The Power of Decentralization: Discovering the New Physics of Organizing

Interview with Professor Thomas Malone
May 31, 2001
Massachusetts Institute of Technology

Claus Otto Scharmer[1]

C.O. Scharmer: Professor Malone, what underlying question does your work address, and how does your own life story relate to that question?

I. Growing up on a Farm in New Mexico

Thomas Malone: I was born in New Mexico. I grew up on a farm near a small town in New Mexico. My dad was a farmer.

COS: And the farm still exists today?

Thomas Malone: The farm still exists. My aunt and uncle still live there, although my uncle is now retired and the farm is run by somebody else—a neighbor kid I knew when I was growing up. The farm is still in our family, and I fantasize sometimes about having a house there where I could stay from time to time as I get older.

COS: Did that shape the way you approach your scientific work, in some ways? Being born and raised, having spent the first years of your life on a farm?

Thomas Malone: That's an interesting question. Certainly, growing up in a rural community affected me in many ways, perhaps some I still don't even understand. I suppose one consequence of growing up on a farm, away from other kids except my sister, was that I got used to playing and working by myself.…

I think one of the skills that's useful in my work—I'm sometimes surprised when other people don't have it—is an ability to see what's important in a situation.

COS: Say more.

---

[1] The conversation with Thomas Malone took place as part of a global interview project with 25 thinkers on knowledge and leadership. The project was sponsored by McKinsey & Company and the Society for Organizational Learning (formerly the MIT Center for Organizational Learning). The interviews and the summary paper are accessible as free downloads from www.dialogonleadership.org.

Thomas Malone: I think one of the things I'm pretty good at is being able to get to the heart of the matter in a situation—to say here's the essential problem or the essential idea.…

Maybe that's somehow related to growing up on a farm where, in a certain sense, the superficial distractions are less present. At least in stereotype, rural people are closer to the basic realities of life than people who live in cities where there are so many layers of…

COS: Noise.

Thomas Malone: …noise. And in some sense, artificial refinements on top of the basic realities of life. I have no idea if this hypothesis is true, but it seems intriguing.…

I went to a small country grade school. In fact, in my grade school class about 80 percent of the kids were children of Mexican-American farm workers. So I suppose it wasn't diverse, because there was one dominant majority race in my grade school. But it wasn't white. I was a minority in my grade school. I think that gives me a different perspective on a lot of the questions about diversity that people talk about so much today.

It wasn't a one-room schoolhouse, but it was a one-class-per-grade schoolhouse.… And I had mostly the same kids in my class for all six years. And then I went to junior high and high school in the nearby town called Artesia. That was a little more typical of a suburban school, though I was a country kid, not a town kid. And there was some sense in which the social hierarchy there had the country kids at somewhat lower status than the town kids.

COS: So, again, you had the experience of the periphery, right? First being a minority, and then you're a country kid.

Thomas Malone: Perhaps, yeah.

Actually, that makes me think of another way in which I think my experience did shape my later career: As a relatively intelligent kid in a rural small-town environment, I got used to thinking and doing things that no one else I knew had done. A lot of kids, a lot of people, only do things which someone else they know has done. But pretty early on I got used to doing things for which I didn't have any local role models: building radios and reading about televisions, doing—what was it?—a ninth grade geometry course on my own in the summer.… And I remember going off to a summer math program after my tenth grade year. I don't remember ever hearing

of anybody else from my school who had done that. I just heard about the program somehow and figured out how to apply.…

COS: So your parents and teachers encouraged you?

Thomas Malone: Yeah, I think I was quite lucky in that regard. I think I had some good teachers, and my mother, especially, was very involved with me and my intellectual development.

COS: What was her role?

Thomas Malone: Well, to begin with, she is a smart person.… I think she influenced me by engaging me in intelligent conversation. I think she encouraged and responded to the things I said at a deep level, rather than just dismissing them as a kid babbling, for instance. And I think she had very high expectations of me, which I'm sure also had an effect.…

II. "Pick a Problem in Society that You'd Like to Help Solve"

COS: Do you remember an instance when you first had an experience of some kind that you felt was connected to what you wanted to do in the future?

Thomas Malone: Sometime in junior high or high school, I remember thinking that the best thing you could do in life would be to be a great thinker like Galileo, Newton, Plato, or Aristotle. But that seemed beyond the realm of possibility for me. What I could aspire to, I thought, was accomplishing important things through organizing situations and people. In other words, I thought I had more hope of making an important contribution as a manager than as a thinker. In reality, as my life has turned out, I believe I have made more of a contribution as a thinker than as a manager, even though I certainly don't consider myself at the same level of achievement as the great thinkers of the ages.

I didn't really even know when I was growing up that there are a lot of what you might call "journeymen thinkers," people like I am now, making their living, in some sense, as thinkers, but without being at the level of the Einsteins and the Newtons and the Galileos.…

COS: After high school, what was it that informed your choice there?

Thomas Malone: One of the things I remember is that I was always interested in both sciences and humanities. Many people have a clear preference for one or the other, [but] I was equally interested in both.…

When I wrote my applications for college, I said that I wanted to focus on the problems created by technology changing faster than society could adapt. A kind of idealistic thing for an 18-year-old high school senior to say!

In the years since then, I have realized that the rest of my life so far can be viewed as progressively refining and developing that teenage aspiration.

COS: Can you share a little bit of the context that prompted you to pick that one?

Thomas Malone: Well, let's see, I wrote this in 1970. I guess part of the personal context is that I was, as I said a minute ago, interested in technology and science on the one hand, and more liberal arts things on the other. So that duality is reflected in the statement. Also, this was at the height of what we now think of as the ’60s, and societal idealism was very prevalent in the world in those days.

