

# RALPH SZYGENDA

## ORAL HISTORY

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### COMPUTERWORLD HONORS PROGRAM INTERNATIONAL ARCHIVES

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Transcript of a Video History Interview with  
Ralph Szygenda  
Group Vice President & Chief Information Officer,  
General Motors

Recipient of the 2005 EMC  
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Executive Director  
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DSM: Let's begin at the beginning. Tell me about your parents and where you grew up.

RS: I was born in Pennsylvania in a city named McKeesport. It was a steel mill town.

My mother was a homemaker for her entire life. She was very supportive. My father was an engineer. He did not receive a formal education in engineering but accomplished this on his own, which led him to be one of the chief engineers of Allegheny County, a county around Pittsburgh. He built a lot of the bridges and was involved in many different construction projects in that city. He did that back in the 1930s and 40s. So clearly I had engineering and technology wrapped around me for a long, long length of time. It was an exciting time to grow up.

DSM: Did you know your grandparents at all?

RS: On my father's side no. They had passed away already. On my mother's side I knew my grandmother for a short length of time. She had come from Hungary. My grandfather lived to be over 100 years old, and he was involved in the steel mills. He was from Hungary as well.

DSM: You have an older brother, tell us about him.

RS: Steve is my older brother. He is 10 years older than I am. He is kind of the academic of the family. He has been a faculty member, an entrepreneur and run companies.

He was always on my case when I was young. That's what happens when you have a brother 10 years older than you are. He would tell me, "You need to do better in school. You need to go to college." We have a tremendous friendship. We are very close, but he was a problem when I was a child because he was always pushing me to do other things.

DSM: Did you move around a lot when you were young?

RS: We stayed in the same area in Pennsylvania all through my high school years. I left after that.

DSM: What was it like growing up in McKeesport? This was during the 1950s. Describe the neighborhood sights and sounds.

RS: Clearly it was a great time to grow up. There were two things in life; you went to school and then you played baseball or football.

I guess back then I always had to be one of the leaders. I was the one who put the teams together and organized them. You never had enough children so you had to recruit the girls to play ball. In those days that was pretty hard because they didn't know how to play sports, but you had to even up the teams. So the girls in the neighborhood were forced to play ball. I don't think they enjoyed it entirely, but some of them are probably great athletes today. So I had a good life.

When I was 12 years old, my father had three heart attacks, and that was the end of his working life. Interestingly, I was with him when it happened while he was on a job. He was building the runways for the Allegheny airport.

Ironically about three or four weeks ago, I flew into Pittsburgh on a corporate jet. I came into the Allegheny County airport, whose runways he built. So it was a piece of interesting nostalgia.

DSM: So you were about in the 6<sup>th</sup> grade when your dad had his heart attacks?

RS: Right, so from that point on through graduating high school he never worked. They didn't give him a long time to live, although he did live to 80, which was basically another 20 years. But again, he never worked after his heart attacks. So during that time I was pushed to apply myself in academics because I had greater responsibility for the family. My brother had already left home.

DSM: He was in college, so it was just you and your dad and mother.

RS: Yes, so that's why I took on some of the responsibilities to keep things going.

DSM: I understand you went to St. Clair.

RS: Yes, it is a catholic grade school which I had to attend according to my parents. I'm not too sure if everybody, no matter what their religion, went to a similar institution like this.

I was disciplined pretty well by the nuns, but I enjoyed school. They kept you out of trouble as best they could and encouraged you throughout your education.

DSM: There is a Sister Alberta story I need you to tell.

RS: School was not of a great deal of interest to me. It was to my father and brother. My father, he's the type of individual that if you came home and you didn't get all As then you weren't that successful. So he was always pushing me. You knew that the day you got a B on your report card that you were in trouble.

I never really cared that much about school. It was more the other things going on outside of school, such as sports and things of that sort. So I didn't really apply myself a lot. And I had this little, wiry nun, Sister Alberta. She must have been in her 60s. Everybody must have had someone like this in their lives. In 6<sup>th</sup> grade I had basically convinced teachers that they shouldn't dedicate a lot of time to me because I wasn't going to go very far in life. Then they gave my class this test to gauge what level you are, which went from 4<sup>th</sup> grade all the way up through college. I think most of my scores were college level. So Sister Alberta got after me and it was an unmerciful day. She said, "You've been lying to us. You have not been applying yourself Ralph." She was about 5 foot 2 inches tall at best, but I was so scared at that point. She had me in the slower group, but at that point in time she moved me to the top of everything in the school. She said to me, "From this point on, if you ever, ever, don't apply yourself you will have to contend with me." I learned a lot from that point on. I was never going to meet with Sister Alberta again.

DSM: Why do you think you tested so well, was it because of you dad and brother?

RS: Probably.

DSM: Did you learn to read early in life?

RS: I don't think so. You have to realize that my mother still spoke Hungarian, so reading wasn't a big push at that time. My mother never went to high school. My father never went to college, but became a professional engineer and a very successful one. So books weren't being read to me as a child.

I'm not sure if it was intellect. I probably just observed a lot. I like to solve problems, and my whole life has been about solving problems. So maybe it started then.

DSM: Was your brother so much older that he wasn't a hard act to follow in school?

RS: He was a great act to follow because right out of high school he went into the Navy versus college. The assumption was he wouldn't amount to anything, but he was extremely bright. So he went into the Navy and went to a university while in the Navy. Then he went on for his masters and PhD at Northwestern University.

Yes he was very successful, and he was an academic, and what I was told was that I should follow in his footsteps. I think he would have loved it if I would have been a faculty member and a professor, but that was too restrictive for me. I was more corporate, not academic.

DSM: What were your favorite sports in school?

RS: Everything including baseball, football and basketball. If I were taller I would have been a great basketball player. Anyway, I got involved even though I couldn't do too much because of my father's condition. Being away from home wasn't easy then.

DSM: Your dad was having these heart attacks when you were really young. Did you immediately realize how serious that was and what a responsibility that would be for you?

RS: When I was born my dad was 48 years old, so he was older, maybe a little bit more of a grandfather figure. So at 12 years old you recognized that the world had changed. Before that it was fine and now it was serious. I think my life changed from frivolous to serious at that point in time as I had no choice but to apply myself.

DSM: Did you go to work, summer jobs and that type of thing?

RS: I was doing things like cutting grass, but nothing serious until high school. Again, I was the only child at home at that time. So there was a protective aspect of keeping me around the home versus having me go away.

DSM: I like to ask folks about their earliest experiences with technology. Was there a TV in your home?

RS: Oh yes, I was right there at the beginning of TV. There were only two stations when it started. Then they added ABC which was a major joy. So that was great.

My dad being a civil engineer was a totally precise individual. So if we built a small wall near our house it had to be perfect. We measured it 20 or 30 times, but I just wanted to get going so I could play baseball. He was always about precision, so technically you understood things very well and how to measure them. That was really where technology came into my life. I'm amazed that I'm not a civil engineer because when he was working I would go to work with him on certain days. So I got to see a lot of the construction business from that viewpoint.

Electronics, except for television, didn't become a part of my life until later when I got involved in telecommunications. That was of great interest to me, and then on to electrical engineering after that.

DSM: Any favorite family stories of what was to come? Does your brother have any stories about you?

RS: No. I'll let him tell those stories.

I was the one who really took care of things. So clearly from a technology standpoint, whether it was mowing the lawn, architecting gardens, I did a lot of things like that.

I never wanted to get into trouble because I had pretty rigid parents, and a rigid education. I remember dropping a gallon of milk shattering the bottle. I went and got an empty bottle, took a little bit of milk from another bottle and added water to try to stay out of trouble.

There are other stories, but let's leave it at that.

DSM: Your brother apparently took really good care of you.

RS: He did. It's amazing that he dedicated that much time to me, even when I went to college. When I went off to college he finally convinced me to move to the University of Missouri where he was a faculty member. I could go there and become an electrical engineer in computer sciences.

I thought that sounded okay and did that. While I was there, he effectively locked me in his basement to assure that I would apply myself. He would say, "You stay down there for so many hours and then we will send you some food." He really wanted me to concentrate and it worked because I got great grades. It's amazing that a brother, especially one that is 10 years older than you would do what he did. I think he felt responsible. We were always close. We played a lot of sports and fished together.

He was always a teacher. That was a problem. He was always an academic. So he was teaching you all the time, so I was forced into studying. Luckily I did as he asked because if I didn't, I would be off doing some uninteresting things.

