A Conversation With L. Rafael Reif on College of Computing, COVID-19, and the Future Workforce

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Published on: Jul 30, 2020

DOI: <https://doi.org/10.1162/99608f92.bfb344cc>

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ABSTRACT

On June 11, 2020, *Harvard Data Science Review*'s Editor-in-Chief, Xiao-Li Meng, and Media Feature Editor, Liberty Vittert, conducted an online interview with L. Rafael Reif, the 17th President of the Massachusetts Institute of Technology (MIT). President Reif joined the editors to discuss the newly established MIT Stephen A. Schwarzman College of Computing; the use of data behind the difficult decision-making process for dealing with the COVID-19 pandemic; and MIT's Task Force on the Work of the Future to form more evidence-driven plans for preparing the future workforce.

This interview is part of HDSR's Conversations with Leaders series.

HDSR includes both an audio recording and written transcript of the interview below. The transcript that appears below has been edited for purposes of grammar and clarity.

0:00 / 28:18Audio recording of the interview

Xiao-Li Meng (XLM): Thank you so much, President Reif. We know how busy you are. It's probably the most stressful time to be a president of anything, especially with such a large institution. Let's jump in right away. Last year, I had the great honor of attending the celebration of your Schwarzman College of Computing. It was a great event. Having been involved in a little bit of university administration, I have this understanding that usually naming an academic unit takes quite a bit of consideration, as well as negotiations among various stakeholders. I'm kind of curious why MIT called it the "College of Computing," instead of the more common "School of Data Science," or, as media reported all over the place, a "School of AI."

L. Rafael Reif (LRR): Okay, well, there are two things. First of all, MIT does not have colleges. We have schools. The first thing we did that was unusual was to name it a *college* and not a *school*, and that's for a particular reason. But your question is, why did we call it "of computing" as opposed to "of data sciences." Well, that was a long conversation, and the real story is that at the end of the day, it's what the faculty wants. This is their home and the faculty should have the right to decide what their home is going to be called. Yes, all those options were on the table, and their conclusion was that "computing" was much more general and much more inclined to not change in decades to come, so it was as simple as a very intense conversation and discussion among the faculty who will be at home in the college, and that's what they wanted. As you are an academia, you know that you cannot go against the faculty.

XLM: Absolutely, and you shouldn't. [Laugh] It sounds like the MIT faculty consider "computing" as being more broad than "data science." Is that the right understanding? Or is it narrower?

LRR: I wouldn't want to speak about what they thought, but data science is included in the College of Computing. There is the Institute for Data, Systems, and Society (IDSS), which is part of the college. The college includes computing and artificial intelligence and those kinds of more traditional computing domains, but it also includes data science. It's all part of the college. You would then assume that because data science is within the college, maybe "computing" is broad enough to cover that. I suppose that's the right conclusion to reach, but I would probably check with the faculty to make sure that they would like me to say that. Data science is inside the College of Computing.

XLM: Thank you for that answer. So, let me say then—not really representing the faculty—what is your personal vision about this college? What do you want it to accomplish from your leadership position?

LRR: Yeah, I think that's a nice question to ask. I think that is behind the name "college" at MIT, which typically has schools. We have five schools but this one is not a school, it's a college, because it has three reasons to exist. One of those reasons is particularly connected to naming it a college.

First of all, one purpose is the traditional purpose of an academic discipline: to advance computing thinking, computational thinking, algorithmic thinking, data science thinking—just to add that component for educational research. That is the typical academic unit way of thinking, and the college is supposed to do that. After that reason, it would be considered a school, but we chose not to call it a school. The reason for that is that we also want—and this is critical, this is key—the computing skills and algorithmic skills to actually penetrate all over MIT and to be at the heart of all disciplines we are teaching and researching. At the same time, we want the college to give feedback to other disciplines on how it is that we can use computing and data science for the good of the group. That is a key component, and that's why we thought to call it a college and not a school in MIT jargon. It's not just about advancing the discipline, it's about working with other disciplines.

