Blockchains Architetcure, Design and Use Cases
Prof. Sandip Chakraborthy
Prof. Praveen Jayachandran
Department of Computer Science and Engineering
Indians Institute Technology, Kharagpur

Lecture – 30
Blockchain Use Cases

Hello everyone, and welcome to this next lecture in a Blockchains course. We have covered multiple phases of this course; we have covered architecture, design of how blockchain platforms are built. And now we are going to get to the next phase of talking about use cases.

So, before we look at the some of the use cases with this lecture is going to be a learn more at an abstract level, about how you should go about thinking about a blockchain application, thinking about use case, what is the some of the concentrations to take when you are building a blockchain application.

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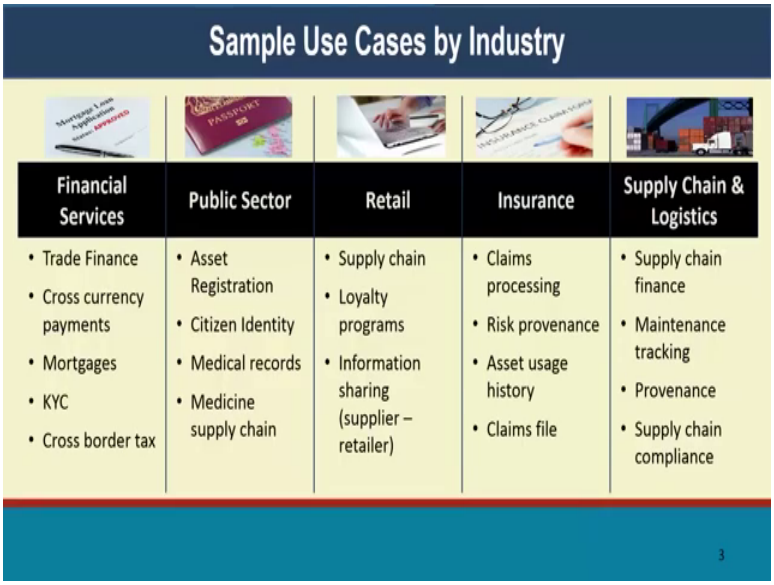

So, blockchain itself is for many industries people think it is going to be completely transformative, I have just named some of the industries here there are lot more that people are looking at. And there are like 100 severe cases that people have if we look at some of the blocks. People are looking at blockchain for all sorts of applications be it an financial services, and supply chain, and insurance, retail, and media, healthcare. There

are almost every industry is looking at how blockchain would make a difference for them.

Here this is a just a very high level overview of some of the applications. Over the next few lectures we are going to take 3 major industries, where blockchain is going related to be make a substantial impact. We going to look at financial services, supply chain, and logistics and the public sector. Professor Sandip Chakraborty is going to cover the public sector use cases and the covering some of the financial services and supply chain logistics use cases.

Over the course of the next few lectures I hope they impress upon you the transformative of nature of this is of this technology there is blockchain, and how you could think of new business models and new applications that were not possible before, before blockchain technology was available.

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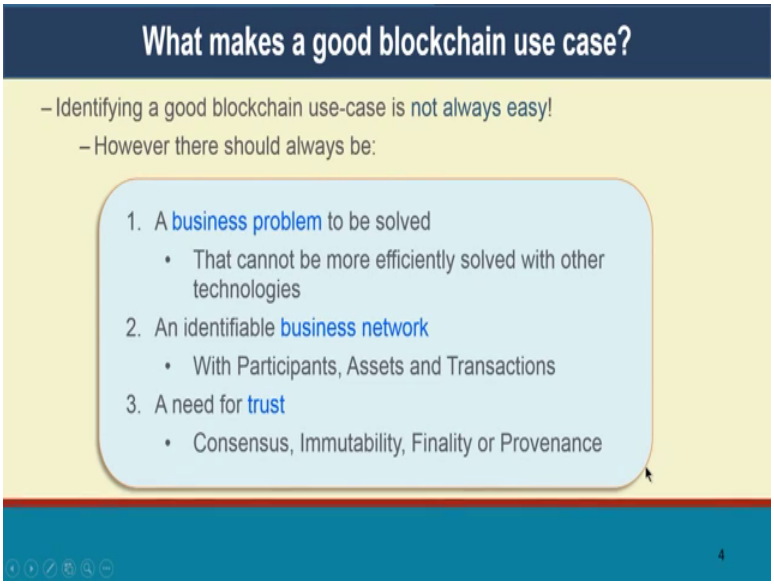