DSM: I heard that when you started high school at Jefferson, he actually went in to see your teachers.

RS: I was in 8<sup>th</sup> grade at St. Clair and this was embarrassing. Here I am thinking I was doing pretty well in school, but my brother is already thinking about what I am going to do in college. Again, I'm in 8<sup>th</sup> grade and not even thinking of college. He came to talk to my teacher and asked about what I should be doing and talked about how I should be working harder. That's the last thing you want in 8<sup>th</sup> grade, is to have anybody talk to your teachers, especially if it's your brother. It's amazing that he did that at that point in time. So my teacher was on my case constantly after that and my brother was always going to make sure that somebody was watching me as I went through school.

DSM: I want to get you into college, but before I get you there, did you have friends or rivals that played a large role in your life?

RS: I had a lot of friends during that time. I'm not too sure I had time to have rivals or anything of that sort. I didn't concentrate on things too seriously at that point in time to have rivals where I was invading someone's territory, or them mine. I would say in my entire life I probably never had rivals, or if I did, I never noticed them. There were people that I didn't appreciate, but I never considered them to be rivals.

I had a tremendous amount of friends through high school and college, but I always moved on to new ones. I knew them for a certain length of time and then I moved on to another venture – the next thing. It's the same way I have dealt with the different companies where I have worked. Most people can't understand how someone can move on to the next environment; or how you create a new management team; or why you didn't take everybody that was on your team to the next organization. I just always went on to the next problem. These people were a part of my life, and I still know a number of them today, but I don't carry friends through life. I value them. Do I still know friends from out of the past, do I contact them? Friends from college yes, but high school, no. Once I left high school and the Pittsburgh area, I moved on to another new experience.

DSM: You went off to Rolla.

RS: Yes, the University of Missouri's engineering school in Rolla, Missouri.

DSM: This is in the Ozarks.

RS: Close and there's nothing there to do but study technology.

DSM: How did you get there?

RS: My brother went there and became a faculty member there. I assume he decided that I wasn't applying myself in school as much as I needed to so he got me to Rolla where he could watch out for me.

Before that I wanted to work in the aeronautical industry in mechanical engineering, but at that point in time companies like Boeing were laying employees off. It wasn't a good time, and there was electrical engineering and computer sciences being offered in school which I thought was pretty neat. That's when I got into electrical engineering and designing computers and started working on software. Those were the pretty early days back 35 to 40 years ago.

DSM: Your brother had been at Bell Labs?

RS: Oh yes, he worked in digital simulation. If you go back even further, those were really the early days, and at Bell Laboratories, that's where most of the switching systems were originated and designed. So he was in the electronics side early.

So I think again, he was pulling me in that direction. I'm not too sure if I would be an engineer if it weren't for that. I also came to enjoy English literature, drama and other non technical subjects. I also thought that I would have enjoyed being a doctor and to this day I think I would have been a good physician.

I have asked people over the years, "If you had a chance to do things over, what would you do?" For me it would have been medicine, which is filled with engineering, health care and subjects like chromosomes that were of interest to me." I was driven to engineering over time and more so to electrical engineering at that point and took a lot of courses. This is where I got the grounding in computing.

DSM: You mentioned English Lit, and there is a story about a Doctor Wise.

RS: You've got to realize that Rolla, Missouri is one of the ultimate engineering schools in the country. It's all engineering. You're in the middle of no place. I've had a lot to do with the University of Missouri to this day, but as I said, Rolla is not a big town like New York City. So while I was a student I went to the laboratories and was interested in English or Biology. Engineers just prayed to get through English Lit courses, writing courses, and you knew if you could get through with a C - life was good. Well Doctor Wise was my English Lit professor and he would give me extra credit to go to the movie theater and watch movies and write about them. That's when I realized there was more to education and life than just technology. I ended up with an A in his class and believe me engineers never got As in this class.

DSM: Is there a law against that?

RS: There is, there totally is, even to this day. So that's what makes me a little bit unique, and maybe not the greatest engineer or scientist because I do have other interests. This clearly paved the way for me and indicated that there are other things in life. I still have these interests today.

DSM: You were in college through the height of the Viet Nam war as well.

RS: Sure.

DSM: Describe going to college during that time. Was it coed?

RS: I was at the University of Kentucky for a while before I went to University of Missouri. My brother took me out of Kentucky which was very liberal at that time as ROTC buildings were being burned and there were demonstrations on campus. I remember Rolla, Missouri as a very conservative school and town where ROTC students protected the American flag from demonstrators.

So it was an interesting time filled with lots of debates outside of technology. Every day you wondered if people were surviving and what was happening in the rest of the world, and what were you going to do in the rest of your career, in your life? Moreover, you asked yourself if you were going to have a career and did it matter? That was the first time I believe that we realized there was a world beyond. So, it was a pretty intense time. I think Rolla, Missouri was a little bit more isolated, but not much because the engineering students knew what was going on and there was a desire to have them join the military. So it was probably not the best time to go to the university, but it's one time again you realize that you should apply yourself in an effort to be successful, because if you didn't, who knows what would happen to you.

But I did do a lot of soul searching about the world and how I might change things. It's amazing that I'm a conservative today.

DSM: Amazing. One of the questions I should have asked earlier, especially given your background going to Catholic schools, tell me about John Kennedy. He would have been elected about 1960 and then killed. Do you remember where you were and your feelings?

RS: Sure. I was in World Culture class in the 8<sup>th</sup> grade. No, I think it was the 10<sup>th</sup> grade. It was amazing because if you came from the part of the country where I did, you were clearly for Kennedy and were a Democrat. My father was in politics and things of that sort so I came from a very democratic family. He would not be happy with me today at all. At that point Kennedy was the savior and he was young. He was seen as a young president changing the world and one way was through the space program. So if you were in engineering or technology this was really important and would have a great impact on technology. The moon project was why I wanted to be in aeronautical engineering. It really changed a lot of people's minds that science was something neat. It wasn't just that boring subject. Clearly when Kennedy was assassinated it was devastating because it was the end of an era.

DSM: Civil Rights movement, Viet Nam.

RS: The period of Civil Rights was probably one of the most complex times in which to live, but coming out of it you tended to understand more of what you wanted to do. You did a lot of soul searching in those days.

DSM: Before we get to BA, you talked about some of the folks who really played a mentoring role in your life including your Dad, your brother and Sister Alberta. Were there others up until this time, teachers or educators that were significant?

RS: I think they were all important. I don't think they were any more significant than any of the others. I think they were all very good. I was very fortunate to have many good mentors and faculty members all the way through school, but again, the ones I've talked about pushed me in a particular direction.

DSM: In 1970 you got married. Can you talk about meeting your wife, and getting a degree, and then going to work for a legendary company? This was a critical year for you.

RS: I was going to school at the University of Kentucky studying aeronautical engineering. Then I transferred to the University of Missouri. My wife was at Stephens College in Missouri, a two-year finishing school at that time and her home was in Kentucky. Her father was a Commonwealth Attorney of Kentucky so it was natural that you would send your daughter to a good finishing school in Missouri in those days. She was dating one of my roommates and over time I got to be friends with her. She transferred to the University of Kentucky to finish her degree. Moreover, if your dad was a Commonwealth attorney in Kentucky, you definitely went to the University of Kentucky at some point in time. So she came to the University of Kentucky and was kind of a big sister, would get me dates and things like that. It was a typical friendship thing, and then you realize one day that this is your best friend and you should get married. We made sure while we were dating that we pushed my other roommate out of the way. We started dating by going out to a concert which was not a big thing, but over time that evolved. When I went to Missouri, she followed me there. She was extremely bright, had a journalism degree from the University of Kentucky and later became a writer. She was a reporter at the Rolla Daily News. Why she wasted time following me I have no idea but she did. And then later on we got married. This was just before I graduated from Rolla.

DSM: 35 years now.

RS: That's right, 35 years ago this year.

DSM: Congratulations. You never thought about an academic career?

RS: I think my brother probably did, but no I never did. Although the rest of my life I spent a lot of time wrapped around helping universities. Maybe I am a closet educator. I have been recruited to be a university faculty member, and been fortunate enough in some cases that people wanted me to be a Dean of a School. The difference was that I have been involved in working with business schools, but never wanted necessarily to be a faculty member. If I'm not doing something constantly I have great anxiety. I have to be constantly moving, and thought that the academic side was a little too slow.

DSM: So, tell me the story about going to Texas Instruments, a legendary company and your first job as a young engineer.

