Shane Greenstein:

This is Professor Shane Greenstein with the HBS Digital Initiative, from the 2019 Future Assembly at Harvard Business School. We are pleased to present Flash Talks, exploring technology in a multidisciplinary world.

Yael Grushka-Cockayne:

Thank you for the opportunity to talk to you about my research. I'm going to present an idea. We've heard various phases of work here, and I'm going to follow An-tay-ka Ye-lit's perspective and say it's not only some results in a midst of a project, this is the beginning of a process that I hope to hear your reactions to, and given your support and enthusiasm, hopefully will develop into the next best big thing. But this is an initial snippet of an idea, a research idea that I'm working on, that I would love your feedback and reactions to.

Yael Grushka-Cockayne:

Okay, so with that in mind, who works here in an environment that has projects? Okay, good. Who's been late with their project? Okay, I'm not going to ask about over budget, but okay, so then maybe you won't be totally surprised if you see the following headline. I'm going to have several years worth of information here, but the cost of the Olympic pool triples. This was in London 2012. Shortly, or quite a few years before that, there was an announcement about, you can go back and look historically, 1976, Montreal's Olympic 12 times the original budget. And Athens, they almost didn't have all the facilities. If you recall, there was a lot of drama and stress that they couldn't run the Olympics, because the Olympic roof and all the facilities were in a clear danger of actually not being up to the scope that they needed to be in order to run the Olympics. So they were running late and they were running under scope.

Yael Grushka-Cockayne:

Time and time again. We see headlines related to projects that are either delayed, they cost more, or they're just not delivering what they promised in terms of the benefits. And this is not only the Olympics that suffers from this. The Olympics are just high profile and they get reported every four years, every two years, actually, with the winter ones. So there's more here. Salt Lake City, I have Vancouver and so on. So it's not only the Summer Olympics, but it's also other projects around us all the time. For instance, so this was right before the World Cup in Brazil. The stadium wasn't going to open on time and recently, I don't know if you guys noticed, or paid attention to what was going on in California, but they just canceled a big segment of the bullet train that they were going to open from the South California all the way to North California.

Yael Grushka-Cockayne:

Projects are plagued with poor performance. And again, if you want to ask me, is this just an issue with publicly funded projects? No. Here's a headline from very recently, from the past week or so, Apple canceling their projects after numerous delays and failure to accomplish what they were hoping to accomplish. So projects around us fail all the time, and my research project together with Bertha Reich and Xiao Zha Gu from University College, London, UCL in London, and a startup company called NPlan. Our project is all about can we solve this problem of poor project planning using data, using machine learning, using AI, and using data? Let me tell you a little bit more. If you read recent reports, this is a 2018 Pulse of the Profession study. This is from the PMI organization, the Project Management Institute, the largest project management institute in the world.

Yael Grushka-Cockayne:

They report regularly on performance. These five lines. I just want you to take away that, overall, if you're looking from where you're sitting, there aren't that many trends, meaning not much improvement, not much change in any way. So for instance, the top line is meeting goals. That's nice to know, but if you look at something like scope creep, or if you look at something like failed budgets, or even deemed total failures, it's pretty constant over time and there's no real improvements. Even though people have been investing in project management tools since the, dare I say 60s? 70s? Some of the tools I'll show you today are so old that it will be taking you back to your undergraduate degree. So there's been little progress in this, yet the problem is huge.

Yael Grushka-Cockayne:

How big is the problem? Why do we need to care about project performance? We need to care about project performance because a lot of money is invested in projects. So these are some stats. The GDB contributions from project-oriented industries, so companies that run projects on a regular basis, that can be new product development, technology, construction, and so on and so forth. The GDP contributions are $20 trillion. If you take into account that about 10% is wasted due to poor project performance, that's what this report reports. Then there's about $20 trillion every year lost for poor project performance. And I'm sure that you guys can all give me examples of cases from your firms, in which money was spent on projects that were not done properly, and had to be invested in in order to fix.

Yael Grushka-Cockayne:

Why is it so problematic? Why is it so hard to accurately predict projects? Why is it such a notoriously hard problem? Well, consider the following cycle, and I want to start on the top where I say that projects are risky and complex. Projects have interdependencies. It's not just a sequence, a very serial set of tasks that we execute one at a time. No, there's relationship between the tasks. We can perform some stuff in parallel. We can perform some tasks sequentially. Sometimes we have to reiterate and do some rework. It's a very complex active set of activities that we're trying to execute on.

