**INTERVIEW**
**WITH**
**THOMAS MALONE**
**October 23, 2014**
**Sloan Oral History Project**

T: Thomas Malone
B: Bob McKersie
G: George Roth

G: It is October 23, and this is George Roth and Bob McKersie interviewing Thomas Malone for the oral history series. Our usual starting point is your first introduction, interest, knowledge of MIT and the Sloan School. When did that happen? Even before you came here?

T: I first heard of MIT when I was a kid. I can't remember exactly when but, I remember thinking it was called "mitt," because that's how it was spelled.

G: Where did you grow up?

T: I grew up on a farm in New Mexico. In fact, this is relevant to your story.

When I was applying to colleges in 1970, I applied to several places and was accepted everywhere I applied, including Harvard, Rice University in Houston, and a couple of other places. But as a farm boy in New Mexico, being accepted at Harvard was a counter-cultural thing. No one I knew had ever gone to an Ivy League school of any kind. .

My parents and I called my cousin, who was at that time Vice President and General Counsel for General Motors, and he had previously been president of the American Bar Association and a deputy attorney general. We asked his advice about which offer of admission I should accept. He said, "Well, with all the student unrest at Harvard these days, I think you might get a better education at Rice."

I followed his advice and went to Rice instead of Harvard. It's one of the relatively few professional choices that I would make differently if I could do it over. Of course, Harvard wasn't MIT, but it was a neighboring school that I thought quite a bit about when I was still living on the farm.

Shall I move now to how I came to be at MIT?

B: Yes.

T: I went to Rice as an undergraduate, and then Stanford as a grad student.

G: Your undergraduate was in …

T: Applied Math, it was called Mathematical Sciences. It was an Applied Math and Computer Science major. When I applied to colleges, I wrote that I wanted to help solve the problems created by technology changing faster than society could adapt.

B: Whoa!

T: Yes, that was a pretty grandiose thing for a high school senior to write. I wrote it and then forgot about it. But years later, at Stanford, I realized that I had a bachelor's degree in Applied Math, a master's degree in Engineering-Economic Systems (from Stanford), and I was getting my PhD in Cognitive and Social Psychology. In other words--I realized--I had received the education I would need to do what I had written about on my college applications. That's been a theme running through my life and my career, and I told that story in the preface of my book, *The Future of Work*.

G: I know of your PhD in Psychology and your work that followed, but how did you make the transition from a hard science like Math and Computer Science?

T: When I was a sophomore in college, I decided I wanted to double major in Mathematical Sciences and Behavioral Sciences. Then I spent my junior year abroad at Imperial College in London. Because of the way the British educational system works, they're much more specialized than we are. If you're a math major, you study only math. So I spent my whole junior year studying only math. Then because of the way the scheduling worked when I returned to Rice, I was not able to get in the courses needed for the Behavioral Science undergraduate

double major. People advised me that was no big deal, that it didn't really matter whether you had that as an official major or not. So it wasn't that I was headed full speed toward math and then changed directions to add psychology. It was that all along I wanted to do both, as indicated by my college applications. I just did them sequentially: math first and then psychology.

I was also seriously interested in organizations. When I was at Stanford, I participated in a program on organizational research. It was one of these things where graduate students from all over the university came to seminars. For instance, I remember being extremely impressed by Herb Simon when he talked there. At the reception after his talk, I and several other students were standing around him, and he started talking about disciplines. Here I was, a student struggling to learn what people thought and said and did in my own discipline. And he said things like, "Well, of course, the economists have looked at this question, but they didn't really see this part of it. And the sociologists got something else right about it, but they missed such and such." I was struggling to see my discipline from the bottom, and here was somebody who could see whole disciplines from the top.

B: That's a great description for Herb Simon.

T: As part of this organizations program, I took classes at the Stanford Business School, including one by Bill Ouchi. That class was very interesting and very influential on my career. That is where I first learned about Oliver Williamson's work, which was a big factor in my thinking later in my career. I also took a class from David Bradford. He taught the T-group Class at Stanford. That was not a traditional lecture or case discussion class; it consisted of actually participating in T-groups (or "encounter groups").

And I took a class from Jerry Porras on Organization Development. In that class, we learned about Ed Schein's work and other things like that. Because of this Organizations program, and these Stanford GSB classes, I hung around the Stanford Business School from time to time.

After I graduated from Stanford I went to Xerox PARC (Palo Alto Research Center). In fact, I did my last year of graduate school as a research intern at Xerox PARC. Then

I spent three years at Xerox PARC in John Seely Brown's group. He was head of a group, but at that time he had not yet become head of all of Xerox PARC.