RS: I had already spent time in the Air Force, Air National Guard. I was active in the Air National Guard for 7 years. During this time I went to work for Texas Instruments.

DSM: Did you join the Guard while you were still in school?

RS: Right after I came out of school I did that. I went to Dallas to join the Texas Air National Guard. I went to basic training. Luckily enough I was fairly intelligent so they assumed that I ought to go into telecommunications. This helped me later on in my career. I then went on and was fortunate enough to get a job at Texas Instruments working on one of the world's largest computers if not the largest at that time, in designing it - the Advanced Scientific Computer. It was the first computer that permitted weather modeling within a 24-hour period. Before that your weather information was couple of days old. It also did seismic processing. It had two central processing units, and 8 peripheral processing units. For its time it was quite amazing, and it would fill up an entire building with its size. And we had to invent everything. Memory devices, tape devices, CPUs software were all invented from scratch. So where else would you want to learn the computing business at that point in time? I was lucky. When you look back, working in that environment was probably the luckiest thing that ever happened to me.

DSM: Did they find you? Did you find them?

RS: I think I sent out a number of letters. I was between school and the Air Force. I found the job through an acquaintance, Bill Beebee. Bill said "Come work here" I got involved in diagnostic testing. You have to realize, with this computer, the biggest issue in the development was keeping it up long enough to effectively run an application. So if an application ran for two hours it was hard to keep the computer up for those two hours. It took us a number of years to make it work. We spent a lot of time diagnosing what went wrong. That was a big challenge that I became very good at.

DSM: Describe this beast.

RS: It was amazing. You had processors that would fill up an 8 by 8 square foot room. You would have memory devices and tape units that were amazing. All the compilers, operating systems were written from scratch.

All the applications to do seismic processing had to be written because they were customized to this parallel processing environment. Clearly, circuit delays were based upon wired length therefore, they had to be cut correctly.

So today you sit there and say, hey what's so big a deal? Today is so easy compared to those days. And writing programs where you only had so much memory. There weren't unlimited resources, and so you learned how to do things in a compact manner.

DSM: I heard folks say that having to write code was a major valuable experience.

RS: You had to know how computers worked. So it wasn't just programming a language. You had to know how the computer was architected and how it worked. You would see multiple processors running calculations in parallel.

So it was a magical time. Inventing this was amazing. There were days that you never went home because you had to deliver this capability. In some instances the first time the applications successfully executed was the night before we sold it. If you are in the information technology business, who else has ever had that type of learning opportunity? And you had to do everything so you got involved in everything and people were totally dedicated to doing this.

DSM: You were 22 years old!

RS: I was.

DSM: When you first started this, were you at all afraid, or did you realize you really liked this and that it was where you belonged?

RS: Oh I loved it because you were on a mission. Delivering this for weather modeling, for other government applications and seismic processing where you are exploring for oil when for the first time you could see these formations, was all new - you couldn't do that before. So it was probably the greatest high that you could ever have. That is what drove you.

Then the question was how do you make it happen with information technology? This is what probably helped me even to this day in trying to solve corporate problems. Basically you ask the question, "How do you take and integrate all of this together to make it work?" Every piece was invented. It was all new. There were about 250 people working on this project. This was as great as putting a man on the moon and we clearly knew the importance of this. I'm sure I wasn't paid enough, but I didn't worry about that at all. I'm sure my wife did, but I sure didn't.

It was a mission. There were days that you just didn't come home. You had to send people home to shower and clean up, but we were on a mission.

DSM: It still remains as one of the greatest computing achievements.

RS: It is, and today the only difference is that you are trying to do it real time. And in those days, doing it in 8 hours was almost real time, where it used to take maybe months.

DSM: Your National Guard experienced helped. You also did some telecommunications work.

RS: Later on I was in the defense systems business. So now you are in a different world. You are in aircraft - you are in the missiles business including avionics, the F-15, F-4 at that time, and avionics computing. I got involved in the military computer business at Texas Instruments and its defense systems business was very large at that time.

So now I moved from one of the world's largest computers to military computers. Basically these were for radar systems, but also for detection systems and imagery interpretation systems. Now you're on the next part of the journey. This is, "Oh my God I'm lucky again." You are working on things with different applications. They are very important applications and if they don't work you know and see this very quickly. However now you are selling. The good thing is that I was always a salesman. On the Advanced Scientific Computer you were selling to people such as Shell Oil or the government. You are in the defense business and competing against other defense systems contractors. So as a technologist you had to sell and this taught you what was important. If you missed a sale of one of these systems during a quarter it had a great impact on the corporation. You realize quickly that you weren't just working on computers, you were running a business.

DSM: By 1978 you were running a department?

RS: Probably during that time sure.

DSM: By 1984 you were running a division.

RS: Probably.

DSM: And then as the Berlin Wall comes down and the Soviet Union collapses and you become CIO at Texas Instruments. Describe moving into that position.

RS: Well it was totally a technology company. So it's like anything else. Engineers knew everything that could be known and invented everything. At that point in time TI had its own information technology company. It had its defense systems company; semiconductor business; and metallurgy business.

I was in the defense systems area and took over all the technology and the computer aided design and computer aided engineering. Then I had responsibility for many of the engineering environments and like everything, I was complaining about the information systems of the company. All of a sudden the inevitable happened and someone of importance asked, "Well, why don't you take this over?" The prior CIO was John White and he had been CIO for 13 years at Texas Instruments. He was a great technologist. He was the President of the Information Technology business. I had reported to him and to the defense systems business management for a long length of time. This experience really broadened my perspective. Now I was also responsible for the semiconductor business and other IT businesses.

DSM: You were 30 years old, 30 or 31?

RS: Yes, something like that. Maybe older. I was pretty young and it was a pretty exciting time. I had been in this area of selling products and services. I took one segment of the information technology business called the Enterprise Systems business which I had responsibility for and was lucky enough to sell all kinds of services to companies like Johnson & Johnson, and the Canadian government and Ford. So I marketed manufacturing systems, order fulfillment systems, and purchasing procurement systems while carrying the title of CIO of Texas Instruments.

This was a period of reengineering. Companies had gone from the point of automating manual processes to the point where you had to change something that you were doing to run your business. Automation was done. That was the point in the progression in businesses where now you had to reengineer your business processes.

DSM: You worked with Michael Hammer then.

RS: Yes and as a matter of fact, I will be joining him in the next few months to help him lead a conference. I haven't seen Michael in many years. We created a reengineering methodology at TI. I'm not too sure whether Michael had his reengineering methodology then.

I don't know who came first, or whether he leveraged ours. I don't remember history at that point in time, but he was very involved in what was going on at Texas Instruments in reengineering. He would come and visit us to understand what was going on. Later on he started his reengineering business and wrote his book on reengineering. We learned a fair amount from him and I believe he learned a fair amount from us back then. So it was a pretty good exchange.

DSM: You were so busy doing business process reengineering, you probably didn't realize you were doing it. When did you know?

RS: We knew one thing - - Texas Instruments had slipped in its industry. The Japanese competitors were coming into the marketplace and semiconductor business. Companies like Intel and Motorola were considered strong players. TI debated a long time about microprocessors, and debated too long in my estimation. This is probably what gave Motorola and Intel openings in this business. But interestingly enough, even though we competed with Motorola, we sold them our order fulfillment system as part of the Enterprise Systems business.

We had to work on reengineering Texas Instruments. There was a need. The company was not where it needed to be and it was slipping in the rankings of semiconductor companies. The CEO knew that as well. Jerry Junkins, I believe was the CEO at that time. I had solved problems on Advanced Scientific Computer and in our military computer business, so when we were challenged, I was called in to help improve our processes. It was just a natural progression. The only difference now is that this was business processes, not just technology. I realized technology wasn't the issue anymore. We had automated things. If we didn't change the business, we weren't going to get the end result. Then once you change the business process you have to apply technology again.

At that point in time I dedicated a lot of time looking at business processes. Therefore I learned what order fulfillment was, and I learned what product development was, and financial processes and so forth. I had been involved in businesses and selling products and services, so I knew what sales and marketing was, and I had to go hire marketing executives and sales people. So it was a great opportunity.

Again, Texas Instruments let me do things that probably I couldn't have done any place else because it was a technology company, technology was the business. So I was able to put them together.

DSM: In your spare time you had a son and got your PhD?

