

ILLUminate Blog Transcript: Kathleen Weiss Hanley and Hank Korth Explain Blockchain

Recorded September 10, 2021. Listen to it [here](#).

[music]

- ANNOUNCER: 00:02 This podcast is brought to you by Illuminate, the Lehigh Business Blog. To learn more, please visit us at business.lehigh.edu/news.
- JACK CROFT: 00:14 Welcome. I'm Jack Croft, host of the Illuminate podcast for Lehigh University's College of Business. Today is September 10th, 2021, and we're talking with [Kathleen Weiss Hanley](#) and [Hank Korth](#) about what you need to know about blockchain. Dr. Hanley holds the Bolton Perella Endowed Chair in finance. She is also director of the Center for Financial Services and co-director of the fintech minor. Dr. Korth is a professor of computer science and engineering who also heads the new [Center for Financial Services Blockchain Lab](#) and is a member of [Lehigh Scalable Software Systems Research Group](#). Thank you for being with us today, Drs. Hanley and Korth.
- HANK KORTH: 00:57 Thank you, Jack.
- KATHLEEN WEISS HANLEY: 00:58 It's a pleasure.
- CROFT: 01:00 Let's start with what sounds like a simple, straightforward question, but probably is not and that is what is blockchain and why does it matter?
- KORTH: 01:11 At the most basic level, a blockchain is a store of information. What makes it distinct from databases that we've worked with for decades is that there are special properties to blockchain. One of them is the idea of being able to submit information irrefutably. I can't deny later that I actually did it. Another key property is immutability. That once it is there, no one else can change it. And that latter property is achieved by the widespread dissemination of the blockchain around the world using the internet, which means that we can trust in the crowd for that immutability, as opposed to trusting in a specific organization, like a bank or a government.
- CROFT: 01:58 So what are the main advantages blockchain offers?
- HANLEY: 02:02 From a financial market perspective, one of the best aspects of the blockchain is the difficulty in changing the information contained in that blockchain. So if you think of financial institutions wanting to protect data, the blockchain allows not only to protect that data, but also to give the history of how that piece of data has been used. So, for example, in settlement issues, whether it's payments or securities or real estate, for that matter, I can use the blockchain to see every transaction that has ever occurred on that particular asset. And I think that is something that is an unusual aspect, at least from the perspective of the financial market.
- CROFT: 02:58 I've seen often that it's referred to as a public ledger, obviously digital and far advanced. But is that basically part of the concept and the service it provides?
- KORTH: 03:12 Well, that certainly a part. But in terms of advantages, Kathleen did a magnificent job talking about things from the financial perspective. I'd like to add just a couple of things in that regard. If we pop it up above just financial, the key advantage here is this removal of certain human intermediaries and any kind of transactional system. And taking humans out of the loop is a way of gaining some efficiency in certain cases.

Obviously, in other cases, blockchain's slower. But another key advantage to a blockchain system is the ability to deploy a smart contract, which is basically code that lives on the blockchain. That code has the capability of running autonomously, even without any subsequent human control, creating a whole new business model that's referred to as a decentralized autonomous organization. This new concept has certainly advantages and disadvantages, but it is a key new power that blockchain technology brings to us.

CROFT: 04:20

And you'd mentioned the disadvantages. What would be the principal disadvantages or, if not disadvantages, issues that still need to be resolved regarding blockchain?

KORTH: 04:34

If I pick up a comment there about the autonomous organization sum, that's obviously a very powerful tool in terms of disintermediation and efficiency. But on the other hand, it creates challenges to regulators and taxation authorities because if nobody, no person or legal entity controls that organization, it then becomes difficult or impossible to tax it or regulate it. And so the whole interaction between the blockchain world and the traditional world of governments and regulation is one that is very much evolving and in flux.

CROFT: 05:16

Dr. Hanley, I know regulation is one of your prime areas of focus on your research and your career. What are some of the issues that you see with what Hank was just talking about, the kind of interaction between the traditional governmental regulatory model and this new blockchain?

HANLEY: 05:42

Well, I think it depends on the application of the blockchain. But generally speaking, regulatory agencies get their power often from Congress and in order to regulate things like the blockchain or applications of the blockchain that application has to be an activity that is overseen by a particular regulator. So if you take the case of a cryptocurrency, for example, there is no regulator that oversees the creation of currency because we only have one currency in the United States or we had only one currency in the United States. And so therefore, there is no particular regulator that can say something about the blockchain. In the case of tokens that are issued by companies, the Securities and Exchange Commission has made a stance that those tokens are a form of capital raising and thus they have jurisdiction over it. Whether that's true or not, we can debate. I think there is room in raising capital from companies in the token space for it not to be a security. And Hester Pierce of the commission has made that argument. But the challenge is, is that regulators oversee activities and the blockchain is just one particular way to achieve those activities. And if there isn't a designated regulator for it, then there is no one way to have a cohesive approach to monitoring and regulating them.