It must have been in my third year at Xerox PARC when I was walking in the halls of Stanford Business School for some reason. I remember seeing on a bulletin board an ad for a faculty position in the Organization Studies Group at Sloan. Ed Schein was the head of the search committee. I knew Ed Schein's name, and I thought that was impressive and interesting. So I sent an application for this Organization Studies position.

G: Were you on the job market at the time, or was it just that job that attracted you?

T: I'm reconstructing my memories of this now, but as I remember it, the job I had initially at Xerox PARC was a time-limited post-doc position. And I believe that, at the time I saw the advertisement, I thought I would need to leave Xerox when my post-doc ended. But before I left, my job was converted to a permanent job, so I could have stayed if I had wanted to.

I also looked at a few other job possibilities in those days. The thing I was most excited about was starting a company in Silicon Valley. But, partly as a lark, I sent this application off to MIT. I'm not sure I was serious at all.

G: But the attraction was Ed Schein's name, or MIT?

T: Ed Schein's name was a big part of the attraction. The idea of MIT was interesting to me, but I definitely had mixed feelings about it. What people might find interesting is that it was the Organization Studies Group that I originally applied to. Some weeks later, I got a letter, or maybe it was a phone call, from Stu Madnick in the IT Group. Stu said, "The Organizational Studies Group sent us your application. Would you be interested in considering applying for the IT Group faculty position?"

I said, "Yes, sure." That's what I ended up interviewing for and then getting the job.

B: And that was 1983?

T: Yes. But as I said, I had mixed feelings about MIT then. My impression, from growing up on a farm in New Mexico, and then living in California, was that, yes, MIT was a famous place, but not necessarily a place you would want to live. For one thing, I thought the weather was cold and awful. I'd spent my junior year in London, which was a very unpleasant year, one of the worst years of my life. Part of what I hated in London was the cold weather. Why would I want to go to Boston where it was even colder than London? And Imperial College, part of the University of London, was kind of like the MIT of the UK. Did I really want to go to the real MIT given that I'd had such an unpleasant time at its British equivalent? I thought MIT would be full of cold and rude people.

G: Are you talking about what happened in Imperial College?

T: Well, I did experience some of that at Imperial. And, yes, I thought MIT might be similar, and why would I want that? Was it worth such a huge quality-of-life sacrifice for the status benefits of being at MIT? Carnegie Mellon was also recruiting me at that time. That was another place I applied, and they made a bigger effort to get me than MIT did.

G: What attracted you to Carnegie Mellon?

T: People like Herb Simon. It was, in some ways, a closer match to my interests in a combination of psychology and computer science. Did either of you know Michael Cohen?

G: Not personally.

T: He became a friend of mine. He did a sabbatical somewhere out near Stanford, and I got to know him when I was at Xerox PARC. He had a bunch of friends at Carnegie Mellon, and he recommended them to me. Eventually I decided that the job offer from MIT was something I shouldn't pass up, so I accepted the job.

B: Did John Seely Brown have any input to this? I remember him coming back and forth to MIT.

T: That was after I came to MIT.

B: That's right. I was wondering what your connection might have been with him.

T: I have continued to have a lot of interaction with him since I left PARC. But when I had the original offer from MIT, he converted my Xerox PARC job to a permanent job if I wanted to stay. [laughing] He offered me a one-year leave of absence so I could come back to Xerox if I didn't like MIT.

The climax of this part of the story is that I accepted the MIT offer and immediately felt I had made a horrible mistake. I thought, "What was I thinking?? Why would I want to do this?? I have wonderful weather here in California... etc. etc." I called up Michael Cohen and said, "How serious would it be if I accepted a job and then called up the next day and said no, I had changed my mind?" He said, "Well, it's been done. It's not exactly a good thing to do, but you could probably recover." I seriously thought about doing that, but for some reason, I decided to try it for a year. I said, "Well, I guess I can stand something pretty bad for a year, and it's conceivable that it might not be as bad as I think."

I do remember one thought: If you are a MIT professor, then reporters will want to talk to you about almost anything you are interested in. I thought that part would be nice, because I'd had some exposure to press. Several things I'd done, including my PhD thesis, got a fair amount of news attention.

G: Let's just say, for the record, what your PhD thesis was; I know the topic, but not the title.