RS: I have an honorary PhD from University of Missouri Rolla. I basically finished all my course work for my doctorate at the University of Texas, but didn't complete the degree. I did get a masters of science in electrical engineering and my undergraduate degree is in computer science from the University of Missouri Rolla.

I was working on my PhD at the University of Texas while I was working at TI managing two operations – one in Austin, Texas and one in Dallas. During this time I was also spending time in New York, traveling on Sunday night and coming back on Friday night.

My wife has never forgiven me. I never did graduate with a PhD and during this busy time started to question the value of graduating and actually finishing it. I had already moved to Dallas from Austin. So I wasn't in Austin any more. The only thing I didn't complete was my dissertation. Again, I arrived at the conclusion that it wasn't important at the time. Today, I think I probably made the right decision, but you know, you question it. As I mentioned, later on I got an honorary Ph.D. in engineering from the University of Missouri.

Shelby and I had our son. The first three years of his life I was on the road all the time. My wife to this day reminds me of that. He is 29 years old. I'm sure she will remind me of this for the rest of my life. So, if anything is wrong with him I'm sure it is because I wasn't there over those three years. But at that point in time I was dedicated to the business mission.

DSM: Texas Instruments was not only a legendary company, but we talked about some of the folks you worked with, John White and Jerry Junkins, George Heilmeier.

RS: George Heilmeier was amazing. We are friends to this day. George came into Texas Instruments as the Chief Technology Officer, Senior Vice President. George has a tremendous history. He invented the plasma display for computers. At RCA he was amazing. He was Systems Director of DARPA. He was CEO of Bell Core. He has done many things throughout his career, but during my time at TI we were just very close technologists.

DSM: How did you meet him?

RS: When he came in to TI I think I was in the Defense Systems business at that point, and that's the area he came from. I think he wasn't as much in the software end of the business in those earlier days, so I believe he always trusted what I said relative to what could be done with software. It was early days for software and remember that TI was the leader in home computers at that time. There was no significant competitor. There was no Dell. Michael Dell was just thinking about this at the University of Texas. So we were in the software business. We were talking about how to sell software, and the answer was, you can't sell software, because hardware was everything. So who would buy software? The hardware guys, designers didn't think it would sell. So we had a lot of discussions about software and defense systems products.

Then later, when I was CIO, and George the CTO, we got to know each other. I knew more about software and he was more of the physical sciences expert and we learned from each other. Clearly he was older than I was, and I realized that this guy was really bright. In every speech or presentation he gave he always talked about silver bullets such as what were the three technology things that would change the world. And I thought, wow, this guy really knows what he is talking about. And amazingly we've been linked for the rest of our careers. As I have moved to other companies we some way came back together. Even to this day at General Motors, George is the head of the science advisory board for the company.

DSM: Can you talk about some of the exciting things that are going on in technology now, things that fascinate you?

RS: Biotech is fascinating as it looks at the ability to understand humans and how they are constructed. Again, it is another engineering problem, which is like building a computer again because effectively the human body is a computer. Being able to understand what might happen to you, what type of diseases that you might be prone to have, and being able to address these kinds of things before they happen. I don't think that's far away – probably in the next ten years. And again computerization and compute capacity is now letting us do this. So basically you can search and find and determine trends which you couldn't ten years ago.

So I don't know whether that means we're all going to live to 150 or whatever, and that creates some problems in itself relative to health care. The cost of health care is so significant now. Just think if you could address those issues and prevent things from happening.

But you have to face up to what might be in the future for you, and that is going to be hard for people. But the advances are astonishing.

DSM: It is an exciting time.

RS: Another aspect of technology is globalization. The world is becoming so small. Working at a company like General Motors where there are no walls. There are no physical corporate walls. There are no doors on cars anymore. Information technology permeates every one of those things today. So what does it matter if you are sitting here or you are sitting in China? It doesn't make any difference. Today we run this business the same exact way throughout the world. We distribute products throughout the world. We design them any place throughout the world. Technology has made the world extremely small. Therefore it's changing the way companies do business, because again you don't do business regionally any more. You used to design a vehicle in a particular region, distributing that vehicle in that one particular region. Today you basically design it and build it in another part of the world and distribute it to hundreds of different countries in the world. So that's changed.

The other thing is that technology goes with you wherever you want it to go - it is ubiquitous. Information, digital information goes with you wherever you want it. Whether you are in the car, whether you are at home, whether you are lying on the beach, it doesn't make any difference. It's always there, and it's real time. So there is no delay. It is instantaneous. So it changes governments. Management's philosophy used to be, well you looked at it and you passed it on to your boss, and then the boss passed it on to another boss, and after about seven weeks it got to the CEO. Today everybody gets it at the same time. So you have to build trust because everybody is seeing it and you have to understand it. So you put all that technology together and the concept of nanotechnology and manufacturing and other things of that sort. My fear is that the future has so much more than what I have seen in the past, and I won't be part of it. That's the only fear because you thought you had seen or invented it all. You've seen men put on the moon. You've seen information technology and the Internet come to be. You are probably going to see biotechnology change humans and how they live and what they do, either for the better or the worse, and then you really think, we probably haven't touched it. We probably haven't addressed the beginning of technology, and you say wow. So I am giving a commencement speech at a university in May, and my comments will include what you are going to see in your lifetime will be amazing, and you get to be part of it and maybe not me.

DSM: Truly amazing. Now going back to your career at Texas Instruments, we talked a little about John White, but one of the things that I read was that you said that he taught you the basics of being a CIO. Talk about that, what he taught you about being a CIO, and what you think leadership in that field is all about.

RS: You realize that I was an information technologist. I wrote and invented software or designed aspects of computer systems my entire career. But I never applied information technology to solve business problems. Basically I solved other problems. I solved how you did weather modeling. I solved basically how you created guidance systems for missiles. But in business, how you do manufacturing and product development, I really didn't see that. I didn't see that you could apply information technology to change the way business gets done. I thought that it couldn't be that important because it wasn't that deep in technology.

When I worked for John White he had been a CIO for 13 years. Probably when he started I guarantee you he wasn't called a CIO, because back in those days he probably ran a computing center. John was applying information technology to automate business processes. In those days it was just automating, but I realized that you could take technology and automate aspects of business, in fact, aspects that information was the business. You could pass data around and it would help you run a company better, or would reduce your cycle time. I thought wow, this was amazing because you never thought about that, and most people don't. John basically addressed how you link information technology with business people - for example, how you should work with the CEO and the CFO.

Then all of a sudden you figured out this could change and you could now not only change products, you can change corporations and how they run. And I think John White opened my eyes. I didn't understand it before. I never had any interest. In fact I thought it was kind of boring. I assumed that you ran computing centers and you did some calculations in the back room, but I didn't realize you could change it. Now the one thing maybe I added to it was the reengineering aspect saying, hey, this is nice we automated it, but we're running out of benefit here because everyone else has automated it. Now we have a chance to change how we do things, and realize the steps of going from the beginning of a process to the end and looking at what happens was really novel in those days. You just didn't do that. This was how business had run for decades and all you did was automate it. In fact we automated things we shouldn't have automated because it was just an opportunity to make it faster.

DSM: So the very notion of redefining it...

RS: I think that was something I probably started to think through because our business wasn't doing as well at that time at Texas Instruments. We were slipping. So clearly we were soul searching, saying well maybe we don't run our business right or maybe we don't know how to market. We are an engineering company. It used to be sales - you waited for somebody to call and say I need semiconductors. Now you had to try to sell microprocessors to them, and go visit them. It was pretty novel.

DSM: You had been 21 years at Texas Instruments. You worked with guys who were legends in their fields.

RS: And many more.

DSM: And then you were recruited to go to Bell Atlantic. Tell that story. It must have been hard to leave Texas Instruments.

RS: It was a terrible thing to leave Texas Instruments. I was able to do anything I ever wanted to do in technology and business. I was given the opportunity and I had great respect for everyone who was there. But Bell Atlantic recruited me and it was driven by the business process reengineering knowledge that I had at TI. And Bell Atlantic had the typical issue back at the time which was - it was our parents' telephone company. Management realized it wasn't going to be that in the future, and it was the beginning of deregulation of the telecom business. So things were going to happen. There was potential that the local carriers could get into long distance and vice versa, and cable companies were cropping up, and entertainment was being considered. The leadership of Bell Atlantic knew they had to redo their business.

You realize that in the telephone business, all the technology architecture, switching systems, provisioning systems, billing systems, had all come from AT&T. So even when the baby Bells were separated from AT&T, they still used the technology. There was a company spun off, Bell Core, to support them, which was separate from AT&T, but the same systems were being used.

