ERIC SCHMIDT PhD
ORAL HISTORY

COMPUTERWORLD HONORS FOUNDATION INTERNATIONAL ARCHIVES

Transcript of a Video History Interview with
Eric Schmidt
Chairman & CEO, Novell

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Interviewer:	Daniel S. Morrow (DSM) Executive Director, Computerworld Honors

DSM: It's Tuesday, January 18th, 2000. We're interviewing Dr. Eric Schmidt, Chairman of the Board and Chief Executive Officer of Novell, Incorporated, at Novell's corporate boardroom, San Jose, California. Without objection, this interview will become part of the permanent research collection at the Smithsonian Institution's National Museum of American History. Portions of this interview may be embargoed for up to 25 years, and will be so indicated if necessary on the transcript and on the tape.

The program is made possible by the Computer World Smithsonian program, a partnership comprising of the Smithsonian's National Museum of American History, International Data Group and Computer World, and the 100 chairmen and CEOs who are members of the awards program chairmen's committee, of which Dr. Schmidt is one.

DSM: Without objection, I'd like to begin at the beginning.

ES: Well, thank you very much for being here and taking the time, and let's proceed.

DSM: Let's proceed. If you would, state your name for the record and tell us when and where you were born.

ES: It's Eric Schmidt, and I was born in 1955, I'm told, in Washington, D.C.

DSM: And tell us about your family.

ES: My father, who is no longer with us, was an international economist, and my mother is a homemaker. She's still alive and lives in Washington.

DSM: Washington must have been an interesting place to grow up. How long did you live there?

ES: We lived in Washington, and I also lived for two years in Italy. My father taught at Johns Hopkins in Bologna, Italy so I had the life of an Italian boy, which is lots of fun. Then we came back and my family relocated to Blacksburg, Virginia, where my father was the chairman of the Department of Economics. The university is called Virginia Tech, and he built the economics presence there. So I grew up surrounded by very, very smart economists who debated everything all the time.

DSM: Blacksburg is at the southern end of the valley of Virginia. What years were you in Blacksburg?

ES: On and off, from 1965 to 1970.

DSM: So do you consider Blacksburg, Virginia, home?

ES: Actually, I think California is now, but probably Arlington, and Fairfax County, and Virginia would be my home.

DSM: When you were growing up were there family members, relatives, who really made a difference in your early life?

ES: Well, because I lived in an academic setting, because it's a small town and so forth, I think that was probably the formative part of it. And growing up in rural Virginia for I think four years makes you really appreciate urban America. Of course now Blacksburg is as of today, the most connected small city in America and perhaps the world. So it's a very different place from 25 or 30 years ago.

DSM: And when you were a young man, who were your heroes? I read in an interview that you consider Robert Oppenheimer one of your heroes now--but what about when you were a little kid?

ES: I don't really remember. I think that like all other boys I was fascinated by the space program, which was very hot at the time. And I think that for many of us who were sort of nerds in training, that was the thing that got everybody going. So my guess is the astronauts.

DSM: Are there any stories that your parents tell, or that you mom tells about you that were indicative of what you were going to become as an adult when you were a child?

ES: Well, I was always very industrious. So they were always impressed by how quickly I would try to disassemble and reassemble new things. When I was a teenager, the school rented a time-sharing terminal, which at the time was an ASR-33 teletype from a service called Dialcom. That was my first experience with computing. This would be in 1970. And as a result my father, who was very interested in helping me do things, for which I am grateful, rented me my own terminal at home. So I then managed to work for them for no fee, and I rewrote all their software.

DSM: This was when you were 15 years old?

ES: Yes, and I still somewhere have all the punched tape, which is how we did it. So I have a real appreciation of what 15 and 16 -year-old boys can do with all their infinite spare time, and lots of extra energy.

DSM: So were your first school experiences in Italy, or in the US?

ES: Actually in Northern Virginia until I was in the second grade, and then third and fourth grade in Italy. I went to an Italian school, so I spoke fluent Italian to my mother. Ten came back to the United States an unfortunately, I've lost most of my Italian language, although I've always retained an appreciation for the Italian sense of humor.

DSM: Were there teachers, early teachers in grammar school that you remember particularly early on?

ES: You know, it's really too bad I don't remember that much. I had a good time. I had a science teacher in sixth grade, who was one of these gifted science teachers, and this was again during the space program and so forth. So perhaps that was the invitation.

