran an ad in 1969, in early '69, announcing this product, and we had 8,000 inquiries, and Cryer said: "You see, I told you." Well, we had 8,000 curiosity seekers and zero buyers. Meanwhile, we were spending money building up this marketing and sales force and everything to go sell this thing into this $20 million market. So Codex really fell on hard times, because in '69 there was no government business to speak of. The slow down had started. The end of the big NASA splurge had come about. We had generated a much larger burn rate, and we weren't finding any customers, and my recollection is that late that year, we decided that our big problem was that there was no disease that we had the medicine for. We also had a machine that didn't work. What we did --

Pelkey: Had you shipped any of them at this point?

Carr: In '68 I think there was maybe two, four, six; something of that sort. We used to joke that we had made something less than 100 AE-96s and shipped several hundred of them, because they kept coming back and going out again and coming back and going out again.

Pelkey: I heard a couple of them you sold many times.

Carr: That's for sure. We created an economic need for 9600 because there was no other need. What we did was we invented a thing called the TMA, which was a synchronous multiplexer, and that quickly became the TM-4. You could either combine eight 1200 bit per second streams, or four 2400 bit per second streams in one stream. So what you did was you went to a prospect and you said: "You've got all these lines running side by side someplace, and if you run from New York to Los Angeles, we can eliminate three of the four leased lines your using," and of course if you were going across the Atlantic where the circuits in those days were 15 or 16,000 a month, eliminating three of them was a major -- you could break even in two or three months, and we were charging $23,000 an end of a modem in those days.

Pelkey: Is that with the threshold decision computer involved?

Carr: No, that was before that came about. So what literally caused Codex to begin to sell in the commercial markets was, as we got the 8096 to the point that it functioned reasonably well, which is a whole story in itself, and we created this TM-4/8, which was this synchronous multiplexer, we went out and we sold economics. As we got into the latter part of 1969, I was beating on the rest of management to develop and introduce a 4800 bit per second modem. The 8096 had a fall back speed of 4800, and at 4800 it worked very well. At 96 it was quite shaky until right near the end. There was great resistance to that, because it wasn't a technical challenge. Milgo was making a 4800 by that time, and therefore why was I beating a drum for this thing. My answer was: "A, it will work. B, I can sell it, and it would be nice if we had some money coming into the place," and that argument -- now Jerry left in the fall of '69 and started Intertel. The reason he left, really, was that he had adopted a posture that this was his invention, it was his great secret, and he wouldn't disclose it to anybody, and the machine was very poorly documented, and when it didn't function, he always said: "Manufacturing was unable to build it or test it correctly," and his group, engineering-wise, was separate from the rest of engineering, so he could

shelter his secret. About August or September or so, Arthur Kohlenberg, one of the founders of the company, had Hodgkin's Disease, and he had been out from the end of '68 through most of the first half of '69 with chemo-therapy, which is devastating. Long about the summer of '68 or the early fall of '68, he went into complete remission, just out of the blue, and so he came back to work. Cryer told him I was beating him up to make this 4800, which he didn't want to do, and this goddamn 96 still wasn't stable, and Jerry was saying that manufacturing people were bad. The manufacturing people were saying the thing just wasn't designed right. I looked at the design and I thought it was terrible, and I was pretty vocal about it, because there were places where he derived timing strictly by stringing a whole bunch of gates together, and in those days you didn't have very much consistency from one batch to the other, things of that sort. It was sort of like a university design, what I would call a "university design." So Cryer asked Kohlenberg, who was a world-class mathematician, to go right into the bowels of the machine and come back and tell him what the hell the problem was. Well, Arthur worked for several days, and I'll never forget as long as I live, we had a conference room that had blackboards on three walls. He started down one wall and went around the corner, and just before he got to the other corner, he threw the chalk on the floor and he called Jerry in. He said: "Jerry, the equalizer in this thing doesn't converge, and it doesn't converge because you never completed the design," and Jerry said: "But Arthur, nobody in the world but you could have ever caught me, and you've caught me."

Pelkey: Did he really?

Carr: Yes. And Arthur said: "What in the world? Why did you stop?" And he said: "I got bored." So the outcome was that Jerry became very upset and Cryer directed Jim Heart, who ran the regular engineering, to get in and make sure this machine was engineered properly, whether Jerry thought it was his great secret or not, and Kohlenberg was the help with the algorithm level work that was necessary to finish the equalizer.

Pelkey: Where was Forney?

Carr: Forney was a kid that read printouts. He was Kohlenberg's protege, and he was doing advance work in forward error correction and satellite coding, and he used to go off somewhere and get all these equations into a computer and sit and stare at the pages. That was my -- I used to say: "Who is the kid?" And they would say: "He's the guy that Kohlenberg brought in." So Jerry up and left at that point, because the first that happened was Kohlenberg and Heart arranged for the equalizer to finally fully equalize, and we used to wonder why these machines would never stay on line. What would happen was, it would equalize, and then they would drift off, because it didn't converge. The fact that the machine equalized still, while it stayed, now, equalized, it wasn't terribly robust in terms of signal-to-noise capability. Jerry had been working at that point on narrowing the filters somewhere, and Heart came in and said he was going in the wrong direction. They had to be expanded and he had to do this, so Heart changed the filtering of the machine. The machine began to get fairly tolerable at that point; then out of the woodwork comes Forney, with his coder that he put in the machine. What it was an add on board. He went through the algorithms with Kohlenberg and they said that occasionally the machine -- it had to get to one of several levels, and it would sometimes be ambivalent about which level it wanted between one or the other, because there just wasn't the sharpness, if I can characterize it in a non-technical way. The machine wasn't robust enough that, if it wanted level II or level III, it absolutely knew the difference. Most of the time it did, but there were some times it would sort of get between the two, and it would pick the wrong one, and that would be an error state. And so Forney came up with what we called the Forney Coder.

Pelkey: When was this?

Carr: This was during '69; my recollection is probably fairly late in the year. I think it was after Jerry left or right around the time he left. He left in September, October, November of '69, something like that. You can probably verify that with him, but I think it was the fall of '69. That made the machine -- the combination of finishing the design, straightening the filtering out, and the Forney Coder, made it adequate at that time to perform this function of combining three circuits and having an error rate of ten to the fifth, ten to the sixth, which was quite acceptable. It was funny, the coder had a little red light on it,

and whenever it was making a decision, or forcing a decision, the light lit, and it sat -- it was on a panel about two inches wide that sat across the top of the machine. When you pulled it out like a drawer, you pulled it out a couple of inches, you could see this panel, and it had a little meter and a couple of switches and this red light. And you'd sit there and watch the red light flash, and you'd know that every time that red light flashed, it was saving the machine.

Pelkey: And you charged for that?

Carr: Well, it worked. In fact, I remember going to Air France in Paris, which was the first trans-Atlantic installation of 9600 bit per second traffic, and watching -- and they used to run with the drawers out all the time because it somehow gave them comfort to see this red light blinking, and I'd stand there watching the red light blinking and I said to myself -- this was a machine that I had now observed a year of them going out and coming back because the equalizer wasn't converging, and they were telling me how happy they were with it and how wonderful it was and how much money it was saving them, and I was standing there, shaking my head and looking at this light blinking on and off, and saying: "I really don't believe I'm here." You talk about pioneering days. It was really pretty bizarre.

Pelkey: You must have felt pretty good at that point, having a product that was somewhat stable in the field now. The customers wanted it.

Carr: We were stable. We could build it. Factory cost was outrageous, and the prices were starting to be forced down.

Pelkey: What were you talking about, $16,900 at that point?

Carr: Yeah, they were in the $16, $16.5K range, something of that sort. It was paradoxical too, because it was being pressed by the lower speeds. You could buy four -- what was happening is that Bell people would go around and say: "Look, if 9600 was possible, AT&T would have done it. We have Bell Labs." Scared the hell out of the customer. Milgo would go out and say: "Don't buy two of these spooky things, buy four 48s," and we were sitting up there selling these 96s with multiplexers and we couldn't charge the premium that we had previously, which was one of the reasons I wanted to be able to open with a 48, and when I had a courageous customer up-sell him and when I didn't, sell him what he was willing to buy. So, in about the early months, February or March of '70, Cryer caved in and said: "Yes, we will commence to do a 4800."

Pelkey: What caused him to cave in?

Carr: Just incessant pressure from me, and the fact that we had had a very bad year in '69. We were losing money, and had a bad negative cash flow. And I said: "Look, one thing about this, whether it's challenging to you or now, Jim, I can sell it. I can collect from people for it without “umpty-ump” months of testing. It makes them feel warm. I can sell them without testing." It was very common, in those days, you had to send people to England and people to New York and run a test for -- we had to run a test for British Airways, BOAC in those days, for months before we got the order. In fact --

Pelkey: And you didn't get paid for that --

Carr: No, that was out of our pocket. In fact, it was funny, because we used to -- when we built a system here in Newton, we'd have a cabinet and we'd hang a sign on it that said this is so- and-so's cabinet. The BOAC people could fly back and forth at no charge, obviously, all the time and they came back and forth and back and forth. We ran test and we'd change the spec and we rewrote the spec and we ran more test. In the meantime, we met up with Air France and, in the course of a month, closed an order with them. So one day the British people came in. They were going to the men's room or something and they said: "What is this 'Air Chance' cabinet?"[1] And I said to them: "While you've been dicking around, we

[1] They used to call Air France 'Air Chance.

concluded with them and they bought it and we're building it," and we got the order very quickly after that, and they insisted we get theirs done first, which we didn't, and so Air France made a big thing. They had a huge press conference in Paris and everything about having the first 9600 across the Atlantic. So then we got into the spring of '70 and Cryer dropped dead playing tennis.

Pelkey: Now, you were in the process of trying to raise money at this point?

Carr: We were short, and so we were about to do a private placement. It was a small one. It was something like a half million dollars, 600,000, something like that. In fact, Jim died on Sunday, April 5, 1970, and he was supposed to go to New York on the 6th to close this private placement, and I remember the dates because I was in Hawaii the previous week --

Pelkey: 18 years ago today.

Carr: My God, that's right. I didn't think of that when I said it, but that's right. Wow.

- Carr then asked me to turn off the recorder -

I came home from Hawaii and there were all kinds of -- the sitter. My wife went with me out there. We went to a military conference. We were trying to sell this concept of combining traffic to the military, which we called channel packing. We had sold a system, in 1969, between Hawaii and the Philippines. The Air Force used it as a test, and they had a communicators conference out there and I went to it, went to the conference as part of this whole thing of trying to sell this concept all over the Pacific. And the circuits there were $18,000 a month in the Atlantic, and $26 or $27 in the Pacific, and the day I got home, the sitter had this string of messages for me. All these people wanted me to call them. They had called that day, and that was the day Jim had died, the day we arrived back from Hawaii. So the next day I was put on the board --

Pelkey: And Arthur had already passed away?

Carr: No, Arthur was out again now. His remission had ended and he was back in chemotherapy again. So the people said: "Well, the private placement is off. With no president, everybody bailed out." Kuhn, Loeb said that they would now have to write a regular investment memorandum, but not to worry, they would raise the money. In those days, when Codex wanted money, Kuhn, Loeb just picked up the phone and called three or four people and that was the end of it. It was no big adventure, but this was in the spring of '70, in the '69 '70 thing. The next month after Jim died, the Penn Central went bankrupt, and the whole spring of '70 was sort of the bottom of that whole thing and it was doomsday everywhere, so Kuhn, Loeb -- a few weeks went by and Kuhn, Loeb sent this book up that had no more correspondence to Codex than if I wrote a book about whales, for Christ's sake. We looked at it and said: "What the hell is this?" And the funny thing was that Jerry was a great -- he's a fine man and a stalwart, but he never really had much of an idea of what the hell business Codex was in. He was on the board from '62 until it was sold to Motorola in '77. So we were in the extremists at this point. They had named Jim Story acting Chief Operating Officer. Since Jim was sort of the marketing guy of the two founders; the third founder had left in a huff when they acquired Holsinger because he didn't agree with that decision back in '67 --

Pelkey: Do you remember his name?

