

RICHA VIRMANI: The following interview is conducted as part of the Georgia Institute of Technology, retroTECH Software Preservation Oral History Project. Today's date is February 28, 2019. The interview is taking place in the Archives classroom in the basement of the Crosland Tower Library. The interviewer is Richa Virmani, and the interviewee is Nils Newman. Nils Newman worked on the Technology Opportunities Analysis KnowBot, with Dr. Allen Porter. Um, so I'm going to start with background contextual questions and thank you so much for participating in this project. So where were you born and where did you grow up?

NILS NEWMAN: I was born in Chattanooga, Tennessee. I grew up in Tennessee and then, uh, graduated high school and, and applied to Georgia tech and was accepted and came down here.

VIRMANI: Um, please tell me about your education and or career experiences.

NEWMAN: Oh, it's a, we only have, how much time? So yeah. I went to Georgia tech B. M.E. [Bachelors in Mechanical Engineering] in class of '89. Uh, spent a couple of years as a mechanical engineer making bearings down in Peachtree city, Georgia. Came back to Georgia Tech and got a master's degree in Technology and Science policy. And that's when I first met Dr. Porter. And, um, spent a little time, and that's actually when the whole program kicked off, was after I'd finished my graduate studies. Um, my thesis committee chairman was, uh, Dr. David Roessner over in what would become the School of Public Policy. Public Policy didn't exist at that time. Uh, spent a little time working with, uh, David Roessner at SRI up in Washington D.C. And in the policy unit, uh, doing research evaluation for groups like the National Science Foundation. At the same time also working with Alan on developing this piece of technology, setting up a company in 1995. I helped commercialize it and then, uh, working with um, another company, Search Technology, which actually had the, uh, had the software engineers that did the development. And uh, the rest is kinda history.

VIRMANI: And then what are your interests and/or hobbies and have they been reflected in your [career]?

NEWMAN: It was interesting in that I was originally supposed to be a mechanical engineer. But I had always thought I was born at the right time to be involved in the very early days of, of the personal computer. I mean, I was playing with PCs back in high school when they first came out. And, uh, at Georgia Tech, I helped pay my way through school, uh, working in the Modern Languages lab, where they handed me 35 broken PCs that they had gotten from the State of Georgia and I had to repair them and to get 15 functional ones. And then, uh, so I got pretty handy in both hardware and software. And so although it wasn't what I was supposed to do, I kinda gravitated toward it. And so, um, it was, uh, an interesting sideline and it was the right place, right place and right time in history to get involved in something like this and the data mining aspect of it, uh, that would eventually become VantagePoint. Uh, that was something that Dr. Porter was very, very early to. I mean, he, he and his colleagues thought about this kind of stuff before even anybody ever really considered what it would do. Um, I'd spent a little time when I was a graduate student working for IBM, and I was talking with one of the IBM executives about this and he basically looked at me and said, you're about 20 years ahead of your time. Good luck with that. And he meant that very seriously in that you're going to have a hard time finding a commercial market because no one would understand what you do. And so I

basically enjoy what I do. So it's kind of my job and my hobby. Um, but in general I've got a, a, a company to run and, and, and two kids and two dogs. And that generally keeps me busy.

VIRMANI: And then please describe a significant person or event that influenced who you are today.

NEWMAN: Well, I was working with Dr. Porter, man. He was on my original, uh, thesis committee for my master's degree. And I was studying, um, let's see, original track in life after being a mechanical engineer. I was supposed to go into, I studied under, uh, original committee chairman was Dan Papp who went onto head Kennesaw and I was studying Soviet foreign policy and then the Soviet Union went away. And uh, I was originally hoping to work for some place like the State Department, but working with Dr. Porter. I originally worked with him on, on high technology industrial competitiveness indicators, which was work being done for the National Science Foundation. And that project had been going on since '86, and I continued to work on that part time all the way to 2007 was the last cycle. It was meeting Dr. Porter and, and, and, and having the opportunity to work on a variety of projects. And, and basically, working with a professor here at Tech who was very willing to present graduate students and researchers with an opportunity to do things that they'd never done before and to try new things. And that's basically, you know, the main driver of the direction my career is, is, is set of faculty at Georgia Tech who, who really allowed me to go through and explore things. I wouldn't have even thought about doing.