It's basically, to me, like a new kind of math. You cannot think of a STEM degree without having math. But computing, AI, those kinds of algorithmic thinking are way beyond math in the sense that it's being used by urban planners, it's being used by economics, it's being used by linguistics, it's being used all over the place. It's being used everywhere there is data, and data is *everywhere*. We have to bring those data skills into every discipline. First of all, the graduates, our students want that and our economy needs that. I think we should educate those people, and, quite frankly, I think many American colleges and high schools, but mainly colleges, should educate people that way. That's the second component, which is why we call it a college.

But in addition to that, is something new with a college—that probably we should have thought of at MIT years ago with the way we practice it, but now we've really just tried to put a flashlight on it—and that is the societal impact of technology. This is a major issue. Understanding, as we advance technology, how it's impacting society from the point of view of whether it's ethical implications, inequality implications, inclusion implications, or all implications to society. That also has to be studied. Again, you don't do that within a school that is self-isolated. You have to do that in a concept that is really spreading out and integrating within the whole of MIT. That is the vision, that's the idea, and that's why we call it a college.

XLM: Well, that's a fantastic answer. I hope you don't mind, I'm going to shamelessly plug in the *Harvard Data Science Review's* mission, because the three things you mentioned turned out to be just the three things that we also emphasize: research, education, and impact. It sounds to me like those are the three big branches you want to incorporate into this one College of Computing.

LRR: In such a field right now, it's so powerful. If you look at the economy, the digital-related jobs are growing ten percent per year for the last decades, while the more legacy economy is growing two or three percent per year. We just have to understand that. Forty percent of our students choose computer science as a major. That's a big fraction. When you really go deep in understanding that, you learn that they really like whatever it is they came here to study—whether it's urban planning or economics or chemical engineering. That's what they really love, but they sense that the jobs are in the computing field, so they may major in that. By doing this College of Computing, they can actually really learn the skills that would allow them to be very, very attractive for a job, but do it in the discipline they came here to study. That, to me, is critical. That's the way the economy progresses.

XLM: Yeah, that's absolutely correct. And actually, that's a perfect segue to my next question. Because there's tremendous demand—following the footsteps of MIT, Berkeley, a few leading institutions—many, many universities are at least contemplating the idea of creating a kind of a "School of Data Science" or college or whatever you want to call it. Since you have led this major effort and also in such an amazing timespan and raised so much money, I'm sure that many presidents of universities and other leaderships would love to have your personal advice, lessons, and experience. How can they organize such an effort to create this kind of major entity in a university setting?

LRR: Well, let me tell you one thing. I know many American college leaders, and I don't think that they need any advice from me on how to do anything. They're pretty smart. *[Laugh]*

But I think that, first of all, you have to have synergy and think that this is really what's needed. It's a point of view. I truly believe that data science from the point of view of data mining, algorithmic thinking, machine learning tools, and those kinds of things is going to be extremely useful to society and is going to penetrate every single discipline. If you understand that, then you can find a way to, within the constraints of your institution, try to figure out how to do it. But the first point is: do you agree with that? I don't know that this is something that I can claim that everybody agrees with. To me, it's obvious. First of all, the one thing you're sure of and think is obvious is to follow the students. That's what the students want. If you follow what they

want, then your institution is sure to win. That becomes self-fulfilling. Listen to what they want, and this is really what they want.

Anything like this requires not just buy-in by the leaders, the administration, the deans, whatever, but also the faculty has to want to do it. They have to buy into that. At the end of the day, an administrator can say whatever he or she wants, it doesn't happen if the faculty don't want to do it. I mean, this is not a military regime. The president can say whatever he or she wants. It doesn't happen if the faculty doesn't want to do it. The thing is making sure that the faculty wants to do it.

XLM: Absolutely.

LRR: The other point that I have encountered here is that this idea is exciting at MIT. The issue is how to measure expectations. I think the good news is that, at least at MIT, people are embracing it. They like it. They see the difference. The students see that this is what they want, the faculty sees that that's what the students want. That is working. That's the good news. The bad news is that *everybody* likes it, so we need to manage expectations. What we did not do well and could have done a better job at, is to say, "We're going to do this first, and this next, and this next." The college is not even one year old—we opened back in September—and there is still some frustration that we have not impacted this or this other department. We just started. The one thing to do—this is after implementing it or as one is planning it—is just to manage expectations. What we're going to be doing first, what next and so forth. That's kind of important. If there is any advice that anybody needs, it's just to make sure the faculty or administration is on top of it. Just be receptive to what the faculty wants and then plan accordingly. Make sure that you manage expectations. The third thing is the one thing that has been overlooked by academia very typically—what I said earlier about societal implications. I think it's important not to lose track in this day and age that we have to study the implications to society of the kinds of changes we're making by doing things this way.