Carr: Joe Van Horn. He just died about a year and a half ago. So I was put on the board because I was the marketing guy. And I found out, much to my surprise, that day, that I was right at the top of the shit list, that I was about to be fired because the view of the board was that I had joined the company and I had pissed all this money away and not brought in any business, which was accurate, although there were, God knows, an awful lot of other flaws in the company, like the product didn't work and we couldn't build it and a few other trivial things like that, but in those recessions, just about every VP of Sales along 128 was being fired anyway, in those days, so I was literally within days of being canned when poor Jim dropped dead. There were lists back at the office of who was going to go and who is going to stay, and

my shop and I was at the head of the "go list" and that sort of thing. So I walked into this board meeting to be elected, but hardly anybody was talking to me. And I'll never forget, Arthur came in that day, because of this tragedy, and the man was -- he was the color of this desk and shaking like a leaf.

He was in terrible shape. He was watching all of this, and after a while -- and he was always known as Arthur and I was always known as Art. That's how we told that. He said: "You know, there's something I don't understand here. Why are you being unpleasant to Art?" And so one of the -- the guy that was called the chairman, a fellow named Tom McGlay who was a legend in his own right, launched into this: "He's pissed away all this money and not sold anything," and Arthur really lit into him, that they didn't know what was going on, that you can't sell something that doesn't work. He told them about the equalizers that didn't converge and the whole nine yards, and when he got all done, probably a three or four minute monologue, he was so exhausted that he had to leave, and he said something like: "You stick with this guy. It's not his problem," and so on, and he left. That was the last time I ever saw him alive, because he died that July. He was never able to come back to work after that meeting.

So anyway, I was on the board. We had this shambles of a --

Pelkey: So they elected you right then and there.

Carr: Well, I had been previously elected. They put me on the board there for window dressing, but it was -- the way the meeting started out was, "we have to have you, but we don't have to like it, and if Jim didn't die, your ass would have been gone," and all of that stuff.

Pelkey: Did they change their attitude about you after the speech?

Carr: They moderated it some. It turned out that Jim Story was a leader of the -- Carter's the guy that's leading the organization. He was the typical black hat CFO and I was, to him, I was a salesman. I had a yellow Jaguar Roadster in those days, and the board guys used to say: "If we get in real trouble, we'll sell Art's car," and that kind of stuff. They were really fun times. So the next thing that happened was, they said: "You're the goddamn salesman, so you write a memorandum, and you go sell some stock," and Fulton Rockwell, who was individual self-designated venture capitalist on the board and investor in the company, he and I were designated by the board to go raise this money. Kuhn, Loeb threw up their hands. They said:

"You can see, we not only don't know anything about the company, we can't raise the money. We just can't make these phone calls anymore and if we got to do it the real way, we don't know how to do that for a company like this," so Fulton and I were designated to go raise some money. I didn't know anything about -- I had taken a course in financial management for non-financial people from the American Management Association in '65 or something like that, but I didn't know anything about raising money, memorandums or any of that stuff, so I sat down and wrote this memorandum. In fact, I kept, I couldn't lay hands on it, it would take me a day or two, but I have kept copies of that memorandum, and the amazing thing about it is every single thing in that memorandum we said we would do we did.

Pelkey: I would love to see that if you don't mind sharing that.

Carr: If I can find that I would do that, because it said we were going to do channel packing, it said we were going to bring out a new generation of modems and it was just sort of amazing. What had happened, to back track a little bit, in early '70, when Jerry left, Cryer got this kid Forney, and he said: "You are going to be, in 60 days, the most knowledgeable modem engineer in the world," and Forney said: "I don't know anything about modems. I'm an information theorist," and Jim said: "Go do what you got to do. I'm telling you, two months from now, you're going to be better than Holsinger ever was." I had pitched that in the 4800 this modem-X was going on. This was a project where they had Bob Gallagher at MIT and Kohlenberg at home a little bit and Jerry working on, and it was intended to create a modem consistent with Codex's theory, something way beyond 9600 bits per second, whatever that was. Nobody knew what it was. Since we now were making a 96 that kind of worked when the red light blinked, we're

now going to take on this new challenge thing. So Forney went off, and I don't know, he did some reading and things of that sort, talked with Arthur and came back and said: "You know, if the question is not going beyond 96, this modem-X is a pretty good way to do a 48, the concepts of modem-X." So (unintelligible) was yelling "Peachy keen, that's what I need," and so on. So he got started thinking about, starting from modem-X, he got started thinking about making another lower speed machine, and right about that time Jim died. We went into the no cash mode, and then Arthur died, and during that whole interval, Rockwell and I had taken this memorandum that I had created. Story became so disgusted with the whole thing he wouldn't participate in the financial part of it, so I made up, with a guy named Sam Germain, the numbers, and it turned out, what was wrong in the memorandum was the numbers were all fouled up, because I didn't know enough about numbers to get them right. Along about the summer, I would say maybe July or so, Jim came in and straightened the numbers out, and we went out and basically got thrown out of every place we went to trying to sell this sick company to get a half million dollars of working capital.

Pelkey: What kind of valuation were you putting on the company?

Carr: There was no concept of valuation. Our concept was to go get $600,000, and when someone told us what they would pay us for that, I mean how many shares we had to give them to get 600,000, that's what we would do. It was in that state. In the meantime, we didn't have any cash, because we needed the cash when Jim was going to close it, so every two weeks, Jerry Katzin and Story and I would go down to the First of Boston, and we would beg for some payroll, and they would tell us that we couldn't have it. "Get some equity," and we'd show them the memorandum. This was a regular ritual. When we were out, how many call we made. "Then sell the company," and we said we would sell the company to anybody that will buy it, "just give us a couple of weeks payroll," and that went on every couple of weeks.

We offered the company to Raytheon. We offered the company to Milgo. We offered the company to Daman, who was in the medical lab, blood analysis business; Christ a rubber company in Muskegon; Andag, that made retreaded tires. Anybody the bank wanted to us to talk to we would.

Pelkey: Was it presented to Bleckner?

Carr: It was presented to the old guy that founded Milgo. I can't think of his name now. Bleckner didn't come with him. He came up with somebody else. Maybe Bleckner did come, I can't remember for sure. We met them in New York, and then they came up and they visited the building in Newton, and I cannot remember this guy's name. Oh, their chief financial guy came with him, and I don't remember his name either, of that era, and their concept was they might acquire us and make us the military division of Milgo, and then whatever his name was, the guy that ran it, thought we were -- in fact, right about that time, Forney had -- it's hard to tell this story without back-tracking, but Forney had gone from modem-X to inventing what is now called QAM. In modem technology of the 8096 time and before, when you looked at an I-pattern, you saw levels of amplitude modulation. There were eight levels for 9600 and four for -- and Forney had this, what we called the Star of David, because his first name was David, but he had these points, and they would rotate, and one of the issues in the patent suits was that the Milgo people stared at that scope or the breadboard of what became the C-Series modem, trying to figure out what the hell his modulation pattern was. But they turned us down anyway, and Raytheon came very close.

Pelkey: Were they aware of the Constellation at that point, of QAM at that point?

Carr: Oh, yeah, we were telling them.

Pelkey: And they still didn't do it? They didn't understand that?

Carr: In fact, Sid Topel, who runs Scientific Atlanta now, was the general manager of Raytheon Data Systems in Norwood, and Spencer was the guy that ran the electronics part of Raytheon in those days, and they looked at it. They looked very hard. They almost went, and it was up to Topel to be the guiding influence. Now, Codex was selling, at that time, for $5 to $7, down from a high of forty-something in the

'68, '69 time frame. Topel offered us a dollar a share. He offered to give us a million dollars at a dollar a share, or buy the whole company at a dollar a share, and we said "no," with great fear that it would get back to the bank that we turned somebody down. That was about August, and by that time we had turned up Becker Technology Fund, which was a guy named Tank Chivoney and Paul Ferry, who is now the chairman of Paradyne, of all things. They were conducting repeated sessions with us, and starting to look like a lead investor. So we turned Topel off and kept begging for two weeks of payroll at a time, started telling the bank about how we had this great thing going with Chivoney, and then, as they started getting hot, Rockwell found an individual in Florida, in Key Biscayne, that was running his mother's money, and he said he would match -- he didn't know anything about the business. He would match whatever Becker put up to be a joint lead, and in the beginning of September, Becker said they would put 300K up if A, I would take over the company; B, I would put some of my money in it, which I didn't have; and C, we got other investors together for a minimum of $600,000, for a total round of 600, which is what Cryer was looking for, and I looked at all these numbers and everything and I said I would take over only if we raised a million or more, so we got into this circle problem. So the guy, a fellow named Higgins that Rockwell turned up, agreed to match Becker, so now we had 600, and then Kuhn, Loeb skinnied around and found enough other people. We actually raise a million 250.

Pelkey: Did you put money up?

Carr: I had Rockwell sign a note for me at the bank and borrowed $25,000 and put my $25,000, which I wish was 50 or 100 but, in any case, I remember saying to my wife, my wife said: "Why are you going to do this thing?" And I said: "If I do it, we've got a shot. If I don't do it, we're all out of work. I've been betting on myself for years, I might as well do this." She said:

"What are the chances?" I said: "This thing looks like a destroyer, but it behaves like a submarine. That's all I can tell you." So, we raised a million 250. Story had to stop down from COO, and he and I worked out an arrangement that the board ok-ad that he was made Exec VP, so it moderated, and he and I had a night meeting the night before we signed the papers for this million-two, and shook hands on the deal where I'd be one and he'd be two and we'd not let each other down, even if this thing went away, and we had been basically enemies up until that time because he was really trying to hang me out to dry, but it was a great exercise in emergency behavior. So we raised the money. I took over.

Pelkey: And you raised it in what month?

Carr: September 26, 1970, and the Codex fiscal year was October 1 to September 30, so I took over at the end of fiscal '70. We bought out this -- we got together. What we did is I cut the place back. We had, I don't know, probably 135 or 145 people. We cut it down to about 90. We concluded that all of us -- what we did was, we kept the higher priced people, took as many people out as we had to get the burn rate right, and said . . .

Tape Side Ends

Carr: . . . to replace the 8096 by the fall of '70, and we introduced a line of multiplexers, called the 800 family, which incorporated this TM-4 concept, but also took a lot of lower speed lines.

Pelkey: So the 4800 is introduced before the financing closed?

Carr: No, the 4800 was introduced, I'm sorry, let me think a minute. I think the 4800 was introduced the month, maybe October of '70, and then it was the following spring or summer or fall that we brought out the 96. I can't -- if you get some time with Forney, he can almost certainly give you these dates more accurately.

Pelkey: Did you introduced the 4800 at a trade show?

Carr: Yes. I think we introduced it at what was then the Fall Joint, which would have been late September or October of that year.

Pelkey: Was it a hit?

Carr: Yes, it was a big hit, and it was a hell of a product.

Pelkey: Where did you price that relative to Racal? Because Racal, I mean Milgo at that point in time?

Carr: We priced that, as I remember, slightly above Milgo. There was an interesting phenomenon that was going on in those days, and I think we all -- we never got into a hotel room and fixed prices, but the people that ran Milgo and the people that ran Codex and later Rixon realized that AT&T didn't have any offering, and the ones they did, that they tried to substitute, were rentals. They weren't outright purchase anyway, so there was sort of an infinite umbrella. When you looked at the savings that they user could come up with, they were enormous, from a breakeven point of view. When you looked at the total buy, somebody leased a bunch of lines and they put up a Star computer network, when they got done buying the data com gear, it was probably two or three percent of the bill. So we all got in the mode that there was not point in carving the hell out of prices, and by nobody being excessively aggressive, we all had nice margins, and we all enjoyed those margins to plow back into the business. And the next thing that happened was that AT&T started announcing these -- well, they announced DDS and they announced two or three different all-encompassing take over the world digital services. So the Wall Street people got the idea that any minute, the modem business would end and the world was going all digital. So they wouldn't give a dime in venture capital funding to anybody else --

Pelkey: To start up.