VIRMANI: Um, and then what specific programs, units, or research initiatives at Tech, have you, did you participate in aside from KnowBot?

NEWMAN: Uh, well we did the, the high tech indicators project, which one, like I said, ran on for a long time. Uh, the KnowBot project, um, which I was involved with for a long time, but that was, and then there were some other things involving, um, I was, because I had already graduated from Tech and Tech was just setting up the MOT Program, the Management of Technology. Uh, it was an executive program out of this combination between the School of Industrial Systems Engineering and the School of Management. And I was basically, um, uh, asked to sit in on some of the projects. This was the first time Georgia Tech had ever done projects with companies. And so they, sent this team of graduate students in to do a class project for a company and they were really concerned about how they would go over. So they kind of stuck me in there and said, hey, can you sit in the program and, and, and, uh, work with these companies to make sure that, you know, it doesn't go too badly. And to be able to sit down and, and, and work with some companies on that was a, was a lot of fun and really enlightening in terms of the needs of industry. 'Cause one of the first things we did was, uh, what was, you know, now been acquired, but it was Wachovia at the time, looking going through their credit card processing division and, and doing data mining models for fraud detection. And so was, uh, uh, back in the early nineties, that was a very new thing to do. And so it was these kind of opportunities that Tech has provided over the years to do lots of interesting things. So, yeah.

VIRMANI: And then what was your role in these Georgia Tech programs? Well, I mean, I was the grunt, so I got to, I got to do a lot of, uh, interesting work and was asked to point at things and then also, um, allowed to, uh, um, take on as much responsibility as I could. Uh, when I

worked at SRI, um, one of the projects I worked on there was for the National Science Foundation, doing histories of science and technology programs. And one of the most fascinating programs we were involved with was basically writing history...

NEWMAN: Okay. [lights auto-shut-off in room]

VIRMANI: That might happen again.

NEWMAN: ...so the, the, the, uh, the history of the Internet. And got to interview people like a Vint Cerf and Bob Kahn. Bob Kahn had kind of thought it up, and Vint Cerf, uh, was to me an aha moment because I interviewed him when he was a, um, one of the senior research vice presidents at MCI. And I talked to him about, he was a guy who wrote TCP IP and I asked him about TCP IP and he said, well, uh, I was a graduate student. I was asked to do something. I did it. And I was waiting for the real programmers to actually show up and they never did. And so that opportunity and that realization that graduate students can play a huge role. And junior researchers can play a huge role in future technology advances just because they're asked to do it. And nobody else is going to do it.

VIRMANI: Yeah, that's true. Um, so what was the purpose or function of KnowBot?

NEWMAN: Well, uh, Alan Porter ran the Technology, Policy, and Assessment Center and this was founded co-founded between him and, uh, Dr Fred Rossini, who then spent after his time at tech, went on to, I believe, George Mason. And was a, uh, a vice provost up there. Um, the Technology, Policy, and Assessment Center's (TPAC) job was to do technology benchmarking and forecasting. And they had done a series of programs or projects for IBM where they did about 300, I believe, technology benchmarks. Basically, IBM would say, what's gonna happen in this space or what's going on in this space? And the TPAC team would write a little summary of what's going on in technology. That was started before I got involved with the program. But as a result of that exercise, uh, Alan looked at it and said, you know, there's gotta be ways to expedite the process of generating these things. So he, uh, basically commissioned the development of some early software to help facilitate the production of these things. And so that initial early code, um, was how I got introduced to the program. And that was, uh, that was a weekend, um, Dr. Porter was going to Brazil to give a presentation and he handed me a data file and there were 1200 records on a piece of technology I knew nothing about. He had basically done a query in I think three to four different databases on the Georgia Tech system. And he said, here's some, here's some data abstracts. These are bibliographic abstracts on research a, here's a piece of software. You go log in to the mainframe and here's how you get to it. Uh, go write a report on this technology and send it out by Monday. I'm going to Brazil. Have fun. And so I did that and I sent it off and got a very nice response back from, from the people who we were doing the work for. And I suddenly realized that, you know, this is a piece of technology that will help facilitate a researcher who has a little bit of understanding write about technology they know nothing about, and that's when we decided that this is something that needs to be pursued further. Kind of set a plan to move it forward from there.

