



Oral History of Harvey Newquist

Interviewed by:
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Hendrie: It's very nice to have with us today Harvey Newquist, who has graciously agreed to do an oral history for the Computer History Museum. Thank you very much, Harvey.

Newquist: Thank you, it's my honor.

Hendrie: For making the time. I think I would like to do this in more or less chronological order, go through your career. So where I need to start is where you were born and brought up, and a little bit about the family you were brought into, any siblings you had, what your parents did, that sort of thing.

Newquist: Okay. I was born in Racine, Wisconsin, 1932. I was the fourth of five sons of Harvey Newquist and Mabel Hartmann. In 1940, we moved to DeKalb, Illinois, where my dad managed a foundry, right next to the Wurlitzer plant. My dad had been in the foundry business, and this was an opportunity for him to run his own business. Shortly thereafter, World War II broke out. My three older brothers served in World War II. My dad was general manager of the largest manufacturing plant in that city of DeKalb ever. They made links for Sherman tanks, and they had huge electric furnaces, doing steel links for treads for the tanks. Of course, the Sherman tanks were very instrumental in winning World War II. That was my first experience to manufacturing. I'd stop there after school and see him and wait for him, and he'd take me home, and it was a really unbelievable situation. So then I went to the University of Notre Dame. I pursued a mechanical engineering degree, because I was influenced by the fact my dad had a metallurgical engineer as a consultant in his foundry. After World War II ended, my dad found himself out of a job. They closed the plant immediately. He was 50 years old and out of a job, and he started his own foundry, the Newquist Foundry, in DeKalb. I worked there summers, and at Notre Dame, a mechanical engineering degree, the design aspects didn't appeal to me too much, but they were starting a new industrial option, which ended up being the first industrial engineering degrees at Notre Dame. So I was a beneficiary of that. Summer before I graduated, I worked for GE as an intern in Schenectady, New York.

Hendrie: Now, can I just-- whoops, sorry. I'd like to roll back and get little bit more color about your early family and your early education. When you went to school, what were the subjects, in elementary and high school, that you enjoyed the most?

Newquist: Well, I was a pretty good student. I really enjoyed them all. But in high school, I enjoyed journalism, and I thought I would take a career in journalism, but it didn't last that long, and I had the beneficiary of being the student body president, and involved in a lot of organizations and curriculums, and became a pretty good athlete in track. So I was offered a track scholarship to several colleges, but my mother and I certainly wanted me to go to an academic institution. That's why I went to Notre Dame.

Hendrie: What were the other colleges?

Newquist: Drake University, Northern Illinois University, and a few others.

Hendrie: Were you a runner?

Newquist: I was a hurdler.

Hendrie: You were a hurdler.

Newquist: Yeah, a high hurdler, and so I set a high school record that lasted 25 years.

Hendrie: Wow.

Newquist: But I gave up that pursuit when I went to Notre Dame, and didn't even think about being in track at that time.

Hendrie: Didn't even go out for the track team?

Newquist: Well, my freshman year, they had a brand new coach. He asked the freshmen to try out for track, and I said, well, I'd try again. So I went out. Not only did I make the team, but I ended up being the anchorman on a hurdle relay team, and set all Notre Dame's indoor records. One of them was only a tenth of a second off the world record. Three other records I set still stand today.

Hendrie: Oh my goodness.

Newquist: And I earned a walk on scholarship, so it paid for my education, the second half of my career.

Hendrie: Wow. So you did do some-- this is at Notre Dame?

Newquist: Yes, Notre Dame, that's correct.

Hendrie: Yeah, wow. Okay, so you did do track at Notre Dame. You didn't drop it.

Newquist: Oh yeah. No, that's exactly right. I just decided I'd give it a try again.

Hendrie: Yeah, okay. So what made you decide that you--? You were interested in journalism in high school. What made you decide that maybe you wanted to be a mechanical engineer?

Newquist: It was exposure to my dad's foundry, and the manufacturing aspects of it that I liked. I liked the business of seeing a factory layout, seeing the work that he did, the products he made. He made gray iron castings at that time, and so that appealed to me. When I went to Notre Dame, that really solidified my interest.

Hendrie: Okay, so when you started to take some mechanical engineering.

Newquist: At Notre Dame, I took mechanical engineering.

Hendrie: Yeah, and that resonated with you, a little bit?

Newquist: A little bit, but I was more interested in the industrial option of it, rather than the design.

Hendrie: Yeah, okay.

Newquist: So I did things like factory layout and management practices for manufacturing.

Hendrie: Okay. So did you take any other sciences or anything like that in high school-- I mean, in college?

Newquist: No. It was strictly a straight ME course.

Hendrie: It was straight engineering.

Newquist: Exactly.

Hendrie: Straight engineering. All right. So when you graduated, talk to me about what you thought you might want to do or where you might want to start out.

Newquist: Well, when I graduated from Notre Dame, the Korean War had just ended several years previous, but the draft was still in existence, so I knew I was going to serve military service in the army. So I took a job with GE. I'd worked there the previous summer before I graduated in Schenectady, in their test engineering program, in large steam turbine generators. When I got out of school, I worked in two assignments, in Erie, Pennsylvania, and again in Schenectady, and then I was drafted and went into the army. When I got in the army, after basic training, they gave you an aptitude test, and I did pretty well on that. So I chose electronic school at Fort Monmouth, New Jersey, in computers and radar.