Carr: And so the beauty of it was that we had, in effect, kind of an oligopoly of people who were being careful not to pee in the soup, if you will, and there were no wackos that didn't understand the problem being funded, so we had this hothouse of - - I mean, Codex made 36% pre-tax profit in 1973, four and five, 36% pre-tax.

Pelkey: You must have had 65% plus gross margins.

Carr: We had 80% gross margins, and we were funding very rapid growth, big government contracts, heavy R&D. We were probably spending 15 or 16% on R&D and we were still doing 30 some percent. We used to say: "We don't want to do this, but we couldn't sensible find places to spend the margin." It was just -- probably never in my business career will I have an environment like that again, but nobody screwed things up.

Pelkey: And you sold you're product, you didn't lease it?

Carr: Well, we -- that's another story that was triggered by the channel packing thing. Let me come back to that, but that whole environment was a limited number of competitors. The dominant monopoly not being competitive and not selling outright, and sensible judgment, if you want to call it that, unrehearsed on the part of the participants, that there was not a lot -- there was not, literally no elasticity in the business, and it was such a small part of the procurement, there was nothing to be gained by cutting prices in half. So we all had a lot of margins and then suddenly from, probably from '72 through the rest of the '70s, even as prices came down, it was a terrific cash cow, profit cow kind of business that you could fund other businesses with. It was literally self-financing. Codex went back to the public market in '72, but only because we won a channel packing job, which was a multiple of our annual revenues.

Pelkey: Was it a $10 million job?

Carr: Well, the job was -- the winning bid was 7.4 million, and as soon as the bid was awarded, it was taken up to about 10. Codex, in '87, probably around November, signed a renewal of that contract for

$26 million, ok? You talk about a good deal! We won that by less than 1% out of seven and a half million dollars.

Pelkey: And you had to go back to the well on that one?

Carr: Every --

Pelkey: IBM wanted that or AT&T wanted that?

Carr: No, Harris bid it. That was one of the things that almost took the company under. We had put this demonstration system in from the Philippines to Hawaii. They bought a second one from Hawaii to Japan. We convinced DCA, the Defense Communications Agency, to take over a military-wide thing, and it was --

Pelkey: You had originally put it in for the Air Force, and then the DCA said: "Wait a minute, this is our domain."

Carr: Right, and we played the game, because they had the clout to do the whole Pacific. They had the traffic. They had weather traffic, they had secure traffic, they had all kinds of things.

Pelkey: So you saw a bigger client?

Carr: Yes. We had invented -- this fellow Heart had invented this encrypted multiplexer. It was called a TM-15, which is still in use as we speak, installed in 1973 or '74, that could take any then-known crypto device that the government had and multiplex it up to 1200 synchronous, which then went into this TM-8 level multiplexer, which then went into the AE-96 --

Pelkey: (unintelligible) problem of the crypto machines was a real - -

Carr: We solved the problem, and in fact, it not only automatically recognized which crypto was coming at it, but it would bridge a crypto out for 24 hours without losing synchronization. That was right around the time of the Pueblo crisis when they couldn't re-synch, and in fact, if they had been transmitting over one of our systems, they never would have lost synch, and this mux went for zillions. I can't remember the number, but it was close to $100,000 a pop, 15 channels, but it was “an as is” a spectacular piece of engineering. Harris had absolutely nothing. They didn't make modems, they didn't make muxes, but they bid the job anyway. I think they probably figured they would go out and buy the parts or buy a company or whatever and, as a lot of these government things went, we invented the concept, DCA chickened out and decided they had to run a competitive procurement. We worked four years on that, from '68 to '72, before it came out as an IFP, and it came out as a competitive procurement, not a -- and there were 44 companies solicited to bid it, and only two bid it, Harris and Codex. They qualified us both technically, even though Harris had never made any of the component parts of the system, and so it came down to a price, and we won by $73 or $74,000 out of $7.5 million. Story had made this algorithm about this long, where if you change the overhead rate it went (trill) and gave you a new price, and the accuracy was probably $300,000 and change, and we won by $74,000.

It was just raw, unmitigated luck.

Pelkey: So you won that in '73?

Carr: '72 or '73. It might have been '73. No, it had to be '72 because we went public. We did a public offering immediately behind it. We raised $2.5 million because we literally didn't have the capital to start building the systems. We were, that year, doing $4 million in revenues and we got a $10 million order.

Pelkey: And what month did you do that public offering?

Carr: I don't remember.

Pelkey: Do you know where I might get a set of financials on Codex during those years?

Carr: I have a collection, I think, of some old annual reports from those years. If I get my hands on them, I can probably run you some copies of them. What happened, channel packing was a three year lease with resident maintenance, and the sum of those numbers added up to this 9.8 or $10 million, and we were coming off a $4 million year. Government procurement, in those days, you got a multi-year lease, but the government could get out any year the Congress didn't vote the money, so we went back to the accountants and said: "We really were accounting for our leases as sales, like everybody else did.

Pelkey: So you were leasing the modems on the commercial side, but accounting for them as sales.

Carr: We were accounting for them like a discounted sale. The rules in those days were you could count the sum of the committed payments' present value as, and take that much proportional cost, and we were accounting for our commercial modem and mux sales that way. Then along came channel packing and we sat down and said: "This is a great opportunity, because we can't count this as a sale. If we could, we wouldn't want to," because we'd have a $10 million “God damned” blip, so we went back to Arthur Andersen, and they said: "Yes, that's right. If they got out, you got to take it on the operating method." So we then rewrote our commercial modem lease to say that: "You have 30 days to reject the product, even though you committed to a two or three year lease," and then we went back to Andersen and said:

"Since it's now indefinite, we have to count these on the operating method," and they said: "That's right." So we went, from '72 to '73, we went from the financing to the operating method.

Pelkey: So your revenues dropped dramatically.

Carr: Well they didn't because we started getting the channel packing thing out, so we were able to have a smooth growth, but we also --

Pelkey: It was great for you taxes?

Carr: Not only that, we also had an instant lease base, a $10 million lease base, for future fly-wheel, and that lease base got to the point where last I saw it it was about four or $4.5 million a year, year in and year out. The other thing I did was I said I had no idea whether they had ever -- it's kind of a funny story but, when they bought channel packing, there was a plan to put a whole satellite network up for the armed forces. So the channel packing program was called the Interim Channel Packing Program. We have a guy, a guy named Marvin Frank that still works for Codex to this day, that said he made a whole career out of selling interim programs to the military, because a permanent one never got done, so that interim program, that started being installed in '73, is still in, and as I said, they just upgraded it for $26 million, and for the first time, they're taking the C-Series modems out and going up to L-Series, to the newest product line. Those products are still running from those days. Well, because we had this instant lease base, we generated this “fly-wheel” that, over the years, Codex -- I can't tell you what the number is. I would suspect something on the order of $100 million or so, they know where it's coming from when they open the doors on January 1, because the lease base will go up that much. And channel packing is $6 million a month, or whatever it is, still at zero cost.

Pelkey: Going back, for a second, to this decision on the 4800, was there a big meeting at some point in time in which the idea of using the modem-X technology and coming out with the 4800, it was decided that that was going to happen and it was a big decision?

Carr: The way it was done is that Cryer used to talk to one of us at a time, and I pushed him and pushed him until the point was he was ready to surrender and have a 4800, and then he went off and he told Forney, because Jerry was gone by then. He told Forney to go off and -- one of the schemes was to just

run the 8096 at half-speed, but the thing cost more than people were selling 4800's for at that point, and Forney came back with Gallagher and said:

"We'll use modem-X as the basis."

Pelkey: So there wasn't -- John Pugh's recollection was that there was a specific meeting in which David didn't feel he had enough confidence in running 9600 on his QAM, but he did on the 4800, and there was a meeting in which it was said: "Ok, let's go the 4800 using this," knowing that, hopefully, you could upgrade that technology to come out with a 9600, and there was a decision at that point in time in a big meeting in which the 4800 decision was made to use this modem-X technology. That's different than your recollection.

Carr: Yeah, but it's not far apart, because as I said earlier, they came back and said: "Since we don't have to make a real high speed machine with this, this would be a good platform for the 4800."

Pelkey: So that could have happened without you having been there, and you just got the results.

Carr: No, I didn't mean I wasn't in that meeting. What I had intended to say when I made that statement earlier was that modem-X was going nowhere, because it was conceived of a greater than 9600, but Dave came back and said: "If I only got to do a 48 with this, this is the ideal platform," and it was subsequent to that decision, in my recollection, that he came up with his QAM concept, and modified modem-X into QAM, which also then provided the basis for making a 96. We did have a big meeting on 96 first or second, and by that time, Jim was dead, if I'm not mistaken, and the conclusion, and that was sort of a consensus, that we had the AE-96 which was working, and I was still coming out of the pew that I needed a 48, so we went 48 first, 96 second, and that's how we did that. As a matter of fact, I don't know if John told you, but at a later meeting, my recollection is between the 48 and the 96 announcements, I asked him to produce a forecast for how many 96s we could sell, and his forecast was 380 some for the life of the machine, and we all sat around my conference table and howled laughing. We thought, and I'll never forget it, I can see it like it was yesterday --

Pelkey: He recollects 465.

Carr: I remember 386, but it doesn't matter because the salient points were, at that point, we had sold and made stay 70 some AE 96s, so he was talking something like four times what we had done, and we thought it was so God damned hilarious. We could believe that kind of a number for 48s, and story ridiculed the hell out of him, and it's a legend around Codex about this meeting, where we all laughed at John, and I remember we had a ceremony in the factory. I'm trying to think when that was. It was before I turned Codex over to Story, so it was probably around '80, but we had shipped our 50,000th 9600, and I told everybody the story of how John had forecast these 300 or 400, whatever, and we laughed at him for being a God damned crazy optimist. That was really something. We sat around my table and, it was funny, everybody was broken up.

Pelkey: That must have been after Cryer's death that that happened.

Carr: Yeah, because I remember, for some reason, leading that meeting. So what happened was, when we raised the money, we said we had this new modem line that was going to expand our ability because we had 48 as well as 96. It was also going to yield, later, the world's greatest 96. We had, in parallel, a 900 low speed multiplexer program, the 6ED-800 family. In fact, we broke John off as a separate product line to develop that, to lead that development. He led engineering and everything, John Pugh. We took him out of marketing and he ran that. These were all going to be great. We had started to get some airline -- international airline business. We were going to expand that and also get that packing kind of business domestically, and then last but not least, we were going to get channel packing, which was going to be a two or $4 million job, and we were going to live happily ever after. Those are the thing that memorandum said that I said the miracle was that we did all of those things. We got together, and we said: "We just got to make this happen before the money runs out," and we got everything but channel

packing pretty well launched, and then we went out and raised another 500K in '71, I think it was, 520, 550, something like that. That was another interesting side-light, because we raised that money and later did channel packing, and later won channel packing, and so now we were into '72, and there's some SEC rule that you can't do a private placement in anticipation of a public offering. Kuhn, Loeb tooled up the red herring and everything, we got all geared up to do a public offering, and we got called and said: "You can't, because you've done this private placement in anticipation," and everybody went: "Whoa! We've got this $10 million job," and SEC turned it over to NASDAQ, because we were over the counter, and NASDAQ has some kind of what I would call an appeal board, and Tommy Underberg was the chairman of the appeal board. So Story and I and somebody else, Forney I guess it was, went to New York, and we had to testify before this appeal board as to why we should be allowed to do this public offering, and they asked me to start, and I told them the whole story about the history of channel packing, and the test systems, and it went to sole-source to competitive, etc. and we won it. And I said: "Basically, all BS aside, we have to do this public offering to finance that contract. There is no conceivable way on God's earth that we could have know we were going to be given this award, therefore we couldn't have know we were going to do a public offering when we did the private placement," and Tommy said: "No point listening to anybody else. We've got enough, you guys leave," and they came out ten minutes later and said: "You're right, go ahead and do it," and we went public. Boy, I'll tell you, we were that close again. Literally, there was no way we could have possibly known we were ever going to do a public offering again, let alone within 12 months.

Pelkey: And that was when?

Carr: '72. Probably the spring, but I just don't remember. Again, I'm sure Goodwin, Proctor: a fellow there named Paul Rugo.