VIRMANI: So when did the creation of this software initially begin?

NEWMAN: Uh, that you'd have to ask Dr. Porter. I think the initial commissioning was in the early nineties. Um, we'd have to look at his, the Statement of Invention was actually filed by Georgia Tech before I was, before I was working with Alan on that.

VIRMANI: When did your involvement with the project begin?

NEWMAN: In '93. I was a graduate student. Um, like I said, the stuff I was doing with Allen was something completely different. Yeah. But he first introduced it to me in '92-'93.

VIRMANI: Um, and then what was being developed in the industry at the time in terms of hearts and software?

NEWMAN: Nobody even thought about doing this. I mean the, there was a book, Dr. Porter and there's another, a couple of professors whose names escape me. Um, who were Georgia Tech professors who wrote a book called Information from The Information Revolution and Its Consequences, which was written in the early nineties. And basically, uh, these ISYE professors got together and realized that the advent of digitized information was going to have immensely profound effects on society. And people were just, hadn't even thought about the implication. This is pre-world wide web. This is not pre-Internet but pre-world wide web. Um, and that, you know, when I was an undergraduate at Tech, the Ei Compendex was, what, six, not six, about four bookshelves at Georgia Tech and big blue books. You go down, read the indexes. Uh, now it's just click your finger and you have access to it. Um, the big turning point was of course the web. But, um, early in that period, uh, researchers at Georgia Tech were looking at the fact that all this digitized information was now going to be available and what it could actually do for a lot of activities besides, you know, standard library functions.

VIRMANI: And then what hardware and software went into the building of the KnowBot?

NEWMAN: The original KnowBot was, I believe in Pascal. Um, you'd have to talk to Alan about the initial, what it was really written on. Um, basically whatever was available at the time and which was not much to be honest. I mean Tech's IT infrastructure in the early nineties was, was um, well in Mechanical Engineering we were building our own computers because we couldn't get any. Um, but uh, there were not a whole lot of things available at the time and the original one was on the Georgia Tech, essentially the mainframe. But then later on it was, it was moved to, uh, to, uh, off the mainframe, but that didn't, there was still a mainframe version all the way up to I think '96 is when, '96 or '97 is when we pulled the plug on that.

VIRMANI: And then what motivated you to get involved in the creation of the software?

NEWMAN: It was that weekend of writing. The writing the report is kind of this aha moment going, this is something very cool and very new and there's nothing else out in the world like it right now. The only thing comparable to that was a, uh, an IBM research team out of, uh, basically at the time in the late eighties, early nineties, there were about, being generous, it was a German team who did probably the very earliest work in the space in '86, uh, there was a Japanese team, um, and there was [Henri Deux?] At the University of [Marseilles?] and Henri Deux and Allen were, had worked together. Um, he was actually going to Brazil to work with

Henri Deux on a series of workshops. Um, when, when that whole thing kicked off. Henri Deux's graduate students, uh, ended up working for IBM and they created probably one of the very earliest versions of this stuff, but other than, um, and that was half a dozen CDs and we had a copy of it. One of our programmers sat with it for a week and couldn't figure out how to even get it turned on. So, um, it was a pretty rough copy. Yeah. Um, but it was very early days and to come across similar, come across this and realizing that this is for once an interesting opportunity and to be at a right, right place in history and to have lots of fun doing it. So, yeah.