Hendrie: Oh, okay.

Newquist: While I was there, I noticed that they also had a poster on a wall in a gymnasium that said people that had fairly good college track records could try out for the Olympics. So I said, well, let me give it a try. So with no coach or anything else, I ended up making and representing the US Army in the 1956 army team for the US Olympic trials in Los Angeles.

Hendrie: Wow.

Newquist: I didn't make the Olympics, but it was a lot of fun competing with guys who did.

Hendrie: Yes.

Newquist: I got quite far in that. Went right from there back to being assigned to Fort Story, Virginia, working as a field engineer on the Nike missile sites around Norfolk, Virginia. Radar, computers.

Hendrie: Now had you gotten some more electronics training?

Newquist: I'd gotten six months at Fort Monmouth.

Hendrie: Six months.

Newquist: Six months there, yeah. That was my first introduction, really, to computers, because at Notre Dame, slide rules were the rule. There were no computers in those days.

Hendrie: Yeah, of course. Well, I mean, I know.

Newquist: I'm an old guy.

Hendrie: Yeah, this is the '50s.

Newquist: You bet.

Hendrie: Early '50s.

Newquist: So I did that and then GE asked me to join them. GE was very good about keeping track of their people that had worked for them and were drafted with the military. So I went, had an opportunity to work in several GE plants, but I decided to work in Light Military Electronics Division in Utica, New York, and I started there in 1957. I had met my to-be wife, Pat Starr, when I was an intern at GE three years previous to that. So we got married just about a month after I started with GE in Utica. I worked on two significant projects, but all of them based on quality control. At that time, Armand-- I forget his name, but he was a quality control genius at GE. He headed up their manufacturing operation, Feigenbaum. Armand Feigenbaum. He emphasized quality at all levels of the organization, so he was a cool guy.

Hendrie: All right, he was very early.

Newquist: He really was.

Hendrie: In the quality revolution. That really didn't start till the '60s.

Newquist: Exactly, exactly. So I got exposed to all of his programs. In addition, close associates of mine were members of the manufacturing training program. Manufacturing training program in GE had been developed by GE after World War II, to compete against Westinghouse, because they found out that although they were good at engineering and R&D, they really didn't have a good management group in their manufacturing operations. So they set up a three year program, six month assignments, all around their facilities, where people would go and take not only an active role-- it was usually above what they merited-- but go to school at night, and almost like a master's class at night.

Hendrie: Wow, okay.

Newquist: Although I didn't get on that track where I was moving around every six months, I did study all their manuals, worked side by side with them, and became very closely associated with the program. So between quality control and manufacturing management, I was regarded as a GE-trained manager pretty well. So I worked there on two projects. One was a sidewinder missile, and the other one was a project called the Hawkeye. The Hawkeye is an early warning system that's carrier based. We brought it from prototype into production, and it still is in the fleet. It's been upgraded, but still in the fleet. That was a real good experience in terms of computers, but we were still using vacuum tube computers in those days.

Hendrie: Wow. There were vacuum tubes in the missile?

Newquist: No, not in the missile. In the early warning system in the airplane.

Hendrie: Ah, okay, yes.

Newquist: They were just started to get to transistors, but they weren't there yet. The development had not come up with that. So after a while, I decided I wanted to look around and see what was next on the list for me. I had kind of an entrepreneurial itch.

Hendrie: Now, how long had you been there when you got this itch?

Newquist: Seven years at GE in Utica.

Hendrie: Oh, seven years. All right.

Newquist: Yeah, it was '57 to '64.

Hendrie: Oh, wow, okay. That's quite a long time.

Newquist: I did, and I moved up the ranks to some pretty prominent management positions there at an early age, just because it was accelerated programs. You know, those Defense Department programs were all accelerated, and you worked a lot of hours. If you were good, and had good people to work with, you were promoted very rapidly.

Hendrie: Okay, so talk to me about a little bit of the steps you went through at GE.

Newquist: Okay, so I started out as just a basic industrial engineer, a test engineer, on the sidewinder program. Got promoted to a supervisor in engineering on a program that built anti-sub warfare gear. Then was promoted to the senior position of this Hawkeye program, that was given very high propriety in the division. Got a lot of experience there. Grumman was our partner on this. They built the aircraft, we built the innards, the computers and the radar. Ended up probably managing over 100 people in their quality control organization.

Hendrie: Yeah, wow, okay.

Newquist: One of my friends in the manufacturing training program was a guy named Bob Grip.

Hendrie: Oh yes, now I'm detecting connections.

Newquist: There you go. Bob Grip said to me one day, "Look, I think I'm going to leave this defense business and get into commercial computers, or at least, more into computer business." I said, "Bob, what do you know about computers? Your background's accounting, and you've been in this electronics stuff." But he said, "Harv, it's just 1s and 0s," he said. "But there's this company in Framingham, Massachusetts, that wants me to do their materials work, and they're hiring GE-trained manufacturing training program guys." They wanted strong manufacturing, because they were more of an R&D operation, and they didn't have a good manufacturing base, and they were getting ready to expand. They had a manufacturing training program, guy named Ken Hammer, who ran the Peterborough plant, where they made modules for Computer Control [Company]. So the three of us made a group of GE-trained manufacturing managers for Computer Control.