He was counsel for the company for a lot of years and was on the board for the last five or six years before Codex was bought by Motorola. From that point on, I think we went into the black the tail end of -- I took over late '70, mid or tail end of '72 we got it back into the black, and Codex has not had an unprofitable month since '72, to this day.

Pelkey: Three or four things that I think happened at around the same time. The acquisition of ESE Canada --

Carr: No, that was quite a bit later.

Pelkey: Oh, it was later? Vandermay, IDCMA and Rockwell.

Carr: Well, Vandermay and Rockwell were unrelated. Let's take -- Rockwell's a longer story that is, in fact, key to correcting Matt's recollection. About the time of channel packing, roughly, we concluded -- we were in the mode internally of --

Pelkey: What time frame is this?

Carr: '72-ish. We were in the mode of being concerned about the future duration of the modem business ourselves. In fact, what triggered that was another that happened in that public offering.

It was when Kuhn, Loeb started it's due diligence, there was a thing, I don't know if it's still around, but AD Little had it, a thing called Service to Management, technical articles, and some guy wrote an article that said there wouldn't be any modem business in 1975. This is in 1972. By that time it would be extinguished by all these digital services, so Kuhn, Loeb pulled the breaks and said: "We can't go forward," and I had to write a term paper on why the modem business wouldn't go away. They read the term paper and they said: "Ok, that sounds logical," so we did the public offering, but that got us thinking inside.

Pelkey: At that point in time, every time you wanted to raise money, you must have been worried about what would happen before the money came through.

Carr: You know, it's funny: I used to have, happily it hasn't bothered me in a while, but I used to have a lot of lower back trouble, and muscle spasms, and nobody could ever find any disc problems or anything like that until we got going with Rockwell, but anyway, the conclusion finally was that when I got tense, I would get muscle spasms. So Story always used to kid me that whenever we were going to need money, he could tell because my back went. ADS, which was --

Pelkey: American Data Systems?

Carr: Right around '71 or '72 they went belly up, and Bill Norred was out farming their technology for Bank of America, or something, and in the process of talking to him, we found out that they were working with Rockwell on designing chips with Rockwell to make a modem. So I sent Story and Forney out to meet Bill and to sort of root through all of the things that they had, as far as technical assets, and to find out what this Rockwell things was all about. And the conclusion of that was, we decided there was nothing they had that we wanted to buy, but that we really ought to go talk to Rockwell. So a few months later, we made an appointment and Story, Forney and I went out to see Rockwell. There had been some preliminary conversations, and we found out that what their real interest was, they were seeing an opportunity to get into the facsimile business in Japan in a big way, and in order to be competitive, what they wanted was a 9600 modem, because they could get a three minute fax transmission, and they would OEM to all the big Japanese people.

Pelkey: Do you remember whom you talked to at Rockwell?

Carr: Sam -- God, there were so many over the years. Story would remember his name; I know he would. Probably Forney would too. So the three of us went out there. It was another one of the stories that came down over the years as a great story. Jim and Dave and I had breakfast. We stayed in a Disneyland hotel, and David had found out that this Sam guy wouldn't want to do business unless there is at least 5,000 units that we would commit to. Now here, again, this is maybe a year and a half after we all fell on the floor when John predicted 400 or whatever the number was, so we sat at breakfast, and I decided that, if he wanted to hear 5,000, the only way to deal with that was to commit to 10,000, and we would commit to it on a take or pay basis, because we were worried about the modem business. Milgo was by that time getting going in 9600. Paradyne I think was started up, or just about started up at that time.

Pelkey: Milgo was copying the AE-96 at the time, RTL technology.

Carr: They weren't into QAM, but they were producing a product, and we were in the mode of, which I believe in to this moment, that you just run scared all the time, and if nobody catches you, that's a pleasant surprise, but you just never let up. There was a lot going on in those days about the world going from MSI to VLSI and rumors that Milgo would have a VLSI modem, which was going to be devastating to the C-Series business, which was really flying, so we concluded we had to get -- we were in a death race with Milgo for a VLSI modem. So I said: "Look, if we go in and we tell this guy that we'll commit to 10,000 and he's buys the deal, we'll get started. If we don't make 10,000, we'll worry about it, but if we tell him we're going to commit to 500 or something, he's going to throw us out and we have zero hope, zero connection of getting," so everybody agreed.

Pelkey: Story must have loved this plot.

Carr: Well, he bought it, absolutely. So the conclusion was, he had all three us would swear on a stack of bibles that we had done a big study, and 10,000 is fine. Well he had enough, we found out much later, he had enough interest from the fax anyway, but he didn't have any modem technology. He was a foundry and we were a systems house. So we went in and we had the meeting and we committed to 10,000 modems, and he took it with a pretty straight face, and I gave it to him with a straight face, and we

cut a deal. The deal was, and Story made a number of trips after that. It was a very hard deal to consummate. There are anti- trust problems, because we were agreeing not to do any OEM business, to only sell to end-users that bought and leased and used it themselves. They, in turn, had to find a way not to compete with us, or sell the technology to Milgo. We had lawyers, and there was a guy at Goodwin, Proctor that had just gotten our of Justice, and we used him for big bucks to get the words written just right. Finally got the thing done probably around '73 or something like that. That yielded a modem that was later known as the L-Series, which was about the size of a shoebox, which came out a full year, year and a half before Milgo had anything.

Pelkey: When did you introduce the L-Series?

Carr: I want to say '75. And we heard, later, from people that worked at Milgo, that the day we introduced it, they had a 12 or 13 hour meeting, and concluded that we had put them out of business, it was such a major shock to them. It was an enormous advance in the art. It was an enormous cost -- it was probably the biggest single thing Codex ever did, and the L-Series built the whole Mansfield campus. That whole product line, and the things that were derived from it, was not replaced until the 2600 family, which came along in '82 or somewhere out there.

Pelkey: Before you introduced it, did you think that much was going to happen from it?

Carr: We thought it was going to be an absolute winner, but we expected that we were in a death race with Milgo. In fact, we went to the show that we introduced it at sure that we would see there's, and we were going: "Whew, at least we're going to be in the same show," and they were --

Pelkey: And what show was that?

Carr: That was, by then, again it was probably an Interface, but I don't remember. John might remember. But the point was, they not only didn't have anything, but they didn't have anything for over a year after that, and we just -- I mean, it just wiped them out.

Pelkey: And that was a 48, 72 and 96?

Carr: Yes. In fact, the difference between the 48 and 96 was A wire, and we charged twice the price of the 48. It was a great business. I never will ever be in a business like that again, I don't think. So, we clearly were in the run away mode at that point. The problem we had was we introduced, it was '75 -- in the fall of '75, which was during the '74 '75 downturn, and we weren't in product. We had made some, but we weren't really in production, and all the C-Series business dried up, because everybody wanted the L's, so we had, in the fourth quarter of '75, a really -- that's the closest Codex came to losing money again from the time we turned it around in '72. It was a very hard lesson. Then we came out of it in '76, but we did like $25 million in '75 and 26 or 27 in '76, where we were going one, two, four, eight, 17, 25, that kind of thing. And it was that transition, plus that recession, that was really a tough interval, but we had introduced it because we had this mind set that Milgo was going to be there, and it wasn't that we were so dumb that we didn't have a risk about not being up to speed, but we just didn't think we dared wait. Then we found out, much to our chagrin, we were a year early.

Pelkey: Did you change the pricing of the L-Series versus the prior product?

Carr: We priced the L-Series at a premium initially over the C, because it was smaller, more compact, used no power, was VLSI. It was a great sex machine. I'll never forget, we introduced it in Europe and our distributors in Europe used to drive me up a wall, because if Milgo would do some small thing like put an indicator on each mux channel, they would tell us that without that, we were no longer the technological leader and this and that. So we introduced this thing in a hotel, and we had all the distributors in the room, and I arranged two of these L-Series on a table with a tablecloth over them, and they all there was a new modem coming, but they didn't know anything. We had really kept it tight to our vest, and they were all looking at the shape of this, and when I pulled the cloth off and they saw there

were two in there, it just absolutely blew their minds. Absolutely blew their minds. And I said to them, I'll never forget, I can almost give you a direct quote, I said: "If you fuckers tell me one more time that I'm not the technology leader after today, I'm going to fire you. I don't ever want to hear that again." Well, coincident at that time, the 6800 had come along. In fact, I think we were the sixth or eighth customer at Motorola for the 6800, and going way back to the Computer Control days, when we were programming minicomputers to be concentrators, we used to say: "If there was a way to make a machine that was locked up and had no function other than to be a concentrator, we could do it for a lot less money and that would be wonderful, and blah, blah, blah," but we could never find a way that had any different factory cost, because we always started with this inherent structure. Vandermay had done some work that Forney was aware of in multiple -- multi-processors, using microcomputers.

Pelkey: What year was this?

Carr: '73 also. And so Pugh and I, going back to the C3 days, were pushing this concept of a statistical multiplexer, because we said: "Gee, now that you've got these micros, maybe this dream we had back in the '60s is now do-able." Then we found out that Vandermay --. The 6800 was not powerful enough, but Vandermay had one of the earliest concepts of multi-processors on a bus, so Forney and I went out to see him, and the two of us worked him and worked him and talked him into joining Codex. We set him up in an organization to create what became the world's first statistical mux.

Pelkey: When did he join Codex?

Carr: '73 is my recollection, maybe '74. I think it was late in '73.

Pelkey: Was he originally going to try to do a front end-processor?

Carr: That was his -- that's what he wanted to do, and what we told him was to reverse the order, and if he did the statistical mux that we wanted, when he got done with that, then we would do the front-end processor, and that made a lot of sense, because we would have a network with the statmuxes in it, and whatever protocols and everything were developed in connection would that, would be common to our front end. Com-10 was really going great in front-ends in those days, and we would take them on, but we would have this broad offering. Jim brought a bunch of his grad students in, who were all smart as hell but none of them knew diddly-squat about designing a commercial product.

Pelkey: Did you pay him money to join, or did you give him stock and salary and a job?

Carr: The latter. He had a little company like most of these professors do, a two or three million company. He was trying in the worst way to get him to acquire his company, and I wouldn't play, a la the Holsinger days. We had a standing rule at Codex: We would do a lot more to get some person than we would ever do to get a company, because you had all the baggage that went with it.

Pelkey: Now, when Jim came aboard -- the 6800 came out and then he wanted to change the micro-processor -- it took a while before the statmux got out, right?

Carr: No, he didn't change the processor. It came out with the 6800, but it came out in two to three times the time that he thought it was going to take. In fact, we had to hire consultants to do things like get the noise out of the machine and stuff that a workman-like engineer knew how to do, but Jim and his team, they would do micro-code and software and multi- computer architectures on a bus and all of this stuff that was bizarre from the point of view -- remember, this is a collection of communicators again, and I was beating the drum because the modem business was going to fade away and die. We've got to be other places, and it's too long that we don't have enough software jocks around here, so Vandermay and his team were seen not only as the creation of a new product line that could build up and offset any decline in the modem business, but it was to bring us close into stored program devices, and it was a disaster for a couple of years. It was really painful. Everybody tried like hell, but Jim and his people didn't know, really, how to make a product and release it to manufacturing, and the organization -- and I think this is to some

extent at the root of what you're talking about in your book -- the organization, the informal organization, resisted mightily this new kind of disease. "How the hell is THAT ever going to make the money the modem makes?" Well, the answer was: it never would. That kind of gravy train came along once in a lifetime, but it was a necessary strategy. There was a lot of intellectual sign-up to the strategy, but there was not informal acceptance. Further, it was a computer jock thing, not a communicator thing. We hired a guy and sent him to Belgium. We had set up a subsidiary in Belgium in '73 to run our subs in Europe, and about six or eight months later, because this thing was supposed to be on such and such a schedule, we hired a guy who was quite a good computer jock to put in Belgium to start creating all the support needed for this program device. He left in a year, because the program got delayed for a year, and there wasn't anything that he knew about modems, and therefore hardly anybody would have anything to do with him. He was an odd-ball. He was an island, in Belgium, and he got miserable and he left, and he was literally rejected like a germ by anti-bodies, which was tragic. We went through a struggle. I think it was probably late '76 that we really got that product on the street, and in fact, I hired a consultant, a guy by the name of Lowell Bensky, who was an engineering manager at Computer Control when I worked there and did consulting work, and Bensky -- and we had another consultant before that that did nothing but go around and redo grounds and voltage distributions and things to get the noise out of the machine -- and Bensky came in and did an overall evaluation for me, and he got -- he came in and his final report was, take another year before you introduce this thing. I told him while he sat there: "It's going next month," and he looked at me and he said: "You are either incredibly ignorant or you have the biggest balls I have ever encountered." And I said: "The fact of the matter is – " We were on it like two years at that point, or two and a half years, and I said: "If we go, we will have to make this thing work." Codex was, properly, quite renown for really not letting the customer down, and I drilled this and drilled this incessantly, and I said: "If we can work at a lab pace, it'll be another year, or maybe longer. Does it work? You tell me, yay or nay, does it work?" "Yeah, it works, but it doesn't have this and that and this part of it is shaky," and I said: "Then we go, and we will night and day in some customer facility, if that's what it takes, we'll take it the rest of the way." And that's what we did. And the’re still selling the 6000 series, later derivatives of it. We introduced two models at the time.

