

O.R. mindset magi

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I first met Ed Kaplan nearly 25 years ago, at an INFORMS Conference when he was part of a team representing the New Haven (Conn.) Health Department that had just won the 1992 Franz Edelman Award for outstanding achievement in applied operations research and management science. As the fairly new editor of *OR/MS Today*, I wanted to congratulate Ed as the lead “O.R. guy” on the prize-winning team and perhaps get a few quotes for an article in the magazine.

I liked him immediately for his obvious passion for his work, for his interest in making the world a better place through operations research, for his ability to explain complex mathematical modeling so even a non-O.R. guy such as myself could understand and appreciate it, and for his sense of humor.

Several INFORMS’ “elders” (technically, it was ORSA and TIMS back then; the two organizations merged to create INFORMS in 1995) advised me that Ed was a young O.R. star on the rise, someone I should keep an eye on. So I did.

Of course, you couldn’t help but keep an eye on Ed. Every time I turned around, he seemed to be turning up in the mainstream media for his data-based research on vital public policy issues that covered everything from HIV and AIDS prevention to homeland security to anti-terrorism. Along the way, he received practically every award INFORMS had to offer, as well as other honors and accolades from numerous organizations, universities and governments around the world.

Over the years, Ed and I have exchanged countless emails and

phone calls on various topics, and he’s contributed many, many news items, articles and story ideas to *OR/MS Today*, for which I can’t thank him enough. Of course, it’s always a pleasure to see Ed at INFORMS conferences, and he always seems to have some interesting project he’s working on. What I admire most about Ed is his uncanny ability to see the chaotic world we all live in from his self-described “O.R. mindset” and to somehow not just make sense of it, but to recognize, structure and solve O.R. problems amongst the madness to make the world a little more safe, more efficient, more livable and more enjoyable, one project at a time.

At the most recent INFORMS Annual Conference in Philadelphia, Ed and I sat down again to chat, only this time I recorded the conversation for a Q&A in this issue of *OR/MS Today* (see page 36). Ed, the president-elect of INFORMS, will become president of INFORMS on Jan. 1, 2016, and I wanted to get his take on a wide range of topics, including the state of the Institute from his viewpoint. We were supposed to talk for 45 minutes, but we went twice that long. Engaging, entertaining and enthusiastic, once Ed starts talking about operations research and INFORMS, there’s no stopping him (at least until the next appointment he had on his incredibly busy conference schedule).

I couldn’t include in the published Q&A half of the ground we traversed in Philadelphia, but I think you, the INFORMS membership, will get a good glimpse into the “Member in Chief” (long story) who will lead the Institute for the next year. **ORMS**

— Peter Horner, editor
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Meet the 'member in chief'



INFORMS President-Elect
Edward H. Kaplan, Yale University

**Interview with Ed Kaplan,
the next president of
INFORMS who plans to
lead by example.**

By Peter Horner

When nominated for president-elect of INFORMS, Ed Kaplan, professor of operations research, public health and engineering at Yale University, said he aspired to be “member in chief” rather than “president” of the organization. When asked recently what that meant, Kaplan said he wasn’t into giving orders; rather his goal was to be the “best INFORMS member he could be” and to inspire the membership to unearth and address important operations research problems, and that he would lead by example.

Anyone familiar with Kaplan’s research knows he has done exactly that for more than 30 years. Starting with his work on a tenant relocation problem on behalf of a huge public housing redevelopment project in Boston while earning his Ph.D. at MIT in the early-1980s to his more recent work on homeland security and anti-terrorist policy and decision-making in both the United States and in Israel, Kaplan has demonstrated a remarkable knack for finding critically important O.R. problems, approaching them with a uniquely “O.R. mindset,” and producing not only useful, but in some cases, life-saving results.

Perhaps the best-known example is Kaplan’s groundbreaking work regarding HIV infections among a population of intravenous drug-users during the early 1990s on behalf of the New Haven (Conn.) Health Department. With virtually no reliable data and barred from gathering any data from the drug-using “clients,” Kaplan came up with the idea of “interviewing” and tracking the needles, and with mathematical modeling and his well-honed O.R. chops, he was able to build a fact-based case (against considerable political opposition) that a publicly funded needle exchange program would curtail the spread of the disease. The program was implemented and succeeded, drastically reducing the rate of infections.