T: It was about computer games. The title was "What Makes Things Fun to Learn? A Study of Intrinsically Motivating Computer Games." This was 1980, and computer games had just burst into the public consciousness. In fact, I take some credit for having started the thesis a

few years before, having had some combination of insight and good luck in anticipating something that was going to become very popular a few years after I'd started working on it.

The idea was that these computer games are really motivating – they grab people. How could we understand what causes that? And how could we use those same factors to make other things, like educational software, more interesting and enjoyable? I take pride in the fact that this concept is what is now called "gamification." Gamification has been a big deal in business in the last five years. And even though I didn't use that word, I believe I was the first person to ever write about this concept: taking the features that make games interesting and using them to make other things more interesting and enjoyable. So that's the thesis story.

Now back to the story about coming to MIT. I didn't end up changing my mind, I really did accept the job, and I came here in September 1983. And from the very beginning, it was just wonderful!

B: Were you in E53? Who were some of your close neighbors?

T: My first couple of years I was in E53-307. It had been Jack Rockart's office, and he moved across the street to E40 the summer before I came. John Donovan shared the suite. The entire time he and I were in the suite, I saw him once.

G: You were there a lot, and he was there a little. Is that right?

T: I was there almost all the time, yes, until late at night. At various times in my early years here, I shared a suite with Charles Jonscher and Marvin Sirbu. You probably remember both of them.

B: I remember Marvin....

T: Charles was only here for a few years. A graduate of Cambridge, very articulate. Marvin was a really nice guy.

One of the nice things about my first office was that it was on the path from E52 to the E53 elevator that went to the parking lot. A lot of people from E52 walked through to go to their cars. When they saw my door open, they would stop in and say "hi." I realized, somewhere along the way, that was a nice thing, a fortunate office location.

One reason that I was so happy here is that I learned the weather wasn't nearly as bad as I thought. If you knew how to dress, with warm clothes, etc., it was in many ways warmer here than in California. In California, they had this illusion that they lived in a warm climate, so a lot of the buildings there were not well heated. Like swimming – there were no indoor swimming pools. If you wanted to swim in the winter, you were outside in the cold weather.

G: Who was it, Mark Twain, who said, "the coldest winter was a summer in San Francisco?"

T: Yeah, San Francisco is even worse than Palo Alto. Anyway, the cold weather wasn't so bad. But my biggest surprise was that this place was really warm, wonderful, and supportive socially – completely the opposite of what I expected.

Not only MIT, but I found Boston as a whole to be a very warm and welcoming place. It was much easier to meet people than I thought. They just seemed really happy to get to know me. In retrospect, part of that was probably because being an MIT professor had a certain kind of status, so people were happy to get to know an MIT professor. Having been a researcher at Xerox PARC, in those days before PARC was famous, was not nearly equivalent. But being an MIT professor was something special. I found it very easy to meet people, and find people to hang out with, and have friends.

I worked a great deal in my early years here. I still work quite a lot compared to most people in the world, but not as many hours per week as when I first came here. And I remember those early years at MIT as the best years of my life, really wonderful years, feeling appreciated and successful, and working on things I enjoyed and found interesting. And when I wasn't working, I was doing things I enjoyed with people I liked.

B: What were some of the things that you turned to? Research, your teaching, working with graduate students.... Perhaps you could flesh out what your world contained as a junior faculty member.

T: Research first. When I first got here, I used to go around talking to people about my interests. I would draw a diagram on a blackboard. I remember it was circle on top, with three circles coming out the bottom. I'm trying to remember what the four circles were labeled. I believe it was "organizational science" at the top. The idea was that there was a commonality between issues that arose in computer science, in economics, in organization theory, and in social psychology.

: When I was at Xerox PARC, I wrote a paper called "Organizing Information Processing Systems: Parallels between Human Organizations and Computer Systems." The paper argued that there was a lot of intellectual promise in trying to exploit analogies between how things were organized or coordinated in different kinds of systems – like computer networks, human organizations, and markets. Those areas tied together all the seemingly unrelated strands in my own background, and I thought there was a lot of opportunity for exploiting potential intellectual synergies.

I also thought, very early on, about how information technology would change the ways that human organizations could be structured and designed. That was something I was interested in back in graduate school. And I thought this theoretical perspective, of exploiting analogies between different kinds of systems, could have real power in understanding--at a deep theoretical level--how new organizations would arise with new kinds of information technology.