Pelkey: The 6030?

Carr: And 40.

Pelkey: Now, you weren't the first with statmux out, were you?

Carr: No, we were. DCA wasn't -- either wasn't in existence then -- I don't think they were even formed then.

Pelkey: What I've heard is that your sales force was a bit resistant to selling the statmux for a while.

Carr: That's considerably understated.

Pelkey: And you had to take some small measures to get --

Carr: We changed two out of three regional managers that one-year, small measures like that. It was interesting, some years later, Infotron, which was in the mux business, went into the modem business probably '79 or '80, and their VP called John Pugh up and said: "Maybe you can tell me something. You've got these mixed product lines. Can you tell me how to get mux salesmen to sell modems?" And John just lost it, because we had been at the end of three years trying to get modem salesmen to sell -- we couldn't get modem salesmen to sell the 800 and 900, which was a straight TDM. The problem was, that we had anyway, again it was this cultural thing about it “ain't” a modem and those are computer things, and secondly, the very pragmatic thing, is that they could sell modems like falling off a log, and they --

Pelkey: This other thing required effort.

Carr: Yeah, the STDM needed support help and you had to work with the customer and you had to configure systems and you had to bid it and the whole nine yards, and it was just too damned hard. We tried contest incentives and I got to what I called the disincentive mode. They wanted to know what that was, and I told them that for everything below quota they were on the STDM, they lost commission on the modems. And I said: "Anybody don't want to do that," and these guys said: "Me," and "Me," and I said: "Goodbye, and goodbye." We had quite a year then, a big, big field turn over year. That was '77, I think, getting that going.

Then over time, they started getting used to the idea that when they were up head to head, as the modem business got competitive -- by that time the Wiggins team had come in at Paradyne and they had resuscitated the organization and got quite aggressive, both in product and pricing and things of that sort, and our guys found out that when they offered the whole enchilada they got sales, when they went head to head on just modems, sometimes they didn't, and it began to go, but it was -- it's a multi-year transition process.

Pelkey: Going to back to one other event that I'm aware of is IDCMA.

Carr: That was about '70, '71, I think that started.

Pelkey: And there was some trade show in which --

Carr: Yeah, it was a trade show in Atlanta, and -- not Bleckner, Matt Kinney I think it was, wanted a meeting of the various suppliers --

Pelkey: And this was on the heels of a tariff increase on the DAA? Or was it the dataphone service being announced that was seen as threatening to the group?

Carr: It was something in the modem area. I don't think Digital Data Service was (unintelligible)

Pelkey: Someone said it was an increase in price on the DAA.

Carr: Well, there was the -- I believe it was the requirement for the DAA itself. You see, the interesting things was, Codex didn't do any business in the dial world at that --

Pelkey: Yes, they were going to require DAAs on leased line modems.

Carr: It was requiring a DAA, which had been in the dial world, and they were proposing it as a requirement in leased lines as well, and we had -- also, the issue was that Bell wouldn't require a DAA, but we would. So you'd not only have to buy our modem, but buy the device as well. That was a crushing problem down in the . . .

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Carr: Joe Looney, he was running Paradyne at the time. Anyway, it was a thing around the DAA, and they had a worse problem, because when you sell modems for hundreds of dollars, and you add a hundred dollar DAA, it was a big deal. We were still selling 96s at that point for $13,000 or something. But they had the meeting anyway, and we concluded that we should form this group to have some kind of a voice in dealing with AT&T.

Pelkey: Do you remember who was at that meeting?

Carr: I was there. Bleckner was there, Matt Kinney was there, Looney, Chuck Johnson, I think that was about it.

Pelkey: And you met in some hotel room?

Carr: We met in some hotel room and we had -- I think we had some lawyer there, but I don't think it was the law firm that we finally wound up using. Somebody --

Pelkey: Who kind of headed it up?

Carr: We agreed not to have a -- pretty early we agreed we ought to start doing one of these, and we wanted to go off and find some law firm, and we found Wilkes, Cragin & Barker, and they kind of advised us, as I remember, or we talked around whether to have and executive director or a president or something of that sort, and we decided to run the thing from the board, and leave that position open.

Pelkey: And who was on the board?

Carr: I was on the board, Bleckner, Joe Looney and Chuck Johnson.

Pelkey: That group, IDCMA, was very important, as seen by the FCC.

Carr: Absolutely. For fairly little money -- we probably had budgets in those days that ran $200,000 or $300,000, and we used to always be concerned about how small our membership was. We had A members, which were the four companies that were on the board, and then B members. We set up a budget that the A member contribution was the total budget, and the B members' was whatever we got, and we mainly were interested in the Bs just to have a lot of names when we had to produce a list. In fact, my kid brother-in-law worked for Illinois Bell at the time, and one of the cases later in the '70s, maybe '76 or somewhere out there, we discovered some stuff of AT&T and we found this enemies list, and I was on the enemies list. I used to kid my kid brother-in-law that if he ever crossed me, I'd write an anonymous letter to Illinois Bell and tell them he was married into --

Pelkey: I interviewed Mike Slomin, the attorney at the FCC.

Carr: Oh, yeah. I had a guy named Farrel Peltz that worked for Codex, that we made --

Pelkey: Like Tom Thompson?

Carr: Tom Thompson's counterpart, only he was early into the company. He was a higher-level guy, and he did all out CCITT stuff with Forney. They did that hand in glove and he did all the IDCMA stuff, and he testified God knows how many times at the FCC. I testified before both the House and Senate on the Bell break-up and that kind of stuff. You can almost right a whole other book about all of that.

Pelkey: If you have any papers or speeches from any of that, that would be helpful. That was an important event, obviously, in terms of setting the stage for the industry.

Carr: I don't have any of those records anymore. There's a fellow named Bob Stearns at Codex. I don't know if you talked to Bob, but he went to many an IDCMA for me after Farrel -- Farrel had lung cancer, and when Farrel went on permanent disability, Bob really picked up most of that stuff. Farrel lives down in Florida now, but that was an organization that was very important in my judgment, and very effective. It did a lot, not only advancing the interests of the independent community, and permitting the independent community to flourish, and I think it did a lot of good things for the customer. There were tariff proposals that were absolute catch-22s and blind boxes and things of that sort that we very effectively fought.

Pelkey: How often did the directors meet?

Carr: We, for a while, we used to meet monthly.

Pelkey: Who was on the B list?

Carr: We had Vadic and UDS and, oh God, it's been so long, I can't remember all the names. Everybody was in -- Infotron. I don't think DCA was on the list. When Wiggins took over from Looney, he withdrew Paradyne from the A list. That was a -- Wiggins and I never really got along after that. He just came to a meeting one day and said he was pulling out and pulling his money out, and we asked why, and he said: "There isn't a single thing that you won't do without me that you'll do with me, and I'm going to take a free ride." So he was not popular with the rest of the guys. Then later when Botwinick took over Timeplex, they moved out of the B list to the A list, and he went on the board, but by the time that happened, I had been promoted up into Motorola and I wasn't directly involved anymore.

Pelkey: Were there any meetings of events of those days of the IDCMA that come to mind, either humorous or important or critical?

Carr: Oh, I think there's a whole series of meetings having to do with DDS, Digital Data Service, that were absolutely vital, and I think, and I think the whole effort around the Bell bills that were before Congress were enormously vital. They were in the '76 to '79 time frame. Both of those were major big dollar efforts. We put up money that we didn't plan to, and we mainly made that work by staffing everything with people from the companies. The other key thing that I think was important in the IDCMA is that we adopted, early on, an agreement that even if one or two companies' vested interest wasn't involved, if it was an issue within the four corners of the policies we were trying to deal with, we would all support it. We wouldn't have fragmented things where somebody would say: "Hey, I don't want any of my input going to that problem, because I'm not in that business."

Pelkey: What do you mean by the four corners?

Carr: Well, the whole question of trying to maintain a competitive, arms-length, non-cross subsidized environment. There was an occasion, for example, where Southern New England Telephone was going to play some kind of game with dial service and low speed modems, and Chuck was on the phone rallying everybody for the IDCMA to participate. We had made a decision early on at the policy level that we would work only at the federal level, that we couldn't fight them state-by-state, that we would be dissipated in nothing flat. Chuck had a tendency to see great elaborate Machiavellian plots in everything. He was forever -- he would say: "If you just give me a minute," and then he would talk for an hour, and he would get -- he would do "the ball rolled down the string and it knocked over a candle, which burned a hole, and let the water run drip, drip," and by the time you got to the end of it, the Russians had taken over and we were out of business. In fact, my assignment --it used to be a standing joke -- my assignment was to say: "Shut the fuck up, Chuck," because it seemed to be that I was the only one that could get away with it, and he'd stop talking. Anyway, he was calling around trying to get us to intervene in Connecticut, and the other guys didn't want to do it, and I called him on it. I told him that we had to because it was of overriding concern to GDC, and that exceeded -- in our agreement that we wouldn't split -- that exceeded the 'don't go to war in a state' rule, and we went in, and that was pretty early. That was probably '74 or '75-ish, and we went into Connecticut --

Pelkey: Installed a line. GDC called for a line that went to New York across interstate boundaries.

Carr: Yeah, they used to do the rusty switch thing; they used to call it that. You go out to a state, close a switch and come back and never open the switch; that was interstate service. Anyway, the details are very -- In any case, we backed him, and that was an important moment in the IDCMA, because from that time on, there was very few state level fights, but there was always solidity among these A members that stood us very well. We used to trade testifying, so that you didn't have one guy always being the bad guy with the view that AT&T would turn their laser gun on someone --

Pelkey: On one company?

Carr: -- and we didn't have a -- we never did have a president or an exalted leader, so we took turns signing complaints, things of that sort. So I guess we all made the enemies list is what happened. I really think that without the IDCMA, the face of the data communications business, and more importantly what

the customer would be able to do in terms of technology today, would be radically different. I really think that was a major -- it was very important.

Pelkey: Micom. In '76 and '77 -- Before that, what was to become Micom was looking for money.

Carr: Yes. We offered to fund them or take a piece of the company, and Bill Norred founded -- he was doing work for Case in the UK, and he was taking the proceeds or Case and bootstrapping Micom, and every time he would start to see the Case job ending, he would get nervous about money, and we would make overtures to him to give him some money, and about the time he'd get close, he'd get more work from Case or something and it would go away for a while. That happened several times. I can't remember if it was three, four or five times.

Pelkey: Why were you interested in giving him money?

Carr: Because we thought a lot of Norred as an individual. He was in a segment entirely adjacent, but unrelated, to what Codex was doing. He was going after the DEC type OEM world, where we went into the end-user, more sophisticated environment, and we saw that as an uncovered, potentially quite lucrative segment, and that he was the kind -- and Evans in those days was the marketing guy. Coincidentally, I talked to Roger two or three days ago for the first time in five years or something like that. He called me up about something unrelated. So we saw Norred and Micom as a significant potential acquisition, but we could never quite get him over the threshold. I don't know how many times we romanced in the moonlight and we got to the door and then he kept the key.