But I think I ad a perfectly normal growing up until I got started using computers. And if you're a teenager, with all the insecurities of being a teenager, being drawn to computing, especially when it was so early, was a way of both defining who I was and also avoiding all the other conflict that was going on at the time. Remember, this was during the Vietnam War.

DSM: So you were a senior in high school at about the height of Vietnam?

ES: Right after the peak. In fact, I was draft number 125 in a year when they drafted the first 90. And let me tell you, your political views are shaped very clearly by a government that is going to take you to a war that is illegal and kill you. And I think most of my political views have been driven from that experience.

DSM: You chose to go to Princeton for your undergraduate degree. What led you to Princeton?

ES: I actually had become interested in architecture. It's a long story, but I had decided to skip a grade, so I went from sophomore to senior. And in the course of all that, I had become interested in architecture, because I had built a lot of furniture, which is one of my other hobbies. So I applied as an architect, and both MIT and Princeton have strong architecture programs.

During my senior year, I figured out I would actually be a terrible architect but a pretty good engineer. So based on that I did the research, and the problem with MIT was that it had this tremendous technical program, but it was not in my perception a very broadly educated populace. Then when I visited the people, they seemed so locked in their specific scientific discipline.

I was interested in a broader perception so I went to a university, which was primarily a liberal arts school, with an attached engineering program. Once I got there as a freshman, I ended up spending my entire four years basically adjacent to the computer center. But some of the liberal arts stuff got in me, for which I am very thankful.

DSM: So skipping a year, you entered Princeton '71, '72?

ES: 1972.

DSM: So the year of Watergate. What was it like at Princeton?

ES: The problem at Princeton at the time was that there were the people like myself, and then there were the, they were called preppies at the time. Preppies were very well to do, very educated people, who wore topsiders. I of course felt that it was important to rebel against this, so I vowed that I would never wear topsiders. I would never be a business person. I would never be successful, and I would have my long hair and all that kind of stuff, and I would continue to rebel. And when you see my collection of topsiders today, you'll see my integrity on that.

But the '70s for many people were very defining, because there was an us-versus-them culture. And all of us who thought we were bigger and better than the rest of the folks in the world, the arrogance of youth really drove us to push very hard, and I think in many ways it was a good thing.

DSM: Your mentioning of us-against-them is going to move me out of my chronology a little. I read when you talk about the Internet, about the new face of networking. Did this--is that one of the things you find so appealing about the Internet.

ES: Well, let's put it this way. One of the most wonderful things about the world is that conventional wisdom is often wrong, and I have always delighted in showing people that there is a new or better way to accomplish something.

This is not unique to me. If you look at our political system, people love discovering the hypocrisy of political leaders, that whatever they said wasn't really true. There's a nature of humanity and the way we organize our systems, where they become sclerotic, they become unchanging, and that in fact they resist change even if it's in their best interests. And this theme permeates the computer industry, the PC industry, and the workstation industry. I was of course part of the Sun revolution, involving UNIX and open systems. That was really a reaction to the incredibly bad decisions being made in the mainframe industry.

All of us wanted personal freedom to compute--individual empowerment. The technology at the time enabled it, but we couldn't get through the computer center managers and the data managers, and many of us had grown up with this sort of small-mindedness of the people. So there were many, many people who felt, literally, the oppression of the bureaucracy. That's how it was perceived, and we felt we knew better. It is that notion of empowerment that drove the PC industry, which up until then was a new concept, this notion of owning a computer.

I still remember when I was at Princeton; there was a big debate about the benefit of time-sharing terminals, versus keyboards, keypunches, and it was concluded that the beauty of the keypunch was that once you bought one you didn't need to worry about its utilization, whereas in a sense the terminal was connected to a computer; you had to worry about it. And of course these are decisions that are made, these viewpoints we now understand were influenced by belief that technology was governed by the principles of physical scarcity as opposed to the abundance now of the digital world.

So all of us felt that the digital world, and the abundance that was going to be created, would do that. If you now come to your point about the Internet, the Internet is simply another example where we are learning that the underlying economics--and now you hear my economic views--favor abundance, right? They favor infinite capacity.

And up until this generation of technology in the last 10 or 20 years, there had not been something which touched humanity that had this principle of abundance, except maybe the hot air of people talking.

DSM: I think this is the first interview I've really heard anyone draw that connection between the sort of cultural preparation inherent in that whole time and place and that academic environment.

