Episode 2 – Engineering Financial Technology

SULTAN MEGHJI: Welcome to the FDIC Podcast, Banking on Innovation. My name is Sultan Meghji. I'm the Chief Innovation Officer here at the FDIC. And this is the most recent in a series of Podcasts we're doing, where we're talking about advances and innovations in technology, as it relates to the banking sector and financial services more broadly. One of the things we've embarked on over the last few months since I joined is to bring in some of the best minds we can find to help us make sure that we're thinking about the evolution of the FDIC into the future, the best way possible. We would be remiss if we didn't include some of the brightest minds in academia. And I am incredibly lucky today to be interviewing Dr. Jimmie Lenz from Duke University, a good friend. Thank you for joining us today Jimmie.

JIMMIE LENZ: Thank you for having me. This is just fantastic. Can't think of a better way to spend an afternoon.

SULTAN MEGHJI: I've known Jimmie for a long time. But it occurs to me, many listeners don't know you very well. So maybe I could ask you to just introduce yourself for the audience.

JIMMIE LENZ: Sure, more than happy to! I come from a long career in finance, several decades, which…boy, that dates me really quickly, doesn't it? I came to academia quite late in life after spending time at mainly large financial organizations in a number of different roles though. Everything from an algorithmic trader, to a Co-President and Chief Operating Officer, to the Chief Risk Officer of the second largest brokerage firm in America. And so, putting all those things together, and maybe a little aside, I came into academia a few years ago to start a different kind of trajectory for myself.

SULTAN MEGHJI: Well, you know, it's really interesting because, you know, you and I met, right, basically, as you were finishing that up, right? You know, which is, after a few decades in very large corporate environments, you were at Washington University, where I'm now a professor, you know, many years later. But you went from that and now you've landed here at Duke. So, I think the biggest question for me is what made you pick Duke?

JIMMIE LENZ: Yeah, it's such a great question, Sultan, and I don't think people think about things maybe this way. But it was a little bit kismet and I think a little bit about Duke, and the way Duke

thinks about things. As you mentioned, I'd been teaching a little bit at a couple of different universities and the subject was always around financial innovation. I taught a lot of machine learning, I taught some blockchain, things like that, and always with a finance perspective on them.

When I had the chance to, through a mutual friend, to talk to the folks at Duke, it was very interesting because it was in the engineering school, it wasn't in the business school. And that gave me a little bit of pause right there. And so, we started talking about an idea that they had to start a program in financial technology. And that was to me, a really interesting place to do that at, because one of the things that I noticed in working at a business school was students were prepared in a very different way than engineers. Engineers come at things from a little bit more quantitative perspective, not always, but most of the time. But they also come from a very applied education, and that's not really taught in the business school. Business school tends to be a little more theoretical, nothing wrong with that, I came from a business school. But the engineering school was more applied and they were actually *building* things. And when they explain their idea, around building a financial technology program, graduate program, I just jumped at it. And so, the...what ended up happening was I became the Director of the Master of Engineering in Financial Technology in the engineering school. And then later, I also took on the role of Director of Master of Engineering and Cyber Security. Which I think are kind of inextricably linked anyway. And so it was a good fit.

SULTAN MEGHJI: Well, inextricably linked is absolutely true. You know, we have these innovation themes here at FDIC. And the second one is all around resilience, because we see, you know, not slightly, but more broadly, than just cyber security. But it is very much about the fact that you can't have a...an effective, large scale, financial technology platform without having robust cybersecurity engineered in from the beginning. So, you know, I see those as, you know, the natural fits of, you know, peanut butter and chocolate or whatever, you know, combination you go for there, right?

But that combination of the business experience plus the engineering experience is, I think, a credit to Duke for putting it inside of the engineering school. You know, one of the things that I spend a lot of time dealing with is how we make the United States globally competitive in the 21st century? You know, how do we really build on the successes of the 20th century…build on the successes that are already there and really ensure that a free market, capitalist, democratically oriented, global economy is the one that is dominant? And, you know, we're in a massive global competition to train the next generation of talent…to make sure they have not just the theoretical experience; but the applied experience and that they can then immediately go into value. So given that, it made perfect sense to talk to Duke because it's one of the marquee organizations. They have an amazing program that I happen to know a little bit about, because of you, but it does position this as a very different kind of academic, governmental partnership than you would see in other circles. I could spend a long time talking about why we chose Duke as our partner on this initiative. I'd be very curious about what got you excited about this when we started talking about it?