But before we go to the use cases themselves, first let us talk about what makes a good blockchain use case, what are the common tenants of a blockchain use case. And it is may not always be easy and sometimes people fall in the trap of using blockchain when you are not supposed to use it, where it might be better than in a centralized fashion. So, for blockchain use case you need of course, a business problem that needs to be solved.

So, do not try to solve a problem that does not exist for anyone, if no one can about it do not try to solve it and of course, do not try to solve it using block chain. So, there has to be a business problem; that people are willing to spend money on spend time on to have it soft. And of course, it has to be solved using blockchain more efficiently then it can be solved with other technologies. Assuming there are other technologies that can be used to solve that problem; there has to be a business network. So, there has to be a set of participants and bond some information that this participants are exchanging with each other. And some transactions these participants are performing that exchange information or exchange some that modify this information in some way.

So, there has to be this business network that is existing maybe existing right now or you are creating this business network to solve a business problem right with my not be network that exist today, but you are creating it so that you can solve a business problem. And of course, there has to be a need for trust. If there is a no need for trust and everyone in this network, every participants in this network is let say are willing to trust a single person with all the information, all the transactions.

And if the single person can perform all the transactions and can be a single custodian of all the data you probably do not need a blockchain for that use case. So, it has to involve multiple parties, who do not trust each other, but need technology such as blockchain; to install trust. So, you need a notion you need consensus, immutability, finality and provenance of the information that is getting shut. Part 2 one part of this trust feature is also the notion of auditability right?

Sometimes it is just regulator who does not trust the individual entities, who wants to see that the individual entities are following due diligence, they are following the right side of policies that are set by the regulator. And they want the individual organizations to prove that they are actually following policy right. So, this is actually in the public sector sectors some of these use cases have this notion of auditability, providing proof for what you are doing and there again blockchain becomes the use case right it is helpful.

So, what makes a good first blockchain use case? So, if you are actually trying to do this for the first time, let say you are a company and you are going to try you are going to try using blockchain for some of use cases; then what are some of the matrix that you should use to determine which use case you try first, because that does have an impact on your

perception of the technology itself of how it is it is use. For instance, pick a use case that is fairly limited in scope, so, that you can test what does with it alright. Blockchain is not a technology that is very mature is yet it still maturing as a technology.

So, I would definitely recommend starting with something very limited in scope, saying I am going to solve this small problem for my organization or a set of organizations, and I am going to define this scope for that. So, I think of it is a minimum viable product that you going to build with blockchain; that takes maybe that can probably we built in a few weeks. Think of also a small business network if a problem requires bringing 50 participants into a network versus another problem that requires just may be 5 participants.

Start with the network that needs just 5 people to come on work, and that gives you have ability to get off the ground quickly and unlike traditional software product where one person can just develop the product put it out there for others to use. Blockchain is a bit different it does require multiple organizations to agree to come together, use a particular join a particular network work is a concussion. So, for that reason start with a smallish network right? You can then expand build your network over a period of time. Blockchain has also built in such a way that it allows for scaling more participants and more scenarios in future. As we discuss various use cases in some of the first production networks that we have built I will try to emphasize the same principal right.

We are starting with solving a small problem, but we then we have the vision of building it up for an entire industry, solving a huge range of use cases using blockchain. So, that is moto rates start small and grow fast.