Hendrie: I didn't realize that Ken Hammer was a GE man.

Newquist: Oh yes, he was there before Bob and I went. So I handled quality control, Ken did the production in Peterborough, and Bob did materials. We got there, and 1s and 0s turned out not to be the only thing they did. From a quality control standpoint, the first problem they had, they told me, "We've got a problem on the line making a module for the navy." I said, "What is it?" They said, "Well, it's a magnetostrictive delay line module," which was more than just 1s and 0s. They were fun to make, but we solved some problems. Once I got with Ed Hampson, who was a manufacturing guy at Computer Control, came to Utica, interviewed me. I went out, flew out, was very pleased with what I saw. He was pleased with what he saw. So my wife and I decided, well, we would take a flight and leave Utica, with five children and one on the way.

Hendrie: Oh my goodness.

Newquist: Which told people, I'd earned my production credentials pretty good, right? So we left there and went to Framingham and started out what turned out to be a four year stint at Framingham. The four years is important, because I'll mention it again later, but when I was talking to Hampson, he told me, "You know, if you want to be an entrepreneur, if you want to get with startups, there's some basic things that you can count on. If you stay in the mainstream with a company that's really on the edge and starting to go in the industry, your chances of success with it may be one in three, and it takes almost five years for you to find out whether it's a success, given the SEC and the IRS, and whether you really made a financial good decision, financial independence." So I said to my wife, "Well, let's give this a shot." So we went there. I loved 3C. That's where I met you and a lot of great people. I worked with you on the DDP-116, which was the first 16 bit minicomputer, took the world by storm. You and I both received Paul Revere silver bowls. Only four people in the whole company got them for excellence in running that program. Still have pictures of you and I smiling at a luncheon. Then moved from that into running almost all the quality control for 3C, and some production. Well, Honeywell, while I was running the quality control and production for the DDP-516 line.

Hendrie: Yeah, okay.

Newquist: Which was the first integrated circuit computer, Honeywell decided their process computer division wasn't really responding to the market. So they decided not only to buy 3C in 1966, but to close their Fort Washington plant, and move all their manufacturing to Framingham.

Hendrie: Ah, okay.

Newquist: And so my job not only was to now run the Honeywell line, and the 16 line for Honeywell, but to train and indoctrinate my philosophy on manufacturing to the Honeywell guys. Did that for two years.

Hendrie: Yeah. Who were some of the people that moved up in manufacturing? I mean, I know a couple in engineering.

Newquist: Yeah, well there weren't too many in manufacturing, one or two, and I actually can't remember their names, but they were guys who were willing to move. Many people were not willing to move.

Hendrie: Yeah, exactly.

Newquist: So it turned out we had a very productive 516 line. We started increased production, several units a day. People weren't doing that in those days. Not only was it increasing in volume, but it maintained the quality that I wanted, which was my first priority.

Hendrie: Right.

Newquist: So the Honeywell acquisition, well, my five year term is almost up and now it's a big company. I was offered the total manufacturing job for Honeywell division.

Hendrie: For the Computer Control division?

Newquist: Computer Control division, and I turned it down, because it just wasn't what I wanted to do at that time. I wanted a little more challenge and something more of a startup.

Hendrie: Yeah, where there were more problems to clear things, just to grow it.

Newquist: Well, yeah, and create with a new technology, not being tied with Honeywell's theory, what their process control division needed, rather than moving forward. And at the time, at Computer Control, in the basement we had an integrated circuit lab being developed.

Hendrie: Exactly.

Newquist: By Colin Knight. I had witnessed GE's tries at trying to do that. They weren't very successful. Colin Knight was very successful.

Hendrie: The basic three transistor cell dynamic RAM came out of that operation.

Newquist: You bet, you bet.

Hendrie: And Intel decided they'd go build it for us, and it turned into the 1103, which was the first really successful.

Newquist: It was.

Hendrie: And the memory cell. Yeah, so there was a lot of innovative stuff.

Newquist: Very innovative, you know, and we had transitioned from building mission simulator computers for the Apollo program, to being now a commercial computer operation, and looking at quality and volume.

Hendrie: Yeah, when you look at volume, then quality follows right behind--

Newquist: Well, no, it's--

Hendrie: No, better lead it.

Newquist: Well, quality leads it, yeah. If it's not good quality, don't bother shipping it, because if we can't ship it, you won't make your costs, so it's that priority. So I was pretty well established on that. So one day, I got a call from a friend of mine who worked at Digital Equipment. His name was Alan Klutchman.

Hendrie: Oh yes, of course. I know Alan.

Newquist: And Alan had worked at 3C before he went to Digital Equipment. I knew him at 3C.

Hendrie: Right, yes.

Newquist: He said, "There's a new startup company taking place and they'd like to talk to you." It was brand new. I said okay. Now I was looking at the next five year stint. Maybe the last of--

Hendrie: What's the next five year plan?