VIRMANI: Um, were there other collaborators involved in this project aside from you and Dr. Porter?

NEWMAN: Oh, absolutely. Yeah, there was a whole, whole, whole host. Uh, Doug Porter, his son, who was, who's still working with us today was one of the original programmers, not a Tech person, Virginia, Virginia Tech, but, uh, um, and then a constant stream of graduate students and other researchers at Georgia Tech. And so there was always a cloud of researchers around this thing working on it in various points. Um, a lot of the graduate students who worked on it went on to become professors who we still engage with. [Lights in room auto-shut-off.] So, so yeah, there's, there's these, a Tech, uh, I mean, uh, Scott Cunningham, who's now at TU Delft in the Netherlands, um, major contributor in the early theoretical work. Uh, [not sure of name?] over in, uh, at VIT in China, um, was a graduate student working on this for a long time. And so there's been a whole host of, of of graduate students who went on to more interesting things. He's still engaged with us and that's one of the reasons why we have our, our, uh, our Global TechMining conference every year is to bring back all the people who've worked on the project and keep them engaged in the community.

VIRMANI: Um, can you tell me about the ownership status of the software? Who created it? Who owns it?

NEWMAN: Well, Georgia Tech, the Statement of Invention was filed by Dr. Porter. Um, and I, I haven't seen a copy of the original one, but I think he and maybe his son are listed on that. Um, so Georgia Tech owns the idea. In, in 1995, when we started to, um, get serious about commercializing this thing in terms of, at that point, uh, the Defense Advanced Research Projects Agency (DARPA) was interested in it. Um, then Georgia Tech licensed, um, the commercial development for the development and commercialization of the technology to Search Technology. And, um, that has continued to this day. Search Technology continues to pay royalties to Georgia Tech for, for the sale of the software. Uh, but the actual, once DARPA got involved, um, Georgia Tech's direct involvement became less and less over time, um, probably tailing off in the mid-2000s, mainly because Dr. Porter retired, as emeritus professor. And, uh, the team at a Search Technology really pivoted to focusing on this technology in 2002.

VIRMANI: And then you said this technology was also one of the kind, so there wasn't really much of a competitive environment...

NEWMAN: Not at the time. I mean, it was, it was, it was, that's both good and bad because you had to, I sat at a briefing one time with a, with a, we were talking about analyzing data out of one of the data aggregators, Dialog, feeding into the software and doing analysis for the Navy. And I

sat in this briefing and this, uh, this, uh, um, naval captain looks at me about halfway through and says, when you're saying Dialog, you don't mean conversation between two people, do you? So just the sheer understanding of these data sources being available, uh, was rare in the '90s. It was, it was the domain of only the librarian actually knew these information sources existed. And even when the web came along, I can remember going to customers in the, in the late '90s and finding out that their employees were forbidden from using the Internet. Because companies were still trying to sort out, you know, we don't want to have our employees have access to information, Lord knows, we don't want to have that. So it's, um, it's, it was interesting to see that tipping point, which actually came quite late in my book. It was only until the early 2000s that most organizations suddenly realized they actually needed to have access to data and do something with it. And they're only really getting traction now. I mean, it's, it's been in the last few years that things have really, really changed and turned the corner.

VIRMANI: Who was the software designed for and who would you say the prime customer is?

NEWMAN: The software was originally designed for these technology analysts who were working on these projects for Georgia Tech. It was designed to be an internal tool. Um, when DARPA got involved in 1995 and then when we started having, uh, military clients at the Office of Naval Research and within the Army Tank and Automotive Research Command, we started having a, making an end user environment. And these are technologists who have to make decisions about the state of technologies now and state of technologies in the future. And so it was, had to be individuals who weren't necessarily, who had expertise in the technology area. And some expertise in the data. And very little expertise in the software and how to do programming. So it was trying to make it user friendly and everything. So that's was why the, the software eventually navigated, wound up as a, as a desktop application in Windows. So, uh, just to make it easier for the end user.