COS: So what then prompted you to assume that the change of technology is faster than…

Thomas Malone: …the change of society? Well, that's a good question. It would not have been thought of as surprising to say that in those times, or even these times, I suppose. I think it's kind of a cliché to say that technology is changing faster and faster all the time, but the real problems are the human problems, the people problems, the organizational problems. We can't keep up with our technology, it's overwhelming us. All these things are now clichés.… I echoed this sentiment, I don't think I originated it. I don't remember any particular insight that led me to formulate things in that way. I think it was part of the zeitgeist.… So I applied to colleges with this on my application, was accepted at Harvard, turned Harvard down, and went to Rice University in Houston, Texas, instead.

Early in my college career, I read Alvin Toffler's 1970 book *Future Shock*. Toffler popularized in that book, among other things, the idea of *career trajectories*—that in the future people wouldn't follow a lock-step career ladder, but would instead move over a whole series of jobs in an individualized trajectory. I was really attracted to that concept and decided that what I should be planning was not a career, but a career trajectory.…

I also concluded, as a result of reading Toffler, and other things, that the world in which my career would play out was likely to be quite different from the world of 1970. In particular, there were three kinds of technologies that I thought had the potential to dramatically change the world. The most obvious in 1970 was nuclear weapons. It was possible that some kind of nuclear war would change the world radically. That was the most obvious at the time, [but] I thought [it] was the least

likely. The other two were information technology—or computers, I guess, is what we would have called it then—and genetic engineering.…

Of course, people had heard of these technologies back then, but I think it was still probably a pretty good call way back 30-some years ago to say that those were the two technologies most likely to change the world in my lifetime.

Of the two, computers and genetic engineering, the one I thought was most interesting, the one I felt I had more talent or interest in, was computers. So at this point I refined my life mission statement to focus on computer technology and how its changes would affect society.

In 1970 I had read—or maybe this was '71 now—I had read a *Scientific American* article by Marvin Minsky about artificial intelligence, and I was very taken by his vision and by the possibilities of artificial intelligence to dramatically change things. I remember talking to one of my friends, a computer science major, who was a senior when I was a sophomore. After reading Minsky's article, it seemed like all this AI stuff was moving so rapidly, I was worried that maybe it would have all been done and they would have intelligent computers by the time I graduated from college. So I asked one of my friends, a computer science major who was a senior when I was a sophomore, whether there would still be anything left to do by the time I graduated. He said not to worry, the research in artificial intelligence wouldn’t all be done by then.

COS: That much he knew.

Thomas Malone: Yes. So by this point, I had identified computer technology as the technology part of my life vision.

COS: What informed that choice, you just had intuitive feelings? When was it that that really became clear to you, that this is kind of "my way”?

Thomas Malone: I think that part became clear when I was a sophomore in college. I had been interested in computers for a long time. When I was in ninth grade I did a science fair project called "A Fractional Logic System." Instead of just having “true” and “false,” I said, why couldn’t you have a whole continuum from 0 to 1?… I knew from working with electronics what the formulas were for resistors connected in various ways. So I said, what if, instead of having a switch that's on or off, you had a variable resistor from zero to one? Then a plausible model for the result of the fractional truth value of an "and" or an "or" could be determined with the mathematical equations for resistors in series or parallel. I can't remember exactly what the equations are. But basically my ninth grade science fair project was using this approach to create a theory for fractional truth values.…

I've been interested in computers for a long time. For instance, I had a Geniac computer kit when I was pretty young, and I had read a lot about computers. So I had much more basis for my interest in computers than for genetic engineering.

COS: But you set out initially to solve a problem, right? What was the reformulation of that?

Thomas Malone: The reformulation at this point was only half complete: I wanted to help solve the problems created by computer technology changing faster than society could adapt. But I hadn't yet focused on any particular kinds of societal problems, just on the technology.

At that point I decided that I would double-major in what at Rice was called mathematical sciences (basically applied math) and behavioral sciences.

When I graduated from college, I didn't want a conventional "go work for a big company and write software" job. Instead, I wanted something that would advance my life mission dealing with social problems…. The place I ended up working was with a regional service center in Houston that was helping the Houston public schools install computer-aided instruction.

Over the course of the year that I worked there, I became convinced that to really do what I wanted to do, I needed an advanced degree. And since I already had a technical degree, what I really needed was a social science degree. To get one, I applied and was accepted in the Stanford psychology department Ph.D. program.

COS: So now we are in the later ’70s?

III. Stanford and Xerox PARC

Thomas Malone: Yeah, I went to Stanford in ’75. It was a research psychology program, not clinical psychology. My interests were in cognitive and social psychology. I did mathematical models of two-person interactions, math models of computer-aided instruction, studies of intrinsic motivation, etc.…

When I first went to psychology graduate school, I thought the problems that psychologists have as their domain are some of the most interesting problems in the world. I remember being really excited, for instance, in my first couple of weeks there when I found out about this cool new methodology called "reaction time experiments." The idea was: If you want to figure out what's going on inside somebody's head, you can give them mental tasks to do, and you can measure down to the millisecond how long it takes them to do those tasks. By varying little aspects

of the task, and seeing how that affects the time, you can make some inferences about what must be going on in their head.

I thought, what a cool idea! Without measuring anything inside a person's head, just by measuring reaction time from the outside, you can figure out what must be going on inside!… Well, by the second or third month of graduate school, I realized that that was about the only cool idea they had in those days! At least at that time, everybody in cognitive psychology was doing reaction time experiments for everything. And I got progressively disillusioned with academic psychology as I perceived it then—rigorous methodologies attacking highly sterilized versions of what once were interesting problems.

What I ended up picking as my thesis topic tied together rigorous empirical methodologies with some of my earlier work on computers in education. In 1978 when I started the thesis work—or maybe it was '79 by then—there had already been a few computer games developed, but they were not yet very well known. In fact, I had worked with some of the early computer games in my job before graduate school. And I was convinced from the work I had done on computer-based instruction that motivation was a key factor in helping people learn with computers. I made the link that studying computer games with their strangely motivating—you might even say addictive—quality could lead to a lot of very interesting insights for how to motivate people for educational tasks. So I did my thesis on that, analyzing what makes computer games fun and how to use those same things to make other educational environments and programs more motivating.