Kaplan and the rest of the New Haven Health Department team subsequently won the 1992 Franz Edelman Award from TIMS (which later merged with ORSA to form INFORMS), the first of many honors and accolades INFORMS would bestow on him. For those keeping score at home, the list includes the Lanchester Prize, President’s Award, Expository Writing Award, Philip McCord Morse Lectureship, multiple Koopman Prizes, Omega Rho Operations Research Honor Society and INFORMS Fellow. Elected to the National Academy of Engineering and the Institute of Medicine, Kaplan received many other awards from public agencies, governments and universities the world over. Suffice to say he didn’t run for president of INFORMS to pad his resume.

So why did Kaplan, who will assume the reins as president of INFORMS on Jan. 1, 2016, throw his hat into the presidency ring? From his viewpoint, what is the state of INFORMS and what does the future hold? What are his goals as president? How did a college geography undergrad major from Canada wind up in operations research and a member of INFORMS? And what do folk dancing, sports and barbeque have in common with the next president of INFORMS?

We sat down with the “member in chief” during the recent INFORMS Annual Meeting in Philadelphia to get answers to those and other questions. Following are excerpts from the interview.

From your perspective as a board member and about to be president, how would you describe the current state of INFORMS?

The state of INFORMS is very healthy. The finances are good. We have more members than we’ve ever had, just under 12,000. We have a healthy flow of new members coming in, and we’re doing a good job of retaining them. The conferences are going quite well. Here in Philadelphia we have well over 5,000 attendees, which is terrific. The section and society structure is working quite well. We have 14 journals that are publishing cutting-edge research and are well respected around the world. As far as a professional/academic association goes, I think we are in very good shape.

What are your goals for your year as president?

Of course, the real goal is to become past president [laugh]. In one year, you can only move the ship five degrees this way or five degrees that way, so it’s really a matter of emphasis, inspiration and direction. I’ve been a member of this organization for 30 years, and over that time I have really come to be a believer in this field. I see myself very much a product of operations research; I owe allegiance to it. My main goal is to inspire the members and represent this discipline in a good way to people inside and outside of INFORMS. We need to engage with government agencies and nonprofits, so that these agencies know who we are and see what we can do.

I think the greatest attribute of the operations researcher is not any specific mathematical method, although the methods are extremely important and I love math and theory as much as the next guy. To me, what is important is what I call the O.R. mindset. What’s the O.R. mindset? Well, the world is this sea of problems. Operations researchers think in terms of problems. The real skill is going out into the world where you have this amorphous bunch of stuff – angst, things are bothering people, or maybe people think there’s an opportunity or something but it’s not really well structured. How do you take that and structure it and turn it into something that

you can analyze and then apply all those great O.R. tools to it and maybe develop some new ones. That’s what I find exciting.

We’re pretty smart. What happens if we all take a little time to think really hard and asks ourselves, “Is there something I can contribute to help the refugee situation in Syria or to address hunger in the United States?” The idea that you can use operations research to make things better, to improve the lives of people, to make things safer, to reduce the burden of disease, to make the world a better overall place is not some abstract pie in the sky thing. There are plenty of people in the organization who have done and continue to make contributions in this way. We have a fantastic new initiative, Pro Bono Analytics, where our members can get involved and help some of these nonprofit organizations. All of this is an area that I’m very eager to talk about and support during my year as president.

Looking further out, what does the future hold for INFORMS?

I think the future of operations research is most dependent on the continual identification of new and important O.R. problems to work on. New methodology goes hand in hand with these problems. Sometimes the development of a new methodology or a breakthrough in technology such as increasing computing power or the ubiquitousness of mobile devices enables you to do things you couldn’t do before. To me, the problems come first, and then it’s how do we address them? How do we think about them? How do we formulate them? How do we solve them?

As opposed to running around with a solution in search of a problem?

As opposed to, “Hey, I got this technology over here, and operations research is nothing more than a bunch of things on a shelf, and you just come and pick the right one, and it will solve your problem for you.” I’ve never subscribed to that view, and I never will. My feeling is we have to keep thinking about how to find new problems. Why does that describe the future of the organization? The point is, what is INFORMS? It’s the Institute for Operations Research and

I think
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the Management Sciences. The Institute and the professional field go hand in hand. If by some horrible act of God the field of O.R. should disappear, it wouldn't make any sense to have INFORMS.

Someone, somewhere long ago opined that all of the good O.R. problems were already solved.