In fact, the last time was, it was before he went public, we was sort of divorced from Case and he was running at that point, and he was in a real cash bind.

Pelkey: This was after Roger joined him?

Carr: Yes.

Pelkey: And after he introduced his statmux?

Carr: Yes. He had a list of people, he told us later, that he was calling to try to raise money, and there was a guy in southern California that was the name above ours on the list, and when he called him, he agreed to guarantee loans or something for him, for a piece of the company, so he didn't call us, but if John hadn't answered the phone, I'm quite sure that time Codex would have acquired Micom, because we were ready, and in fact, Story called him not too long after that, and that's when we heard. He said: "Gee, you were next on the list, but I got my money from so and so." Then he went public, and we became a pretty substantial customer of his. In fact, we became his largest customer, and out theory was that we had to be in that segment. We didn't have a product, so we would do the classic thing; we would OEM from him and then design them out. I remember a trade show. He was in registration, an Interface I think it was, and we introduced a replacement product for his product at Interface, and he and Roger came by, and they looked at the product, and Bill came over and said: "It looks like it's real." I said: "It's real," and he said: "The lights aren't just blinking, it's running?" I said: "It's running." He had this real gray look, and he said: "Buy you a cup of coffee?" And I said: "Yeah," and we went off to the cafeteria area, and we were sitting there, and Roger said something like: "So you won't buy any more of these?" And I said: "Hey Roger, look -- "And they were introducing some product at the show too. I said: "First off, nothing stops like a curtain coming down. We'll have some number of these we'll buy from you on probably a declining basis as ours comes up, but we're interested in the XYZ thing, so we'll buy something else." So he said: "You're telling me you're still going to keep buying from me?" And I said: "That's what I'm telling you and that's what you want to hear, Roger," and we got them running. They took off for the phone because they needed in the registration to tell the underwriter or whoever the hell was asking them the question: "Are you now cut off by this introduction?" Because Codex was their biggest customer, and nothing stops like that. And I knew what they had to hear, and I told them. If I had

taken -- I don't know what would have -- If I had taken the position I'm going to stop buying as of tomorrow, and if somebody forces me to, I will occasionally, I'm not sure they'd been able to go or not.

Pelkey: Do you remember one other trade show that Roger remembers a conversation occurring between you and he, when he approached you about OEM'ing some modems from you? His recollection is that you were kind of on the run, and really didn't want to deal with it, but you asked how many, and he gave you some number, and you said: "Wait a minute." His recollection is that you were kind of surprised that you would want that many, and then you went and had dinner and talked and you finally struck an OEM modem deal where you OEM'ed modems to him because he was going to build them into a statmux?

Carr: Yeah, I remember that. That was later, after they were public, my recollection is. And I think the issue there was that we were building L-Series modems by then with built in multiplexers. Rather than these four and eight things being another box, they were in the box. They were in this little shoebox. He was building statmuxes that he wanted to put a modem in, and our view was -- our modem turned out a lot more -- if you added all the costs up, we were more of the total than the statmux when the dust settled. So we went through this drill that said: "Are we putting him in the modem business? Is he going to be selling our product against us? We call it a modem with a mux, he calls it a mux with a modem, but it's the same function." So I was giving him the slide until I heard the volumes, and then I ok-ed getting serious with him.

Pelkey: It's his recollection that you thought you were much more of his volume at that point in time, and when he gave you the number of how many he was selling, that you couldn't believe he was selling this many other than -- because you thought you were a very significant portion of his business.

Carr: I don't remember that, to be honest with you. But we always had a great deal of respect for those guys.

Pelkey: That was one of the great companies in the industry at that point in time. UDS, when did you do a deal with them?

Carr: Well, UDS was a supplier to Codex. Codex was an OEM customer of UDS, and we became their biggest account.

Pelkey: When did you start the OEM relationship?

Carr: Oh boy, I don't remember, but I would guess '75, '76. Grumbles would remember for sure.

Pelkey: George has agreed to sit with me. Do you remember when you were evaluating a number of dial-up modems and he came in with a box with the Codex name on it --

Carr: Yes. He had it all. He had it painted the right color and the whole bit, and that's the way they did things.

Pelkey: Whom else were you evaluating? You must have been looking at Vadic?

Carr: We were looking at Vadic and somebody else. I think it was UDS and Vadic, primarily. And Vadic -- Racal hadn't bought Vadic yet, so that was pretty much an even up, we thought going into it, and they did a good job all around, UDS did. We went down and looked at the plant and did that whole number, and then I think we got to be better than 10% of their business. Maybe I remember backwards, they might have been 10% of our business, but it was a pretty significant relationship, and then about -- let's see, we sold to Motorola in '77, in May of '77, and about the same time, Milgo was taken over by Racal in a big fight with ADS in Long Island. There was a show in the summer in Atlanta. I don't know whether it was the Spring Joint Computer Conference or something like that, but it was in Atlanta, and I remember Mark Smith got a hold of me, and he told me that the Racal ADS Milgo thing was a big negative for the

industry, that it was poorly done and bad behavior and all that sort of thing, and that he thought the Motorola Codex acquisition was a class transaction and complimented me for how it went. Then a year or so later, he got a hold of me and said that they had decided to sell the company and that there was only one company in the data com business that they would talk to, and that was Codex, and that they were talking to two or three other people in unrelated businesses, and so Forney, Story and I went off and met with Mark and George and somebody else might have been there, Lonnie or Leon, one of their top technical guys in New York, at some lawyer's place, and we cut a deal. We were part of Motorola by then, and we cut a deal, and then the transaction was done in the form of them being merged into a Motorola subsidiary. Then I was given responsibility for -- I was still running Codex, but I was also supposed to oversee UDS, and we called that Data Com. We put the two of them together into a data communications organization.

Pelkey: And that was what, '78?

Carr: About '78-ish. Maybe early '79, but we were acquired in the spring of '77. I can't remember just when the close was, but it was probably '78, and they always took the position after that -- as a matter of fact it's a bone of contention between the organizations to this day that they were acquired by Motorola, not by Codex, and -- that is technically correct, because the one share was held by Motorola, but it was held by Motorola because they were our parent, but the original transaction, Mark was still impressed with the quality of the thing done between Codex and Motorola, and he didn't want to get connected to anybody else. And then it was subsequent to that that we bought ESE.

Pelkey: Before I ask you a question about Motorola, earlier in the modem business, you had GE, Collins, and Rixon; there were other big companies.

Carr: There were lots of companies, but there was nobody in the 9600 area and the 48, except for Rixon, Milgo and ourselves.

Pelkey: Why didn't these other bigger companies come and run at you guys?

Carr: Well, first off, I think we had a substantial technology lead. We were enormously profitable. Plowed it all back into the business. We had this “fly-wheel” in the operating lease base created. I think we managed that business very well, so that it didn't -- for a big company that was looking for big businesses, they didn't see it as an attractive investment.

Pelkey: Why wasn't Rixon successful?

Carr: They had crabs for technology. They lost their patent suit to Milgo because they flat copies the Milgo machine, and there was testimony in a Kansas court that the president directed the engineering guy to take one apart and copy it wire for wire. They just didn't have the horses to compete.

Pelkey: Two other major issues that I can think of. One is the sale to Motorola and the second one is the Milgo suit.

Carr: The sale to Motorola --

Pelkey: Why did you do it?

Carr: We were approached by Motorola in '76. A fellow named Keith Bane, who was corporate director of strategy out there. Motorola had sold its consumer electronics business to Matsushita, and they had $100+ million as a result of that sale, and the consumer business was about a quarter of Motorola's business. They had done a study and they concluded -- if you looked at Motorola as a milk stool, they had the communications business, the consumer electronics business and the semiconductor business as the three big legs. They were dabbling in a zillion other things, but those were the three legs. Well, they sold one of the legs, because Galvin properly concluded in the late '60s that it was going to be the

pits to be in the TV and stereo business against the Japanese. They concluded they had to get into the information business. That was the only business they could see that had enough growth potential to become a quarter in some reasonable time span. When they looked at that business, they focused on data communications because they were a communications business themselves. Motorola today is the world's largest provider of FM radios. I mean they're bigger in that business than IBM ever was in the computer business, and more dominant. So they focused on data communications, and this guy came out in '76, this fellow Bane, and gave me this pitch why we ought to be bought by Motorola, and I basically threw him out. Their plan was that they were going to buy five or six companies for this $100 million and be in the data com business, and they had to do that because there was no in-house expertise, and I told him he couldn't find five or six good ones, if he did, he couldn't manage them, he couldn't do it for $100 million anyway, therefore he didn't know what he was talking about, and we had, in our long range plan, I got my document out, and "we will not be acquired by anybody" was one of our top objectives, and showed him the door. It's funny because he still talks about it now. On the way out he said: "If I come up with a good plan, can I come back," and I said: "Yeah." So about six, eight months later, they had hired AD Little and written this whole formal thing, and they had boiled it down to us, ADS and somebody else, but I can't remember who it was now. They were now going to acquire three companies, and I said: "It still doesn't float." He said: "Come out and meet Galvin," so I agreed to do that. One thing led to another, and they agreed to skinny it down to buy Codex, and that we would be the core of an acquisition program that we would run, but that we were going to be 2.5% or something of their business. Motorola has a compounding growth rate that runs 15 - 17% a year, and we were, at the time, growing, probably, 75% percent a year, but there was no way the arithmetic was going to get us from 2% to 25% in a reasonable time frame. We talked about it and we concluded that we were still interested in getting into this front-end business. We were coming toward the tail end. This was late '76, '77. We thought we were seeing the light at the end of the tunnel on the statistical mux getting going, and it was going to be time to make that investment. And again, still having this concept that the modem business -- you've got to assume the modem business is going to go away. We were also looking at getting into the terminal business, the intelligent terminal business, and saying that at the end of these complex networks, there is a terminal which is talking over our networks to the host, so that's another choice, and we were going back and forth on which of these two should we go after. Then, here came Motorola and said: "If you're buried in Motorola, you're not going to be visible. You don't have to perform every quarter. We can fund you. Our interest is in making you the foundation of a new business that we're willing to fund. Your interest is in dominating your marketplace. With us, you can do more than one thing at once." We started thinking about how much capital we could raise, and we thought we could raise a lot of capital, but we didn't see how we could manage the P&L. We were literally going and having analysts -- we used to have an analyst meeting every quarter, and we had analysts who stood up and were unsatisfied with 36%. They'd say: "You've been doing 36% for six quarters now. When are you going to improve it?" You want to climb up on the guys' chest and take a hold of his tie.

Pelkey: Are you serious?

Carr: I'm serious. We were literally in the mode where we were almost doing nothing wrong and they were on us about things we were doing right and why weren't they better. And you also know that -- and we had this really scary quarter at the end of '75, with this C to L transition --

Pelkey: And you had a flat '76.

Carr: -- and the board, believe it or not, was giving us the same routine. "Why don't you crank up earnings per share?" So the insiders, which was Story, Forney and I, we were the three inside board members, we finally concluded that A, we had had enough of the board; B, that we could probably fund both the front end and the terminal launch inside of Motorola; C, they were our kind of people. We spent a lot of time on that, in terms of ethics and the way they went about things, culture. Lastly, we would not only be autonomous, but we would be the core. I had told Galvin all the horror stories of Computer Control being acquired by Honeywell at the time it was just passing Digital, and dissolving it over the course of the next three years. So he told me that if we did this thing, that I would be in charge of managing the acquisition, not somebody at Motorola, because they didn't know anything about it. So we finally decided that, from a strategy point of view, we believe we could advance the fortunes of Codex

more significantly being buried in Motorola and drawing on their resources than we could by being a free-standing company and having to dance the quarter- by-quarter tune. We knew where we wanted to go. We had a plan written and the whole bit. So we agreed to do the thing.

Pelkey: Now how much of the fact of the L-Series having come out and your seeing the impact of semiconductor technology --

Carr: None. This whole idea that there was great semiconductor synergy is all bullshit, ok. The fact of the matter is that the Rockwell chips were in PMOS, which was a process that Motorola didn't even use anymore. It was used in wrist calculators and crap like that. There was no way, by that time, this is like three or four years into Rockwell; would we become disengaged from Rockwell, no conceivable way.