COS: That's a really highly relevant thesis, right?

Thomas Malone: Yeah. I was pleased to have found a topic that I thought was actually valuable and worthwhile, and that also was acceptable within the fairly rigid academic framework of the Stanford psychology department. It also turned out that through luck or insight—I'm not sure which—I managed to do this at a very good time. My thesis came out in 1980, and that was just the time that the early computer games like Pong and PacMan were exploding in popularity. Because of this, lots of people were very interested in my research. Lots of people quoted me, I did lots of press interviews, and things like that. My thesis was distributed as a Xerox PARC technical report, and they sent out well over a thousand copies. It had a lot of influence, I think, in the early years.

COS: So what was your connection to Xerox PARC back then?

Thomas Malone: When I finished graduate school I went to Xerox Palo Alto Research Center (PARC). In fact, my last year of graduate school I worked as a

research intern at Xerox PARC and then stayed on as a full-time staff member afterwards.

COS: I see. So you came in the most interesting group of people that ever worked there, right? Wasn't that one of the most productive and interesting teams over the last 25 years or so?

Thomas Malone: It was kind of like a magical place in those days. People there were very smart, most of them were also very nice, and they were doing things that almost everyone now knows changed the world.… In my first year there, I remember writing a letter to my grandmother with a laser printer. Today, of course, we see typeset-quality computer output all the time for all kinds of documents. But in 1979 it was a really amazing thing to think that you could have some random thoughts, or a letter to your grandmother, that looked as beautiful as a published book. And, you know, you could have big fonts and little fonts, and bold and italics, and you could do all that stuff. It was a really amazing thing in 1979. I remember feeling really special to be part of that.

I was still [working] on the educational uses of computer technology then, but it wasn't really where my heart was. I had also been interested in organizations for some time, and in fact, while I was a psychology graduate student, I had hung out with the organizational research program at the Stanford Business School. I took a couple of classes in the Stanford Business School, and when I went to Xerox PARC, I did work in that area, too. The first year or two I was at Xerox PARC I became increasingly convinced that I didn't want to make my career in educational computing; I wanted it to be in more organizational uses of computing. I guess there was another formative experience I had as a graduate student.…

IV. Formative Experiences and the Physics of Organizing

When I was a graduate student, I remember at one point going with a friend to an antinuclear demonstration at the--I believe it was called--Abalone Nuclear Plant, down near Monterey, California. I wasn't a heavy-duty antinuclear activist, or anything like that, but I did go, this one time, to a planning meeting for a demonstration.

And I remember very clearly sitting in this big room where the demonstrators were sitting around planning what they wanted to do. You know, when they were going to do what to disrupt things. There were 30 or 40, maybe 50, people sitting in a big circle in this room, trying to make consensus decisions about what to do. And I was really struck by the difficulty of making consensus decisions in such a big group. It's not impossible, but it's really hard. Everybody has to have their say. Anybody who has any objection has to say it, and everybody has to listen to the objection. In many

cases nothing happens, and if anything does happen, it takes a long, long time to come to a decision.

While watching all this, it struck me that it should be possible to say something in situations like this about what you might call the physics of organizing. It should be possible, for example, to have principles like: the difficulty of consensus decision-making increases with the square of the number of people involved, or something like that. It seemed to me then—and still today—that it should be possible to formulate some much more precise rules or principles about organizing than had been done so far.

Now this reminds me of another much earlier, and in retrospect quite formative experience, which I skipped over. In junior high school I read Isaac Asimov. I was a big science fiction fan, and one of the really memorable things I read was Isaac Asimov's Foundation Trilogy. I don't know if you've ever read it.

COS: I don't know that, no.

Thomas Malone: It's set in a future world, where people live and travel among the stars. There are empires and rebellions, and so forth. One of the central characters of the trilogy is a scientist, named Harry Seldon, who is what Asimov called a "psychohistorian." He had figured out the mathematics of predicting the behavior of large groups of people. And he had perfected this to such a degree that he was able to more or less predict the future history of civilization fairly successfully for a long time after he died. He had prerecorded a set of messages to future generations to be played at certain times in the future and to address the problems that he had predicted centuries before they would be facing at that time.

This idea that it would be possible to have something like a psychohistory, a set of mathematics of human behavior, was quite intriguing to me. And I guess there were echoes of that in the observations about the nuclear protest.

By now we're in the late '70s, but a lot of what we now call the '60s was still very present, especially in the Bay Area where I was at Stanford. In some ways there was a kind of '60s idealism about making the world better and power to the people, and all sorts of things like that. The nascent form of Silicon Valley already existed then in the San Francisco Bay Area, and much of the early experimentation with computers there was tied to this '60's idealism. Steve Jobs, for instance, and many others like him, were very much part of this '60's culture and saw personal computing as a way of using computer technology to bring power to the people.

You may remember, for example, the famous Apple commercial that aired during the Super Bowl in 1984 where a woman destroyed a big image that represented IBM.

This commercial epitomized the ethos that the personal computer was a rebellion against the big mainframe mentality represented by IBM. I was attracted by that whole view of computers.…

It was really not until my first year or two at Xerox PARC that I became increasingly convinced that I didn't want to focus on educational uses of computers, but on organizational uses of computers. I felt that if you understood the "physics of organizing" better, it should be possible to use computers and the capabilities they provided, to create organizations that were better. You know, to make the world better through better organizations enabled by computers.

My sense of "better" was not terribly well articulated at that time, but it included the idea of some degree of decentralization of power, things like that. I was also influenced in graduate school by a work by Amory Lovins, *Soft Energy Paths*. I don't think I read Schumacher's *Small Is Beautiful* until later, but it is part of this ethos, too.

COS: So then you went to PARC.

Thomas Malone: I was at PARC when I came to this realization, and I shifted very consciously my focus from educational software to organizational software. And as part of that I became convinced that PARC probably wasn't the best place for me to do that, because there was not much of an organizational research community or infrastructure there. There was a lot of educational software stuff, not much organizational stuff.…

So I looked around; I actually thought seriously about taking some management jobs. I interviewed for several jobs that would have been managing groups of software developers in the Bay area. I even thought seriously about starting a company at that time.