It's not true. It's absolutely not true that all the good O.R. problems are solved. It's true there were many good O.R. problems that were solved, and there were lots of people that were thinking hard about it, but things develop at different times.

We have always been an opportunistic profession, and the pendulum swings in different directions. Sometimes someone comes up with a new technique or is able to come up with new algorithms, which when combined with the new and improved computer power, gives us all sorts of things we couldn't do before. And sometimes people are coming up with brand new problems for which that technology may or may not be appropriate. Not every good operations research problem requires analyzing a 50-gigabyte database, but there are problems that absolutely do require that. What I think is most important is to continue coming up with new and important things to work on and study.

You took a somewhat unusual undergraduate track to operations research. Tell us about it.

I was a geography student as an undergraduate at McGill University in Montreal. Geography in British countries and Canada is not the same field of study as it is in many American schools. It's not about how long is the Amazon River or what's the capital of Japan. It's much more of a science, and there's both a physical and a human side to it. On the human geography side, in my particular case, it was urban and economic geography. Why do people do what they do where they do it? Why do cities have the characteristic shapes that they do? Why is it that every city has all the big buildings downtown, and why do you have the industries out on the fringe? Why do people live where they live? That's the kind of geography I was studying.

That sounds a lot like operations research.

At the time I had no idea what operations research was, even though I was solving what I would later recognize as location problems: Where's the optimal place to locate facilities if you want to minimize travel time or maximize customers, depending upon if you were locating a fire station or a shopping mall. That was one of the many things I studied in urban geography. My original idea was that I was going to be a city planner. I was going to try and stop Calgary

from turning into Los Angeles. I grew up in Saskatchewan, Canada, eh? But I was lucky enough to get very good advice from people who said, "You're the kind of guy who should think of a more technical place to go for graduate school."

So you didn't have a "traditional" mathematics background?

I always loved math, but I wasn't a mathematician. I wasn't in the math department. As I said, I was in the geography department, but as an undergrad, I discovered this course in the math department called Mathematical Models and Applications. I read the description of the course, and it was fascinating. It was about using mathematics to study the laws of planetary motion, traffic, the spread of disease, the spread of rumors, voting and coalitions – this potpourri of applied topics from pure science and social science.

In order to take the modeling class, however, I had to take a bunch of prerequisite classes in things like probability, differential equations and linear algebra, and here I was a first-year geography student. I sat down and for the first time in my life solved a little dynamic program, which was: What do I have to do in order to take this course my senior year? So I filled my spare time with all of these math courses. And when I finally got to take the modeling class, it was fascinating. I loved this class. And because I took this course and the math prerequisites, I was able to write an undergraduate thesis on locating facilities that was much more mathematical and interesting than anything I could have done before.

You wind up going to MIT for grad school. You go in thinking "city planner" and you come out an "operation researcher." Explain the transformation.

So I get to MIT and I meet (former INFORMS President) Dick Larson, who was cross-appointed between electrical engineering and urban studies, and he was also directing the operations research center. Dick sees what I worked on as an undergrad, and he says, "We don't get too many urban studies students who seem to have this kind of modeling interest."

He grabs me to be a teaching assistant for a course that he was doing, and that simple act changed my life. Dick started telling me about operations research, and I looked at all of the problems he was working on at the time: urban service systems, design and optimization. Fascinating stuff and great techniques to go with them – queueing models, network models, all of this great stuff that I didn't know anything about – and here it was all in front of me. Because I had gotten all of my math prerequisites in order back at McGill, it was a beautiful fit.

I was so lucky that Dick found me and picked me. About halfway through my teaching assistant assignment, Dick reminded me that at some point I

would be writing a thesis, and he said that maybe I could get a master's degree in operations research, too – a joint thesis that could count for both. Two years later, I had two master's degrees – one in operations research and one in city planning.

You went on to earn a Ph.D. at MIT. What did your thesis involve?

This is going to feed into your question on how do you find important O.R. problems. The short answer is, they often fall into your lap, but you have to know them when you see them.

One day I was hanging out in my graduate office when in walks one of my classmates whose boyfriend was a consulting architect for a large housing project in Boston that was being completely redeveloped. The redevelopment required ripping down buildings and putting up new ones, and there were 10 or 15 buildings. A big undertaking. The tenants wanted to keep their community together, neighbor with neighbor, but how do you do that during all of this construction and relocation?