Newquist: Well, yeah, because, you know, if you've got three chances, most people don't start it before they're 30, and most people won't start it after they're 45, so this would have been probably my last good shot at it. I was just 35 years old. So I said, "Okay, I'll meet them." I went to the Framingham Motor Inn after hours, walked into the lounge. Sitting in a corner booth, very dark area, were three engineers I'd

never heard of. Ed de Castro, Henry Burkhardt and Dick Sogge. They said, "We're from DEC. We just formed a new company in April." This was in May. And they said, "We're looking for a manufacturing guy." I said, "Okay, I'm a manufacturing guy, and I'm looking for an opportunity." We went from the Framingham Motor Inn to a beauty parlor in Hudson that night, shortly, 20 miles, walked in, and there on a table was the Nova computer, prototype.

Hendrie: Yeah, wow.

Newquist: That's what I said. Wow. I'd never seen anything like it. When we were at 3C, I was on part of a product planning team that worked with marketing. We were thinking about doing something with more medium scale integration things, especially from Fairchild, but didn't want to impact the existing lines and Honeywell wasn't interested really in it all. But I was, and I looked at it, and it was a beauty. Not only was I impressed with its design, but I knew it was a game winner. And I knew I could produce the hell out of it. But I didn't know these guys. They were all younger than I was by-- Burkhardt was 12 years younger. He was 24 and I was 36. I didn't know of de Castro's role in the PDP-8, or Sogge at all. I knew he'd done memory work. So they said, "Well, we'd like you to join us," after a discussion, and I said no. They said, "Why not?" I said, "Well, I've got a stock option with Honeywell that vests in September, and you don't really need a manufacturing guy right now, based on where you are, just having this prototype and planning to announce it in December, later on in the year. You don't really need me. Save your money. So I want to finish my role at 3C, and if you're still interested, come back." So they said okay. So I did some research and I found out two things. One was, the leader of their new company, and the manufacturing guy, and a guy named Pat Greene, at Digital Equipment who was de Castro's boss, had put together their business plan and at the last minute, he and his wife decided it was too risky, and he decided to bow out of it, after he raised the initial funding. The initial funding was \$800,000, \$400,000 up front, \$400,000 after they got a manufacturing operation underway, and got some orders.

Hendrie: Okay. Yes.

Newquist: So he was going to be the president and the manufacturing guy, and they went out without him. Second thing I found out was, the major investor was George Cogar. George Cogar I knew of from work, a long time previously, when he had set up Mohawk Data Sciences. He and I had worked together in Utica, just down the street from each other. We didn't really know each other, but our experiences were in the same place.

Hendrie: Okay, really?

Newquist: Yes.

Hendrie: Okay, I didn't realize that.

Newquist: So they contacted me in September and said, "Are you ready to talk about joining us? We still haven't hired a guy." I said, "I want to talk to George Cogar." They said, "Okay, well, you also ought to talk to Fred Adler," who was the Wall Street lawyer who had also participated in funding. So one day,

on an early morning, I flew out of Logan with the three of them. We went down to Adler's office at Reavis and McGrath in Manhattan, talked to him. He didn't know a damn thing about manufacturing. This was his first venture capital operation. He'd put in a few bucks, but most of his friends in Wall Street had put in the rest of the bucks. But he was anxious to get a manufacturing guy on board right away. So we had a nice, cordial discussion, and I think he listened to my background and said okay. So we hopped on a plane and flew to Herkimer, New York in the afternoon. There I met George Cogar. George was in his home on about 20 acres of land, or 80 acres I guess, a private airstrip. He had retired from you guys' operation. His wife answered. He and I ate lunch and the other three guys went into town. George and I talked for almost three hours. I wanted to know what he really thought of this design and this product, and what he wanted to know was, did I have the management experience that those guys did not, and would it be an asset to the company? At the end of that conversation, he offered me the job of manufacturing director and founders' stock, one of the largest blocks of founders' stock. I went home, flew back to Boston, talked to my wife. She said, "How long's this going to take?" I said, "It's going to be another one of those five year deals, but this time, it's going to be on full time. I'm going to be away a bit. It's going to take a lot of personal time from the family." She said, "Well, if you want to try this, let's do it, but you know, five years from now--" by that time we had six children, the youngest was four-- she said, "I'm going to need you be on scene to help raise this family. I said, "You got it. That's what I want to do. So I'm going to take this job. I won't take it for more than five years, win or lose. If it wins, I'm out of there. If it's a success, I'm out of there. If it loses, I'm out of there, and we'll go do something else." At the same time, Alan Klutchman told Ken Olsen at DEC he was going to leave and join Data General. Olsen was upset, obviously, that the guys had broken away.

Hendrie: Yes, of course.

Newquist: But he told Klutchman, "You're crazy. These guys left without their leader and their manufacturing guy, and it'll never succeed." Alan knew of my experience at 3C, where we had worked together. Even though Olsen offered him a bunch of stock, which DEC didn't do in those days, to stay. Alan left. He came and ran an outstanding--

Hendrie: Oh, he was amazing.

Newquist: -- advertising, PR and marketing plan.

Hendrie: He was an amazing person.

Newquist: Herb Richman from Fairchild joined the company in June. Alan joined it with me in October.