So with the telecommunications change and deregulation, Ray Smith who was the CEO of Bell Atlantic, and an extremely interesting individual, who was very innovative, and known for implementing things before their time, was looking for someone who could help look at the change and the processes. He wanted someone who could build technology inside the company without going to Bell Core, or relying on the legacy systems that were there.

His idea was to build the next generation information services, communication and entertainment company, which by the way, maybe slower than we would like, evolved to Verizon today. But that was his vision. It took seven months for me to make the decision to leave TI because why would I ever leave them? Why would I leave Texas Instruments and go up to the Washington DC, Virginia area? But, Ray was amazing. He was also a playwright. He had written books. He had done a number of other things. He was an actor. He was from Pittsburgh, Pennsylvania, where I grew up, and Ray used every aspect of that to convince me – “Why would you stay at Texas Instruments? The real movement is in telecommunications.” I think he was probably right, when you look back at it, because that was the beginning of the real time digital environment. The Internet came after. So, “Why wouldn’t you come now and be in the telecommunication industry?”

After a lot of pressure I thought “Why not? I’m still young.” I started to wonder, am I going to be here the rest of my life? So I said, “Why not?” I had a hard time convincing my wife, but we went. It was a phenomenal time but I was only there three years, but I got to build the new billing environment, provisioning system and sales services systems. Realize we were already testing video on demand to homes in the Virginia area, way before its time. We basically, if I remember, hired the inventor of Sesame Street to come work for us. We digitized movies that were transmitted over the network. Nobody else was even doing that at the time. Now today it’s a little bit more common, but in those days it wasn’t. So the idea was, how do you bill now for someone ordering a service? Before we just billed for phone minutes. That’s all you did, and then, cellular service. Well gee, wireless didn’t exist and now it existed, and how do you charge for that? How do you charge for Internet and information services that someone buys? Well there were no billing systems to do that. So there was a big debate. Do you build one billing system where it comes out on one bill, or multiple bills? My assumption is the customer would want it all on one bill. Well when you add it all up and that’s a big dollar number and people then would stop using it. Well maybe you keep it separate. So there were big debates about provisioning. When you go to a new home you used to have to call servicemen to come out and wire you up. The new idea was you came to your new home and it was all there and you just plugged it in, and it linked you to Bell Atlantic, and immediately somebody could turn on your service. Service negotiation – when you call the phone company we would know that you have a 16-year-old daughter, but only one phone. We immediately offered a second phone for 50% off. So here it was - the idea for a new kind of CRM system. The next thing you knew you needed a bigger footprint. You couldn’t just be in the mid atlantic region, so why don’t we go look at NYNEX and acquiring it. Later, Ray went on to the GTE acquisition and to create the Verizon of today.

That was the beginning, and it was a wild and crazy time of deregulation and being right in Washington DC, and working in the middle of all of this including the political and regulatory aspects that didn't exist at TI. Unions – we didn't have unions at TI. You didn't change things as quickly as you thought you could. So it was an exciting experience and Ray was unbelievable.

I need to tell a story about Ray. He hosted a Christmas party and if you were in attendance you had to play the role of an actor in a play. I never had to do that before. You'd walk in his door and he tells you, "This is your part." And you ask, "What do you mean Ray?" "Well it's a Christmas party and it wouldn't be a Christmas party without a Christmas play." It would be a play he had written. All of a sudden you had to act it out. He was an amazing guy.

DSM: It seems like no time since 1993. It's been what 12 years, and it seems obvious today how you bill for digital products and how you use the Internet. Describe what it was like though when none of that was obvious, when no one knew where any of this was going.

RS: It was all new. We knew we were changing the way the industry and telecom companies were run. Your telephone company had been around for a long time; realize the billing systems were around for a long, long time. They hadn't changed a whole lot. Why would they? The big invention back then was when MCI basically offered Friends and Family that effectively everybody knew they could call for one price. That was revolutionary. Now today every cell phone system you pick up has a different billing approach, but you didn't in those days. So it was a major breakthrough. The next thing – entertainment – you could use these bits and bites to do more than voice. Now you're talking about passing video into the home, and other services, and then the Internet. The question is how do you bill for it? How do you bill for the Internet?

It sounds kind of easy now. You charge for a service so much per month, but in those days, how do you charge for that? It's like the question earlier about whether you could charge for software. Bill Gates sure thought so, and he made a pretty good decision.

Who would think a person would buy an operating system for a computer. Don't you have better things to do in life? But all of a sudden Bill Gates made a few bucks on this deal. It was the same thing here. So it was like reinventing the telecom industry. The only thing that probably slowed it up was the regulatory environment. You still realize that in every state, things were different and the capital-intensive aspect of it made it difficult to change.

Then the next thing was wireless. I mean, c'mon now, and then broadband. The biggest issue though at that point in time is that there were not enough bits that you could pass fast enough to do things like video. Now today you sit there and everybody can do it. Remember, getting broadband to your home was a big, big thing.

So those days were all exciting because you were inventing. So I think Ray Smith was 100% right – why don't you come and be part of that? I got to learn the telecom industry more than before. Thank goodness that back in the Air Force I played with telecommunication, amazingly it came back to help me. It was a little different back in those days. It was aircraft and wireless communication, but it's amazing as it came back around.

It was a great time, and it was a frustrating time for our corporation, because the people in the corporation had been in the telephone business all their lives. Most of the people that were operators now went off to become administrative assistants because you didn't need operators any more. Now when you talk about the next generation you need a whole different set of people skills. Then we basically had agreements with studios on new movies or things that we were going to do together. We had actors coming into the building – people with earrings coming into a telecom business, and they weren't women. This was like, wow, we never saw these types of people. I remember one time kidding Ray Smith. I said, "You know Ray you're Board of Directors in the next 10 years will probably have rock stars sitting on it." And by the way I think today there are boards with rock stars sitting on them. It was an exciting time. It was fun.

DSM: So you started your career at Texas Instruments at the birth of the modern information technology industry, and at Bell Atlantic in the midst of arguably one of the greatest periods of turmoil and change in the history of telecommunications, and then you come to General Motors.

RS: A car company! Can you believe that? What is wrong with me?

DSM: The world's largest automobile company, also in the middle of just huge change. Tell me about that decision to come to General Motors.

RS: General Motors has an unbelievable history. At that time, back in 1996, it was the world's largest corporation, an icon, and maybe a star that was fading. It almost went bankrupt in the early 1990s. It was just turning around from a critical situation, and the question was, could this icon be brought to life again?

It also had an interesting history in information technology, where the company had acquired EDS Corporation. It had a history that was sordid at times with issues between boards of directors and Ross Perot. All of a sudden EDS was splitting off from General Motors and now the company had no information technology expertise at all. It's the world's largest company, and it's recovering from almost going bankrupt. So now they are looking for a CIO – and they never had one at the company before. In 1996, there was no one leading information technology, which is almost amazing when you think about it. They had plenty of technology, but it was a very decentralized. There were many different companies inside GM, so having a CIO didn't make sense because each company did its own thing.

So all of a sudden, they were recruiting for a CIO. I got a call one day. They said, "Would you be interested in this, in interviewing for the CIO position at General Motors? My answer was, "No, no way." I had no interest. I mean c'mon, a car company? I had heard about this. The company had some issues, including EDS. I heard EDS still controlled the information technology. I didn't have any interest.

DSM: So this call came from a headhunter?

RS: The call was from a headhunter, and the answer was no. I had no interest. I was only three years into the transformation of the telecommunication industry. I'm not done yet. Why would I do it? I said no. I have no interest from that viewpoint.

Then I get another call and I still had no interest. I'm down giving a speech for the telecommunication industry at the Ritz in Naples, Florida. I took my wife so we could stay through the weekend and it wasn't a bad place to be. So I got a call on Friday from this recruiter again saying that the Vice Chairman of General Motors wants to see you and talk to you about the CIO position. I said, "Didn't you hear, I don't really want to do it - No." He said, "Harry Pearce," who was the Vice Chairman at that time, "wants to see you." I said, "Oh, maybe. Why don't I think about this and we could do it some weeks later. I am busy right now." He said, "No, Harry Pearce wants to see you tomorrow." "Tomorrow, that's Saturday!"