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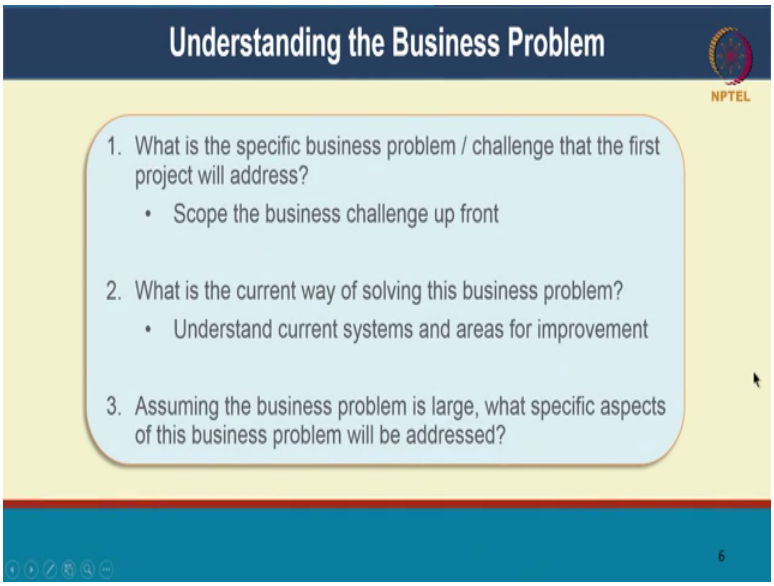

So, the next thing is about understanding the business problem. So, what does it mean? What are some of the things you should think of; when you are you are trying to address problem. What is the problem we are going to address? So, the scope of that challenge is going to be, and set that set that as a clear goal saying at this is the problem statement that I want address. And what is think what is the current way in which that problem is being addressed, may be partially maybe not at all think of the current process that is being followed that creates this (Refer Time: 07:15) right understand current system that are involved in this interaction.

Maybe there are no systems, maybe it is about people are currently exchanging paper documents today, people are probably picking up the phone and calling each other that; that could be the business problem. And blockchain helps you address and automate some of those things right. So, understand what current systems are involved and where systems do not exist, and identify areas of improvement. So, that would be the next step and assuming the business problem is fairly large then figure out whether some problems can be attempted right way, what specific aspects of the business problem will this first application try to solve right. Make a scope of the problem fairly limited.

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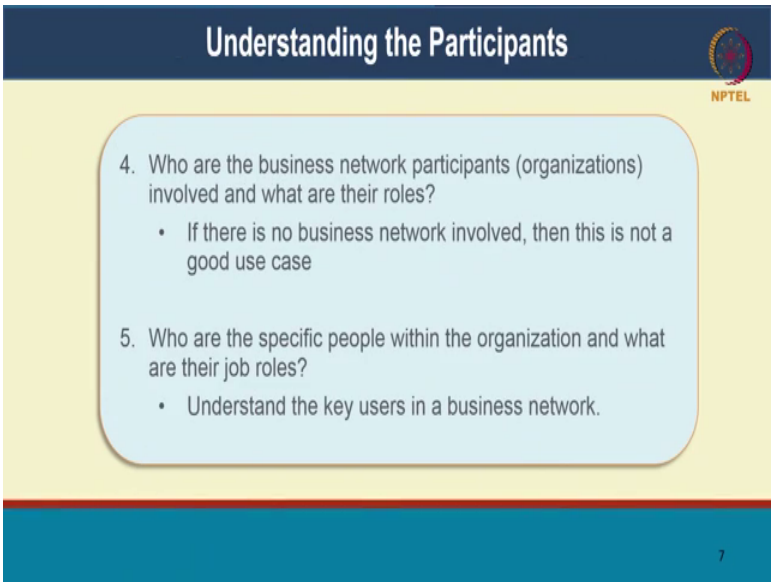

So, the next once you identified where the problem is you scoped it out clearly, then you need to understand who the participants are. So, who are the business network participants or the organizations who are involved, what role do they play in this business network.

If there is no network that is there if you tell me there is this one participant in this in this ecosystem, then that probably is not a good blockchain use case right. If you just one participant you should probably you will be using some kind of a centralized system, maybe a database, maybe a web server that you need, maybe a combination of those, may be it can be solved with just that you probably do not need a blockchain for that. Then who are the specific set of people and organizations and what are their job roles. Understand the key users in the business network and how they interact with each other. Again this goes back to the access process how is the process working currently. And in that process clearly identify the users and their roles that they are performing today.

That might change that we want to change that in the future, but identify the current set of users and roles.