Hendrie: Okay. I didn't know that.

Newquist: We hit the deck running.

Hendrie: Yeah.

Q: Would this be a good opportunity to get you a glass of water, just take a quick--?

Newquist: No, I'm fine thank you.

Q: Okay, what about you? Would you like one?

Hendrie: I'm fine, thank you.

Q: Just wanted to make sure.

Newquist: So I walked into the beauty parlor, sat down, and wrote a ten page manufacturing plan, outlining the next fiscal year. Actually developed a fiscal calendar ending in September. They didn't agree with that at all. Didn't figure out it was necessary. That's what I'd used at GE and 3C. It was to match the government funding programs.

Hendrie: Okay, yeah.

Newquist: And they'd never change that, all the rest of their existence in 30 years. I mapped out the first year's shipments and capital equipment and facility expansions and everything else. They were busy doing what they did. Henry was sitting in a closet on a teletypewriter, in touch with the Princeton University computer, doing the software at the same time those guys were finishing the logic design and the mechanical design.

Hendrie: Yeah, right. Wow. Okay.

Newquist: So I also ran personnel and field service at that time. We interviewed--

Hendrie: They didn't really have any managers who could do that sort of thing.

Newquist: Well, they didn't, but beyond that, they didn't have an understanding of the management concepts that I did, which were very disciplined, the GE discipline structure management principles. DEC's was more loose and part of why de Castro had left is he and Olsen had clashed over that, and it was very obvious that our styles of management were entirely different. But I'll tell you frankly, Gardner, I was attracted by the computer, not the people. We lived with the management differences. It worked very well, because we ended up having a split personality in the company. I could put together a very rigid, well-oiled manufacturing juggernaut, and they would hire individuals in their development and R&D and let them run on their own. Just hire super smart guys and try and get a new model out as fast as they could. I developed a technique that nobody had ever seen in the industry before. Most engineering programs, when they've got a product, will go from preliminary release to final release, after a prototype. I changed that from partial to full release. I would work with the engineers, and we'd start building the bill of materials on the things they had most confidence in right away. I'd work with them and start ordering those complements and getting those ready for production, and hold off on the other stuff until they were finished with the real challenging aspects of their design. We put together a pilot run that would make ten

or 20 units. Half of them would stay in the house, the other half would ship. Engineering changes all over the place, but I was with them all the way. So Sogge and I developed that relationship. While I was controlling the documentation and the quality of the releases, he was helping with the vertical integration. So we were sharing risks. He helped bring in a printed circuit facility. He helped bring in a semiconductor facility, helped bring in a core facility. Dick and I were very close.

Hendrie: Okay. Really? Okay. I never got to know Dick.

Newquist: Very few people did. He was a very confined person.

Hendrie: And he left relatively soon after I got there, and I of course, had known you--

Newquist: Well, no, that's exactly right.

Hendrie: from 3C.

Newquist: That's correct.

Hendrie: But anyway.

Newquist: Before we got you to join us, we were actually putting together quite an operation, and setting manufacturing records that the computer industry hadn't seen before. We could bring a prototype into production faster than anybody. We could turn inventories better than DEC or IBM. For example, DEC would turn their inventories three times a year, which meant they had four months' worth of inventory. We turned ours ten times a year. Very seldom would we have more than a month's worth of inventory. The reason is, I dealt with our vendors who were memory stringers in Hong Kong, and everybody else, integrated circuit packages, as just an extension of our product line. So I wouldn't order 1,000 more than we needed to get a low cost. I would give them 30 days' notice on a change and mix, which from our standpoint, we had 1200 hardware options and 600 software options. Mix was changing all the time. So we could turn the inventories and get the materials in faster and out, a kind of a just in time delivery, which they now call it, but we worked it pretty well. And I brought a lot of guys with me from 3C. So we went from zero to 1 million, to 7 million, to 15 million, to 30 million, to 50 million. We were the fastest growing, most profitable computer company in the world, and it was, as advertised, the best small computer in the world.

Hendrie: Yes. A basic machine. It was really clever.

Newquist: It really was.

Hendrie: We have stories from Woz who designed Apple I and the Apple II, that he had learned about the Nova, and he had a picture of a Nova on his office wall, because he'd gotten a hold of logic diagrams, and realized how incredibly clever a machine it was in terms of what it could do, within a very few number of parts.

Newquist: Well, not only that, he would play around reversing engineering it, with the newest parts he could get his hands on, just to kind of see if he could redesign the Nova. It was his inspiration. He's been very vocal about that. There's no question that Nova inspired Apple, no question.

Hendrie: Absolutely, yeah. Well, one of the things that I had heard that you did in the early days, long before I got the data job, was that you wanted to really understand what all the different operations were. So you would go down and learn with the various women on the production line, and try to understand what they were doing. Is that a piece of folklore, or did you really do that?

Newquist: I did it. I was a walking around kind of manager. I mentioned that I brought several people with me from Computer Control, several of them who had management experience as well, but handling production, handling quality control, some handling materials, manufacturing, engineering, all the aspects of it. As they came on board, they hit the deck running, because they knew what my style was. So we didn't have a learning process to go through. So I would work with them and put their operations in place, and that included walking the lines. I hired many of the women, assembly people on the line, when I was in early years.