What I just said covers almost everything I did at MIT up to today. In order to explore that path, I did several different kinds of things. When I first got here, I was finishing up some work I had started at Xerox on designing computer networks using market-based scheduling algorithms. We had developed a system called Enterprise when I was still at PARC, which was a way of sharing tasks among personal computers connected to each other on a network. Networks of personal computers were very unusual in those days. PARC was one of the few places in the world that had that. Now, of course, everybody has it.

G: Did Xerox develop or first exploit LANs?

T: Yes, the Ethernet was invented at Xerox PARC by Bob Metcalf. In fact, John Shoch, was also involved in the invention of the Ethernet. He had done an experiment just before I came to PARC, where they did the first version of sharing tasks among processors. If you think about it, there are a lot of computers sitting around, connected to the network, and not doing anything. Wouldn't it be nice if you could take advantage of that idle computational power? John did something along those lines. The thing we did that was different was to say "Wouldn't it be interesting if you could use some intelligent way of allocating which tasks went to which processors according the importance of the tasks and power of the processors?" What we realized was that markets provided a very natural way of doing that kind of task assignment. Based on work that Randy Davis did, what he called "contract nets", we developed a system called "Enterprise" which used market-like bidding to determine which computer processors would do which tasks.

G: This is the Randy Davis here at MIT? He was near your suite when I was a graduate student here.

T: Yes. There is a long story about that. I knew Randy a little bit at Stanford because he was a graduate student in Computer Science when I was a graduate student in Psychology. I can't remember whether we ever talked to each other then; I think we talked a little bit. I knew his reputation. He was several years ahead of me, and well thought of in the Stanford Computer Science department, which I also hung around in as well as the business school. I was especially interested in this work of his that we were just talking about, the contract nets.

He visited PARC several times when I was there, and I remember talking to him then. He was an MIT professor, the only one I knew before I came here. I remember asking his advice about whether to come. When I did come, he was a person I knew, and he became my best friend. In fact, the first month I was here, I went to a party at his house where I met my future wife.

G: Could you sketch out the broad vision of your work then...

T: I was talking about the Enterprise scheduling system. In those early days, when I was at Xerox PARC, I wrote my papers on Xerox's pioneering personal computers called Altos using the Bravo word processing program. Bravo essentially became Microsoft Word, because the guy who developed Bravo at Xerox, Charles Simonyi, went to Microsoft and developed Word. I had a bunch of papers that I had started writing using Bravo software on the Alto computers, but there were no Alto computers and no Bravo editors here at Sloan. So to continue editing my papers, I went across campus to the Computer Science department where they had a couple of those systems. My first year here, I spent a lot of time in the Computer Science department, sitting in the office of a couple of graduate students where this Xerox computer was sitting. Deborah Estrin and Karen Sollins were the students in the office.

Another one of the important projects I worked on in those early years was the project I presented in my job talk at MIT. It involved modeling the tradeoffs in different organizational structures: product hierarchies, functional hierarchies, decentralized markets, and centralized markets. I built models to analyze the relative advantages and disadvantages of these structures using analogies with scheduling in computer networks. I had a very simplified information processing model of what you would need to do to assign tasks to processors, but I said "Let's assume this is not just computer processors on a network, let's assume this is people or machines in an organization or a market." Then I used queuing theory to analyze the wait times and the delay costs and counted the number of messages you would need to exchange to figure out which processor should do which task. And I used that to model he tradeoffs in different organizational structures.

That was a big thing I worked on in my early years here. I talked about it at a conceptual level in my job talk, and then ended up working out a lot of the math, writing papers about it, and publishing them in *Management Science* and *Operations Research* in my early years here.

I still think that that was profound work. I was disappointed that it didn't have more influence in the organization theory community.

G: Those aren't journals they read.

T: Not only did they not read the journals, but I think a lot of people in organization theory are not particularly predisposed to want to think about things mathematically in any case.

One of the other things I did, based on that first mathematical work, was to use a very simplified qualitative version of these models to think about the implications for organizational design of information technology reducing the costs of communication. I wrote a paper about that with JoAnne Yates and Bob Benjamin. Bob was a visiting researcher at CISR from Xerox. We published that paper in *Communications of the Association of Computing Machinery*. I thought at the time that this was kind of a "cheap trick," like "I've done this deep, important and profound theoretical work and here is one little implication of it that's kind of interesting." But that paper ended up being well known and widely cited. I think it is still the paper of mine that has the most citations.

G: And the title is?

T: "Electronic Markets and Electronic Hierarchies."

G: And you use Williamson's forecasts...