JIMMIE LENZ: There were several things that kind of charged me about doing this. We already work with some financial institutions and things like that, but the FDIC is a very different animal. I really do think about the FDIC as the Federal Deposit Insurance Corporation. You all, I would imagine are the largest insurer in the world and being able to have students exposed to that, being able to have them exposed to how you manage that, is a fascinating topic because it is very quantitative at the end. And

most of our students are very quantitative. And one of the things that we've tried to do, in the program is introduce both the finance and the technology in almost every course they take.

So, for instance, they start off taking a couple of programming courses, but the things they are programming, are things like Markowitz efficient frontier, which is very core to finance. And so, I saw this partnership very much furthering that education. That idea that the...we were working...we could work with the FDIC, who has a purview over all of the banks, but is also an insurance company and you have, to me, one of the mandates that the FDIC is among the most important for any economy…that idea of a sustainable presence throughout the economy and we've seen that materialize over and over again. We usually think of the things that are core to economy are like an operating stock market and things along those lines. But you all are the backstop and we've, you know, we've seen what happens when an FDIC doesn't exist, it didn't work out well. And so, I think that the...that on top of the successes that the FDIC has throughout their history…they've managed changes of all kinds. You know, they've managed changes that were very systemic in idiosyncratic risks. And they've come out the other side just that much stronger. So, that learning that our students have, and our students are from around the world, they can take that home with them. Whether they decide to stay here in the United States, whether they decide to go back home to a different country. They can take that experience home with them and hopefully that proliferates kind of what you were talking about before.

SULTAN MEGHJI: Well it's...In an era where systems are often under pressure and the need for the foR systems are being questioned; showing effective systems like what we have here in the United States, in terms of our federated regulatory model, I think. is really important.

I had the opportunity to give a lecture at a think tank earlier today actually, and I drew the comparison between a highly centralized, fairly rigid economic systems and federated systems, right? And it becomes a really interesting question that gets into some of the research that we're going to be exploring together between FDIC and Duke. And one of the areas that you and I were talking about, that I'd love for us to spend some time on, is talking about zero knowledge proofs. Because, you know, when you're talking about thousands of institutions, hundreds, basically regulatory and support bodies and, you know, petabytes of data, the old way of just throwing data around and having to spend, you know, hundreds of millions of dollars a year on data management is just a waste of resources. And it presents all sorts of opportunities, whether from a cybersecurity perspective for bad behavior or just from a regulatory perspective, right? We want to protect the personal information of consumers, right? And so, for me, near zero knowledge proofs becomes a really interesting opportunity. Are there ways for us to analyze hundreds, if not thousands, if not tens of thousands of data sources around a system, in a way, that keeps them secured?

JIMMIE LENZ: I think it's a great idea! You and I have talked about that a little bit, and zero knowledge proofs are certainly a... something that's been around for a long time but with the computational power that we have now, we can actually affect it in a different way than just that theoretical realm.

For those listeners who don't know what a zero knowledge proof is, this is probably worth mentioning a little bit. So there's this great analogy…I was talking with a guy not too long ago, and I

can't remember who it is because I would give him credit for this,…but the analogy that *he* gave when he was asked to explain what a zero knowledge proof is: You know those 'Where's Waldo?' books for kids? They're like *huge*, these books. So, 'Where's Waldo?' when you open it up and it's two pages and you have to find Waldo in a beach scene, or, you know, a dog park or something. And he said, zero knowledge proof is cutting out Waldo and showing somebody Waldo, you don't have to show him the rest of the picture. All you have to show him is Waldo.

SULTAN MEGHJI: That is absolutely, that's fantastic! And far better than any explanation I've had to give to any of the people who've asked me about it in the last couple of weeks. I'm going to have to steal that one. So, we need to figure out who that is and put it in the show notes, yeah. But it's, I mean, it's fascinating, right? I mean, we have...you think about all the different data from banks that we're potentially looking at. It's everything from balance sheet data, to board minutes, to, you know, loan files and I hate the idea of moving data around. I hate the energy it costs. I hate the time it takes to manage the...all the energy around it, the security routed, all of this, and the idea that instead of going to a bank and saying, "Give us all your data" and then we go off and spend days, weeks, months, whatever it is, to try to analyze something. That instead, we've simply point a piece of technology at the bank, and that comes back and hands us the Waldo that lets us know, you know, is the bank, you know, being run in a safe and sound manner? Is it trending the right way, et cetera, et cetera. Right?