Hendrie: Yeah, when you were getting it started.

Newquist: I personally hired them. Exactly. One of the guys I brought on board was a guy named Larry Donovan who handled the production and Larry and his wife Bunny had 12 kids, and he knew how to handle the women assemblers on the line. So Larry was very good at it. So we were rolling along very well.

Hendrie: Who else did you bring on?

Newquist: John Kyle was in production. A guy named Ed Richards. Several of the supervisors of test engineering were guys I brought on. Dick Mank was a leading technician. A good crew.

Hendrie: Yeah, okay. So you took the--

Newquist: Well, I got called by Honeywell, saying, "Hey, you're stealing some of our people," and I said, "Give them better jobs. They want to join me."

Hendrie: Okay. All right.

Newquist: So we were tooling along very well, and Pat and I were getting close to the four year, four and a half year, mark. We went to vacation on Cape Cod and Truro. We took it for a week in '72 and extended to two weeks that we enjoyed it so much. I recently came up on a photo I took. I'm not much of a camera man, but I took a picture of her and our eight children. Two more of our children were born while I was at DG. As a matter of fact, talking about the children, we have a press release that Alan made at DG, that showed six of our kids working on teletypes at a time sharing machine for the Nova. One of those kids came down to this meeting with me today.

Hendrie: Really?

Newquist: Yes. His name is Eddie. So they knew what the Nova was all about. They knew that the dad they didn't see that often in the first three years or so. Now they're starting to see more of, because things were really starting to go. The financial gain from the stock options was becoming very evident. So it wasn't a question of walking away after five years to something that wasn't working. It was a question of walking away five years from something that had been a roaring success.

Hendrie: So you were saying you were down at the Cape.

Newquist: Took the picture, and there down behind the dunes of Truro was Pat with all eight kids. I looked at it, I said, "Now I recognize the contribution she made in this thing." I couldn't have done it without her, and now it was time to go back and spend more time with the family. That's exactly the main reason I left. There were others. The clashes in some management styles were some. Dick Sogge left two months before I did, and I was losing a good partner that had helped make that operation go in terms of the engineering. So I said, it's time for me to go, so I resigned, and retired. I was 40 years old. We moved to Phoenix, Arizona, and I just enjoyed 46 years of retirement.

Hendrie: Now your stock options, I think, were they five year vesting?

Newquist: Some were, yeah, most of them were, but I had founders' stock, which you could do a little bit sooner. But I also had qualified stock, which usually was a five year deal. But yeah, the five year timeframe was also influencing this.

Hendrie: It worked. It fitted in to your overall plan.

Newquist: Exactly. When I told you that given the SEC and the IRS, it's obviously a factor in stock options.

Hendrie: Yes, right. Now tell me about when you retired, you didn't stay in Massachusetts.

Newquist: No.

Hendrie: Tell me that story.

Newquist: Well, we were fortunate enough, we could choose where we wanted to live. Stay in Massachusetts. We chose four other places around the country. St. Petersburg, Florida, the Tampa/St. Petersburg area, Denver, San Francisco and Phoenix, because they all had some sort of development of computers, areas, being developed in those areas. But mainly, they had excellence that we wanted in education for our children. So the prep schools that we wanted the kids to go to. Phoenix started out dead last, finished first.

Hendrie: So you just investigated each one.

Newquist: Yeah, we did, for a period of time, and just moved to Phoenix. Didn't know anybody there at all.

Hendrie: So fundamentally, was the school system the most important factor?

Newquist: I think it was the most important, as it turned out, looking back on it now with all our eight having been through colleges and doing very well in their careers, it was a good choice for us. We were very pleased with the school system, especially the prep school systems.

Hendrie: Yeah, and they were all really young, so they had--

Newquist: And I did some consulting work. I got down there, and Motorola was the only big operation in Phoenix. Honeywell was there, but they were closing up their computer plant. I knew some of the guys who had gone down to the Honeywell plant when they were with GE, and it was a GE plant they were running. So I started to do consulting. I did actually two major consultings that are interesting. I consulted with firms that were startups, primarily in Asia, in Korea and Hong Kong and Singapore. I would travel to those locations once a quarter, in exchange for compensation from them to get them started in their manufacturing of computers. The other one, I got a call one day from Hadco Corporation. Hod Irvine was the head of Hadco. Hadco was our sole supplier of the big 15 inch circuit boards that are generally used. He was having manufacturing problems, big time.

Hendrie: Oh, really.

Newquist: He wanted me to come be on his board of directors, gave me significant stock, and I solved his manufacturing problems after three years, and we took the company public, and it was very successful.

Hendrie: That's very interesting.

Newquist: Yeah.

Hendrie: Okay. I happen to know Hod pretty well.

Newquist: He's very involved with the arts.

Hendrie: Yes, exactly.

Newquist: Haven't seen him in a long time, but he and I spent a lot of time together in the 1980 to '84.

Hendrie: That reminds me. Tell me the story of how you ended up with Hod Irvine, with Hadco, as the sole supplier of your big circuit boards.