CROFT: 07:30

Mm-Hmm. And you mentioned cryptocurrencies and probably a good idea to take a step back there and kind of define the terms. Bitcoin obviously has been in the news a lot for years now, but there are apparently more than 5000, I believe, forms of cryptocurrency. So what are cryptocurrencies and what are the main ones that people probably need to be aware of?

KORTH: 08:01

I'll take a first stab at that. Obviously, bitcoin is considered the largest, both in terms of the publicity, but also a concept that's referred to as market cap, which is the value in dollars of one unit of the currency times the number that are in circulation. And bitcoin is the oldest. It's the largest. But in terms of significance, probably Ethereum is actually the most significant because unlike Bitcoin, Ethereum actually supports this

autonomous organization framework via smart contracts and Ethereum then enables infrastructure above at what's referred to as layer two, which allows such things as decentralized finance in many different forms, the issuance of tokens, etcetera. And so while that is perhaps the most significant of those, there are a number of leading competitors to Ethereum with slightly different structure, but to a large degree, the same high level objectives. I'll note a couple of them, Cardano, Polkadot as just a couple. And then there's another category of cryptocurrency called Stablecoins. So these are independent cryptocurrencies that promise that their value will be pegged to a particular fiat currency, most being pegged to the US dollar. They're also a matter of some controversy regarding the reliability of the peg and how the backing funds are being used. But that is another pretty important category.

KORTH: 09:46

And then an emerging category are government-provided digital currencies, the term for that being central bank digital currencies. China at the moment has the most advanced version of that, taking a very centralized approach. But many nations are pursuing that in many, many different modes.

CROFT: 10:08

And Dr. Hanley had kind of referenced this. But depending on your point of view, cryptocurrencies like bitcoin either offer needed protection from total government control over money or they open the door to widespread money laundering and other criminal activity. Is there some truth to each of those views and how do we resolve the inherent tension that seems to exist between those views?

HANLEY: 10:41

Well I think there is definitely truth in both of them. We have regulations around the use of cash. I mean, you can think of cash is also being anonymous, just like a cryptocurrency and you don't know who held that cash before. But we have stringent laws around the transfer of large amounts of cash in order to ensure that the federal government can make or identify illegal activity. And so, of course, if you have a currency, an accepted currency that allows anonymity, one can imagine that this might be a good way for illicit activity to take place. Now, there are some challenges to that. First of all, the uptake of merchants who accept cryptocurrency has not been astounding. So if you were doing something illegal and wanted to buy a house, you would have to transform that that currency into fiat currency of some sort. So, the touchpoint for the regulator is going to be that exchange, for example. So part of it is not the cryptocurrency that's an issue. It is the ecosystem around it. So if I want to take my holdings of bitcoin, make it into cash, I have to use an exchange of some sort. And that exchange is where the regulation, for example, can come in because we do have things like anti-money laundering laws that do it.

HANLEY: 12:27

So yes, I mean, it is definitely the case that anonymous forms of payment can help illicit activity. It's also the case that individuals don't want to be in the banking system. We have a lot of people who have suspicions about the banking system and the ability to make payments through a blockchain is attractive. Instead of making payments, for example, on a credit card or a check in which that transaction is seen by a third party. Does that make that an illicit transaction? Of course not. It's just a different way of making a payment.

KORTH: 13:08

If I could pick up on that for just a second. And that is to address the anonymity issue. It's kind of a popular notion that bitcoin is anonymous and indeed it technically is. But there's another factor here. When we talk about the nature of a public blockchain, the blockchain is public. And so all transactions are out there visible to everyone else. And many people have done studies of past behavior of various IDs on the blockchain.

And so to get to Kathleen Hanley's point about the interaction with the real world. When there is an interaction with the real world, we then learn something about some blockchain ID. But then we also see where that blockchain ID has interacted and from all of that through data analytics, you can infer a lot of information about these supposedly anonymous IDs. Another source of this would be the origins of the actual interactions that submit a transaction to the blockchain. And so if for some particular ID, all the transactions happened to come from my cell phone that creates strong suspicion that that is an ID that I either own or have some influence over. So the surround outside the blockchain itself, the interfaces the blockchain with the real world becomes the point where regulators have the opportunity to enforce regulation, much as is the case with cash today. I can walk around with a suitcase of cash, but as soon as I attempt to interact, there will be opportunities for regulators to get involved.