COS: Did you?

Thomas Malone: Yes, in fact, I had already started two companies by that time. One was when I was in graduate school; my college roommate started a solar energy company, and I was a cofounder and limited partner. Nothing ever came of it. I lost the little bit of money that I put in.

Also, my last year of graduate school, I was instrumental in bringing together about half a dozen people in what we called a multidisciplinary consulting firm. I still think we had a great name for the company. It was called Nexus, N-E-X-U-S. And we actually did a little bit of work and made a little bit of money. We had some very

egalitarian ideas about sharing the money in proportion to hours worked, independent of status or level.

COS: And how did that work?

Thomas Malone: It was actually a very enjoyable group. We did some consulting for the computer center at Stanford University. We had some computer scientists, some organization theorists, some psychologists. The group mostly disbanded when most of us were finishing graduate school and the company wasn't really enough of a going concern to support us. So we all went our separate ways with one, or maybe two, of the people continuing to work using the company's name for a while longer.…

V. MIT and a Moment of Ephiphany

Anyway, the management jobs that might have tempted me, I ended up not getting offered. I did look at a couple of universities, but none really seriously, other than MIT. I ended up taking the MIT job to work on organizations and computers. And I think by this time, the basic form of my life mission was clear. It was to use computer technology to help create better organizations. This was still very much a descendent of the basic idea in my college applications.

COS: So when then did you come to MIT?

Thomas Malone: 1983. The basic vision was clear in my mind by then. I remember my first year here going around drawing a little diagram on people's blackboards when I would tell them about what I was interested in. I think I've still got it in some old documents. The diagram contained four circles. On the top was a circle representing a body of theory—I think originally I called it "organizational systems." Below that were three circles representing three application areas. One was distributed and parallel computer systems. The second was helping people work together using computers. And the third was designing new organizations. A number of years later I came up with and became very attracted to the name "coordination theory" for the top circle.

COS: How did that come about, can you say a little more?

Thomas Malone: Well, I guess I'm a little hazy now on the exact chronology of this.… I think I wrote a working paper while I was still at Xerox PARC, called something like "Organizing Information Processing Systems: Parallels Between Human Organizations and Computer Systems," back in 1981.

At one point, I remember that I hadn't taken a vacation in over a year. I took a vacation in Hawaii, and I remember sitting on the beach in Hawaii and coming up with some ideas about abstract models of organizations. And how you could use those models to calculate things like communication costs and production costs and things like that. So the key idea came sitting on the beach in Hawaii.

COS: Really, is that true?

Thomas Malone: That's true.

COS: And then what?

Thomas Malone: Well, the basic ideas occurred then, and I think I might have…

COS: The basic idea being?

Thomas Malone: Some models of organizational structure which I continued to develop. I remember talking about the models in my job talk here at Sloan, and I ended up publishing them in my first few years here. The basic models are in a paper in *Management Science*, and some more elaborated versions are in a paper in *Operations Research*.

These were examples of what I now would call coordination theory. This whole structure was pretty clear in my mind by the time I came here, so it must have emerged in my mind in the last year or so at Xerox.

COS: What gave rise to choosing that whole domain? Coordination as…

Thomas Malone: Well, what gave rise to that, I think, was the following line of thinking: If the world problem I was trying to solve was helping to create better organizations with information technology, the intellectual leverage I saw for doing that was developing what I originally called the physics of organizing, and what I would now call coordination theory. That is a deeper understanding of the underlying constraints and possibilities for how coordinated work could be structured in the first place.… From an engineering point of view you could call it the design space for organizations—that is, the space of possible designs of organizations.

COS: Yes, I remember you talking about that.

Thomas Malone: If you could have a more precise way of articulating that design space, and the tradeoffs among different areas in that design space, then that, it seemed to me, would give you a much more systematic and much more powerful way of doing what I was hoping to do: use technology to build better organizations.

Because it gives you the possibility of being much more systematic about how you explore possibilities.

VI. Teilhard de Chardin and Non-hierarchical Coordination

COS: You have suggested that "anything that can be coordinated in a hierarchical way can also be coordinated in a non-hierarchical or emerging way." And then, "as communication and coordination technologies become better and better, it becomes possible to coordinate the work of more and more people, and larger and larger projects, more and more effectively. If you take that to the extreme, you have everybody in the world working together." That's an intriguing picture, particular intriguing because in a way it describes what reality, in a certain way, is: the world economy.

Thomas Malone: Yeah. You're right, in a certain sense that that's true today, the global economy is that.

COS: We are heading towards that…

Thomas Malone: Well, we're certainly heading toward that. I think it's interesting to observe that in a certain sense it's already true. In a certain sense, everyone in the world is working together and their actions are coordinated by the global marketplace. It's far truer today than it ever was before in history. There's one kind of intriguing version of the extreme form of this, which is Teilhard de Chardin's global mind, global brain.

COS: Can you say more about that?

Thomas Malone: Yeah. He [Teilhard de Chardin] as you may know, was a French philosopher and theologian, writing in the mid-1900s, who observed the very early stages of the telecommunications network that now is far, far more developed than it was then. But even from its beginnings, he extrapolated the possibility of a future in which the world would become more and more closely connected until at some point it might become what you could call a global brain or a global mind.

It's interesting to observe, I think, that in a certain sense this is not a question of "is it true?" but one of "do you choose to regard it as true?" In other words, from a certain point of view, it's true today. It's easy to hear things about global brains in a kind of mystical, nonsensical way. But I think there's a very intriguing sense in which this is not a matter of metaphysics at all, just a matter of point of view.

There was another book written not too long ago called *Non-Zero* by Robert Wright. Wright argues that there's a kind of—if not inexorable, at least surprisingly

common—tendency in human history for people to organize their affairs in ways that lead to higher levels of organization and non-zero-sum, meaning positive-sum, benefits for the communities involved. And of course, the logical extreme of this is, again, everybody in the world working together.