So you sit there and think, the Vice Chairman of General Motors wants to see you tomorrow. This is an interesting approach, because up to this point I had no interest, and my wife was with me in Florida. We had planned to stay over the weekend for some relaxation. Now if I leave here, she is going to stay by herself for the weekend. So this was interesting, and I kept asking why would you go? Well, the meeting was with the Vice Chairman of the largest corporation in the world. In the end I thought, why not just go and meet him if nothing else? My poor wife. I told her, "I'm going to get a plane out and go to Detroit, Michigan."

DSM: She, who you just dragged to Washington.

RS: That's right, three years before. We left Texas, where she spent 21 years of her life and loved living there. So here we go again. So I met with Harry Pearce at a hotel on Saturday. In fact before I came to GM, I never went inside a GM building. I met with Harry for two hours and he tells me all about the company. This is rather depressing because Harry never asked me a question about me or my qualifications. So you are left wondering why? You decide that they are desperate for a CIO and they don't care who it is - they just need somebody. Nobody else would take the job I guess. So Harry kept telling me about the company and issues. The leadership ran their independent companies and therefore trying to implement processes was hard. Realize I had a long history of putting processes in business and making them common across the organization.

Then there was the issue of the big clash with EDS as they were still handling the majority of the technology needs of the company. And as part of the split off agreement EDS was to have a certain percentage of GM business for 10 years. So all these things were of great issue to me, and I kept asking myself, why would you take this job? I'm involved in the telecom revolution, why would I move to a car company? And Harry was saying to me, "We have a very aligned team, and the EDS thing is rough but it can be worked out. Why wouldn't you want to do this? That is what you are known for. You are known for doing the impossible thing." Harry, aside from being the Vice Chairman was the Chief Legal Counsel for GM. He was very articulate, a typical lawyer with great sales skills. So I said, "That's fine Harry, and I'm real impressed with you. This is really great, but unless I have total agreement with all the senior management that they would support what I want to do, and go in a common direction, I just couldn't take this job." Harry says, "That's fine Ralph. I'll set it up so you can meet all of the senior executives on the leadership team of General Motors."

I thought I was going to get on a plane and simply take a nice ride up here. It was in April. The weather wasn't too bad as there might have still been snow on the ground. This did make me think though that I didn't want to do this. I thought I would go back on Saturday evening to Naples, Florida and lay on the beach. Then Harry asked, "How fast can you do it?" I said, "Well Harry we're in the process of due diligence on an acquisition and I'm really busy." And I really was. It was a 24 hour a day working situation. He said, "How about next weekend?" Oh no, next weekend? So again, Harry was smart enough to try to close the deal pretty quickly. So I said, "Okay Harry."

The next weekend I flew up. I can remember the very nice hotel I stayed at in Birmingham called the Townsend Hotel. I stayed in one of the presidential suites which had a big dining room table in the middle. One at a time these executives came to see me. I had lunch with the CEO and Chairman for two hours, and I met with the president of North America, who is my boss now, the Chairman and CEO of General Motors. The head of GM's international operations flew in from Zurich. Clearly it was an amazing show of force. I am a techie. I think I'm pretty good, but who would think that this could happen? Everyone spent the day selling me on how well the team was aligned. I was so impressed. The only individual and I who debated a fair amount was my present boss. Rick Wagoner is the Chairman and CEO today, but back then was president of North America business. We talked a lot and decided to meet for breakfast Sunday morning to continue our conversation. We had healthy debates then and by the way, after 9 years we're still debating many issues in the company. The debates are also enjoyable. But at that time I was very taken by all of this.

Then I had to go back and do some soul searching – CIO of the world's largest corporation in the midst of massive change. It's great when you have a product that you can feel and touch and have some emotional connection. It's a little different from bits and bytes in the telecom industry. And how interesting it was to think about the transition with EDS, a major provider of technology. In fact, while EDS was a part of GM, all the GM folks were transferred to EDS, so there was hardly anyone in GM working IT left. So I had the opportunity to take a clean sheet of paper and create how you implement technology at the world's largest corporation. That's pretty special! So you now have governance. You have business. There is no IT organization. Now you have to transform the company and business processes.

I returned home and Harry called me and I said, "My wife will never come to Detroit, Michigan." She showed me on the map where it is basically more north than the southern part of Canada. There is no way she is going. She is a southern girl. At that point in time J.T. Battenberg, who was head of GM's components business and later CEO of Delphi Corporation, his wife Luanne and a number of other GM executives' wives had the responsibility to work on my wife. During the next few weeks we flew up to Detroit again and had dinner at the Battenberg's home. His wife was very gracious, and they tried to sell Shelby on this area. They did. We looked for homes and Shelby was in tears when we returned to Virginia. She came around and said, "Why not?" Why wouldn't we do this? This was the next big move. This had never been done before. This was a total outsourced IT organization. I agreed to go and it has been a great experience.

DSM: So Harry Pearce spent time with you and never asked you a question about yourself?

RS: Harry had conducted his own due diligence on me. The reason I know this is because one of the leading partners of Accenture, at that time Andersen Consulting, later told me that he was called. Another individual I knew in the IT business was called by one of the board members as well. However, I was still upset about this because when was the last time you went for an interview and no one asked you about yourself? So I walked away thinking they must really need a CIO because it didn't seem to matter who they hired. It was an interesting story, but in the end, I found out that they had really done their homework.

DSM: From what you have described it seems you were dealing with legacy systems, and fragmentation, and decentralization, and EDS. What was problem number one?

RS: One issue was there were no IT people at the company. When I arrived there were 20 support staffers looking at IT. It was a lonely area. Here you are managing over \$4 billion of information technology investments and the largest business in the world and there wasn't anybody working in this shop or really doing anything in IT. So the first issue was effectively, how do you put a people structure into the world's largest corporation while it is operating. There were tens of thousands of IT people that were at EDS supporting GM. How do you manage this situation?

So I had to find and hire some of the best information technology leadership in the world. I brought in one thousand of the best information technology people, and they were not programmers or people running computers. They were all leaders in information technology because I knew it was an outsourced environment. They were all senior executives. Some were CIO's of major corporations and others, heads of consulting groups. I had five recruiting firms working in competition against each other. I don't think this has been done before and I knew I had to move fast.

I interviewed 300 people for the top 20 senior executive positions. I sold them with, "Where else would you want to be, but in a position to bring an icon back to life, the world's largest corporation, and inventing information technology? You will be empowered to do what you need to do. You will be able to sit down in your rocking chair and tell your grandchildren what you were part of." So thank goodness it was before the Internet generation, or I would have had a hard time hiring. This was back in 1996 to about 1998 time frame, which was just before the Internet bubble.

So I brought in all these people. They were Fortune 100 CIO's from companies, retail companies, telecommunication companies, manufacturing and banking companies all coming to an automotive company. Once we got all these people from many different industries and environments I had to mold them together. Clearly the companies they came from were the best companies in the world, so now trying to get them to work together as a team, and to structure GM was the challenge. And we brought in a total of one thousand people. We also took a thousand of the internal GM people who knew the automotive business, and coupled them with the outside hires. So effectively we went from a totally outsourced model to two thousand of the best information technologists and automotive people in the world. I had to put them together from scratch to manage and transform General Motors, who had seven thousand information systems. Each business unit was running autonomously to a great extent and not leveraging information technology across the business. So our product development process in one business was totally different than the other business, and our manufacturing environment had the same issue. We had 22 computer-aided design systems for designing cars and trucks. Why do you need 22 different computer-aided design systems?

DSM: All the potential out there.

RS: It was phenomenal and we were spending over \$4 billion a year, and buying over \$4 billion. So we were the largest buyer of any corporation in the world of information technology. But when you are trying to buy \$4 billion of information technology a year, you had better know what you are doing, and how to apply it.

The great thing is today we are spending about \$1.2 billion less than in the beginning when I came in the door, and we transformed most of the company. Clearly the auto industry is still a fashion business. It's only as good as the cars and trucks that you design, but our product development cycle is 50% of what it was at that time. It is world class now. It was then 48 months and now we are in the teens on cycle time which is astonishing.

DSM: So half the time, three quarters of the cost, but better.

RS: Relative to productivity, most people don't realize, if you look at North America, four of the five most productive plants belong to General Motors. Again, these are not plants of the foreign competition, and most people don't know that.

Relative to quality, we experienced a major turnaround. We still have work to do on durability and a number of other areas, so we aren't finished. We don't carry inventory and we ship to factories on time. We spend \$90 billion on materials to build vehicles throughout the world. Then we have to distribute eight million vehicles throughout the world, and we have cut that time in half.