So you moved from Princeton, which is also famous for its very conservative theological seminary, to wild and woolly Berkeley on the West Coast. Tell me about that decision.

ES: It's important to know that Princeton was in transition at the time. Princeton today is not anything like the stereotypes that people have. And one of the major reasons that universities changed had to do with the politics of Vietnam, and all the student protests and so forth. Universities became much more open, much more liberal, much more meritocratic. Also, women were brought in to the universities. It just became more open, and less historically aligned with the power bases. That's true in America today pretty broadly, and that's a great achievement.

So I left Princeton. Princeton was a place that still was relatively isolated, but was a meritocracy. Today by the way, Princeton is incredibly interconnected, and you would have a very different undergraduate experience today than you would have 20 years ago. That's important to note that it changed with the times, which was great. At the time I was at Princeton, the big debate was that all these women were screwing it up for the guys, and that's the kind of conservative mindset, which I abhorred.

Berkeley had the benefit that it really was a place where people could do what they thought that they could change the world, but of course it also had the disorganization of chaos. Berkeley turned out to be my choice, because I wanted to move to California because of the weather, which is always the best way to make career decisions. Unfortunately, I went to the wrong place. I went to Northern California, as opposed to Southern California. But, you know, you make these mistakes as a young person.

The other reason was Berkeley had a super computer science program. I had been hired at Bell Labs. It's a complicated story, but my adviser at Princeton was a consultant at Bell Labs. Bell Labs invented UNIX. UNIX, for the last 25 years has become the defining operating system for building new things, because it was distributed for free and so forth and so on.

It really helped define a whole generation of computer science. So I was fortunate to be in early on that. What happened then was that by going to Berkeley I was in fact continuing that tradition. Because Berkeley had done a version of UNIX called BSD UNIX. That version of UNIX became the defining version of the Internet.

A lot of people wonder where did the Internet come from? Vince and Bob wrote the original memo….

DSM: Vince Cerf and Bob Kahn?

ES: Bob Kahn, in 1973, I believe, '72, '73. The team at Berkeley led by Bill Joy wrote the code that would take UNIX and put it on what was at the time called the ARPANET. That code became the defining implementation of the Internet around the world for maybe 15 years. That was an amazing accomplishment for a small team, and I think is primarily to Bill Joy's credit.

At the same time, through a set of connections, I was brought in as a junior researcher. I was initially summer student and later researcher at Xerox Park. And Xerox Park, which was the Palo Alto research center, was where all of the ideas of modern computing were invented, with the exception of the Internet. For example, the graphical user interface, the use of the mouse, the personal computer itself, the local area network, the graphics programs, the word-processing programs--what today are popular applications like Microsoft Office and Windows--are fundamentally clones of what was done at Xerox Park with products like the Alto. And by the way, the Smithsonian has these things in its museums, so I know that you all value them.

So I was fortunate to be a junior member, to work with the people who had invented those things. I was able to go between the two worlds, the UNIX and Internet world, or ARPANET world at the time, and then the Xerox world.

DSM: You and Bill Joy overlapped at Berkeley?

ES: Bill and I worked together, and have worked together ever since. He was one year ahead of me. He and I, and a number of other students formed the core of this group that I was referring to. There was a fellow named Eric Allman for example, who wrote SendMail, which is the application that does e-mail all the time. Bill of course went on to found Sun, and I followed him to go to Sun.

DSM: Sorry we don't have more time to go into this in depth. I wanted to talk to you about Bell Labs. Was Douglas Engelbert still there?

ES: Engelbert was actually at SRI, Stanford Research Institute. He had done his seminal work maybe five or ten years earlier, and his ideas were very influential in the work that the people at Xerox Park did.

The Bell Labs group actually came out of a different group. The Bell Labs folks were influenced by an operating system called MULTEX, which had been designed at MIT essentially. UNIX was simply MulTEx, but not plural. So if you go back to the original design of UNIX, it was influenced by work done in the 1960's at MIT.
So you had the MIT group, which went to Bell Labs, and then you had this group from Xerox, which had come, believe it or not, largely out of Berkeley in the 1960's.

DSM: That was an exciting time.

ES: Very interesting time. What is amazing about that period compared to today, the year 2000, is that in the late '60s, early '70s, you had companies where the companies couldn't get capital and went out of business. And the researchers, the smart people, went into academia or research, because they were literally bankrupted.