XLM: Yes, I completely agree. You mentioned that the college actually formally started last September, so it hasn't even been a year. Unfortunately, we kind of just got into COVID-19 not too long after that, so a natural question I want to ask is, how is the college helping to advance solutions to the COVID-19 crisis? What are some opportunities that research can find here?

LRR: This is the best of human beings: what we've seen at MIT with COVID-19. Everybody, no matter what their expertise was, all of a sudden, they dropped everything to try to figure out how to help. This includes

every segment of disciplines we have on campus, and the computing part is no exception. The data mining approach that machine learning and other techniques use, can, for instance, identify what kind of molecule would be the best one to be used for testing, or for vaccines, or for therapies. Those techniques are being used to explore that. There is a group of people [[PACT](#)] who very quickly got into contact tracing using smartphones, but in a way that it doesn't invade your privacy and doesn't share your privacy. That's something that developed very quickly: identifying ways to invest in a very smart way, so that you can basically improve the chances for vaccines to be developed successfully. The idea that all of a sudden, people in the biotech domain had data science, data mining, and ways to get data and get some smartness out of it, was really the very first time that something like this was being used for these kinds of technology. It started a little bit before COVID-19 with other areas like cancer and so forth. People are working on those tools in therapies of different kinds. But they quickly put that energy into COVID-19 and hopefully, something good will come out of all that.

XLM: Yeah, I can certainly testify to that from the *Harvard Data Science Review* perspective, because we've got actually two articles from your Professor Andrew Lo and his team for the special issue on COVID-19, and we're really deeply grateful.

Liberty Vittert (LV): President Reif, I have to jump in here on the back of this coronavirus discussion. MIT was one of the first universities to close in response to COVID-19, and I'm sure there was a whole heck of a lot that went into making that decision. Was there certain quantitative evidence or risk assessment that you and your team did and relied upon to make that call?

LRR: Well, there was lots of risk assessment and lots of consultation with experts. I'm not an expert in that space. I tried to learn very quickly in order to make informed decisions. Towards the middle-end of February, we had a team here paying attention to that. We call it an emergency management team. They've been monitoring that since January, when things started. To make a long story short, there was very early evidence that, goodness gracious, if this goes into a typical epidemiological model, there's going to be a surge and that's going to be a pretty difficult surge to manage. I was also reading the horrible stories at the time—this is, again, early February and mid-February—about Italy and how the hospitals had to make very tough decisions of life and death about whom to give ventilators and so forth. I discussed some data with everybody I could find around MIT that was an expert on that, and I remember showing them some data and discussing implications. I had two conversations. One person told me, "We are about four weeks behind Italy" and the other person told me, "We are two to three weeks behind Italy." And these are experts. Being any time behind Italy, while I was reading what was going on there, it just looked pretty dire. That was one data projection—this is not real data

you just don't know what's going to happen—but goodness, I didn't find anybody that said, "This is not the case," so this is serious to me. My people are telling me this, that's one thing.

Another thing is an observation that one of our colleagues and experts said. At the time there was the issue of this cruise ship that had all sorts of illnesses on board, and this person said to me, "You know, our dorms, they are like cruise ships." The only difference is on a cruise ship, you can go to port and unload. The students are here, and what do we do with them when something like that happens? That was point number two. Point number three is that spring break was coming, and the idea of everybody leaving MIT to come back? In this environment? I really had this thought: I'd rather be laughed at in a month for closing the place and everybody realizing that nothing happened, than have the burden of thinking, "Boy, I should have closed the place, and because I didn't, these bad things happened." That was heavy on me, and that's why I made the call. But if I didn't have the experts telling me those things, I wouldn't have been as informed. I saw the data, but I didn't know about the curves and other things, so I had to learn from them and become an expert really quickly. We're really blessed in this area—whether it's Harvard or MIT—to have experts that can give us advice about what to do so we can move very quickly.