VIRMANI: Yeah. So when was it officially introduced to users?

NEWMAN: Uh, it depends on who, what you mean by user. I just said with DARPA the, it was an internal thing at Georgia Tech. Yeah. And starting in '93. Um, had various guises, is there in terms of how it was launched and what it was at Georgia Tech mainframe thing. '95 rolls along, DARPA starts paying money for this thing and between '90 and '95 and 2000, production of actual end user software. Um, we had clients using beta versions as early as '98. Um, the official military version was released at like '98 as well. And then the commercial version was launched in 2000.

VIRMANI: And how would you say it was received by these different user groups?

NEWMAN: It varies. Um, people still struggle with the notion that they have to use information to make these decisions. We have had some incredible advocates in various places within the, there was a handful of the military guys who loved it and a handful of military guys who hated it. I mean, the, uh, the Office of Naval research over in the international field office over in London, um, some of those crew really, really liked it and some of the crews didn't like the fact that it reduced their opportunity to travel. Which was basically what it was replacing. We can go to a

conference in Malaga or we can sit down in front of a terminal and type in some queries and do some analysis. Sunny Malaga; sit in front of the computer. So.

VIRMANI: So um, how do you think the software could be used today and how has it inspired other software's creation since its own creation?

NEWMAN: Well, it's, it's, it's, there is now, um, when, uh, the biggest shift for me is, is when you had the conversion of all these data sources from paper to electronic and then you had with web the, the, they used to be back in the librarian days, if you wanted to do a query at Georgia Tech, you had to go get a librarian who knew how to run a VRS query. The Internet came along and by say 2000, starting '95, 2000, you started having these end user interfaces to information. And so a student can walk into a library and run their own query and get their own results out of these data aggregators at the time. So a company like Dialog and SDN were the primary data aggregators at the time, those data aggregators, they're under a lot of threat because the data producers are saying it's a lot easier for us to not pay you the money. Lose, lose the percentage of the sale and sell directly to the customer, putting an interface in front of those things. So the data producers all started producing their own access to their data. And then now in the last five years, most of the data producers are now putting the kind of analytics that we were designing back in '93 into the front end of their databases. So when you go into a, if you go out and query a patent database, for instance, you can get to see lots of here's a timeline, here's you know, list of the top assignees, here's a map of the world. So a lot of the things that we were talking about in '93 are now appearing as front end implements to online databases.

VIRMANI: Um, does the software still exist in its original form?

NEWMAN: Uh, no. No, we, we, um, the original main, yeah. The original one was in Pascal, so that's gone. Uh, TOAK KnowBot um, pretty much wound down as a project by the late nineties. Yeah.

VIRMANI: So how do you imagine the software might continue to evolve in the future?

NEWMAN: Well, the, the, um, the big shift for us of course, is AI. And we've, we've been doing [AI on the?] Search Technology side for several years now and it's the ability to, you've got this little graphic that I used to use in presentations. You say you have the, the, the amount of digitized information available and some of it's structured, some of it's semi-structured and some of it's unstructured. A lot of the structured stuff is increasing because our ability to automatically structure stuff is increasing. Um, our speed at which we can read is not increasing. It hasn't increased for about a hundred years. And so you have this massive increase in information, this inability of humans to digest it. And so what replaces reading is basically what we're all about. And that was one of the premises of the original information revolution's consequences is something's got to replace reading.