T: Exactly. It was strongly based on Williamson's work. He talked about transaction costs and how they would lead you to do things in markets rather than hierarchies. We said, "What does information technology mean for that? What information technology does is reduce transaction costs." Lots of people, including Coase, said that if coordination costs are lower in hierarchies than in markets, work would be done in hierarchies. And if they are lower in markets than in hierarchies, work would be done in markets. That's kind of obvious. Lots of people have said that.

But we said something that was surprising and not nearly so obvious. We asked what would happen if transaction costs fall proportionately in both markets and hierarchies. This

seems to me the most justifiable assumption since, in principle, technology can help both markets and hierarchies equally. And what we found was that, even in this case, there is still a reason to believe that markets will become more desirable in more places. This is what lots of other people have talked about since, some of whom rediscovered it themselves.

B: But they have emulated that too.

T: Exactly. When people introduce me as a speaker, I suggest they might want to mention that the paper we published in 1987 on electronic markets and electronic hierarchies predicted much of what happened in the world of the Internet, e-commerce and e-business over the decades after it was published.

That was one line of work I did, focused on organization theory. The other line of work was designing computer systems to help people work together in new ways. Irene Greif, who was at that time a research scientist in the Lab for Computer Science, convened a workshop on computer supported cooperative work at Endicott House, in 1984 or 1985. I was at that workshop. She later organized the first conference on computer-supported cooperative work, which I went to, presented at, and was on the program committee for. Another stream of my work in the early years was in this nascent field of computer-supported cooperative work.

We initially developing a system called “Information Lens” which used what in those days was considered artificial intelligence technology. It had what was called “production rules,” if/then rules, to help people automatically filter their email. At the time, 1986 and 1987, most people in the world didn’t even have email. The relatively few who did have email got only a few messages a day, maybe five messages a day was typical. The idea that there would ever be enough messages that you would need help sorting them seemed strange to people. Most people didn’t understand why this was even interesting. But having been at PARC, where there was a much more developed email culture, it was clear to me that this was coming. We thought this was an interesting way of helping to deal with a problem that more and more people would feel in the future.

One of the things we did early in that project was to get ideas about how to help people deal with large volumes of incoming information. This was in the days when John Reed was involved with the Sloan School, and Citibank was a sponsor of the Management in the 1990s project. As part of that connection, we ended up interviewing John Reed's executive assistant – not a secretarial job, it was a professional job, a staff job of some kind – she was the one who managed John Reed's mail. We interviewed her about how she managed this huge, incoming flow of information for a senior executive. We also interviewed other people in other situations, but that was one of the interesting data sources, that we used for thinking about this problem.

Today, of course, virtually all email systems have some kind of built-in filtering, but I think our Information Lens system was the first well-known system, to ever include automatic filtering of email.

Following on that, we built a system we originally called Object Lens, but later we changed the name to OVAL, which stood for Objects-Views-Agents-Links. This was a general version of what we had done in a very simple way with filtering email. OVAL provided a way of letting you have objects representing all kinds of things, not just email messages but people, or meetings, or places, or anything. It let you have different views on these objects so you could sort them in tables, make graphs of them, or other things like that. You could use intelligent agents to process these objects, and you could have links between objects. You could, for example, say, here is an email message to invite you to a meeting, and here is an object that represents that meeting. That object could include the place of the meeting, the people who are invited, and the subject of the meeting. And some of those could be links to other objects, like here is a link to the object representing George Roth, who is one of the invitees to the meeting. All that could be linked together, and then you could write rules that would let you take into account that knowledge in order to have agents do things. For instance, you could say, "If this is a meeting from George Roth, then automatically put it in my calendar, unless it's somewhere outside of my building, in which case ask me what to do.". You could do all kinds of cool things like that.

Of course, any computer programmer can do these kinds of things with regular programs. What was particularly interesting about our work was that we had a very simple and

intuitive user interface for doing these things. Lots of people who weren't programmers could do a lot of interesting things for themselves. One of the papers we wrote was called, "A Spreadsheet for Cooperative Work." The idea was that the same level of skill needed to use a spreadsheet--which is much less than what's needed to be a professional programmer--could allow you to do useful things with your own personal databases and with other people's databases.

The punchline of the story about this OVAL system is that there were a lot of interesting things we did in that system which still aren't widely available. Some aspects of what we did were later incorporated in Lotus Notes and the World Wide Web. But some of the things we did still haven't been realized in any commercial products.

OK, so moving faster.. I was involved in the Management in the Nineties program....

B: You probably had a chapter in Michael's book, I guess?