The same age group 25 years later, are half- billionaires at the age of 28. So in 25 years, the relative value of their contribution has gone from essentially none to essentially infinite, which I think is a wonderful thing.

DSM: Some have described this as a greatest creation of wealth in all of human history. When you were working at Berkeley at Bell Labs and at Xerox Park, did you have any idea that what has happened with the Internet was even vaguely possible?

ES: No, and in fact I think anybody who tells you that they did is lying, because we spent a lot of time talking about the impact we could have. We were happy if we could just displace one mainframe, because that was sort of the older architecture. So we defined our success by how our model would be adopted as the successor model.

Even in the 1980's at Sun, the job was to build mini-computers, but we built replacements for mini-computers. They just weren't called mini-computers. They were called workstations and servers. But for 10 years, the way you expressed Sun was, there is a mini-computer industry, and Sun is offering an alternative to the same customer. It was not until the web happened, which is roughly December 1993, before people saw the benefit of interconnectedness that the Internet represents.

Now my attitude about this is that this is a complete failure on the part of myself and my buddies because we had been working with this technology for 20 years. There was nothing we did not know about TCP/IP protocol, the FTP protocol, the power of computers. Many of us had spent a lot of time working on the early part of the ARPANET, the earliest parts of the Internet. And yet here is Tim Berners-Lee, who is a random guy we don't even know, who invents this thing. How could this possibly be? Well, of course it shows you how brilliant Tim really was.

To this day, I do not know why the teams of which I was a part, and I'll hold myself responsible here, didn't see this five or ten years earlier. I think it took a real visionary to see it, even though in hindsight you go "It's such an obvious idea." We had this technology in the '80s but somehow we couldn't see it, and he did, and changed the world.

DSM: That's one of the questions I wanted to be sure to ask you before I let you go is about the nature of innovation and creativity. There must be a thousand theories on where it comes from. Is it one brilliant guy? Is it a team working in an area in which the problem-solving structure breaks down? Where do you think innovation comes from?

ES: Well, of course it's both. In my experience in technology, it's always the same. You have one or two people who are made to feel unimportant. Whatever the conventional wisdom is, is not true for them, and rather than just take it, they rebel. They come up with a new set of ideas. They say, "I know a new way to do something" and they build it. And they have the intellectual capacity and the energy to not just build it, but to also popularize it; that's the important thing. It's not just the fact that it's built in a lab, but also that there's some kind of vehicle for adoption. That then creates the wave. So what I always like to think about it is who is the person who is going to get it started? Then how do I get the wave started once the thing is there?

I can give you some examples. The Microsoft product Windows was built by one fellow, Scott MacGregor. He left the company shortly thereafter. UNIX was built by two people, Ken Thompson and Dennis Ritchie. Java was built by essentially two or three people, James Gosling, Bill Joy, and maybe one or two others.

If you look at the history, every one of these initiatives has had an incredibly small team that then created the next revolution. The web, Tim Berners-Lee did it himself. With respect to browsing and Mosaic, which really defined the use of the Internet, is Marc Andreesen, Eric Bina, and two or three other people, out of a university no less at the age of 20. Now, again, why didn't the rest of us think about this? Well, we were too busy with conventional thinking. It's always the same. It's always a little group, on an edge that somehow gets it right. And there's a couple of things they do; one, they really do get it right, they're at the right time, and two, they have a clever vehicle. They give it away, or they get a big endorsement. In almost all cases, there was some component of both luck and skill with respect to adoption. If you look in the scientific community, in most cases I think there are similar answers. You look at the work of others. You come up with your own idea, and then you have to popularize it. You have to get people to think about it.

DSM: In your work here at Novell, one of the things I've read that you've done that is quite different is giving those kinds of people an important role in making sure the idea moves from idea to product.

ES: One of the changes that has occurred, if we go back to sort of my experience with the industry, which starts when I was 15, the notion of capital formation, idea formation, and company formation has changed radically.

The example I used of my friends from Berkeley who were older than I, who were bankrupted because their companies didn't work, and who today, if they were 25 years younger, would be half-billionaires. That is the defining story of capitalizing intellectual value for the last 25 years. I remember in the ' 70s when I was studying to be an engineer that there were articles that said that we would have too many engineers, we'd have too many technical people in our country when, indeed as we know, there's a huge shortage today. And if I look backward, the thing that changed was that the venture industry and various other kinds of incubators began to realize that you could take these weird corner-case type people that I was describing, and you could accelerate the process of change by creating a separate company and fund them.