Pelkey: From your perspective, you didn't see aligning yourself with Motorola having any strategic value?

Carr: Well, we thought that -- we had all kinds of “sugar-plums dancing” in our head about synergy. Motorola had a display group at that time. They had the semiconductor business. They even had a data communications part of the two-way radio, the communications business. They had a lot of money and a good management record, and a culture/style and a set of people that we got along fine with, but our fundamental thrust was, "we can do more of what we want to do just, literally, by being isolated from the quarter to quarter thing." And furthermore, by getting their investment, we don't have to spend all our time doing road shows in Europe or some goddamn thing. Then thirdly, there’s supposed to be all this synergy there, but it really was third. It turns out, with 20/20 hindsight, that there was no synergy that we ever could really -- we tried and tried and tried, and to this moment, if frustrates the hell out of Motorola's senior executives, that their in six independent businesses and they tend to behave independently. Synergy is a radically overused word, but I think, looking back -- Codex will have been part of Motorola 11 years next month, and the senior management's still in place, the key people are still in place, the technology is still in place, the management of the acquisition, the independence that was granted to Codex -- they still have separate benefits from Motorola to this day, to the best of my knowledge, I know they did two years ago when I left -- has been a marvelous management achievement. I believe Motorola is far and away one of the best-managed companies in the United States. I think that they have a classic “Midwestern inferiority complex”. You never see Motorola in "In Search of Excellence", or something like that. They had a program called Participative Management in the late '60s, before anybody even talked about quality circles. You never, to this -- there's probably 50,000 people in that company, out of 100, that are involved in Participative Management. Anyway, you never see it written about. Why? Because it's not fashionable to blow your own horn in that company, and they don't, but it's a great company. Codex has quality levels, management of assets --

Pelkey: How soon do you go up into ISG?

Carr: There were two steps. We were acquired in the spring of '79, and then we bought UDS in ‘79.

Pelkey: No, '77.

Carr: I'm sorry, '77. We bought UDS late '78-ish, somewhere around there. In '79, the spring of '79, I was elected a VP of Motorola, an elected officer, but I still ran Codex and ran Data Com, and Data Com was joined around '79 or '80, by ESE, we made that acquisition. Then in '82, when we were about to buy Four Phase, the Information Systems Group was created, and then I turned Codex over to Jim Story, and we had UDS, Codex, ESE and an International Division that I formed out of Codex, and Four Phase, as well as Four Phase reported to me as a group executive, and then within a few months of forming the group I was made an executive vice president.

Pelkey: One other question before the Milgo lawsuit. You slowed the "arrows in the back culture" -- you changed the culture somewhere in the late '70s, after the statmux, relative to not wanting to necessarily pioneer products, and Paradyne came out with the first 14.4 and started to become a problem for you in

your customer base, so you turned to ESE to get a 14.4 because you couldn't get the Codex engineers to do one?

Carr: No. That's really inaccurate. There was never any conscious intention to slow innovation at Codex. Quite the contrary; I think, if anything, we had too many irons in the fire, but the key issue on high speed modems was that, in the '76 to '78 time frame, just trusting my recollection, may '77 to '79, somewhere in that time frame, this continued bugaboo about "is the modem business finally going to go away" was still with us. We had just really got rolling in '76 with the L-Series, which was a major hit, and I did raise questions about resource allocation in the company to more modem development, as compared to statmux, front-end, terminals, network management and control, things of that sort. ESE had been working, prior to the acquisition, on two things: echo canceling, which is significant in the V-32 world now, and the 14.4 modem. About '78, I authorized the creation of a custom semiconductor shop that was split between Mansfield and Tempi, AZ, and we undertook to design a series of custom chips that the next modem family would be built on. I think it's fair to say, if that were '79 instead of '78, or '78 instead of '77, that my questioning whether another full family was necessary, did introduce a delay into the heavy funding on that program. Once we made that conclusion, it took us the better part of four years from start to bring what it now called the 2600 family to market. The reason for that was that it was architected around a 68000 primary manager and a bus structure like a computer structure, with a series of custom chips, the biggest of which was more complex than the 68000. Now, there was a place that we did get some synergy. We arranged, once we got into this, we arranged that all of the 68000 process rules be applied to the custom chips that we were doing, so they could go down the same line and ride the yield of the whole 68000 line, rather than just their own volume, but that turned out to be, not in any way being defensive, but I would say I contributed a delay to the start of that program, but the program ran damn near two times the total length that we anticipated, because the combined creation of this custom design facility, the capital -- I used to go down to Tempi and kid the guy that ran it that I was coming to visit my money -- The capital investment to do it in Calma's and things like that, plus the complexity of the circuits took a lot longer. I think it, again -- the 2600 was a product as far ahead of the competition as the L-Series was in its time, but it probably came along a good two years later than it should have. Now, as that was going on, we saw the 14.4 coming on. ESE had already undertaken a project, so what I did, I authorized parallel development within the 2600 confines and within ESE, and it was a plain old competing development program, winner take all. The outcome was that ESE got out first, with a machine that was inferior to the 2600, so we had to do a transition out of the ESE machine into the 2600, but it wasn't a case of saying: "We're not going to be leaders," or anything of that sort. It was much more pragmatic kind of stuff.

Pelkey: And looking back upon the more recent history, Codex isn't a factor in the T1 market.

Carr: Yeah, and I think that borders on the criminal.

Pelkey: Why?

Carr: I think the whole process in Codex has slowed to a crawl. I think it's become terribly bureaucratic.

Pelkey: But that T1 market was an '82, '83 phenomena. At this point you had moved up to ISG and now had Four Phase --

Carr: I can't tell you that anything would have been any better if I were still running Codex, because I don't know that, but for sure I had a rule in ISG that was universally understood, and the rule was performance equals independence. If you met your business objectives, you didn't -- you had to worry about whether I had abandoned you, rather than having me bother you. If you didn't, you had me in your pocket. Four Phase was such an utter disaster that in '82, '3, and '4, UDS -- I made one visit in two years to UDS. That's criminal for a manager, but I had 400 some thousand miles a year going back and forth to Four Phase, and I want to emphasize I can't tell you that if I were running Codex, rather than Jim, that it would have been different, but what happened was, we got a late start on LANs. That was during my time, and we got basically a no start. I don't think we saw the significance of T1. We didn't see the tariff changes, the significance of it. When we did, we bought product from Avant, and again, it was a la the

old Micom days. The theory was, buy from Avant and design them out. The first step was, they were going to enhance Avanti, beyond Avanti's design, and then design them out. The same thing had been true in a number of other things since then. What's happening, in my judgment, seeing from the outside and I don't know the details, Codex is depending entirely too much on buy-out product, as opposed to what it's doing inside, and they've got a monumental organization down here in Canton that isn't turning out the product, and when I run into them I break their balls something fierce about this.

Pelkey: Should you have gotten this opportunity in LANs, why did you not, since LANs were during your stay on the launch?

Carr: Well, I think that we were all very skeptical about the LAN business. We started hearing about LANs from the Chief Executive Office of Motorola within a year of being acquired, and I think it's fair to say in the '77 '78 time frame, there were a lot of magazine articles about LANs but there weren't any LANs, and we got into a kind of a contest with them, to some extent, that had a negative connotation in it, that I was digging my heels in, saying: "I know what I'm doing. Get off of my ass." About '80, I think it was, we decided to get under way. We brought a guy name Murray Bolt from IBM Raleigh, and he was in the penalty box because he had blown LAN token ring down there, running that program. That token ring program should have been much further along at that time, and today, than it is, and Murray was -- the recollection was that he was unfairly in the IBM penalty box, and he became available to us, and we brought him in, and Murray tooled up a hell of an organization, that didn't generate diddly squat. It's basically as simple as that.

Pelkey: Then he gave long notice and he left.

Carr: No he didn't, but there was nobody ringing their handkerchief. It was a cultural mismatch. In fact, I used to have Story give me rundowns, a quarterly thing, and I was looking at his budget one day and I said: "Geez, Jim, if you look at all of these lines and you look at the operating cost as a percent of revenue, then you look at the LAN business," and the LAN business was called an independent business unit, which was supposed to be a technique to have a lean, entrepreneurial type shop inside of a bureaucracy, his budget was bigger, and his organization chart was more elaborate, and Jim said: "Well, these are my Codex organizations, and this is my IBM organization." I said: "What are you doing about that?" He said: "Well, I got to give him time. I got to give him a chance," and Murray just didn't hack it. I hate to hang the whole thing on one guy, but that was really -- I would tell you that I think that was the turning point, back about '80, in the engineering organization's ability to get stuff out in a timely way. It started in LAN and it's spread now, in my view, throughout the company. They should not be OEM'ing what they're OEM'ing.

Pelkey: Milgo lawsuit.

Carr: Milgo lawsuit? Well, funny . . .

Tape Side Ends

Carr: Our attorneys told us that we had to advise them of our patent position, so we told the attorneys to send them a letter. The legal theory called "latches," that if I have something like a patent and you're violating it and I don't tell you, if enough time goes by, then I'm precluded from attacking you for it. So the lawyers were giving us the: "latches, latches, latches." You don't know what these guys are doing," so we said: "Ok, send them a letter." So they wrote them a letter that said something like: "We want to make you aware of patent number blah, blah, blah that's issued, and modulation etc., etc., and don't violate it," or whatever, and the lawyers sent if certified. I found out from Bleckner later that it was seen by Milgo as the opening salvo, that the next thing we would do would be to launch lawsuits against them.

Pelkey: Do you recall what year that was?

Carr: It was around '72.

Pelkey: And you and Bleckner were on the IDCMA.

Carr: Yeah.

Pelkey: Didn't you enough of a relationship for him to say: "What's the story here?"

Carr: At that time, we didn't have any conversation about it. The next thing we knew, Milgo sued the Yellow Freight Company in Kansas and us in California. They sued Yellow Freight in Kansas because they had won this case against Rixon in Kansas on these four patents, and we didn't have any office or anything else, so they sued a customer. Then they sued us in California because we had offices in California. You know, these lawyers do what they call forum shopping, and there are forums among the district courts that historically have favored the patent holder, and there are those that favor the other guy. California was the forum that favored the patent holder and Kansas is where they had this hanging judge that had wiped out Rixon. I was really pissed that they sued a customer; that they had brought a customer in. So we turned around and countersued them in Massachusetts and in Florida for violating our patent in the UK and in the United States with their V-29 machine. Those are forums that favor the patent holder. Then we went through a whole bunch of rounds of forums and we wound up in Massachusetts and Florida. We won all of those preliminaries, so we had them in the locations we wanted. After that, Bleckner and I talked about, at a trade show someplace: "Let's not get into this," and I had the impression that he would like to have stopped but he couldn't, that when Racal bought Milgo in this flap, one of the thoughts that they had was that they gotten a wheel. They saw this patent portfolio and the fact they had won against Rixon is something they had on all the modem companies in the world, and he could not convince the chairman of Racal to back off. He never quite told me that, but that was the clear impression. He further said that he had bad legal advice. He should have never gotten into the thing in the first place. They had put too much credence on this letter they got, and their lawyers just said: "The launch has already been made, it's time to get your missiles out." We got into a multi-year struggle that was very debilitation for both sides, very expensive. About '77 or '78, I came up with the idea that if we could smoke out -- I don't remember the name of the chairman of Racal right now, I've forgotten all these names -- but we had made overtures through Motorola and other ways to try to talk to him on the theory that if we could get to him, we could get this litigation stopped, and that didn't work. So I came up with the theory that what we'll do is sue them in the UK, and that'll smoke him out. Once we get some contact, we'll get this thing settled. Well, that didn't smoke him out either. They just dug their heels in and said they'd fight it to the queen, and all that shit. So the next thing that happened was, if my recollection is correct, we came to trial here in Massachusetts, and luckily, we got a smart judge, which is the luck of the draw, and Forney put on about a four or five day tutorial for this judge; what is a sine wave, what is a bit, what is modulation, what is the Star of David, what is phase modulation, and the just sat up their taking notes. It was an incredible phenomenon. To make a long story short, we went through the trial and we won in Massachusetts. Not only -- and this was a defense against the Milgo suit -- we not only won the fact that we had not violated Milgo's patents, but in fact, Milgo's patents were invalid, the four that they had won in Kansas, and furthermore, they were fraudulently prosecuted in the judge's opinion, so Milgo had to pay us a million dollars, out legal fees that we had accumulated fighting the case. He wrote this opinion not only very extensively -- it was a very long opinion -- but he even wrote, I mean he drew wave forms and formulas in this goddamn opinion, because it became clear that Song had really -- he kept adding to the claims. He'd sort of see what was going on and say: "I got an idea," and claim that he had this in mind and that in mind and the other thing, and so the judge really got ticked off about the whole thing, and gave us not only the win, but our legal fees. So they we were left with the case in Florida and the case in the UK. We sent Forney over to the case in the UK, and everybody went in for round one, and this guy comes out with his powdered wig and he says he doesn't need to hear an awful lot of testimony, he's read all the briefs, and: "Let's keep this down to a day or two." So he hears a day or two of testimony and all of a sudden he just pronounces that Milgo clearly has violated our patent. Furthermore, they are hereby ordered to remove and destroy all of the offending units that are installed anywhere in the United Kingdom forthwith. Bang! He walks away, ok, and we're all sitting there saying: "Holy shit!" -- oh, and to reimburse Codex its lost profits for the years '70 something to the date of the trial, all three things, and all our guys are sitting there saying: "We came over here to smoke this guy out and the judge threw a hydrogen bomb right in the middle of it." So Milgo gets a hold of us and says: "Hey, guys, if we have to take these units out, there's going to be N datacom networks that grind to a halt, and