I'm not at this point prepared to be very emphatic about this, but I think at least it's an intriguing possibility to consider as one view of where human evolution…social evolution is leading us.

COS: So what is it that intrigues you about that possibility? And how would you account for such a possibility?

Thomas Malone: It intrigues me, I think, because if it's true it suggests a way of thinking about how to make the world better. A way of thinking about an enterprise that is far bigger than any of us as individuals. A purpose to which dedicating our efforts might be worthwhile.

How do I account for it, meaning how could it happen? I think one element of it is obvious, which is better and better communications. And in fact, that's happening in many ways far faster than I, and I think most people, would have predicted ten years ago.

Another element that I think is needed is a better understanding of the physics of organizing, or what I would now call coordination theory. Just getting everybody connected isn't enough. You also need the connections to be fruitful, the activities need to be coordinated or organized in some constructive way.

The third thing that's needed is something you could call social or cultural, or maybe even moral, or spiritual. You need a willingness among the people involved to become part of something that's bigger than any of them, to place their own interests below that of some greater good.

VII. None of Us Understands the Potential of Extreme Decentralization

COS: I'd like to come back to what was said to you when you were a teenager, that you should pick a real problem and then contribute to its solution. How would you explain to a fifteen-year-old or a layperson what kind of problem your work is referring to and what kind of solution your first phase of work, which is everything as of now, provides?

Thomas Malone: My work refers to the problem how to use information technology to design organizations in general and businesses in particular in ways that are better. I think a fifteen-year-old can understand that.

COS: Better in terms of?

Thomas Malone: Better in terms of not only economic values, but human values as well. In fact, you correctly realized that one of the first questions that problem raises is what do we mean by "better"? And the part of it that intrigues me is the part that says not just more economically efficient but more desirable from the point of view of other human values as well.

The answer that I've reached so far—I think the part of the answer that I'm most confident of—is that new information technology makes it economically possible, and in many cases economically desirable, to organize work in more decentralized ways, to distribute decision-making authority much more broadly among the people involved in accomplishing goals. That's a deep fundamental shift in the way many of us think about work and business and management.

It's not that decentralized ways have never been used before; they have for sure. All of us, for instance, take for granted the idea of using free markets as a way of coordinating much economic activity. All of us also take for granted the idea of using voting and democracies as a way of making certain kinds of political decisions. And we all understand, at least in principle, the possibility of delegating power more widely. But I think, in practice, almost none of us understand the potential of extreme forms of decentralization in each of those directions. In other words, almost none of us understand how many business problems could be solved in much more decentralized ways than they currently are. And I think that that realization and that understanding has a potential to create organizations that look and feel different from those of today, and that are—here I'm bringing in the other point—not only more economically efficient and flexible, but also potentially more desirable from the point of view of other human values.

Now you might ask, why do I think it's more desirable from the point of view of other human values? One reason is that if people are making their own decisions about what to do, they are, by definition, better able to take into account their other preferences in deciding what to do. If you are, for instance, an employee following orders from your boss, then your ultimate choice is, should I do what the boss says or leave the company? If you're a contractor deciding whether to accept a given contract, your choice is simply, should I do what this customer wants or not? And in many cases, passing up a particular contract is a much less serious decision than leaving a job altogether, leaving an employment relationship altogether. If people have more choices, they are able to make those choices more congruently with all of their values, not just their economic values.

I think the teachings of what you might call the wisdom literature of the ages are pretty consistent in pointing to the risks of power over others, both from the point of view of the ones who have power, and also from the point of view of those who don't. I think decentralizing power reduces those risks. That's as far as I've gone so far.

COS: You said that most of us really don't see the full potential of that decentralization and ways of coordinating and organizing. So what is it that's getting our way?

Thomas Malone: I think one thing that gets in our way is what Mitch Resnik of the MIT Media Lab calls the “centralized mindset.” That is our lack of ability to imagine other possibilities; our, if not instinctive, at least automatic assumption that if there's a problem the solution for it is something centralized. So, in order to get beyond that barrier, we need to expand our imagination, expand our mental models about what's possible.

COS: And in terms of doing that work, in terms of helping people to develop these kinds of organizations, what have you learned over the years that could help them to actualize that potential better and to overcome these barriers more easily?

Thomas Malone: One simple lesson is that communication bandwidth increases with information technology. If you've got 50 people sitting in a circle in a room, only one can be talking at a time. If you've got 50 people communicating to each other in electronic chat rooms, all 50 can be “talking” at the same time and then reading what each other is writing, too. So in a simplistic sense you've just increased the amount of bandwidth available for communication. You’ve also made it possible to use more decentralized systems in places where they might not previously have been feasible.

I think there are several things I've learned over the years to help people think about these possibilities. One is we have examples of more decentralized ways of doing things, some real, some hypothetical scenarios. The e-lance economy is now one of the best developed, a hypothetical scenario which is becoming more and more real all the time. Another thing we've developed is a conceptual approach to understanding what actually needs to be coordinated in any given case, and understanding what the options are for how that can be coordinated. So that's what we've called coordination theory, which is, I guess, my current name for what I at once called the physics of organizing.

COS: Could you outline that for a layperson?

VIII. Coordination Is Managing Dependencies Among Activities

Thomas Malone: Yes. What I mean by coordination theory is that body of theory and principles that help explain the phenomena of coordination in whatever systems they arise. Now what do I mean by coordination? **We define coordination as the management of dependencies among activities**. Now how do we proceed on the path of developing coordination theory? The work we've done so far says that if coordination is the managing of dependencies among activities, a very useful next step is to say: what kinds of dependencies among activities are possible? We've identified three types of dependencies that we call atomic or elementary dependency types. Our hypothesis is that all the dependencies, all the relationships in the world, can be analyzed as either combinations of or more specialized types of these three elementary types. The three are: *flow, sharing,* and *fit*.