So we now find ourselves in a situation where everything is turned over. It used to be that you had to work in an extremely large company in order to get the intellectual freedom to sit on the edge to do something new, and every once in awhile you would hope that some senior executive would recognize the brilliance of your idea so you didn't get fired, and then eventually you could change the world.

DSM: Is that how Bell Labs worked?

ES: That's how Bell and Xerox and IBM worked. Now we have the inverse. Now the problem is that there are all these edge cases, these people who are in their own little spaces, and what they do is they get capitalized, and they can actually go public, even without very much of a business. So now all of a sudden their transition to wild and crazy person, to being captains of industry with at least high valuations has occurred very, very quickly. This changes the whole dynamic, the whole dynamic of how the cycle works. So we have to figure out a way with what we call a pipeline to get these ideas into the company, or through the company, so the people don't quit to do their own startups.

So we're fighting against the inverse, and in our case what we've done is we've created a group, which is an incubator. The rule is very simple, you go in this, and you come out in 12 months, and please come out with something interesting. We hope that that cycle will continue to generate new ideas. That, plus acquisitions of small technology companies, seem to be the way it's done now.

DSM: I was going to ask you, where do you look for talent? Do you buy it?

ES: Well, now, wherever you can find it. The problem with the technical industry is that engineers are not fungible, and the difference between the best engineer and the worst engineer is not a factor of two; it's a factor of 20,000. So you have to find people, and they're often very young. They often don't even appreciate how talented they are. I was just in a meeting with a fellow, who I think may be one of the top two or three technical people in the company. He doesn't even know he's that good, and he says, "Well, it just seems like what we're doing is so obvious," and he described a brilliant idea as far as I'm concerned. And I said, "Well, if it's so obvious to you, why hasn't anyone else in the industry built it?" And he goes, "I don't know, good question."

DSM: How old is he?

ES: Oh, 25 maybe. But my point is, these are the kinds of people who I'm trying to find. You get them in multiple ways. Many of them show up in the company because of recruiting. You know if you hire 100 people, one of them will be brilliant. You just don't know which one of the 100, in which case you could just not hire that other 99. So you try to identify these people through various forms of recognition programs, and frankly, the best way to do it is to just ask, because if you find one, they know all the others.

DSM: I've been totally derailed from my chronology, which is great. So M.A., Ph.D. at Berkeley. You got your Ph.D. in--

ES: 1982.

DSM: 1982. So 1983, you were employee No. 92.

ES: No. 92 at Sun.

DSM: And were you recruited directly by Bill?

ES: Bill and I were closest friends. Bill went off to Sun. When Bill went to Sun, I told him it was a terrible idea, and that it wouldn't work at all. So, once again I am showing you how brilliance my guidance was.

So he goes off to Sun, and we're chatting, and he says he needs an engineering manager. And I said, "Well, I'd be a perfect engineering manager." And he said, "You don't have any engineering management experience" and I said, "That's why."

My wife had been hired by him to do the company's marketing. She was employee No. 44. So I already had a connection, and this was back when joining a startup was a very big career risk. No one did it. But I figured I was young, and I would give it a try, and Bill was really smart, smarter than anybody I knew, and I would just follow him. So the partnership that we put together was that he was the smart one, and I would do what he came up with. I appointed myself protector of my employees. My most significant contribution in the first two months, and I have two stories to give you a sense, maybe a few.

When I started I thought I had like nine people working for me, which is sort of my limit. When I showed up, I actually I had 12. Then one day that first week I'm wandering in the hall, and there is this woman, whose name was Laurie Duvall. I said, "Who are you?" She goes, "Well, I work for you." I say, "Well, who hired you?" Well, she was hired the day I showed up. I said, "Well, where do you work?" She said, "Well, I don't actually have a desk. I have just been moving from desk to desk." And I realized that the whole administrative system was just completely crazy.

So then people would complain to me about the computers. So I had a cabinet, which had all the boards that would work. Now, I have no hardware background at all, but I learned enough to know which boards worked in which combinations in the computers. So whenever an important project would need to get finished, I would go and put the boards that worked inside their computers. These were multibus boards. Multibus was a predecessor to the modern computer buses. Of course it was very experimental at the time, and one day Vaughn Pratt, who was on loan from Stanford, decided that we needed to make a slightly different backplane. So he and I together got a hacksaw and cut it in half. Only later did we discover that that really shorts out the entire backplane. It was a wild and crazy time. But somehow we managed to get our product shipping, and work on our customers, and grow a great company.