If you think about it, it's really a scheduling issue. You're trying to figure out the order you should be doing the redevelopment such that at any point in the process you're moving people around so that everyone always has an appropriate place to sleep.

I was invited down to the Housing Authority where they were trying to manually schedule all the moves of tenants from one apartment to another. I said there's a much better way to do this, and that became the first real O.R. problem I solved on my own – an integer programming problem to make sure you can get this entire housing project redeveloped in the minimum amount of time such that everybody always has a place to live. That became known in the housing area as the relocation problem. Everything took off from there.

How and why did you join INFORMS, your professional association home for the past 30-plus years?

I had been working on the housing problem; we're talking 1982, 1983, 1984. I graduated in 1984. There was an ORSA/TIMS conference in Boston around that time, 1984 or 1985. INFORMS hadn't been born yet. Dick [Larson] suggested I present some of my housing project work in one of the conference sessions. I remember Jan Chaiken was in the audience, and if memory serves, maybe Peter Kolesar was there, maybe even Warren Walker. Those were the sort of people I started to try to model myself after. I joined ORSA and TIMS at that conference.

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When
I left MIT
 after all of
 those years,
I knew who
I was.
 I'm an
operations
researcher.

How has the affiliation with INFORMS impacted your career?

INFORMS has always been my primary professional affiliation. Operations research has always been my primary professional identity. I'm very proud to be an operations researcher. Whenever I have gone off and worked on problems in public health or housing or homeland security or whatever and everyone is being introduced, people always ask, well, what do you do? I say I'm an operations researcher. And then they ask, "Can you tell us what that means?"

So what does O.R. mean to you?

Operations research is the scientific study of operations. Operations are the things organizations and people actually do, and the reason you make these studies – and sometimes the studies are empirical or statistical in nature and sometimes they are very mathematical in nature – is because you want to improve decisions that are being made so organizations get better outcomes out of their processes. The process could be about public health programs or various enterprise operations and functions.

Operations research is totally who I am. MIT was this huge change point in my life. I did fine at McGill, but I never walked out of McGill saying I'm a geographer. I didn't identify myself as a geographer. The thing I was most excited about was the course on mathematical modeling. When I left MIT after all of those years, I knew who I was. I'm an operations researcher, and that's how I define myself.

Did that strong identification with O.R. motivate you to run for president of INFORMS?

You don't wake up one morning and say I want to be president of INFORMS. In this organization that's not how it works. I feel immense loyalty to the profession. It has given me so much, and that's the biggest reason why when you get a phone call and a member of the Nomination Committee asks if you would be willing to run for president-elect of INFORMS, you say "yes." You want to give something back to the organization.

INFORMS' early embrace of the analytics movement produced several developments such as the CAP program and the Analytics Section, now the largest section in INFORMS. Your thoughts?

I'd love to see the Analytics Section turn into a society. If you look at the numbers, it dwarfs the other sections. The field of operations research is flexible, and over time different things get emphasized. Right now, analytics is hot. It's a recognizable phrase in the outside world, and

it's something where we have a lot of in-house expertise and hence we have a lot to share. Those are all good things, but it's not the only thing we do. There are all kinds of other exciting things going on in transportation, in health applications, you name it. There are new activities going on with the methods of optimization, the methods of this, the methods of that. INFORMS is very, very broad in scope. Analytics is one area that's doing quite well, and I'd love to see it continue to do quite well.

What do you want the membership to know about INFORMS that they probably don't?

Some might be amazed that stuff doesn't just happen by magic. There's an office in Maryland with 50 employees working very hard to make sure that all of the internal functions of the organization happen, from the website to publications to the meetings to public relations. People obviously know that these things exist, but I don't think they understand how much goes into it.

The second thing is, it's a voluntary organization, but again people might not realize exactly what that means. It's really quite amazing. Take, for example, the awards ceremony at this conference last night. Every single one of those awards has a committee, and every person on those committees is basically doing it out of service to the organization. It's very important to understand how big and intensive these initiatives are. I understand members want to publish in journals, they want to come to meetings and give talks and network. But you can't expect the entire organization to function with a relatively small staff. There's a big engine room, composed of volunteers, working behind the scenes. And the volunteer board is providing oversight and steering the ship.

You teach courses on policy-making. Share a few of your insights on the art and science of policy-making in a complicated, political world.