At the same time we reengineered all the computing and telecommunication infrastructure. Today we are under three thousand systems. We eliminated over four thousand information systems. Have you ever tried to take information systems away from a business unit? It's a not a pleasant experience. That's why you needed that senior management support or it would never have happened. That's why I had to go through that process. EDS was the only provider in 1996. Today every major information technology company in the world is working at General Motors. So the transformation has happened. It's not over, but basically it happened over that time.

Realize the Internet was a beautiful phenomena for us, because instead of rebuilding every legacy environment, we were able to take advantage of the Internet and have it link to our suppliers, to our dealerships throughout the world, to our employees, and to our customer base. That technology was at the right place at the right time. I spent \$1.7 billion on Internet-based applications at General Motors even after I cut \$1 billion a year. We reinvested our savings. In fact our new investment in information technology has been flat or increasing the whole time. So we cut money out, but we never cut the investment in new technology. We let that transformation occur at GM.

So this was a company that was decentralized. We spent a lot of money on information technology, maybe not getting the benefit. We had to change and create the technologists in this company and manage it from scratch, which has never been done. But that's a great thing, because then you create the A-Team. You didn't have any legacy environments. It was a clean sheet of paper, and it was nice because the business supported the change. They knew I needed that. All the people I brought in reported to me and the president of the business unit. They couldn't report down lower in the management chain. They had to sit at the major table. So everybody I brought in couldn't just be an information technologist. They had to be a great business person as well. One of my CIOs was the head of the heating and air conditioning business at Whirlpool. At the same time he had a Ph.D. in computer science. If you go down the line, every one of the executives reporting to me are like that as they have both business and technology backgrounds. Maybe that's my history of coming through and putting business and technology together that make it happen.

DSM: There is so much to do, so many projects, is there one that was the toughest, and one that you are most proud of?

RS: I think it's an easy answer. If you cannot design and do the original development of a vehicle quickly, at an acceptable cost, you won't have any vehicles to sell. So the first challenge is the product development process. When I came to GM, I asked the Chairman and CEO, Jack Smith, "What's the first thing you want me to work on?" There were a lot of things I could devote my attention to. He said, "Product development. We are not competitive." Our competitors had cycle times better than ours. Even if we had great ideas we couldn't get the products to the marketplace. Realize we are still suffering from our history. We are a legacy company. We're one of the oldest automotive companies. A lot of our competitors were more like start-up companies that came later and had a cleaner sheet of paper. So we implemented the information technology and we reduced the 22 computer-aided design systems to one.

Have you ever worked with engineers and said to them, "We're taking away your computer-aided design system." Most computer-aided design systems have probably a 5 or 10% difference. But that 5 or 10% is a religious battle - for engineers it's everything. So how do you get people to evolve? We were building vehicles across business units. We are building them now globally. Today we build vehicles 24 hours a day, 7 days a week throughout the world, with teams in different parts of the world, all through electronic capability, all visualizing with advanced technology, using basically Hollywood type capabilities for visualization. We had to do that. That was a major challenge. So I had to travel around the world with some of my new executives to convince the leaders of what we needed to do. I'm known for making it happen and at GM I had tremendous business management support from people like Rick Wagoner. This represented a major transformation.

Now we have the opportunity to be competitive in what we are doing. You still have to have the right vehicles, but information technology isn't the preventer anymore. You can now worry about manufacturing and then distribution channels. But if you can't design it and develop it, then you don't have a chance.

DSM: I want you to talk about the period of transition you are going through now. You noted that the CIO is going through a period in which he plays the role of caretaker in a sense, and evolving into an entrepreneurial generator, an optimizer of value.

RS: Clearly the CIO position and other positions involving managing information technology are very immature. If you are a CEO of an information technology company, you haven't been around too long.

Over 35 years I've seen most of the things that can happen in this business. We have come to a time when CIOs are now very important. They must use what I call precision information technology, to make positive business change. You can't just implement technology for technology's sake, which we did years ago. We're not just automating businesses, we're changing them. So the CIO has to become much more business literate, has to understand the business, and hopefully be able to sit at the table with the senior executives of the company.

We've come through a couple eras, periods of the information technology generation that have been very confusing for companies and for company CEOs. One was Y2K, during which most people continue to say, "Why did I have to spend all that money?" Then the second thing was basically the dot-com bubble, where all of us went wild. Not all of us did this, but some did and I described this as the time when companies almost or did get drunk on Internet-based businesses. CEOs of companies are now saying, "Well that was really stupid. It really didn't change what we thought it would." There were a few successful companies, eBay, Amazon, but many of them don't exist anymore. We were basically investing in businesses based on web hits, versus profitability.

Coming after that was a downturn in the IT industry where people weren't buying information technology. People were questioning Chief Information Officers, or IT CEOs that were asking you to invest in things that didn't really pay off, or they didn't see where it paid off. There was a kind of recession in the IT industry, which we're starting to slowly come out of. Now, people are asking CIOs to be caretakers. That is they are saying, don't get too carried away with this craziness with the Internet or anything, just change my business. When you invest in information technology, there had better be some benefit. Innovation is somewhat stifled. This is what I call the caretaker period that is typified by precision investment. You can't increase cost and don't get too carried away on this technology thing because we have heard it before. We were told if we went off and bought telecom switches we would revolutionize our business.

But I think what's going to happen, and I see it beginning, is we're going to come back to the point of innovation. There are things that are changing. There are companies that are regional becoming global. Basically access to information is everywhere. I see a point of innovation that is coming back and indicating that we have to cannibalize our business processes again. In the last couple of years it has been cut costs, not cannibalize and innovate. But now, we have to differentiate our business and we can't do it by just cost reduction, we have to increase the top line of revenue.

So now go invent again, and to do that you're going to have to cannibalize business processes that exist, break them up, look for new ways, and then figure out how to automate them, make them global, make them ubiquitous, and deliver on time information. The CIO is becoming what I call a business information technology broker. Business leaders want to make their business better with IT.

So be a broker. It's almost like being on Wall Street. Go find the right information technology to transform your business. So you have to be of the mindset to find it, buy it and reinvent the business. That's going to be an exciting time for people that know technology. You're innovating again, you're going to change processes and when you change processes it's going to create new problems that have to be solved through technology. We haven't worried about that in some time. So the next five to ten years is going to be really exciting. The technology is there. You have the compute capacity to do this. You have wireless capability. You can identify things. You ship things around the world. You can monitor them. You have real time information. It doesn't matter where you are.

And we're going to globalize the information technology industry. That's an interesting point. I hate to say it, but we do not have a birthright that says that all inventions of information technology will occur in Silicon Valley. It's going to occur in many places throughout the world. Silicon Valley will still be important, but so will China, Brazil and Poland and there will be inventions of information technology in places you would never imagine. Many information technologists might not be only living in the U.S., but might be overseas. We build cars all over the world. We will have people running businesses in China. Ten years ago we didn't have any business in China. Today it's GM's number two market place in the world. It's amazing that happened in less than ten years. So what's going to happen with the information technologists? They will globalize, but the neat thing is that we're moving to the next generation of transforming companies. We transformed technology through the Internet. We didn't necessarily transform companies. We are leveraging the Internet. We're maturing it, but it's like any new technology, it takes a number of years to really figure out how to leverage it.

The other thing is our processes are becoming dated. We sat back while we were doing this invention of technology. We didn't change the business processes that much. We were too scared because it was too volatile. Now I think we're going to get back to the point where we say, hey, information technology is going to be there. Venture capital firms are starting to invest more in information technology again. The nice thing about being around for 35 years is you've gone through peaks and valleys of information technology, and I think we're about ready to come back up.

That's why I say I'm not too sure I'll be around long enough, and that's the disappointment if I don't get to experience the next big boom of transformation. But I'm young. I think I want to spend a few more years at this.

DSM: We talked before about OnStar being part of GM's transformation, but you broadened it to the automobile as a technology unit in and of itself.

RS: We all know with ubiquitous access of digital information that the home, the office, the vehicle and being mobile are all going to come together. So, clearly as I look at information at home, or listen to digital music, or I get called by my wife, I want to have the same environment in my vehicle, in my home and in my office. So the last area of invention is the vehicle. The home has been underway, but it really started in business where technology was applied first. It has now moved to the home with Internet and broadband. The last aspect of it is the vehicle. We have always had the radio, but haven't communicated. Using satellite capability, OnStar and GPS technology today, we have nearly 4 million customers. No other automotive company in the world comes close to those numbers. And that's another digital node in the overall connected world. Today we have been able to save lives through OnStar, help people who have been lost, unlock car doors, and basically we will diagnose your car in the future, telling you when you have a problem before it happens. Clearly issues like digital radio to the vehicle and in time, two-way communication where you can answer back is coming. It's now time to link the vehicle together with everything else in your life.