LV: Well, as an alumnus of MIT, having lived in the dorms, I know exactly what you mean by the dorms being like cruise ships at most colleges. I'm right there with you. That's a great analogy, even though I loved my dorm, believe me. But on another note, the decision to close was made and it was clearly the right decision. The decision of when to reopen and how to reopen also has to be really, really difficult, in some cases probably more difficult than the decision to close in the first place. So, again, what are the points or the thoughts or the data and measurements that you and your team are looking at to figure out how you're going to reopen?

LRR: Yeah, that's a really tough call, and we haven't made that call yet. I can share a lot of what we are doing, but the punch line is the following: There are three elements that in my mind as of today—and I emphasize *as of today*, because it seems like almost every day I learn something new—ought to be in place for me to be able to say, bring students back, whether all of them or a fraction of them. The three elements are practicing face masks all the time, practicing social distancing all the time, and having frequent testing. Now, the frequent testing is something that's a capacity issue. We're working on that, and hopefully we'll have that in place. But I need to make sure that we can practice safety protocols.

I know that MIT students are no different from students elsewhere. Young people are there to break rules. I think the students want to be back here because they want to be with other students. They don't want to be alone at home. So how do we tell them, "You can be here, but you have these protocols you have to practice. You have to wear your face mask all the time, you have to wash your hands all the time, you have to maintain

social distancing"? We can arrange things. We can de-densify the dorms by bringing half of the students in the dorm. But how do we prevent them from doing what they want to do, which is to be together? I'm concerned about that. I know I can trust our students the way you can trust any 18-year-old. Yes, you can trust them, but when is one of them going to just do something and then, all of a sudden, we have a problem? I am stuck with that right now.

Those are the three elements, if those three elements are under control, I really think we can have a relatively safe and controlled environment with the right kind of density. I don't think we can have it with all our students back, but with a good fraction, we can. I'm still working on how we make sure that the face masking will be accepted all the time and the proper social distancing will be there. We'll provide the testing. Once I feel comfortable with that, I'll make the call. I'm still working on that. In fact, right after this conversation, I have a meeting to discuss another aspect. We had a meeting this morning. I have some people checking something for me and then we're going to have another meeting later today to discuss that same topic. So, it is a tough call. At the end of the day, I won't come out too far away from when we closed the campus. I'd rather be laughed at than make a very serious mistake. But it is a tough call.

LV: I know. I was thinking about it the other day, and I almost feel like the goal of freshman year is to not socially distance and to be as close to your classmates as possible. So, I can't imagine what a tough call that is.

LRR: But I think particularly at MIT, Liberty, this is a place designed in architecture—the classrooms, the labs, the dorms—for interaction. Our curriculum is awfully hard, and it's awfully hard so that you're forced to study with others. You cannot do your first year by yourself, it's impossible. You're forced to learn communication and you're forced to study with others. How do we create a situation in which we are designing everything for you to be with each other and tell you not to? It's not going to be easy.

LV: Some of my best memories are those late nights working on problem sets with my group, so I completely understand that, and I'm glad I'm not the one making the decision [laugh]. But in terms of thinking or predicting the future, which we've just asked you to do with coronavirus, let's move on to talking about what the future will look like in a different sense, and that's in terms of work. MIT established a task force on the Work of the Future to really look at this relationship and these real questions behind new technologies and what 'work' will look like. Based upon the findings of the group so far, where do you see this emerging new field of how people and the work that they know is going to be married with the incredible technology and future that we have moving forward, in terms of research?

LRR: I think one important point to address is that technology is not something that happens to us. It doesn't come to us. We develop it. We do it. What we are trying to do here—or trying to teach and demonstrate and practice—is to develop technology that is there to assist, to enhance a human and not to replace a human. That's a fundamental point. If we get to that point and we can demonstrate that, that's a better way to create a future in which we can be better at everything we do today and more productive as opposed to being replaced. That's part of what we are driving at.