T: I had several chapters. That ended at the end of the 1980s. In the early 1990s, about 1991, we started the Center for Coordination Science. By that time, I had further developed this initial intuition about the commonalities between disciplines, and I had come to call that Coordination Theory, or Coordination Science. The idea was that there were fundamental similarities in the ways coordination occurred in different kinds of systems, and that it should be possible to develop an interdisciplinary area of study about those things. That was the goal for the Center for Coordination Science. We did both development of software, like what we've been talking about, and we did development of organizational theory. We did case studies, etc. There's more I could say, but I'll jump ahead.

Starting probably about 1994, there came to be an interest in something broader, on a School-wide basis, about new organizations and information technology. Michael Scott Morton and I became the co-directors of the initiative on "Inventing the Organizations of the 21st Century." That was a joint project of three research centers: the Center for Coordination Science, Center for Information Systems Research, and the Organizational Learning Center. It involved

lots of sponsors; a really interesting question, and a fair amount of visibility. We ended up writing a book about that. Again, there is more that I could say.

One other big project at that time was called The Process Handbook. We had the idea that you could represent, in a rich database, knowledge about business processes. Not just the coordination processes, which were the focus of coordination science, but production processes as well. Back in the very early days, before the Web, we started developing this knowledge base. We eventually had thousands and thousands of activities represented as a way of sharing best practices, as a way of getting innovative ideas about how to redesign processes. This project was in the days of business process reengineering, and we saw this as a powerful tool for that as well as many other things.

The initiative on Inventing the Organizations of the 21st Century ended in 1999, just before the 21st century project began. We continued in the Center for Coordination Science for several more years; published books about the 21st century initiative, and about the Process Handbook project. Then I published *The Future of Work* in 2004, which was a summary of my work for the previous two decades. That's where I said, "What does information technology mean for how work can be organized? Here's what we've learned." After that, I spent a year or two promoting the book.

Then I began thinking about what I wanted to do next. I considered several possibilities, including putting into practice ideas that were in *The Future of Work*, kind of "Here are these big conceptual ideas, now what happens when companies try to actually implement them? What are the practical lessons we can learn?" I thought about other things, too, including what is now called "*sustainability."* I didn't like that word particularly, but that was an area I seriously considered delving into.

What I ended up coming to believe was that the best thing I could do next was not to put conceptual ideas into practice, but try to look over the horizon again. I remember a dinner with Esther Dyson, the computer industry market analyst and investor, and Vernor Vinge, the science fiction author. We talked about what Vinge called "super-human intelligence." By the end of that dinner, I was convinced that super-human intelligence should be the next thing I worked on. But it didn't really feel like a decision; it felt more like I was finally admitting to myself something that I had known for some time: that that was the next thing I should do.

I ended up believing that "super-human intelligence" wasn't the best term, but "collective intelligence" seemed like a very good term. That led to the creation of the next center, the Center for Collective Intelligence, which we started in 2006. It turns out that the easiest way to start a new center at MIT is by renaming an old center. So we renamed the Center for Coordination Science to be the Center for Collective Intelligence. It was far more than a cosmetic change, however. We made a lot of changes in who was involved and what the mission was. And that has been the main focus of my work since 2006.

B: You got a lot of recognition, some major news stories about it.

G: It continues to get recognition. Is sustainability the centerpiece now?

T: There are two projects that have taken most of my attention and have gotten the most attention in the world. One is the Climate Co-Lab project, which is where I come to the sustainability theme from the collective intelligence point of view. We thought it would be interesting to work on very large-scale collective problem solving. Not just five people around a table solving a problem, but what happens if you have 5,000 or 50,000 people trying to collectively solve a big problem.

For better or worse, the big problem we chose first was the problem of what to do about global climate change. I say "for better or for worse," because it's obviously a really big, hard, complicated problem. There are reasons why it was a stupid thing to do first. But there are also reasons why it did make sense. It's clearly a big, important problem that a lot of people are interested in. That meant we were able to use people's passion as a motivation for them to be involved in this project.

B: Is it connected with what Jake Jacoby is involved in?

T: There is some connection between the initiatives. They are co-sponsoring and co-organizing the conference we have, and Jake has been involved as an advisor. We keep talking

about having some simplified version of their model accessible through our system. We haven't done that yet, but that would be warranted.

B: His is more on the science, is it?

T: They are more focused on the science and the policy analysis about global climate change. But they are focused on doing that work themselves, whereas what we're focused on is providing a framework in which other people can help solve the problem. We're not trying to solve the problem ourselves; we're trying to provide the infrastructure, and the processes to support many other people doing that.