DSM: You mentioned that your wife was employee number 44, and you were number 92 at Sun. Were you married when you were in graduate school?

ES: Yes, I got married in graduate school.

DSM: Do you think that plays a role in being a successful graduate student?

ES: Well, it certainly made life a lot better. Because graduate school is different from undergraduate school, in the sense that graduate school is pretty harsh, and you don't have the social structure that you did as an undergraduate. So I think that's why a lot of graduate students get married, or live in weird communal situations, because it is just too weird otherwise.

DSM: Well, you were at Sun for 14 years, which in this industry is a long time to be at one company. What were you must proud of? You worked with Java.

ES: I think the thing I'm most proud of is all the people that I hired. My attitude in life is, I'm an organization builder. And given where we were and what we had to deal with, we built certainly one of the greatest collections of people.

There are a number of things I'm not proud of, where I think we had opportunities in front of us that were even larger than the ones that we pursued. So if I could do it over again I would take exactly the same people, but I would be more mature with respect to how we made business decisions and technology versus business tradeoffs.

But without the people in the high tech industry, you're nothing. And to this day, I am amazed at the strength of the underlying franchise that was created at Sun, and I'll take some credit for that, because we established an environment where the really smart people wanted to work. We are in the process of doing the same thing at Novell. It can be done anywhere you want if you become focused on it.

DSM: You were a very successful executive at Sun. Tell me about the decision to leave Sun and to come to this turn around at Novell?

ES: As a little history, I had been an initial engineering manager and had managed a set of divisions. I eventually managed one of the operating companies and then over the 14-year period, became Chief Technical Officer. So every 2-1/2 years or so, I got a new job. I had always spent some of my time running businesses or projects, and other times being an influencer, staff positions, evangelist, and so forth.

Between the time I worked at the company in the early 90s, I had largely been internally focused because we were very busy, hiring people, getting products out the door. Then sometime in the early 90s, I decided to become more externally focused, spend more time speaking publicly, try to develop those skills, communication skills, influencing skills, which I didn't think I had worked on very much.

In 1994 when I became Chief Technical Officer, I began working on a set of projects which led to the Java initiative, which is probably the biggest impact that I personally had, because it was both a computer language and a platform that has challenged, and we hope ultimately will beat, the Microsoft monopoly that exists today. Whenever you do those, there is a point at which where your primary contribution is done, and it is time to re-up or do something different.

I had been interested in the problems of networking and network services because it seemed to me that networking was the largest un-standardized area. In the chip area, in the operating system area, in the user-interface area, we largely knew who the winners were going to be. To me, those were sort of landlocked arguments. We know more or less what the shares would be.

Whereas this networking -- this was this immense revolution -- and this was even before the Internet and e-commerce revolution. It was clear that there was something big there. So I started working on that. But the Sun culture and focus was really on its core business, which makes sense. So when the Novell opportunity came along, I figured, here's the world's largest networking company and I'm pretty good at networking, and people like to work with me, and I enjoy that kind of stuff, and I'll go have a good time. Plus, you know, it seems like it's an okay business. They have a president; here are the results. I did my due diligence. I chatted with a few people. It seemed fine to me. And that was frankly the level of understanding. Remember, when you interview for a CEO job in a public company, you can't actually meet the company because it's material. So in fact there are limits to what you can do. Were I to do it over again, I can tell you the five questions to ask.

DSM: What are the five questions?

ES: These are things like "Tell me about your day sales outstanding. Tell me about the linearity in your quarter." All of these are questions about the business. Because when I came to the company, I discovered that things were not as they seem, because I was very sheltered, right? I had worked in a well-managed company. It didn't seem well managed when I was in it, but it turned out to be a very well managed company, and I assumed that other companies were managed in the same financially responsible and tight, focused way.

So I learned a lot about quickly turning a company around by taking the job. In hindsight, had I known what I was getting myself into, I would not have taken the job, which would have been a great mistake. So it's just as well that I had deceived myself.

DSM: So the great asset that you saw at Novell was share of desktop space?

ES: Market share, channel size, and technical talent, which are very much present in the company. What I didn't realize was that I had an incompetent and incoherent management structure. And a hard turn-around fundamentally is, you take the assets and you get rid of the liabilities; and I ended up doing a hard turn- around.