I want to say that the reason we had to start the Work of the Future is that at the time I was asking experts to tell me what they thought about the future. I had a number of experts telling me, "In the future, there won't be any jobs. Everything will be automated. Those who are lucky enough to have a job can work two or three days a week, and that's it, because there are not enough jobs in the future." They will tell me with tremendous conviction that that was the future. Another group would tell me, "Oh no, there's going to be plenty of jobs. Jobs are not the problem. The problem is people equipped to handle the skills to do those jobs." They would say this with the same certainty of conviction that that was the future. None of them had any evidence to support any of their predictions of the future. That's why I felt we needed something more data-driven to give us a sense of the future, and that's where the Work of the Future is.

The report is going to come out in a few months, the preliminary was last September. But a key point that we're learning and practicing is the idea of creating technologies that are assisting humans and not replacing humans. That's a key component of where we're going with this.

There is another issue that I also have to address, that we are going to be pushing very hard, which is everybody—every company, every employer—should try to do the best they can to upskill their employees. Just as we give employees two weeks a year, three weeks a year, a month a year for vacation, we should probably give them one or two weeks a year in addition to upskill. I've had quite a few conversations with CEOs about that. Their initial reaction is always, "Why would I do that? I mean, if I upskill my employees, somebody else will recruit them away." Then they start thinking about, "Well, but if I upskill my employees, perhaps they would have more loyalty to the company." That is a way of thinking that goes together with building technology that assists. That's an important goal that we have to achieve. But also, we have to then prepare the workforce of today—and of course, the future workforce, which is part of why we created the college—to be able to work in this new world in which they have to use technology to assist them. That is a transition that has to occur. I think employers ought to help employees get there. Places like MIT can help, of course, and other universities and community colleges, but the employees need to have the time and the support to be able to do that.

XLM: Thank you so much, President Reif. We know that you have another meeting to go to, but it would be such a missed opportunity if I didn't thank MIT for all kinds of support to what we do. First, the *Harvard Data Science Review* itself is published by the MIT Press. This past year or two that we have worked together, I really appreciate the direct support from MIT. Second, I want to mention a historical trivia, that probably most listeners don't know. I have to personally thank MIT for helping to create the Department of Statistics at Harvard, which gave me my education as well as my current job. As I wrote to you previously, I discovered when I was department chair that the founding of the Department of Statistics at Harvard was actually started from a letter by an economics professor at MIT, Professor Harold Freeman. He wrote a letter on December 9, 1948, more than 70 years ago, to the person who would later become the founding chair of my department, Fred Mosteller, and proposed, "Can we have a joint MIT and Harvard degree in statistics?" It's a little bit ironic though, because we all know that MIT still does not have a Statistics Department. My statistics colleagues always ask me this question particularly about those histories, so I'm going to pass on this question to you. Why is that? Why does MIT still not have a Statistics Department? Perhaps the Schwarzman College of Computing will have one?

LRR: I did not know that history until you shared that with me, so this is a very fascinating story that I was unaware of. Indeed, we don't have a Statistics Department. We do have statistics faculty in different departments. We have them in BC (brain and cognitive science), we have them in Sloan, we have them in math. But they have a second home where they are aggregated. Going back to the college concept, there is something called—I think I mentioned at the beginning—the Institute for Data, Systems, and Society (IDSS). There are statistics faculty that are part of IDSS, so they may be in math and IDSS, they may in Sloan Operations Research Center and IDSS. The home for statistics at MIT is the Data, Systems, and Society unit, which is part of the College of Computing. That's the way that statistics is organized at MIT. It's not a department per se, but it's a unit that focuses on those three components integrated: data, systems, and society. And that is part of the College of Computing. That's the way we are organized.

XLM: Well, thank you again. I think I understand. In a sense, you have more than a department for all the statisticians there. That's great to know. Again, Liberty and I want to thank you for taking the time to talk to us. These are all really great insights and advice. I'm certainly looking forward to attending the five-year anniversary of the Schwarzman College of Computing, and even more. I wish you every success, particularly at this really incredibly hard time for all of us. Thank you again.

LRR: Thank you for having me. I appreciate it. It was nice to talk with both of you. Thank you so much. Be well.

Disclosure Statement

L. Rafael Reif, Liberty Vittert, and Xiao-Li Meng have no financial or non-financial disclosures to share for this article.

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