G: To where people invent alternatives, bring them forward, get feedback....

T: Exactly... Yes, it's that, among many other things. One simple phrase that most people understand is: We are crowd-sourcing the problem of what to do about global climate change.

B: And that goes back to collective intelligence.

T: Exactly. That's why we think it's appropriate to do this project in the Center for Collective Intelligence. We view it, from our research point of view, as a collective intelligence project about how to facilitate large-scale collective problem solving. We just happened to pick the problem of global climate change, which is of interest to a lot of other people for other reasons.

G: You have people like John Sterman or Jake Jacoby, people who are working on it are alternatives.

T: Right, they involved in our project as contributing substantively to solving the problem.

B: And probably others from around MIT – this is always an issue, how do you partner with the Engineering and Science side of things?

T: We have other people from around MIT, and also from all over the world. We've put together advisory boards and advisors for different sub-parts of the problem, including professors at MIT, Stanford, Columbia; people from World Bank; George Shultz, the former Secretary of State, is one of them. I'm very happy to say that we have over 32,000 people from all over the world as registered members of our site, and over 200,000 people from all over the world have visited the site.

G: It's an approach to bring together potential solutions, to get feedback, compare them, get help, and find partners. It's a very interesting way of putting your ideas forward and getting other people to help you. That's what crowd-sourcing is, right?

T: Right. Yes, we are giving people a forum in which they can put their ideas forward and a context in which those ideas can be compared to and combined with lots of other ideas.

B: Who is providing financial support?

T: A combination of NSF and corporate sponsors, and we've had a little foundation support. We could use more support, by the way, if you know of anybody. [laughs] That's one big project in the Center for Collective Intelligence. The other main project is on "measuring collective intelligence." In this project, we used the same statistical techniques that psychologists use to measure individual intelligence, but we've used those techniques to measure the intelligence of groups. We had hundreds of groups come into our laboratory and do different tasks, and we found that there is a single statistical factor for a group that predicts how well the group will do in a wide range of different kinds of tasks." Just as intelligence predicts that for an individual, this factor predicts it for a group. We call this factor "collective intelligence."

G: CI?

T: Yes, CI. Or sometimes we use the letter "c" (little c) because there was a psychologist named Spearman, who was the first to document this kind of intelligence at the individual level, and he called the factor he measured "g" (little g) for general cognitive ability. So we use "c" for collective intelligence.

We developed a test for measuring this factor, and we also looked at what predicts it. We found that there are four things that predict this collective intelligence factor.
First, the average individual intelligence of group members. That's correlated, but only moderately with the group's collective intelligence. So just having a bunch of smart people in a group doesn't necessarily make a smart group.

Second, the average social perceptiveness of the group members. We measure that in a test of how well they are able to read emotions in other people's eyes. If you have a bunch of people in the group who are good at that, the group on average is more collectively intelligent.

Third, the degree to which people participate about equally in the conversation in the group. If one or two people dominate the conversation, the group on average is less intelligent than when the conversation is more evenly distributed.

And, finally, the group's collective intelligence is significantly correlated with the proportion of women in the group. More women are correlated with more intelligence.

G: You were in the news on that?

T: Yes. Actually, this research was originally published in *Science* magazine, which we were really proud of. We got a lot of media attention about the whole thing, and one of the most newsworthy aspects was the result about women. For instance, there was an HBR article about that, and there has been even more attention for this work than for the Climate CoLab.

B: That is so good. Good for the field, and so good for the School.

T: Thank you! It's nice to hear that.

G: It's such a breadth of work; things that are clearly mainstream MIT to here in social psychology and organizational studies.

T: You could say I just can't focus!

B: No, no, it goes back to what you said in high school – there's an umbrella here that captures it all.

T: I do think that, but many people don't realize that.

B: That's what is so amazing about your journey. We should have you say whatever you want to fill in in terms of courses and students – the other role that we all have here, which is working with students either in the Master's program or the PhD program. How would you describe your life there?

T: In terms of the MBA program, there are four main courses I've taught over my time at MIT. The first was called "Management Information Systems." It was an advanced elective in IT that Jack Rockart also taught, about the organizational and managerial implications of IT. I taught that from my first year here.

I also taught, for many years, the core IT course, the one required for MBA students. I can't remember what the various names for that were, over the years. The name I used at the end was "Information Technology Essentials." I taught that for many years in various combinations with other faculty members.