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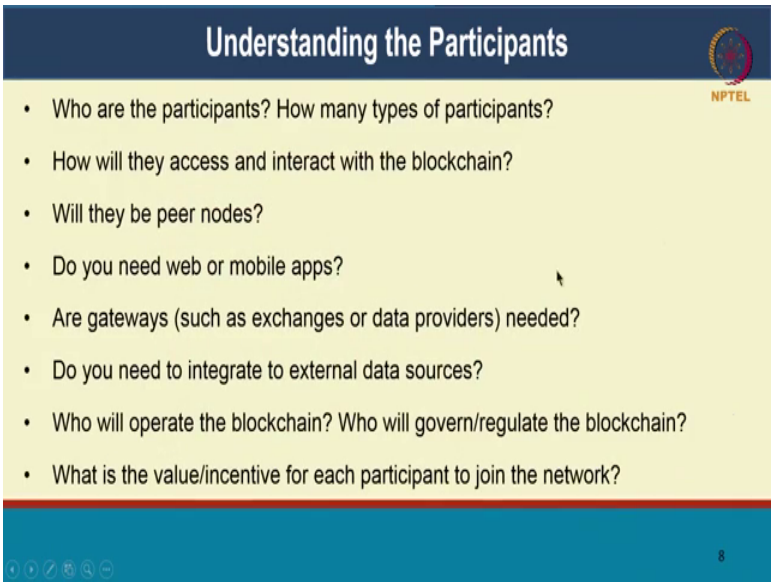

Now there are many more questions you can ask yourself I am I am hoping the set of questions will help you think through may be your first application; that you want to try out yourself, maybe it is a start of that you want to try. So, in all of these things in thin these can be leading questions that you should ask yourself before (Refer Time: 09:13). So, I mentioned who are the participants what are their roles what are the different types of participants, how are they going to access and interact with the blockchain. So, is this what is there what are the access control rules, who are going to be operating the peer nodes, who are the big entities here, who need to be part of the network, are there going to be some web applications or mobile applications that you need to be that need to be developed.

That was the interact with the blockchain and those are the ones that users, end users will use, are there gateways other exchange other data sources from which data should be gathered and fed to blockchain. Likewise, should the blockchain data be sent to other systems of record, think about those things.; they also think about who is going to operate the blockchain who is going to governor a regulate the blockchain, maybe it needs it requires forming a contortion. Maybe there is one large player let us say a large manufacturer who brings in all their suppliers on to a on to a blockchain platform. So, all of those models are possible we will talk about that later in this lecture.

And for each participant each role in this network be very clear about what is the value or the incentive for that participant to join the network. If they are better off with their current systems and they do not really have any value to join the network, is going to be very hard for you to convince them to join the network. So, every participant in this network should have a business incentive to join the network. I think this is a very aspect in the bitcoin world all you are doing guys you are exchanging bitcoin access transactions on the network. And the set of peer nodes we are disjoint from the set of participants right, it could be 2 distinct nodes and the peer nodes they were getting incentive wise through mining and you get a crypto currency for it.

In permission blockchains we are leveraging the fact that in this business ecosystem there is actually a business incentive for all of these participants to join the network and it is important to identify that incentive the value that you will be providing for each participant. And that is a going to be a key part in growing the network quickly.

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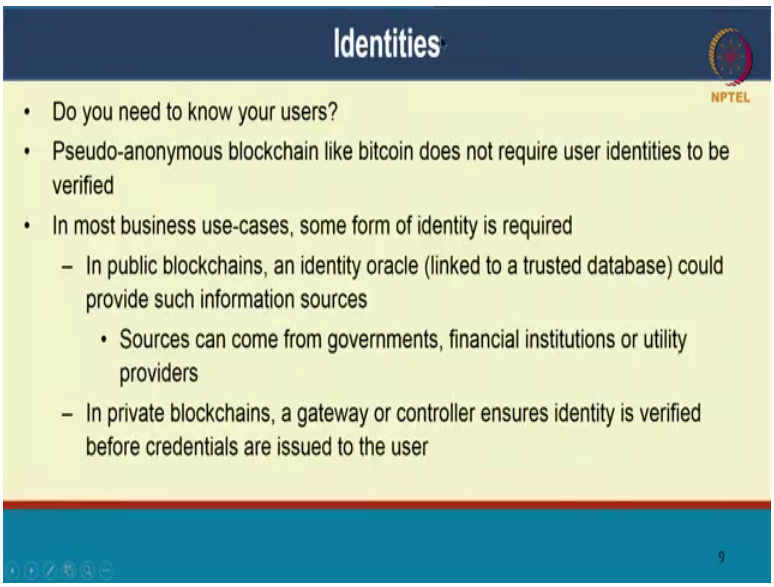