HANLEY: 15:01

And I think we saw this-- I mean, the federal government has used reverse engineering to find Russian hackers. They found somebody was involved in the Mt. Gox hack because he used his public key to make a complaint on an email. And therefore it is very difficult for an individual to remain exclusively within the ecosystem of, say, bitcoin or whatever cryptocurrency without going outside of it. And so I think that is where, as Hank has said, this is where we can get a lot of information or more information about people and where regulators are. That's where regulators are right now trying to push their agenda. So Hank mentioned taxes. Well, if you buy bitcoin and you trade it for a profit, obviously you have a capital gain. It doesn't matter whether it's a cryptocurrency or the Euro and tax authorities want a part of that. And so it's important to understand that it's not in isolation.

CROFT: 16:17

Yeah, I think the last count I had seen was that there are currently 18 bills introduced this session of Congress to regulate blockchain technologies, cryptocurrencies, or central bank currencies. So, given the issues we're talking about, how difficult is it to draft legislation that covers the range of issues that you've both raised so far?

KORTH: 16:48

There's one place I'd like to start here, and it's not with a specific legislation, but something much broader, and that is education. If you look at the people that we have in government, whether it's Congress, the executive branch, there are very few individuals who have any real understanding of blockchain cryptocurrency and what it truly is. And as a result, we have seen in some of those bills - I haven't counted them, but I'll trust your 18 - but some of them are basically attempting to repeal mathematics, if I oversimplify just a little bit. And so I think looking longer term, one of the great needs we have is broadly to educate people in blockchain technology, so that whatever walk of life they go into, this becomes part of the common knowledge just like we educate folks in so many other things. And if I can give a quick plug for Lehigh here, we actually have three courses in that area focusing in computer science, an interdisciplinary undergraduate course between CS and business, and a graduate level course at our master's in financial engineering. And taking all of those things together, we come pretty close to touching about 100 students a year. So we're doing our part there, but there's a long way to go.

HANLEY: 18:18

And I think, as a former regulator, what I learned there is that you have to understand what is the problem you are trying to fix and regulators-- I mean, not regulators, but people in Congress and regulators, too. I'm not saying that they don't do this. They have to do something for their constituents and oftentimes they respond to what the

flavor of the day is whenever a crisis is ongoing and make legislation that has not been fully vetted by economists and computer scientists and others as to its impact. They are not required to put their legislation up for comment, for example. And in this space in particular, the benefits of blockchain and business application, you think of things like supply chain, where it's important to know where you get components of your business. The benefits of the blockchain are quite significant, and it isn't clear that some of these regulations will not impede the ability of businesses and individuals to leverage the blockchain for greater productivity. And so I think the reason why the bills fail is because a, others don't understand it and b, that sometimes they are informed that the costs of that rulemaking outweigh the benefits that they think they're going to get.

CROFT: 19:52

In the news this week, there's been a lot internationally about bitcoin, as El Salvador became the first country to adopt it as an official currency. And I think everyone would agree it was not exactly an auspicious beginning. On the first day, the government's new digital wallet had to be taken offline temporarily. Large protests broke out on the streets and bitcoin prices dropped sharply. Kind of setting aside the specifics of what's happening in El Salvador, it seems to raise a more interesting question to me, which is what is making bitcoin or any of the cryptocurrencies at this point an official currency something that countries should be considering at this stage? And if not, do you expect it will be something they will consider at some point in the future?

KORTH: 20:47

Arguably, many are indeed considering it when you look at the whole concept of central bank digital currencies. But the idea of using an existing crypto bitcoin, the example of El Salvador has a whole bunch of pluses and minuses. I think it's worth pointing out that in the rollout in El Salvador, the problems relate to the infrastructure around making this available. And we need to realize that in any blockchain system that interacts with the real world, there's a lot more to deploying that than blockchain. And here we have a situation of deploying a new complicated information system in a less developed country. Not surprising that it might have been less than smooth. And in terms of the use of bitcoin in particular, obviously, there are issues of volatility relative to the dollar, which is the currency used in El Salvador. Their attempts made to allow people to convert quickly and mitigate that. But all of those things take time and development. I think more generally, the issue here is that things we've said earlier, both of us, about the potential efficiencies in using a digital approach are things that ought broadly to be considered. As for specific choice of currency, that's much more debatable.