One of the most important things is that you have to really understand the problem, whether you're working in homeland security, transportation, health-care, whatever. You really have to understand things not only as an operations researcher but also from the client's perspective. Whether you agree with them or not, you need to learn how they think about these things, they being the key decision-makers. You have to learn how to communicate with them, and sometimes that means learning an entire new language.

When I was doing all the HIV research and working on the needle exchange project, I was at a disadvantage because I had never taken an epidemiology class in my life. I was not a doctor. I had to learn all of these new words and phrases just to be able to talk to them. I

had to understand the community that they were trying to help. I had to understand the hard constraints that they were working under.

This is not something you are taught in school. With few exceptions, we don't teach people how to formulate problems, how to identify problems. We teach people how to solve problems that have been posed. You're supposed to pick up everything else by osmosis. It would be really nice if someone could come up with a way to teach this stuff. Soft skills are important to O.R., and I think there is a method to it.

Your work seems to focus on issues that resonate with people and real-world problems, whether it's fighting disease and terrorism or analyzing the sports world. What drives your research?

Research can often be a very lonely thing. It takes a lot of head scratching. I don't want to spend time scratching my head if it's something I don't care about. Dick Larson taught me that you have to be passionate about what you're doing or you're probably not going to do a good job.

Second, it has to be something that I feel I can actually do something about. That means maybe, at a minimum, that I can come up with an idea that is suggestive and that people could find useful. At the other extreme, it could be something that is actually implemented and leads to good results.

Third, it's not enough that I'm excited about it. There has to be some third party that's really interested in it, because if I'm the only one who cares about it, I'm going to be riding around trying to convince you that I got this great idea and you should pay attention, and you're going to say yeah, yeah, yeah. You need to find something that other people need and are excited about.

Finally, is there something that I can contribute using operations research that is going to be different so that there's real value added?

When not teaching, researching and volunteering for INFORMS, what do you like to do for fun?

Years ago, I used to folk dance, believe it or not. I met my wife folk dancing, and we both used to perform at folk dance festivals. My first all-expenses-paid trip to Israel as an adult was not to do academic work; it was as part of a folk dance troupe. There are hundreds if not thousands of dances, and they all go with specific pieces of music, and the people who are part of the folk dance world know the dances.

I'm an avid sports fan. I teach a class in sports analytics. I've published a few papers in this area, including a recent one on hockey. Sports analytics has been tremendous fun for me. The models are really interesting, and it's totally changed the way I watch the games.

I like eating, but not necessarily fine food. I'm an aficionado of barbecue. Larry Wein and I have this deal where every time there's an INFORMS meeting, no matter where it's held, we always find a barbecue place, and we've been doing that for years.

By the way, earlier you asked why I've made INFORMS my professional association home for all these years. Well, I've made so many good friends in INFORMS, far too many to mention them all here. These are my homies. I have such huge respect and admiration for them. I have a whole other family in Israel – not only my personal family, but also all the operations researchers that I know there. To me, it's so much fun to come to an INFORMS or comparable conference and just get together with these people for an evening. They're all such interesting people and they're all so smart, but they're also funny and engaging and exciting, and I just love spending time with them.

We started this conversation talking about your grad school experience. What advice would you give today's young O.R. grad students?

Find your passion. Whatever it is you're doing, find your passion. You have to love what you do.

Second, think of the difference between answering all the questions on a problem set versus creating a problem set in the first place. You're going to go very far in life if you can create problem sets out of all the different situations you come across. I'm talking about structuring and creating something you can analyze out of whatever the mess is that you are faced with. That's very important.

You can take some risks when you are younger. The system is kind of stacked against it; the usual model is people go through school and get their technical chops. It's only later in life that they start deviating somewhat from the more technical things and start working on some of these more applied problems. Remember, you can go back and forth between theory and practice.

Take the gamble. If there is something you really care about, and you think you have the ability to do something about it, you can afford to take a little time and give it a shot. If it doesn't pan out, what's the worst thing that is going to happen to you? If you never take the risk, you're delaying happiness. You're delaying the payoff both to yourself and perhaps to society at large. People should be happy with what they are doing, not working on something just because they have to.

Every INFORMS president seems to have a theme for their term. What's yours?

Let's do stuff! **ORMS**

Peter Horner is the editor of OR/MS Today and Analytics magazine.

Sports analytics
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