DSM: Is there a turning point at which you knew that you would pull this off? Or is it still a work in progress?

ES: In the first place, we've clearly turned. So we know we've pulled that part of it off-. It's not an issue any more. I started in April of 1997, and we had between April and August what we called million-dollar surprises, one a day, and they were always negative. So we got to the point where we would laugh about it and say, "What million-dollar disaster are we going to find today?" Sometimes they were worse. Sometimes they were hundred-million-dollar disasters. The low point was in August when we actually announced how bad the restructuring had been, what the costs to the shareholders were, and that also coincided with the low of the stock price.

At that point, frankly, my strategy was to get through this with my honor intact. In other words, I wasn't going to lie to anyone, and I wasn't going to make any commitments. I was going to do the best I could do. It really was a low point. I think it was clear we were going to do something interesting in November of that year when we went to the sales meeting, which had 1,000 people from around the world, and I stood in front of the sales force and gave a nice speech about all the new things we were doing. And the energy and the roar from the audience indicated to me that I had an asset, it was a human asset, that wanted to win, which indeed has driven our success since then.

DSM: So this was November of 1997.

ES: November 1997. So in our case, if you're looking historically at turn-arounds, we did it right. Turn-arounds are done by putting the patient in the intensive-care unit -- you administer shock treatment. You make everybody focus very much on the short term. You get the business model right. You become profitable. You serve your customers. We were through that within six to nine months, which is about as fast as it has been done, and I'm very proud of that.

We had the benefit that it's a softer business. So we did not have a lot of capital assets, and our inventory problems were largely accounting ones, in the sense that we didn't have a lot of physical inventory we had to go destroy or blow up or pollute the world with. So a turn-around in a network-based intellectual property industry is a lot easier I suspect than in a physical industry. And frankly since then the news has been almost continually good.

DSM: Again, we're approaching our deadline here. When you started working on the Internet, and were at Berkeley working on your degree, you talked about how anyone at that time who thought they could foresee the future had to be lying if they claim now that they did. So I'm going to ask you an impossible question. Where do you see this revolution, if you had to guess?

ES: Well, since I spend all my time thinking about the mistakes that I made, for things that I didn't foresee, so nowadays I'm a little wiser, so I begin to think about why I don't see it. When I was at Berkeley for example, I built the first network at Berkeley. And I'm very proud of that, but your respect for me will be much lower when you understand that I designed the protocol for that network, which I did myself by the way, to only allow 26 computers on the network--A through Z.

DSM: How could you possibly need more than 26?

ES: Well, we didn't. We only had four. And what is funny is that Berkeley ran that network until they had many, many thousands of computers. So it was my own little architectural failure, so I understand how easily done those mistakes are.

I think we know some things about society and people now that are sort of worth explaining, and my guess is that these will be true for the next hundred years as well. We know that people are social. We know that people like to form networks. We know that people are infinitely fascinated by brands and communities. And the promise of the Internet today is not so much the technology that I'm describing, but rather, the fact that it allows new forms of community, new forms of governance, new forms of communication, and new forms of information. And all of those will play out on top of the Internet.

If this vision is roughly correct, and I think it is, then the dominant uses of computing will be network and communication-centric, because it is ultimately driven by people, not by the manufacturing needs of a corporation or whatever. If you define it that way then the market is very, very large. Today there are a couple of hundred million people using computers on their desktops, or at home, personal computers. Today there are roughly one billion telephone lines in the world, and there are roughly six billion humans. So if you look at that, what does that work out to be, three percent penetration, in terms of the human need for computing and communication?

I'm not suggesting that this revolution will be personal computers. I think it's highly unlikely that it will. But it is clear that consumers are the customer, the humans are the customer. We haven't come up with an alternative to that, nor will we. Those consumers are highly audio-visual. They want to interact, they want to hear and see and talk and so forth. The devices and ways in which they have to use computing will have to be human-centered; human-centered in the sense of things which they can handle and operate and understand. And that the infrastructure, which I spend all my time working on, will be subservient to those human needs, which I think is the right answer. So if you think about what I do as simply building an infrastructure that enables the kind of computing and communication that's going to occur over the next 100 years, then you understand what drives us. And the reason that this building out of infrastructure is so important is that it is ultimately empowering of the human condition in its whole.

If you go back to our discussion about the 1960s and the 1970s and the rebellion of the PC people against the mainframe people and so forth, they all had the characteristic that they were empowering or freedom making. Another analogy would be the launch of commercial satellites, which enabled CNN. It's very difficult to be a dictator these days, because CNN ships video images, and then you get bombed.