Now the next part once you identify the participants you need to know their identities. So, do you know all the users are going to be there how are you going to create the identities. So, in the bitcoin world again there were pseudo anonymous identities that were created. So, none of these identities where verified in any way, in most business use cases let us say I have a particular organization engaging in business.

I already have a set of entities I do business with, and I do want a recognize I do want to validate the fact that it is only those entities that are actually part of the network. I do not want anonymous entities, people I do not even know to be joining the network and part taken in part taking in the transactions I have for instance, I do not even want them to know that this network exists; leave alone seeing data and transactions on the network.

So, in public blockchains is possible to have an identity oracle could provide the information about who are the identities, but in permission blockchain, blockchains including hyperledger fabric. There is a gateway or controller or consortium that determines the identities of entities or verifies these identities of (Refer Time: 12:35). So, let us say there is a consortium of 10 banks they might collectively determine whether a 11th bank should be admitted or not, and they will verify the identity of 11th bank before admitting them.

So, it is not going to be a anonymous user who freely joins the network they are going to be validating these new, new participants every time they join the network. So, that is good be some gateway, some permissioning that happens of (Refer Time: 13:01). In fabric actually give you some of those governance capabilities.

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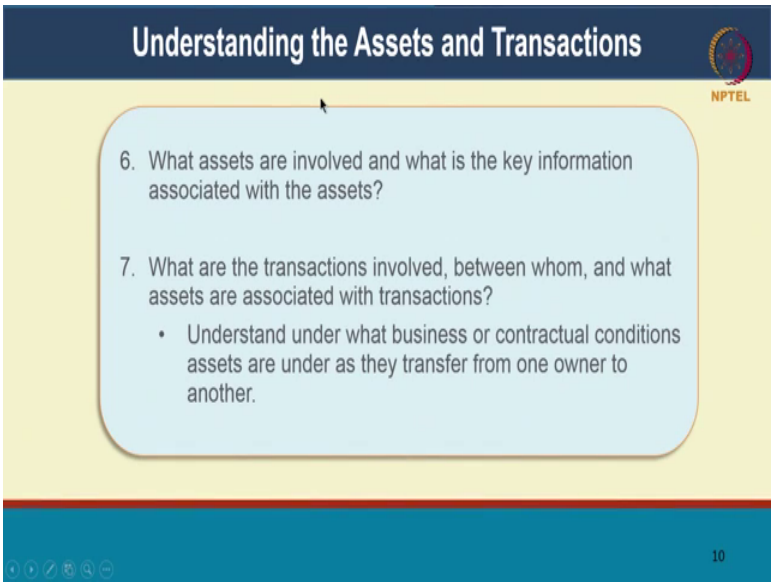

The next step you have indentify the network, the participants, the identities. The next step is for you to understand what are the assets and transactions. So, what is the data that is information that is going to get exchanged, amongst these participants? What are

the set of transactions to be performed and what transactions are going to operate on which data, and by whom right all of these need to be identified.

So identify the assets, identify the transactions for each transaction who is who are the set of parties or roles who are admitted or permission to perform the transaction, and what is the transaction actually going to do; it might read to assets write 3 assets so we need to identify that. So, it might just be a ownership transfer and so you can define what your transactions are.