KORTH: 22:12

And besides efficiency, when you look at parts of the world where there is less development and more corruption, the ability to prove that an individual, in particular, let's say low paid workers, having been paid a living wage - because you can see it on the public blockchain - that could create a huge potential for social good in enabling a guarantee of payment to workers, bringing banking to the unbanked. So there are great social gains possible. The question is really how best to get there?

CROFT: 22:46

Dr. Korth, you had mentioned what Lehigh is doing, and I would be remiss if we didn't talk about the new Center for Financial Services Blockchain Lab, which you had and which Dr. Hanley oversees the broader Center for Financial Services. So this represents an interdisciplinary approach to research into the potential uses of blockchain technology and financial services. I'm wondering if both of you can can

give us an idea of what you hope the center will offer, not just for Lehigh faculty and students, but to expanding the knowledge base in this fast growing field.

HANLEY: 23:32

Well, we're delighted that Hank has taken on this additional responsibility. As you can imagine, it's quite busy and having him aboard certainly is important to us as the center's mission is to bring innovation to the greater public, our alumni, and the public more broadly, innovation in financial services. And of course, blockchain is a huge part of that and it's becoming much more mainstream. It was a buzzword three or four years ago, and now it no longer is such. And our goal is to, as Hank has put forth, educate. We're going to hopefully employ a speaker series that will be open to everyone, as well as to produce research on the topic. And Hank can talk more broadly about that. But engaging both industry and academics in the discussion of blockchain and how that can make financial services more efficient and to provide value for both their customers and to the company that is using it.

KORTH: 24:45

And I'll take you up on that in talking a little bit about the research side, since we've already talked a good bit about the education mission that we're conducting. Research in the overall blockchain space fits a number of disciplines, I mean, certainly across all the business disciplines. And using the blockchain lab as a launchpad, we're looking to stimulate research interest across the College of Business related to the use of blockchain, the opportunities it presents, the needs to oversee and manage it. In my other role in the Department of Computer Science and Engineering, we have quite an extensive research activity going on as well. And there are a number of things there that just simply relate to kind of systems issues in terms of efficient consensus, efficient processing. But I think most notably for our discussion, if you look at the issues we talked about in regulating a blockchain, the capabilities there are limited by the particular way that particular blockchains are structured. Ethereum, for example, is set up in a way that makes it particularly easy to engage in front-running. Something in the stock market is totally illegal and well-regulated and there aren't easy ways to fix this. One of the things we're looking at is alternative architectures for a blockchain that make it more regulatable, both to prevent malfeasance or where it can't be 100 percent prevented to make it detectable after the fact, to be mitigated then outside the blockchain world within the legal system. So that's an interesting mix of computer science technology and business applications.

KORTH: 26:37

There's also a lot of interesting research around the whole domain of information privacy and information aggregation and doing that in ways that are succinct, yet provably correct. The technical term for that is something called zero knowledge and an area that would probably justify a whole podcast in its own right. But I can just say that we have work going on in terms of the efficiencies in constructing those types of systems within a blockchain framework.

CROFT: 27:10

Well, great. I think that's our time for this session. But I'd like to thank Drs. Korth and Hanley for being with us. It's been most enlightening about a topic that I think a lot of people have. I don't think zero knowledge, but certainly not as much as they probably should.

KORTH: 27:28

Well, thank you, Jack. I appreciate you setting this up. It's been a great opportunity.

HANLEY: 27:32

It's been a lot of fun. Thank you.

CROFT: 27:34

Yes, it has been. Thank you. I'd like to once again thank my guests, Kathleen Weiss Hanley and Hank Korth. Prior to joining Lehigh Business in 2015, Dr. Hanley was the

deputy chief economist of the Securities and Exchange Commission and the deputy director in the SEC's Division of Economic and Risk Analysis. She previously was a senior economist at the Board of Governors of the Federal Reserve System in the risk analysis section and a senior financial economist at the SEC. Prior to joining Lehigh, Dr. Korth was director of Database Principles Research at Bell Labs. At Lehigh, he was chair of the Computer Science and Engineering for seven and a half years and for eight years was co-director of the Interdisciplinary Computer Science and Business Program. This podcast is brought to you by Illuminate, the Lehigh Business Blog. To hear more podcasts featuring Lehigh Business Thought leaders, please visit us at business.lehigh.edu/news. And don't forget to follow us on Twitter @lehighbusiness. This is Jack Croft, host of the Illuminate podcast. Thanks for listening.

[music]