JIMMIE LENZ: I think there are so, so many interesting things that we have at hand now and being....you know, both of us have been in the industry for a while. Me a little bit longer and seeing the development of computational power being applied in the way that it is now. I mean, as I said, I kind of came up on the algorithmic trading side. And when I very first started, there was no algorithmic trading, right? It was really, really nascent and I remember the first big kind of program that I saw that actually operated within and that was Barra. That was when Barr Rosenberg very first invented Barra and allowed you to tilt an index. And for those of you who are familiar with that kind of thing, you would say, well, I can do that on my iPhone now. And it's like, yes, you could. But we were harnessing the full power of Lotus 1-2-3 to be able to do that. And so, it...it's changed so much. And so, now we can talk about utilizing zero knowledge proof for this, but also I think, for analyzing things in a very dynamic manner. That's, to me, that's the beauty of what we can do now, is the...we have the opportunity to basically head things off before they happen. We can, we know with a certain degree of probability, the outcome of this collection of variables at this certain point in time. And so, I think having that and being able to muster that, you know, you all have, you know, just this real opportunity out there.

SULTAN MEGHJI: Okay so, we've just talked about zero knowledge proofs and, by extension, we've talked about artificial intelligence. What are some other things on your research plate that are exciting, that are big, that are things that you would want our listeners to be thinking about or hearing about?

JIMMIE LENZ: So, we're definitely…the AI and machine learning, we're doing a lot in that space. As I said, we, the Blockchain space is fascinating. I have more students wanting to take that class, then I have space to teach it. We will definitely be doing more in that area. Applying algorithms to trading and end up trading different kinds of assets and things like that, is very popular, in fact, we just

added a second class. Quantitative risk management is probably the second, when we...when the students come in the door, we ask, you know, "what do you intend to do? Or what would you like to do when you graduate?" That's probably the second or third on the list, quantitative risk management. And they're looking at Insuretech companies, they're looking at banks, they're looking at non-banks offering financial services, looking at all kinds of different applications of that. And so, we're offering quantitative risk management. Again, being in the engineering school is fun because everything's applied, we get to build stuff in every class. It's just fun!

SULTAN MEGHJI: It used to be, you would have one set of data, one analysis, and one risk score, right? It was a one-to-one-to-one very straightforward, very linear, right? Nowadays, I think we're getting to a point where it's going to be many sources of data, many analyses, and many risk scores that then get aggregated through probably some sort of artificial intelligence to create an aggregate score that is changing every 30 seconds. That seems to be the direction we're going on. On your side, on the academic side, do you see the same kind of push; you see different algorithms, different data providing, in some cases probably contradictory risk scoring, but that's still fundamentally needed to be taken all into account together.

JIMMIE LENZ: Absolutely. That is, I think that is what many…and in different applications. So, it's not just in finance, in other applications, this ability to take in dynamic assessments is critical to a lot of different things that are going on in the environment. And environment is a big factor. The environmental risks that we see people are finally, I think, starting to, to come around to that, that is a data point that is...that should certainly be taken into account. But the ability to take all these things in and assess them, I mean, I still see banks and other kinds of organizations that are basically benchmarking their risks at the end of the year, everybody gets together and they say, okay, what are our risk tolerances is going to be? And everybody who's done this for the FDIC knows exactly what I'm talking about. But what are, what are our tolerances going to be for these different things? And we set them, you know, they set them in, I guess, November, December, and roll them out in January. And that's the risk tolerance for the year. Are your risks in January, really the same as they were, as they are in December of the same year? Probably not...

SULTAN MEGHJI: I would say the 2020 possibly would give you a different perspective on that. Right?

JIMMIE LENZ: It certainly should give everyone pause. If you think that that's working, it's not. And so, to your point, I think that not only do your risks change, but your tolerances need to reflect that. Their tolerances should reflect the environment in which things are occurring, not the environment from eight months ago.

SULTAN MEGHJI: Okay. So as we come to the end of this podcast, and I'm sure we've made a couple of people's ears bleed, you know, with some of the more technical sides of our conversation. What are a couple of things that you would highlight for our listeners that they should be thinking about, or paying attention to, in the coming weeks and months as they continue to study this market?

JIMMIE LENZ: Yeah. I think there are a number of things that are very apt. Obviously, the proliferation of non-banking entities that offer financial services that is not going to slow down,

absolutely not going to slow down. Some of the things that we're seeing in the blockchain and the cryptocurrency space, not going to slow down, those are here to stay. I think some of the cutting edge technologies around machine learning and artificial intelligence, but I would say not just the use of those, but there is a real need to understand the way they work.

One of the things that I try to do is, you know, at the beginning of the...so, I teach a class on machine learning, the first two thirds of the class we spend just on…how does this operate? If somebody says, if somebody is in a boardroom or in any room and says, well, it's a black box, immediately that's a sign that they have no idea how it works. Question black boxes, question them a lot.