it's going to be because you made us take them out. Do you want to do that?" We said: "No," so we jointly went back and petitioned the judge to leave them in place and we would settle this by financially compensating Codex, and then we went into this big, long negotiation of what were our lost profits and what were their margins --

Pelkey: After you agreed to be conciliatory?

Carr: But they knew it was conciliatory in our own best interests, too. It's kind of like Apple suing HP about the icons. If we were --

Pelkey: The visionary lead, John Scully, in Fortune magazine, suing over this.

Carr: Racal was a high flyer. It was a company people in the UK were proud of in a time that British industry wasn't flying very high. We not only whipped them, but if we humbled them and disconnected a zillion networks, we would -- it would have been crazy, and they knew it and we knew it. So to make a long story short, we negotiated a payment of $8 million from them to us for our lost profits in return for them being allowed to leave stuff in place and never do it again. They had to change the machine and all that crap, so that's basically what went on.

Pelkey: What happened in Florida?

Carr: Florida, the last I knew, was still outstanding, and the problem there was the US Patent Office was making noises like it was going to invalidate our patent, the Codex patent, because they got some testimony from Bob Lucky at Bell Labs, as I recall, that he had some prior art that Forney had never seen and wasn't obvious, but Milgo was using that, and, honest to God, I don't remember what the outcome --

Pelkey: Did you file back to have the patent reaffirmed?

Carr: Yeah, the last I knew, we were going into a mode where -- I'm trying to remember how that worked now -- we're trying to get it out of the courts, back into the Patent Office. In other words, it was going to be some kind of a deal, the outlines of which were, we'd go back and fight the fight in the Patent Office, and if they killed the patent they killed it, and if they didn't then Milgo would cave, or something like that, but I don't remember.

Pelkey: Do you know of anyplace where anybody wrote a good summary of that patent and the fights and documented any of that?

Carr: If anybody has it, it's Forney.

Pelkey: Was there anything ever in the media or anybody else?

Carr: Oh, yeah, Electronic News wrote up both the Massachusetts and the -- and Forney may have in his files, and he probably does, whatever press there was on it. And Codex put out releases on it, I know.

Pelkey: The competition -- I think we've touched on it. Paradyne became a nuisance factor for a while after Wiggins got involved - -

Carr: We blew Paradyne, I think, because what happened was that it was on the ropes, and Ferry brought in Wiggins and his team, and they got it turned around, and they were really low-balling prices. If you go back to the statement I made earlier that we all looked at prices and we said: "Let's not fiddle with them." Paradyne was coming in about 40% below the oligopoly, if you will, and we consciously decided that, rather than meet their price, we would wait until they got to our threshold of pain, and we used to count units -- how many units Paradyne shipped, and we'd ask if that was to our threshold of pain, and it turns out that was a mistake, because by the time Codex and Milgo decided they got to the threshold of pain, they were healthy again. They were off and running. Then everybody did adjust pricing, and the

issue was, by then, that they were back, alive, and well, and a strong competitor, and they did a good job. We could have cut them off at the pass, and we didn't do it.

Pelkey: You've been very kind with your time. I have some more global issues, and you've touched on some of them, in terms of culture or organizations. Are there any other comments you have in terms of how this industry grew? Were you aware of Arpanet?

Carr: Oh sure.

Pelkey: Did you think that was an important issue to your industry?

Carr: It was. We had, in fact, our statmux business was fairly carefully conceived to drive in the direction that would be compatible with X-25, and there was Arpanet, and we used to put products out in Sweden someplace on an Arpanet. We saw those things as a continuum, if you will, to the evolution of networking, and Codex, as a strategy, evolved from a product company, to a subsystem company, to a network solution company where they're at now. And the problem now is that they don't have enough home grown components of that strategy. It seems to me, from a distance, that Codex has got an excellent strategy, financially, of managing the business very well, but the engineering organization, which in the dawning of my experience there in '68 was the biggest engine in the world, is now the weakest link in implementing the strategy. But I think that SNA was carefully evaluated.

Pelkey: You spent a lot of money on teleconferencing, as I understand.

Carr: There was a program that was going to bring out a teleconferencing product, but it wasn't a lot of money, and it was killed by the organization, which was while I was running Group. They used this echo cancelling capability of ESE -- it was going to be used in combination with product ops in Codex to produce a product that looks something like an overhead viewer, with something that looked like a speakerphone, and you'd be able to have a meeting between two places and see each other's view graphs and talk, and a quite inexpensive project, as compared to full blown teleconferencing with videos of the people and all of that. That went along in a pretty good fashion, was pretty much on schedule, was on budget, but they concluded that the continuity to the total product strategy and the size of the market was not what they originally thought, and they popped up and recommended that it be shut down, which I approved of at Group and said: "Congratulations. That's hard to do." That was one of the shinier events. The big black ones were the inability -- the LAN and T1 experience.

Pelkey: United States companies competing with, as an example, the Japanese, or what's happening in Europe, the need to have much larger scale and to be able to compete internationally -- Codex, UDS, Motorola is clearly the best example of a company that would be in a position to be able to do that, and yet here, going back to the LAN and the T1, not to beat a dead horse, but here's this organization that had played in both of those marketplaces --

Carr: What's the biggest LAN company today? In terms of sales.

Pelkey: 3-Com.

Carr: What do they do?

Pelkey: $300 million.

Carr: Ok, so that would take Codex over three quarters of a billion, close to a billion --

Pelkey: And NET is 150 --

Carr: I think you can say that Codex was aware and active internationally, as far back as '68. Our first distributor I signed up in September of '68 when I had started with the company July 26 of '68, and that

was a very short fight inside. There was a faction that said: "Who needs a foreign business?" I just went and did it, and in fact, Codex got, in the 40-ish % of its total business internationally at its peak. I don't know what it is now, but it might be close to that -- I wouldn't be surprised if it was in the vicinity now. The problem that any American data com company has in foreign markets is the regulatory influence -- non-existence in the computer business. For example, in Germany, we elected in about '72, to do a private label deal with a Phillips subsidiary there called Taka-Day, rather than having either our own sub or a distributor, and we sold to them, they put their name on it and resold it, because they were a member of the club at the Bundespost, and the Bundespost had announced that by '73 or '75, they were going to only buy -- only provide modems to the Bundespost itself. It turned out, they didn't do that 'til almost '80 -- '79 or '80, but when they did, they bought them from Ericcson, which was the first time in the history of Germany that they bought from outside, and from a non-club member even inside. So Codex, I think, made the right decision, teamed with the right guy, and then the government changed in '79 and the whole thing went up the chute. France -- when we brought the L-Series out, they would not homologate it, period, and we went through embassies and the State Department and Commerce and you name it, and they just -- you got the finger. And when the V-29 spec came out, because it was a recommendation, they had to accept our offering in V-29, and that's how we got 9600 modems going back again in France. They just arbitrarily said: "No way." We started selling in Japan in 1973, because that we the first time they did their Carterphone kind of judgment, and they for years wouldn't let 96 be used there. I remember sitting late one night, having a debate with NTT people about the difference about permit and provide. They would permit us to offer modems, but they wouldn't let us provide 9600 service is what they kept telling us. So you have all those kinds of phenomenon that radically affect the -- well, I'll give you another one. In Italy, all equipment is installed by SIP. If you want to sell a bank, you've got to sell the bank. When the bank is ready to buy from you, they've got to buy it from SIP. If SIP takes the notion they're going to run an auction and buy it from Paradyne, they force it on the bank, and all your sales time and everything is right down the tubes. Now, from Codex's point of view, that's always worked the opposite. SIP has been a major account, and we've done very well there, but there was a time when SIP -- when we were thinking about being in the terminal business, SIP said they were going to absorb terminals. They were going to leave -- the theory in most foreign countries is, the interface, the demark to the network, is where you have to homologate . . . (interruption for telephone call) . . . so those are factors that clearly bear, in addition to how you execute your technology and all the rest, as far as domestic/international.

Pelkey: And, that the issues of Codex on the LAN and T1, those are probably just management issues, as opposed to lack of vision or lack of recognition of the market. T1 is a little bit of lack of vision.

Carr: I think that's the sad part of it. If you could be cleared to read this year's strategy document, this year's business plan at Codex, and I haven't seen it, I would guarantee you would be blown away by how articulate it is, how deep the understanding of the marketplace and what's going on in the industry is. The problem, in my judgment, that Codex has, which is typical in the industry, it happened to Milgo, it happened to Paradyne ad nauseam, is execution. We do not execute adequately once an organization gets above some particular mass.

Pelkey: That's a really important issue for us as Americans -- we are competing with organizations of massive scale --

Carr: Oh yes, and the interesting thing is, and I think there's a lot of data around that most of the innovation in this country comes out of the small start-ups, ok, why doesn't innovation come out of the major organizations that have the resources? Well, that's -- Disraeli, I think it was, said: "All generalities are false, including this one." I can point to some, for example, Motorola is a six or $7 billion company, some real innovation in the semiconductor area and the com area and so on, but if you look at every single part of that $7 billion business and you say: "What proportion of that business is innovating?" It's the pits.

Pelkey: The’res a few examples. Intel, over half the revenue every year goes to the products engineers, but it's rare in the United States that we --

Carr: It is, and in equipment companies, it's much worse.

Pelkey: We all get locked into this -- I think it's two things. One is that we get locked into the customer base. We got to be able to carry that prior installed base forward, which really starts to become a millstone on innovation.

Carr: And beyond that, there's a theory, an incorrect theory, that you don't disrupt your own customer base. Now Four Phase, for example, went down the tubes in the late '70s because the president adamantly refused to accept the idea of implementing a micro-processor based product line, because it could be sold for less than his mini base and he would disturb his nice, neat lease base. And the answer to that is always the same: if you can do it, somebody else is lurking out there that can do it. Get there before somebody else. You at least have the remains. If you have lack of planning, you have bad judgment, and you have bad execution, in my view, I think bad execution is most frequently - - my old boss at Motorola, Bill Wise used to do the pogo. He said: "We found the enemy. They is us!" Codex knows just what it wants to do and just when it needs to do it and what forces in the industry are making it do it. Stearns could tell you that stuff in his sleep, and they can't make themselves get the stuff done when it's got to get done, and that's, in my view, what we have to find the solution to.

Pelkey: Thank you very much for your generosity with your time this afternoon.

END OF INTERVIEW