Flow occurs whenever one activity produces some resource used by another activity. Sharing occurs when a single resource is used by multiple activities. And fit occurs when multiple activities collectively produce a single resource. So those are the three topological possibilities for how two activities and one resource can be arranged. And each of them has a clear analog in the world of business or any of the other kinds of systems we talked about.

Flow is probably the most obvious. It happens all over the place, and in some ways is *the* most elementary of all. Sharing also happens a lot whenever you've got one resource shared by multiple people or activities, whether that resource is a machine on a factory floor, a budget of money, or a room, or whatever needs to be used potentially by multiple activities. The least obvious is the last one called fit. A good example of where that occurs would be if you have engineers designing a car. One engineer is designing the engine, another engineer designing the body, and so forth. There's a dependency between the activities of those engineers that arises from the fact that all of the pieces have to fit together in the same car.

So the idea is that, for each of these types of dependencies, there's a family of possible coordination processes that can be used to manage it. For instance, with a sharing dependency, one way of managing that is by *first come, first served*. Another way of managing that is by *priorities*: the [people with the] highest-priority activity get to use the resource as long as they need it, as long as there's no other higher-priority activity there. And for each of the other types of dependencies you can have a similar kind of family of coordination processes for managing them, some of which are centralized, some of which are decentralized.

IX. Decentralization: Of Markets, Dialogue, Localization

COS: If we take the world economy, what are possibilities for how extreme decentralization could look? What are some of the scenarios of possible extreme decentralization that you could see?

Thomas Malone: Well, let me take as one example an extreme form of an e-lance economy involving people all around the world. It might be a case in that scenario that if you had some task to be done—writing a computer program, doing some market research, composing a song for your wife's birthday, drawing a caricature, preparing slides…

COS: You would post it.

Thomas Malone: You would post it, and whoever was best able and most available to do that, wherever they were in the world, you could pick.

COS: Do you actually do that yourself?

Thomas Malone: Sometimes. I used e-lance.com…

COS: I've always intended to do it, but whenever I have an important task, I'm kind of very conservative and fall back to the people I know. And it did work?

Thomas Malone: Yeah, it worked well for me.

COS: So that will be a new way for the whole world economy marketplace, right?

Thomas Malone: A single labor market, a global labor market. And a very fluid, global labor market.

COS: Is that what you mean by decentralized? Is that the only possibility, or would you see an additional possibility of extreme decentralization that would play out in a different way?

Thomas Malone: That's only one possibility. Just in the last few days I've become clearer about the possibility of categorizing different forms of decentralization in three types: hierarchical delegation, market decision-making, and democratic decision-making.

COS: Voting.

Thomas Malone: Yes. I just gave you an example of market coordination—decentralized market coordination.

COS: That is one possibility of extreme decentralization. Are there other scenarios of extreme decentralization?

Thomas Malone: That's a good question. You can tell I'm thinking about it. It's actually quite related to some stuff I've been doing in the last few days, just thinking about this. Here's another one that's different, at least in some respects. The version I gave of the e-lance economy was one where it was a market for money.

Another example of that would be the development of the Linux computer system. There you have a very decentralized system, but no money is changing hands. What's essentially changing hands is recognition. In that sense, it's like the scientific community.

You can view the scientific community as a certain kind of market, but it's a non-monetary market. It's a market where the currency is recognition, where you pay other people for their ideas by recognizing them. Usually that means citing them in your papers or your talks or your conversations. You get paid for your ideas by other people's recognition of you.

Somebody whose research adds little value to the ideas that they build upon is rarely cited and therefore “paid” relatively little for their work. People who add a great deal of value, whether that's building upon a bunch of ideas other people had or creating a bunch of ideas no one had, in either case, if you add a lot of value, in general, you get cited a lot.

The question I'm pondering right now is: are there any forms of radical decentralization that aren't in some sense equivalent to a marketplace, even if a non-monetary marketplace? The question is, is there some other way of delegating that seems plausible that isn't equivalent to a market?

COS: For example, dialogue, which is conversation as a mechanism by which the related actors agree on a joint plan.

Thomas Malone: So how would you describe dialogue as a coordination mechanism?

COS: Dialogue, in terms of coordination, is a mechanism that allows all participants to see a picture of the whole as it emerges, and then to act accordingly.

Thomas Malone: Yeah, that seems to me a form of democracy. I think the intent of a democracy is that everyone voting is in a certain sense voting for the whole. That's a good point.

COS: For example, in the US Army, they have these devices which they give to their people. [Instead of] the specifics of how to command, what they get is maybe a varying strategic objective and this device that enables them to see the picture of the whole. In other words, it allows them to bring all the tacit knowledge that they have into the decision-making process, which could never be integrated in a centrally coordinated way via headquarters. I recently met a US general who told me that story. But I don't remember the names of the devices.…

Thomas Malone: I just spent a couple of days with a bunch of generals and admirals and other very senior military people. And they did talk about things like that. I think you may be thinking of the Marine experiment that was held in Monterey, California. That's a very interesting example. Is that a kind of dialogue, are you saying, or is that just another example of participants seeing a picture of the whole?

COS: Yeah, the latter. I'm not sure about the former, but I am sure that what dialogue's really done is to provide you with that perspective, to shift your perspective from just seeing everything from your own individual interests to taking into account the whole, the perspective of the whole.

Thomas Malone: That's a cool idea. Giving everyone a picture of the whole. That seems to me a form of democracy. At least that's a good form of democracy where everyone tries to vote for the good of the group. Sometimes you do that by saying what you think is best for you. But if you think what's best for you is not best for the group, then that's a kind of perversion of democracy. Just as it’s a perversion of capitalism when you try to exploit others in order to make more money, rather than trying to add more value in order to make more money. Does that make sense?

COS: Yes.