DSM: Harder for the bad guys to hide.

ES: It's harder to be a bad guy. And that to me is a triumph, in addition to social organization, also of technology. And if I had worked on that, I would have been very proud of that.

I hope that the work I do, and the people I work with will have a similar effect in terms of improving the likelihood of people getting along better, exposing canards, and bad ideas, and asshole governance and those kinds of things.

It's important I think, that society understand that this technology, though neutral, if used properly could have an enormous impact on the state of the world of the many, many people who are not as fortunate as I am to live in a prosperous Western country.

DSM: Any concerns for the future?

ES: There are many, many potential negative implications of technology. There has been a lot of discussion in the last few years about the implication for the human genome, and the manipulation of genetics by computer analysis and things like that. These are issues which undoubtedly will get sorted out. There is a lot of concern there, but my sense is that it's likely to be sorted out by enough smart people that it's a containable problem, that we don't have a situation like the nuclear arms race, which came to the brink of war.

A bigger problem is the gap between the haves and the have-nots in a digital sense of have and have not. And you might think that that gap is correlated with income. I'm referring to the gap that is correlated by affinity. There are people who don't get it, don't want to use it, don't care about it, and there are others who love it.

When I was growing up, my father said that when he was a child getting a college degree was how you got ahead of everybody else. When I was a child, the way you got ahead of everyone else was you got a Ph.D., which is one of the reasons I got into the program, because those are all inculcated in you.

It is clear to me that the primary predictor of success in the years beginning with 2000 is going to be an ability to work with the new digital world in some form. In my world everyone assumes this, but it is still basically a new thing, and in many cases a foreign thing for many people. It is possible that the landed gentry of the digital age, basically people who I represent, will ultimately have a set of people who oppose them in a political sense. If you look at our history in America, there were a whole bunch of Luddite-kind of resistance movements to technology. And I always worry about that, because it can cause various bad political outcomes.

DSM: I would like to ask you one last question, which will help me do some of my work. One of the things that we've done that has been the most fun has been to gather from time to time the leaders of this revolution, a very small group of them, around Thomas Jefferson's table down at Monticello, and talk about this revolution around that revolutionary's table. If you could put together a group of six to eight folks from this revolution in that revolutionary's house, who would you like? Who should be there and talk about their goal?

ES: The people who understand this the best are often people who for one reason for another either won't join such a group. But in the proper setting Bill Gates is very effective in this area, as is Larry Ellison, but they won't be on the same table together. Bill Joy, of course, who I think has seen more of the world than anyone else ahead. I really do believe he is the Einstein of the Internet. And you have people like Paul Saffo, who is very clever, another example is Bob Metcalfe. One of the interesting comments is that it used to be a lot easier to be a pundit.

Five years ago, when I was sort of doing all my evangelism, I tried to do one keynote a day. And my objective was to talk to 100,000 people in one year about this new vision of computing. Today, if I look at the talks I gave back then, I'm very proud of them, but it is now conventional wisdom. But if you go back to my original model, which is conventional wisdom is often wrong, the problem is now seeing the next one, which I don't think we've agreed to. So one of my rules is that once you sort of have figured it all out, and you sort of know where everybody goes, something really wild is about to happen, and wouldn't it be nice if I could get ahead of it this time?

DSM: Well, promises made, promises kept, it's 4:30. I really appreciate your spending this time with us.

ES: Happy to do it.

DSM: My experience has been that whenever I do one of these interviews, I always--well, I have pages of questions that I wish I'd asked, and you may think of things that you wish we had talked about. And I would like to personally extend an invitation to renew this conversation at your leisure, if there is time and some topics you would like to talk about. I'd be delighted, and we'd be honored to have you talk on tape for the collection; you could update.

ES: And we have all the outcomes that you would have predicted?

DSM: Never in a million years. Never in a million years.

ES: And I think that that is indicative of how wild these changes really are. Who would have predicted? In the early nineties we were all convinced that Netscape would win; the AOL model was terrible. Who would have predicted that Netscape would ultimately be bought by AOL? Who would even further have predicted that they would merge with Time-Warner?

DSM: When you were talking about Marc Andreesen, do you remember the first time you used that technology?

ES: Andreesen should be on your list. He would never be in a room with Bill, but Marc is really that good.

DSM: Well, thank you so much.