Newquist: Actually, Sogge picked them. Sogge was a designer of the 15 inch circuit board, and they had a prototype shop in Massachusetts, Hadco. They were the only ones who could really make it happen.

Hendrie: So he gave the design to a bunch of-- to multiple people?

Newquist: Well, he needed a lot of hand holding. They were having a lot of problems making the board, but I was able to do that with them. Dick and I worked together with them. So they became-- they grew with us. It wasn't until we started to do the vertical integration and manufacture our own circuit boards that we let them go, because they were very key for the first three years, three and a half years, almost four.

Hendrie: They were the people who could make that _____--

Newquist: They were almost a sole supplier, of the big board.

Hendrie: == with the line width tolerance and so on.

Newquist: The line width tolerance was double plated through everything, something that could be gone over our way, but not die and it was pretty good.

Hendrie: All right. That's very cool. Tell me a little bit about some of the issues-- talk a little bit more about the management style issues with the DEC educated founders.

Newquist: It's never good to disparage the dead. Several of the individuals are deceased.

Hendrie: Certainly.

Newquist: Just suffice it to say, we had very significant management differences. Not early on, because we'd only meet in a hallway and say, "What's going on?" We never had-- in all the years I was at Data General, we never had one board of director-- we had a board of directors' meeting, but we never had one management meeting. The five of us never got together and sat around a table and met and talked about the future.

Hendrie: Really?

Newquist: We'd go to the local fast food joint, and talk about how much money each one needs, and say, "Okay, let's get it done," but it was always on the fly. They were doing their thing. I was doing my thing. So what really made us very good in the beginning tore us apart towards the end. Big disputes on style, philosophies, how to treat people. So I told you the main reasons I left were my five year window and the family, and that is true. But it was also impacted by the fact it was time to go, because we were just having too many arguments. One of them was the direction that now we should take after five years. I thought we should take the direction towards the smaller computer, because we had the best small

computer in the world, and the semiconductor guys were starting to head our way with smaller stuff. They agreed, so I told them, the best guy you can hire is Gardner Hendrie, and bring him in and design the microchip.

Hendrie: Okay.

Newquist: To head towards the small computer. They said they didn't really know you that well, but I knew you very well.

Hendrie: Yeah.

Newquist: And so, as you mentioned, we hired you, and about six months before I left, that unfortunately, we didn't get a chance to spend a lot of time on that project.

Hendrie: Right.

Newquist: The other direction, obviously, was go for a bigger machine, and DEC was starting to get their act together on their 16 bit units and starting to go 32 bits. Burkhardt and de Castro wanted to go for the 32 bit machine and compete against IBM. I didn't have a strong feeling in that direction at all, one way or the other, or really towards the small computer, one way or the other. If I'd had one, it wouldn't have changed my decision.

Hendrie: I understand.

Newquist: I was still ready to leave. So last time I saw you, you were over a drawing board in a cubicle, designing the Micro Nova. I followed it, and we had just done 50 million in sales. We had almost 50 million in cash in the bank. We could have gone after either market we wanted to. We left the door wide open for the smaller computer guys to jump in, which they did within two years.

Hendrie: Exactly.

Newquist: And I followed the larger computer activities, but you know, the book "the Soul of a New Machine" told me, it was exactly what I expected would happen. It was not as much a definitive strategy as it was a competition to go get something against DEC. Part of the reasoning that everybody had was, Ken Olsen had said publicly, "I can't see any reason why anybody would ever want a computer in their home." And de Castro, Burkhardt agreed with him.

Hendrie: Yeah, exactly.

Newquist: About 25 years later, they regretted that, said, "We missed the mark."

Hendrie: They did.

Newquist: Yeah, they did.

Hendrie: They absolutely did, and Ken Olsen, yeah. Ken Olsen totally missed the mark too.

Newquist: Yeah.

Hendrie: DEC went down, trying to build a machine to compete with IBM mainframes. It's really sort of sad.

Newquist: And they both went out of business at almost the same time, within a year.

Hendrie: Yeah, exactly.

Newquist: I think both of them-- both de Castro and Olsen have said that they missed that call. But it was easy to miss it. From my viewpoint, one of the weaknesses that we had to making the smaller computer call wasn't because we didn't have the resources, the design, the manufacturing to do it. Didn't have the marketing will, we didn't have the marketing will. Richmond was a good salesman, but he was a salesman in the OEM market. He didn't understand that small computer market.

Hendrie: Yes, right. His background came from selling semiconductors.

Newquist: Exactly.

Hendrie: Which is the OEM, which is fundamentally--

Newquist: Yeah, he was good. He was very good at it.

Hendrie: Yeah, you're right.

Newquist: So that's the answer to your management conflicts that took place. It wasn't a big huge thing, but we've never spoke to each other since. To this day, they've never mentioned to me that Pat Greene was the leader and manufacturing guy, that he and his wife decided it wasn't worth the risk to go.

Hendrie: Okay. I knew that Pat Greene was originally part of the team, and then he bowed out, but I had never heard that they-- it was sort of, that there was a family decision part.

Newquist: It was.

Hendrie: A piece of it.

Newquist: Yeah, it certainly was. They left when he was in Japan, but it was partly a family decision, I think. After they left, he gave their business plan to Olsen. He showed it to them, and he actually had

some stock in DG. He had a little share of stock. So that's how I became knowledgeable of his continuing relationship with them.