NEWMAN: And so this, we went through this period where, you know, visualizations, replaced readings. So instead of reading something, you're going to see these pretty graphs and they're going to tell you what to do. Yeah. We find very few managers willing to make decisions off of the visualization. They want to know what's underneath the hood. Um, I think the, the

visualization, we've been spending years on the visualization stuff on our side as well. Although most of that visualization technology is being borrowed from other spaces. That's going to be supplanted. I think that's a phase. In the end it's going to be an answer. And so can we use AI to produce an answer? You type in a question. AI looks at it says based on everything that I know as a system, the answer is this. And so instead of reading, here's, cause I remember when I was a graduate student here at Tech, we had to do our obligatory bibliographic search. Yeah. And at the time it was a printed binder. And so this library, I'd tell the librarian what I'm doing, which is high technology industrial competitiveness indicators. I get back about 600 printed pages in a binder of which not to besmirch the librarian, maybe 2% was valuable to me. 'Cause it's awful hard to sit down in one 30 minute conversation, explain what it is that we're trying to do and what's relevant, what's not relevant. Um, we're in that same kind of situation today except we're just doing it all electronically. Instead of handing you 600 or thousand or 10,000 printed things, we're giving you a few visualizations, which may or may not be useful. Eventually the AI is going to get to the point where it can answer the question. And so that's kind of the future for us as in the AI space.

VIRMANI: That's really cool. So we're nearing the conclusion of the interview, but how did the creation of the software affect your personal growth overall?

NEWMAN: Oh, it's just been, I mean, I could have been sitting in a manufacturing plant in Peachtree City, Georgia, making bearings for machines for my entire life. Um, this has been far more interesting and far more fun. When people ask me about, you know, do you have a job? I say, not really. I'm avoiding a real job and I'm having way too much fun and I enjoy what I do and I enjoy the people that I meet. I've been able to travel around the world and talk to fascinating people about interesting stuff on a wide variety of topics and all centered around this notion about how we access, utilize and make decisions with information. Yeah. And frankly, it's just been a lot of fun. Yeah. And I don't see my original track as a mechanical engineer making bearings that are put into automatic teller machines was gonna actually do the same kind of thing. So I've just been having a lot of fun.

VIRMANI: And then how would you describe the experience of working to create or discover a new piece of software?

NEWMAN: That was fun too. Although I'm not, I'm, programming-wise, I mean I uh, we talk ideas. Um, I'm not, I refuse to code anymore. My coding days were long, long ago. Um, I still have my original programs in punch card, so that's how far back I go. Um, so the actual software side of it, I mean, I haven't touched that in a very long time, but uh, as far as coming up with the ideas about how we utilize and how, how best to present information, how best to digest or how much can a computer, how much can a piece of software, distill information down to a point where it makes it more usable for human. That's the bit that, that I get involved with. And thinking about a lot and that's, that's been the fun thing.

VIRMANI: And then kind of a broad question, but are there any further experiences you would like to share?



NEWMAN: Well, I mean, I, I think that, um, well I've got a lot of soapboxes I could stand on if I wanted to. Um, I was actually just up in, in, in a National Science Foundation, um, workshop last, last week, two weeks ago. And um, it was looking at how the NSF engages with, um, other countries in, in terms of collaboration and how do they find people to engage with, and I'm just talking with a colleague of mine who was at the Ohio State and it's this growing gulf that we see beginning develop between, uh, we have all these wonderful technologies and how we utilize and process and access information. Yeah. And then you have unfortunately, this huge portion of the world which is being frozen out of the process. Yeah. And so how do we actually prevent ourselves from this becoming, you know, the have, have not of information and where we're doing work with, uh, with WIPO at, looking at emerging patent offices. And trying to help them figure out how to get up to speed and not just get up to speed but actually leapfrog the process so they can effectively, um, utilize this information in policy decisions on a national level and actually get to the point where governments start effectively using information to make decisions. That to me is the most fun, when you start, 'ause then I put on my policy hat, from my Technology and Science Policy days, and start looking at, you know, how does information help, can be utilized to help make better decisions and what needs to be done to that information to get that in the hands of policy maker.

VIRMANI: Well thank you so much for participating in our Software Preservation Oral History Project and sharing your story with us. But yeah, if you have any other questions or would like to communicate with us, feel free to do so.