Thomas Malone: Each of these forms of coordination, hierarchies, markets, and democracies, has both a good form and a bad form. In the case of markets, the good form is when everyone is motivated to add as much value as they can by buying things cheap, doing whatever they can do and creating something of substantially more value.… The bad form of market coordination is where you try to make money, not by actually adding value but by exploiting, taking advantage of other people. For example, paying your suppliers less than [something is] worth because you know more than they do and selling it for more than it's worth to your customers because you know more than they do. That, I'd say, is a perversion of capitalism.

In the same way I'd say the ideal form of a democracy is where a group of people agrees to share their fate and agrees to abide by the collective decision of the group. Each person then should cast their votes for what they think is best for the group. In

some cases, the best way of figuring out what's best for the group is for each person to vote for what they think is best for them and then the majority will at least get what's best for them. The same way that markets or capitalism has a downside or dark side, a perversion of democracy might be when each person votes only for their self-interest, even when they think that's in the group's interest.

COS: Another scenario of decentralization would be extreme localism, that is, to get rid of the necessity for coordinating in the first place. For example, rather than having a global market for agriculture and all the ecological problems that come with that, you would simply get rid of that whole coordination by having local cycles of production and consumption.

Thomas Malone: Right. So sort of self-sufficiency or something like that. In a sense, that's what we had to begin with in human history. We always had a global economy, it's just that it was mostly unconnected. So here's a question I think would be interesting: How can we do better than that? You're saying that local self-sufficiency might be better than what we have. In a way, I guess that's Schumacher's argument. But I'm wondering if we could do better than that.

COS: Creating smaller cycles or ecologies which in themselves constitute…

Thomas Malone: Why would you have a need to do that consciously? If I could support myself more easily by being self-sufficient than I could by making money to buy the things I need, why wouldn't I do that? I guess Schumacher would say because I don't have the technology or the mental model to do so. Is that what you're thinking?

COS: I wasn't thinking that much about really getting rid of the division of labor. What I was thinking about is that from a purely ecological, environmental point of view, what's going on today is totally crazy. We pour the tax money into transportation infrastructures. Which then amplify the environmental costs from shipping everything around the world before being consumed, rather than encouraging local production-consumption cycles.

Thomas Malone: I think I understand what you're saying, but it seems like the real problem there is market externalities, and that if you don't have important externalities reflected in market prices, you get bad outcomes.

COS: Yes. I agree.

Thomas Malone: If, for instance, you can buy cheap soap in America without knowing about or paying for the devastation of the South American rainforest that was needed to create it, then there is a market externality. Whereas, if I am buying the soap in South America and I can see the rainforest, and I know that buying the soap

causes the devastation, then I'm less likely to buy it. That's on the assumption that I would be willing to pay more for soap that didn't cause the devastation. But to the degree the proper cost of the environmental externalities is included in the price, the interactions can occur over long distances just fine.

COS: But are you strictly operating from your own economic preferences or are you really open to taking into account the larger picture? These are the moral subtleties, whether or not you see the whole picture. This element could be potentially…

Thomas Malone: Umm hmm, that's a good point. If all the proper externalities are included in the cost, then the cost summarizes a view of the whole picture. But if they aren't (and, in some sense, perhaps, they never could be), then your picture in incomplete.

X. Blind Spots

COS: What do you consider the blind spot of your field?

Thomas Malone: Well, the first question is, what's my field? One possibility is the field of management thinkers, business intellectuals? So you must mean what is one of the most important blind spots that most people in this "field" don't see.

COS: Or it's maybe something that recently you've become aware of.

Thomas Malone: Well, here's one possible answer. It's the role of luck. I think management thinkers and business intellectuals in general are blind to how powerful the effect of luck, chance, or fate is. We over-attribute outcomes, both good and bad, to the personal qualities of the individuals in charge. And we fail to appreciate the degree to which those exact same individuals in different circumstances would have had very different outcomes.

COS: Yeah.

Thomas Malone: Another blind spot concerns the centralized mindset in the field of management.

COS: Can you say more?

Thomas Malone: A lot of people still think that big companies solve all the most important problems and what we need are ways of helping big companies be more efficient and more effective. I think, instead, that small companies and networks of independent contractors will be able to solve many kinds of problems better.

I think there's another blind spot, again, not shared by everyone, but by many. It's a blind spot to what you might think of as non-economic values. Peter Senge, for instance, is someone who I don't think is blind to that. But I think the majority of management thinkers write for an audience of people who are motivated by economic results. There's a bigger market for books that tell you how to make more money than a market for books that question whether money is the right thing to be making.

COS: So it's luck and chance, it's centralized mindsets, that we still focus on the big companies, helping the big guys in the big companies. And then it's the non-economic values.

Thomas Malone: Right.

XI. Science and Spirituality

COS: You mentioned non-economic values and spirituality. Can you say more about that?

Thomas Malone: Well, it's the question of what do we mean by good. If we want to use IT to make organizations that are better, what do we mean by better? The more deeply you think about that question, the more you come to questions that are really philosophical or spiritual questions. At a superficial level, better organizations are ones where you make more money or where you spend less time working. But then why do we want to make money in the first place or why do we want to spend less time working? What else do we want that we can get with the money or the time? What else do we want that we can't even buy with money?

As soon as you start asking questions like this you start on a path that takes you deeper and deeper. You can start with Maslow's hierarchy of needs—you know, security, socialization, etc. I can't remember them all off the top of my head. But even he ends with the last motivation of self-actualization, or what in a later work he called transpersonal motivations. That's really what the wisdom literature of the ages, spiritual and philosophical teachers, have talked about. What's the meaning of life? What actually matters to people? What *truly* makes you happy, as opposed to just what do you *think* would make you happy? So the connection of that to my work is: if I want to help design better organizations, it's useful to think about what we mean by better. And I've spent a fair amount of time thinking about that just from a personal point of view, and also increasingly trying to tie that into the rest of my work.