Hendrie: Yeah, but he just-- yeah, too risky.

Newquist: Yeah. So it turns out that family matters made decisions for both somebody who didn't want to join them when he thought he could, and somebody who left when I thought I could. Our oldest was just starting high school when we left, and you don't know whether you have enough money to live on and educate all those children, but you know, it worked.

Hendrie: Well, you have a good guess, because you started out-- I mean, you got a reasonable nest egg when you left.

Newquist: I did. Yeah, I certainly did.

Hendrie: Well managed, that can go a long, long, long, long way.

Newquist: Yes, yes. Well, 1973, when I left, was the largest recession in the United States since the Great Depression, so it came out at a time when the economy wasn't looking all that great, but we have gone through ups and downs and that sort of thing.

Hendrie: After you left, did you-- just a little curious. Not sure whether it needs to be-- you know, the Computer Museum is interested, but did you manage your own money, or did you find some individuals or firms to do that for you?

Newquist: I managed my own. I had a good broker, obviously, a good lawyer, and other advisers, but no, I managed my portfolio myself.

Hendrie: I would have sort of suspected that.

Newquist: Yeah.

Hendrie: Okay, good. Tell me what advice you would give to kids who've found that they like science, they like engineering. Their minds work that way, and maybe they have a little bit of-- maybe they do, maybe they don't have any sort of entrepreneurial rumblings in their heads. What would your advice be in terms of a career direction, or principles that maybe they ought to use to figure out how to have a successful life.

Newquist: That's a tough one, Gardner. I think it varies with every child. I think looking at our eight children, each has been motivated in their directions, their career directions, for different reasons. My responsibility and my wife's responsibility is to make those open for them, so they could make the decisions, give them a foundation with a good education. For those who were thinking of going into a technical field, I would give them the same advice I describe for you. Stay in the mainstream. Don't get

too far off the path. Give yourself an opportunity to look at five year segments. After a certain period of time where you've gained experience, and if you think that you can make a contribution by forming your own company, or joining a company with other qualified people who you respect, then do it. Take the risk. The risk is worth your reward, and the reward is worth the risk.

Hendrie: Yes, okay. Good. What areas haven't I covered that you'd like to may talk about a little bit?

Newquist: I'll just finish up with, how do you spend 45 years in retirement raising a family and just doing some consulting for a period of, like, ten years. I haven't done any consulting in 30 years now. But I did get a chance to give back to the community, which I think is very helpful. Not only to the family, but to the community. So I got involved with the university in Phoenix, advisory boards. I got involved with the banks, convincing them to loan money to technology startups, helped influence the decision to bring Intel into Phoenix. I got involved with the education facilities, obviously, the schools our kids went to. Got involved with hospitals. In 1987, just 31 years ago, I was asked to lead the group that brought Pope John Paul II to Phoenix on a visit. Spent two years of my life doing that, with the bishops of the Catholic church and Secret Service, and the community that I put together, people organized in Phoenix, 10,000 volunteers. Had a wonderful experience. That's something I look back on, saying I'm glad I had the opportunity to do that.

Hendrie: Yes.

Newquist: To meet with the Pope not only when he was in Phoenix, on several occasions, but he asked Pat and I to join him in Detroit on his way back to Rome.

Hendrie: Really?

Newquist: Had sat in a room like this and talked to him for a while. He's now a saint, and one of the things I had mentioned to Ron Gruner, who flew me up here today, was, if you've touched a saint, you may be a relic yourself. So shake hands with a relic.

Hendrie: I like that. I like that. All right. That's very good. So you never retired retired, not doing anything.

Newquist: True, that's true. With eight kids, it's never dull.

Hendrie: You're right.

Newquist: But yes, I had an opportunity to keep a hand in, which was one of the reasons we chose it. Yes, it was helpful to keep up with the technology. I actually had one of the first home computers in Arizona. I put it together with a MITS 8 bit machine.

Hendrie: You did?

Newquist: Hobby shop, yeah. Got some guys from Motorola who were on layoff at the time, and did the interior work. All I needed then was to get Basic into the machine. Went looking at how to do that with a marketing friend of mine, and talked to two guys in Sunnyvale, two software guys that said, "Yes, we can do it, but it'll cost you 25,000 bucks up front." When I was sitting on that decision, I wasn't sure I wanted to do that. This was 1976 or something like that. Couple of drop outs in neighboring states, in Albuquerque, where MITS was, convinced Gates and Allen to do Basic on their machine. It was exactly what I was looking for. And then as you mentioned, Wozniak and Jobs developed their situation up in California. So I said, okay. So I went out and bought one of theirs, and that was it.

Hendrie: Yeah. Didn't need to spend \$25,000, did you.

Newquist: No, you're right. Exactly.

Hendrie: Okay. Well, that's very cool. All right, I want to thank you so much, Harvey, for taking the opportunity to be willing to do this, and do an oral history for the Computer History Museum. It's been a delightful conversation.

Newquist: It's been delightful to meet you, and it's just wonderful to see you again after all these years.

Hendrie: Yeah.

END OF THE INTERVIEW