Starting in the 1990s, I also did versions of the course that I now teach called "Strategic Organizational Design," which is focused on my research and the organization design implications. I now spend about half the course on traditional organizational design and things

like product hierarchies, functional hierarchies, and the matrix; and the other half on novel organizational designs.

I've taught for over a decade now, the Distributed Leadership Workshop, with Deborah Ancona and Wanda Orlikowski. Peter Senge taught it for a while, too.

Those are the main Masters courses. In addition, over the years, I've been privileged to have many great PhD students, including Erik Brynjolfsson, who is my MIT colleague now, Chris Dellarocas at BU, Avi Bernstein at the University of Zurich, Paul Resnick and Mark Ackerman at University of Michigan, Kevin Crowston at Syracuse University, and George Wyner at Boston College. I hope I'm not forgetting others now!

One thing that I was thinking of a few days ago; I went to an NSF meeting a couple years ago that Ben Shneiderman organized. I looked around the room and in this meeting of about 30 people, almost half of them were either my current or former students, or their current or former students. I think some were even students of my students' students. I felt good that somebody else had assembled a group in which my intellectual descendants were so heavily represented.

B: As long as they don't start retiring before you! Who are your intellectual buddies? The Organizational Studies Group, I know you interact there. How do you describe your informal network here?

T: I'm officially part of both the IT Group and the Org Studies Group. My social network is as confusing as my intellectual history. I have close connections with my colleagues in the IT Group – Wanda, Erik, Stu. I also work, at least from a teaching point of view, with Deborah Ancona in the Org Studies Group. I'm friends with some of the other people there, but I haven't collaborated with other people in the Org Studies Group.

A lot of my research work is focused in the Center for Collective Intelligence, so I work a lot with the research scientists. the post-docs, and the graduate students involved with that Center. John Sterman is one of the co-investigators on the Climate Co-Lab project, so I work some with him in that context. Jason Jay has been increasingly involved with the Climate Co-Lab. Hal Abelson is another co-investigator from the Computer Science department. Other

people on the Steering Committee for the Center for Collective Intelligence are Randy Davis Associate Director of CSAIL, Rob Miller, also from Computer Science, Sandy Pentland, from the Media Lab, and Josh Tenenbaum, from Brain & Cognitive Science.

B: That's a great line-up. Do you have regular symposia? How do your people connect under the umbrella of your Center?

T: In the first two years, we had regular seminars. I confess we've been a little lax recently. We probably should have more. Speaking of seminars and events, the Climate CoLab had an annual meeting last year, and we're going to have one again this year, an annual conference just for that project. We had 300 people in person and 500 people online last year. We're hoping to find somebody else to help organize that next time!

B: George, are there certain things that we should cover?

G: One of the things that we often ask people is what are they proudest of? It applies to you because you've done things in some very different areas, and they've also been somewhat cumulative, so I don't know how you would even think of addressing that question.

T: I don't know. There are plenty of ways I can answer that. But the thing that keeps coming to my mind right now is this: In 2010, I gave a talk in Davos, at the World Economic Forum, in the MIT session that Susan Hockfield chaired. The name of the session was "On Intelligence" or something like that. There were people there from Brain & Cognitive Science; Tim Berners-Lee was there from the World Wide Web, and I was talking about collective intelligence. The format of this session is what they call the Pecha Kucha format, where you have slides that are rigidly restricted. The slides are supposed to contain only pictures, no words. Each slide is shown for 20 seconds, on a timer, and you have exactly 5 minutes to talk. It's an extremely rigid format for a talk. I spent more hours of preparation per minute of presentation for that talk than any talk ever in my life! [See video posted at https://www.youtube.com/watch?v=LOox5aa61gk]

I gave an early summary of our results from the Center for Collective Intelligence and I'm proud of that. I was thinking, if the high school senior who wrote my college applications could have seen that 5-minute talk that he was going to give 40 years later, I think that fellow would have been pretty proud!

B: Yes! That's a great capstone. Down to 5 minutes.... That's a pretty high-powered place, Davos. Well, we are getting close to the time when you have other engagements. Tom, this has been fabulous to hear your journey, and it's still unfolding.

T: Thank you. I was especially happy to talk about the old days because I felt those were really good years for me. I guess maybe I'm not the only who thinks those might have been the "good ole' days."

B: Yes, when we talked to Ed Schein and he reflects on the hires here, it's not been the easiest place to survive and thrive. He said, "I think about Tom Malone as a great example of the kind of person who comes here and it really works – for him and for the Institute, and the larger community."

T: That's really nice to hear.

END OF INTERVIEW