SULTAN MEGHJI: Well, you know, it's Interesting. You talk about that one in particular, because, you know, I think you've probably heard me say this a few times. You know, if you're on the, if you're a C-Suite person, or a board member, or an examiner, and you should ask the question. It should be, is your algorithm deterministic, or is it probabilistic? Right? Is it explainable? Right? Can it tell you why it made the decision and does it fundamentally alter in a positive way, the risk to your organization? Does it fundamentally decrease the risk? And if you, and if the person you're talking to can't answer those three questions, then I would say maybe, you know, fire them and find someone else to talk to.

JIMMIE LENZ: I would agree with you. I really would, because I think those are where we're depending more and more on those. And people, you know, and it's very easy to say, well, I just don't understand that. Well, do. Do understand it, it's, really important. I think that we're going to, you know, in my mind, I think that we're seeing some of the things we're seeing people should look at very closely. So, this rise of nonfinancial, non-banks offering financial services. Why is that occurring? The rise of cryptocurrency and decentralized finance, why is that occurring? I think the, why, people should be very concerned with and be thinking about quite a bit. Payments, as you said, are now proliferating different ways to pay for things. And that's being more, you know, basically more democratized the ability to pay for things in different ways to open accounts in different ways. I think that, you know, going forward in the back of my mind, a lot of what I do is around trying to provide, you know, more access, more equality, I guess, more easy and more equal access. That's probably the best way to put it. Equal access to all kinds of, you know, financial products and services. I think that's huge. And if you just want to look at it from a bottom line standpoint, it just makes sense. If that's the way you want to look at it,

SULTAN MEGHJI: You know, it's interesting. We use some slightly different language, but I think, you know, as an organization, we have a very similar mind, you know. Our first theme of innovation here at FDIC is around inclusivity. And I paraphrasing and I say something to the effect of, you know, how do we ensure that we are building the most inclusive, most diverse, most equitable banking system for the future because the American population are not homogeneous. They don't all look the same, they don't all like the same, you know, and we need to have a system that that's respectful of that. And what are the things I think the banking sector hasn't done the best job of over the last few decades is meeting the customers where they are. And that's kind of to your point about, you know, why so much of the FinTech ecosystem has emerged is, you know, they *have* met the customers where they are. And so, as these non-banks, or, you know, layered banking infrastructure has come up with these banking as a service players, we're going to continue to see more and more of this and more federation of activity. And it's just going to become more and more complicated.

And so, you know, I think that the biggest thing for me, and you have a unique perspective on this. This is the last question. If I was a bank C-Suite person or on the board of a bank, or I was a regulator or someone in market who is listening to the two of us. And just is like, I don't understand half the words these guys are saying, you know, it doesn't make any sense to me. I mean, distributed, what? What would you suggest for them to do, to start to learn, so that they could start to understand how this universe is evolving around them?

JIMMIE LENZ: Yeah. I think there are a couple of things. I think the...there are great podcasts to listen to. I think there are universities that have short courses, constantly, on all these kinds of topics. I think that there are a number of different avenues of self-education platforms, like Coursera are out there and similar, that allow you to learn from people that are teaching this, that are innovating these things, that are...that want to give this knowledge away. I mean, my teaching philosophy, you know, when you, you've already gone through this, because when you're hired as a professor, one of the first things they ask is "What's your teaching philosophy?" And mine, you know, usually it's like a dissertation. Mine, is I want to give everything I know away as many times as possible. And I think most professors are like that. If you...if you're a banker at a, you know, small, medium, large size bank, and you're listening to Sultan and I and we're talking about these different things, and you're like, what the heck are these guys talking about? I don't know what you know, this is, you know, what I'll guarantee you, if you pick up a phone, call the business school at your local university and say, "Hey, do you have anybody who teaches this?" They would love spending an hour with you.

SULTAN MEGHJI: That's a great one. I think it's...that's a great one. And of course you're not hard to find online or social media. So, I'm sure some of the...some of our audience will be reaching out or can reach out to us as well. But Jimmie, thank you so much for spending a little bit of time with us here this afternoon. It's always a pleasure and Duke is lucky to have you. It's a great organization, and I'm so excited for this partnership to continue for the next coming...few coming years.

JIMMIE LENZ: Thank you very much. I really do appreciate it. And I would welcome anybody who wants to contact me, feel free to do so. Thank you so much for having me though, here today. It's great to talk to you. It's the partnership with the FDIC is kind of a dream come true for me, and for Duke, for our students, it's just going to be fantastic. I'm so looking forward to continuing down this road, thanks again, Sultan. I really do appreciate it.

SULTAN MEGHJI: Fantastic! Thanks so much to Jimmie!