So I'm really in the automotive business and the information technology business too, because I sell that as a product. We sell it at General Motors. So what an exciting opportunity, and where will that go? Clearly it's just another node in this great universe that is going to occur and is occurring. Then there is the electronic aspect of the vehicle. There are many microprocessors in the vehicle that run the vehicle today. What is that architecture going to be in the future? How is that going to work with alternate fuel sources, whether it's hybrids or hydrogen? Consider linking it with entertainment. How about entertainment in the backseat of your vehicle where your children can download any video? So as I said, I am back in the telecom business. I thought I was out of it, but I'm back into it today. We are basically a reseller of cellular minutes through the OnStar system. In fact we are the largest reseller of cellular minutes

DSM: One question I like to ask in these Oral Histories is about leadership. How would you define leadership?

RS: I think a great leader is driven to success, number one, because if you don't know where you are going, you can't lead anybody else. I think they must perceive their environment and understand what can affect them either for the better or the worse. The other characteristic is that leaders need to be logical, so people can follow them. Now that doesn't mean a leader is not intuitive, they are intuitive before logical. They look at it intuitively, and can logically explain it.

Also, leaders are extremely ethical. You can trust what they say. You can believe in them, they give people working for them hope that whatever they do, right, wrong or indifferent, it is going to be ethical and you know they are doing it in the best way they can. So you don't have to look for ulterior motives.

The last thing is they know how to have fun. They effectively understand that life is short, so if you can't enjoy what you are doing, and you can't enjoy winning or losing as you go down life's path, because everyday will not be a winning day, then life is pretty miserable. Why would you want to be part of a team that never can have fun? So that's how I see it.

DSM: Where does your own sense of honor and integrity come from?

RS: Clearly from my parents. While I was growing up I was disciplined immediately on everything. My father was the role model of ethics, of doing something the right way, with very strong religious background and respect for others. Again, if you didn't do it the way you were expected to do something, clearly you understood that you were in trouble. There was fear and sometimes fear is good. When I look back on what I learned sometimes I am haunted by it. You learn a lot of things when you are very young, and if you get it right then, you're probably going to do better all your life. So I'm not too sure if anybody's done studies of anyone that has gotten in trouble in business and what happened in their childhood. I'm sure psychologists have but it would be a good book. Maybe some of our leaders today got lost during their first 20 years of their life. I think there probably had to be something there.

DSM: I want to ask you about innovation. You have worked with some of the most innovative, creative people in the world. Some folks say innovation comes from great problems, from great people working together. What is your own experience?

RS: I don't see innovation as all that amazing or complicated. The amazing part is being able to understand the problem you are trying to solve.

It's like laying down that original goal or what you are trying to do, and what are the reasons that are preventing you from getting there. Once you understand the problem and you understand the constraints and things like that, then you have no alternative but to look all around you and say, "how am I going to solve this?" You might not have the intellect to solve it, but somebody has the intellect. So if you don't have the intellect, know where you can find another individual with the intellect.

I am probably not the brightest person in the world, probably not the most innovative, but I guarantee you, I can define a problem and then find the right people that can give me input that have the intellect or the knowledge needed. For example, you see this great innovation, it would be interesting to see the 10 years before the innovation and who the innovator communicated with, who they debated with, and who added value to that discussion. Why? Because those individuals might have really been the inventor, but you only see the last person. There's always the benefit of being there at the right time, right place, but it's really leveraging a lot of what you get from other people. I bet good inventors leverage a lot of ideas from other people and they know how to do it.

You have to define the problem. A lot of people have a very difficult time defining the problem. Once you define a problem, then you have to be practical and understand the constraints, and then assume you can overcome constraints, that's invention. So you don't let yourself be encumbered by constraints – you just knock them down.

So when I hire people that report to me, I hire people that have capabilities that I don't have. I've done that for years. Why wouldn't I? At the end, it's the team so I am not going to look for someone like me. God forbid my whole staff was like me. That wouldn't work and it wouldn't be any fun either. So when you look for people like I described I think that's where you capture innovation. I believe you should say I'm not going to let constraints stop me. I know the problem and I'm going to go use the best knowledge base I can find. I don't care whether I am researching a subject or simply talking to other people.

You put it all together and say, wow, you get this aha feeling. If we put Joe's ideas with Jane's ideas, maybe we can do away with that constraint, and that's what I think happens.

DSM: I get the feeling from talking to you that you have a real pleasure in finding an elegant solution to a problem.

RS: I don't think there's anything I have done in my career that wasn't an impossible problem. If I listened to everybody that said that was impossible I would still probably be back in Pittsburgh. I still remember hearing that it was impossible to change the telecommunications world because you have regulations and you have laws, it was impossible to change a legacy automotive company that's been around for 100 years and it was impossible to invent new areas of technology through software or new guidance systems for missiles.

DSM: Two more questions, the first about heroes. We have talked about some of the heroes in your life, your father and brother and people you have worked with. Are there others that have been role models in your life?

RS: Clearly from a technology viewpoint there are people that I respect significantly. I have the great honor of interfacing with every major CEO in the information technology industry or innovators, because I buy more information technology than anybody else. So I get to know people, and there are people that you come to respect. If you had to look at that area, there are some clear names such as Steve Ballmer of Microsoft. I have tremendous respect for his dedication and direction and really attacking problems.

Another is Michael Dell. Michael came to see me when I was at Texas Instruments. I think he was still at the University of Texas. He's amazing. He had some problems on the way but he overcame them. Steve Jobs is another innovator - look at the iPod and Apple. Joe Tucci at EMC also comes to mind. EMC is a storage company which doesn't sound all that exciting. I always give Joe a hard time saying you're just a memory company, but here's an individual that has taken a company and started to put software businesses around it to grow this business. So he has taken one business and evolved it pretty successfully from that perspective.

So in the information technology industry, those are the people that I think I have great respect for. I have respect for all the CEO's I have worked with.

Remember that with innovation, you sometimes have constraints and you try something and it doesn't work, but you don't say the world is over. You go back and try again, and maybe the next time you are innovative and smart. All of these people were very innovative whether it's Rick Wagoner or Jack Smith at GM or it was Ray Smith or Jerry Junkins. They were all extremely interesting people to be around and work for.

Relative to those in my family I admire and respect, there is my brother who spent so much of his time dedicated to me, my wife who has put up with all of this for 35 years and then my son who said to me, “I don’t want to be a scientist.” He went off and became a very good lawyer by the way. Sometimes, it is hard having a son who is a lawyer. He was a world-class debater so we debate everyday. Those are the type of people who affected me, but the most important are the people that have been on my teams, that did all the work. These are big problems that take a lot of people to work on them. Thousands of people have been on my teams. So without them, what could I have done? I could have done nothing. I couldn’t sit here today. Yes, maybe I coded something, maybe I designed something that was innovative, but after that, transformation of businesses and transformation of the application of technology were done by them. So when you put them all together this is what is important. So you sit back and see their faces and recognize that these are the people who made the transformation. I clearly know that my team today was responsible for whatever we did successfully, and it wasn’t me. Maybe I was a half-decent leader, but it was them. Hopefully I was smart enough to pick people that had the knowledge base, and would push me. You want people to push you. You don’t want them only to listen to you. You want them to tell you when they think you are wrong.

DSM: The last question is the hardest, but you answered a lot of it just then, but when your grandchildren’s grandchildren look back at this time – how would you like them to remember your role in this IT revolution?

RS: First they will think I am pre-historic. I think they will say that I was dedicated to what I was doing, that I really did the best that I could do and that I did it hopefully honorably. However, I don’t think I’m ever going to be driven by them saying I did anything wonderful. That’s not a requirement, because I’m not too sure I did anything wonderful. I learned a long time ago that whatever you do, someone will figure out how to do it better. So the best thing is to be considered a good person, that you were dedicated to what you were doing, you cared about the people that worked with you and you enjoyed what you did. I hope they don’t articulate the 10 greatest things that I ever did because I think that’s probably not worth it.

DSM: I think your family will be very proud of you. It has been an honor to spend this time with you.

RS: Thank you.