Yael Grushka-Cockayne:

Not only that, when we plan projects, and I'll show you in a moment some tools that you're all familiar with around project planning. When we plan projects, we typically focus very internally on a specific project at hand, meaning we take what's called an inside view. This is a term coined by Kahneman and Tversky, it's always good to cite Kahneman and Tversky. Kahneman and Tversky, two behavioral economists or psychologists, they coined the term back in the 70s already, to say when we plan a project, where do we start? We start by thinking about what has to be done for this project. We don't think about how well we performed yesterday.

Yael Grushka-Cockayne:

We take an inside view, then we set unrealistic goals for our project and lo and behold, things don't turn out that way. And so then, mind you, years have passed sometimes, if we're talking about construction or capital investment projects or IT projects, years have passed and we haven't met our expectations. And so there's a very bad and sour taste, and we don't track. We don't keep track of how accurate our initial plans were, three or four years ago, when this project got approved. And so there is no way for us to really improve. And again, these are just some slides, or some screenshots of the tools that you're all familiar with. Critical path, gang chart.

Yael Grushka-Cockayne:

Yes. I'm back in the 70s, I'm back in stuff that you'd know from, I don't want to say grade school, I wish, but you know what? Maybe from your undergrad. And so these tools are very internal-looking. They don't represent uncertainty, and they don't give you any concept of what happened in other similar projects elsewhere. And so our vision is that we can do this differently. Some attempts have been made to incorporate risk and uncertainty into project planning. I'm not going to expand on them now, but just so you know that it's not that nobody's tried to incorporate uncertainty. If you're in the construction industry, which some of you are, Monte Carlo simulation gets run on a regular basis, ranges are delivered when a project is put in place, ranges are given, distributions are given, and yet still it's not helping us to plan more accurately.

Yael Grushka-Cockayne:

And so we want to use machine learning and AI, we want to do it better. We want to develop more sophisticated tools, and we can do that, and we're going to demonstrate that we can do that if we all have better discipline around this field. Again, some work has been done. Really, I want you to take away from this is that nobody has attempted to use machine learning in this specific way. Some folks have tried to use machine learning once the project is on the way, if things are not looking really good, you can try and use machine learning to then update your forecast to see if you can correct course. But what we're proposing is start from the beginning, from the get go let's distill some information about your chances of being accurate with your project plans.

Yael Grushka-Cockayne:

And so I'm going to pause in this main slide, which is our vision, and to tell you that this is already ongoing experiment with several different companies, mainly in Europe, in UK and Europe. I should put those in separate brackets these days. And so we're working with the startup end plan, and we have really interesting experiments going on, or kind of experiments with HS2, which is high speed two, project in the UK, which is one of the main kind of new rail lines that they're trying to build in their late, and some other banks and institutions across Europe to try and implement this framework.

Yael Grushka-Cockayne:

And what does this framework say? We're going to collect a database. We already have thousands of plans. We have thousands of plans, tens of thousands of plans, detailed plans to the task level with actuals. We need plans, we need actuals, you cannot improve your forecast if you don't track your plan. Compare your original plan to your actual. We create a database of project tasks, at the task level, plan versus actuals, and then we use natural language processing. We pick up on patterns, and we come up with a prediction of the accuracy, or the chance, that each task will actually take as long as we think it's going to take. So I can use natural language processing, machine learning and prediction models to come up with better predictions of each task's accuracy. And then the final step is generate a forecast for the entire plan. That's less novel, meaning others have shown how to do it. I just want to get there in a better way.

Yael Grushka-Cockayne:

And so to sum up, and to kind of tell you the bottom line of all of this, the bottom line is that when we throw this into a machine learning algorithm, and we use the task names and the predecessors in the structure of the network, and the criticality of the task, and all of those pieces of information, we can actually improve prediction. That's it. That is the dramatic moment. And so my vision is, and this is

where I'll end, is to say it's all about the data collecting actuals versus plans, and using machine learning to predict project tasks, project durations, and project costs is what we're all about. Thank you very much, everybody.