I've had a deep personal interest in this for a very long time. Questions such as the meaning of life and how one progresses on the path of understanding that better. My sense is that virtually all the major world religions started with people who were in a certain sense all doing the same thing. If you think of spiritual enlightenment or the

goal of spiritual development as the top of a mountain, I think there are many paths to the top of the mountain. And which one is best for a given person depends on who they are and where they are. Different teachers in dealing with different people might well prescribe what seem to be different paths, but it seems to me the paths are all leading to the same place. And in fact, there's a remarkable similarity in the teachings of spiritual and philosophical teachers through the ages.

For the most part, my reading of that is that you can make spiritual progress in any situation, in any social or environmental situation, but some are probably more conducive than others. If you have to spend all your time desperately trying to find something to eat, it's harder to do the things that lead to spiritual progress. Maybe not impossible, but harder. And similarly, if you're in an environment where everyone around you is feverishly seeking money or some other kind of material reward, where there's no discussion of other possibilities, again, I think it’s possible, but more difficult to progress down a spiritual path. In the same spirit, I think it's possible to organize work in ways that make it harder or easier to progress down a spiritual path. I've done some thinking about that.

COS: What would be an example of that?

Thomas Malone: Well, decentralization is one. I think more decentralized ways of organizing work are probably more conducive to spiritual development.

COS: Why would that be?

Thomas Malone: One is that in some ways surprisingly it may be worse for the people who have power than those who don't. Decentralization reduces the amount of power that anyone has and therefore the temptations of power.

COS: Okay.

Thomas Malone: I think that designing work in such a way that people are doing things that have intrinsic interest for them is probably better than where they only do things in order to make money or some other external thing. It's probably more likely to happen in a decentralized way.

COS: What kind of practice have you found that works for you?

Thomas Malone: Well, the main practice I've used over the years has been reading Sufi stories. And frankly, for me, I think the main barrier to my own progress is my inability to get past my own ego. I think the path of spiritual development for me—and maybe for all of us—is a progressive weakening of one's identification with

one's particular self, and then increasing of the identification with larger and larger wholes: society, humanity, the universe.

COS: How has that influenced your work as a teacher and scientist?

Thomas Malone: Well, let me divide it into two parts. One is the content of the teaching and research. And the other is what you might think of as the style. By style I mean essentially how one interacts with other humans, regardless of what you are saying to them. I think the most important consequence is in the style part. That is, I think no matter what kind of research you do, whether it's particle physics or esoteric mathematics or anything, a clear implication of any of these spiritual paths is that one should treat one's fellow humans well. Do I believe I've done a good job of that? I don't know. Sometimes yes, sometimes no. But I guess it is fair to say that I have tried to do it, tried to treat my fellow human beings well. In terms of the content of my teaching and my research, I also try to put in some of these things about non-economic values and things like that. It's more difficult in some courses than in others. But I try to do that when it seems appropriate.

COS: Well, let me finish just with one sentence about you as a teacher. When I was in your class, I did notice the quality of presence that you brought into the room and the degree of being there in the now. All your students at MIT noticed that, as far as I recall. The quality of presence you bring to the situation is one of the major transition mechanisms of deeper learning. I think that may be a whole other dimension where you have impact, impact on other people that you are totally unaware of.

Thomas Malone: Well, that's very nice to hear. I would feel very good if that were true.

XII. Reflection

Thomas Malone's question concerns how to use information technology to design better ways of organizing. Three themes stand out. The first one is the notion of a "physics of organizing," which allows one to be much more precise in defining the space of possibility and articulating the laws of coordination among actors and activities. Coordination, according to Malone, is the management of dependencies among activities. His hypothesis is that there are three elementary types of dependency that map the possible space in which activities can link: flow (one activity produces a resource used by another), sharing (a single resource is used in multiple activities), and fit (multiple activities produce a single resource).

The second theme concerns his proposition that anything that can be coordinated in a hierarchical way can also be coordinated in a non-hierarchical or emerging way. As

communication and coordination technologies become better and better, it becomes possible to coordinate the work of more and more people, and larger and larger projects, more and more effectively. “If you take that to the extreme,” says Malone, “you have everybody in the world working together.” That picture is intriguing, particularly because it describes much of what is already happening in the world economy. Rethinking all key issues of economics and management from this point of departure—“the whole world working together”—is a fascinating idea.

The third theme is the proposition that none of us understands the full potential of extreme decentralization, in either market- or non-market-based forms of decentralization such as hierarchical delegation, democracy, or dialogue-based coordination. Whereas Wanda Orlikowski said she was “disappointed” with the actual changes that technology had brought about in the cases she had studied (see Orlikowski interview), Thomas Malone focuses more on the enormous space of possibility that arises from modern communication technology and distributed patterns of collaboration across the global economy.

XIII. Bio

Thomas W. Malone is the Patrick J. McGovern Professor of Information Systems at the MIT Sloan School of Management. He is also the founder and director of the MIT Center for Coordination Science and was one of the two founding co-directors of the MIT Initiative on "Inventing the Organizations of the 21st Century." Professor Malone's research focuses on how new organizations can be designed to take advantage of the possibilities provided by information technology.

For example, Professor Malone predicted, in an article published in 1987, many of the major developments in electronic commerce over the past decade: electronic buying and selling, electronic markets for many kinds of products, "outsourcing" of non-core functions in a firm, and the use of intelligent agents for commerce. More recently he has described possibilities for future organizations such as an “e-lance economy” where electronically connected free-lancers, joining together in temporary teams, will perform many of the tasks now performed by large companies. Much of his current work focuses on developing on-line “process handbooks,” electronic repositories of knowledge about business and business processes.

Professor Malone has been a cofounder of three software companies and has consulted and served as a board member for a number of other organizations. He has published over 50 research papers and book chapters, is an inventor on 7 patents, and is co-editor (with Gary Olson and John Smith) of the book *Coordination Theory and Collaboration Technology*. Professor Malone has been frequently quoted in publications such as *Fortune*, the *New York Times*, and *Wired*. Before joining the MIT faculty, Malone was a research scientist at the Xerox Palo Alto Research Center

(PARC) where his research involved designing educational software and office information systems. His background includes a Ph.D. from Stanford University and degrees in applied mathematics, engineering, and psychology.