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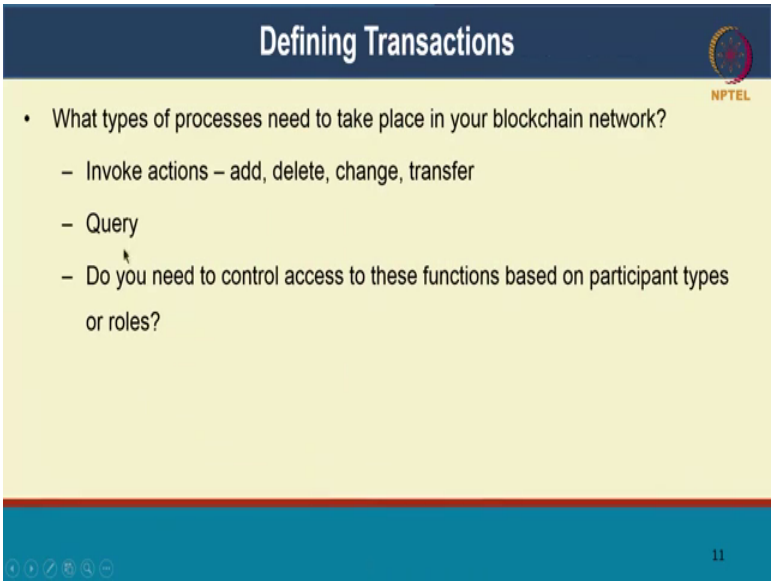

And transactions themselves could be of different types. They could be invoked transactions. These invoked transactions are going to be recorded on the blockchain these could be add, delete, change, transfer ownership it could be any of these; or it could just be a query. A query may or may not be added as a transaction on the network and by definition the query only reads data there is not going to be writing any data.

So, it is possible for you to just read one node in the blockchain and accept whatever information it is giving you so that would be a query right. And for all of these functions think about whether you need to control access. So, it is possible for you to define access control rules on who can create, delete, update or even query; some of the information that is getting stored on blockchain. So, based on the participant and their roles you can define the access control roles.

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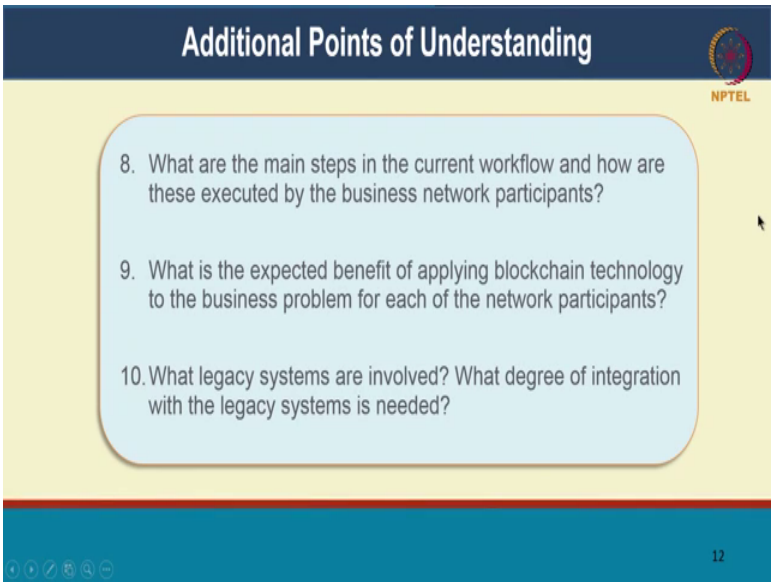

So, what are some of the additional points if understanding that you need to think about; think about how the current process is by the different network participants? And think about how you would like it to be in future. So, you might be think about completely different way of executing this process. Maybe some of the existing participants may not even be there. So, that is the disintermediation that you might read a lot in blockchain. Some of the intermediaries middleman can actually be eliminated in the in the new world and that can significantly improve efficiency reduce cost and so on.

And once you determine the process you want to go to the eventual process with blockchain, identify the benefit for each of the participants with the new business case. And also determine what legacy systems are involved and how that how those might change in the future. Maybe some of the data you are storing and is going to get changed. I talked about paper documents maybe current legacy systems are actually just storing scanned copies of paper documents, that is very common in the supply chain world in the logistics world today.

Where existing systems although internally within an organization they are all automated, they are actually storing scanned documents. And whenever they are sending that information to another organization they might actually print it and courier it, that is that is the reality today, but maybe in the future with blockchain we are looking to digitize all of this information automatically transfer that over the network. And in that

case the legacy systems would have to move from accepting these scanned documents to be able to accept digital documents. So, there might be some changes to legacy systems is well and that is a could be disruptive for in some cases. So, we will have to work out; what the disruptive might be and how systems by change in the future.

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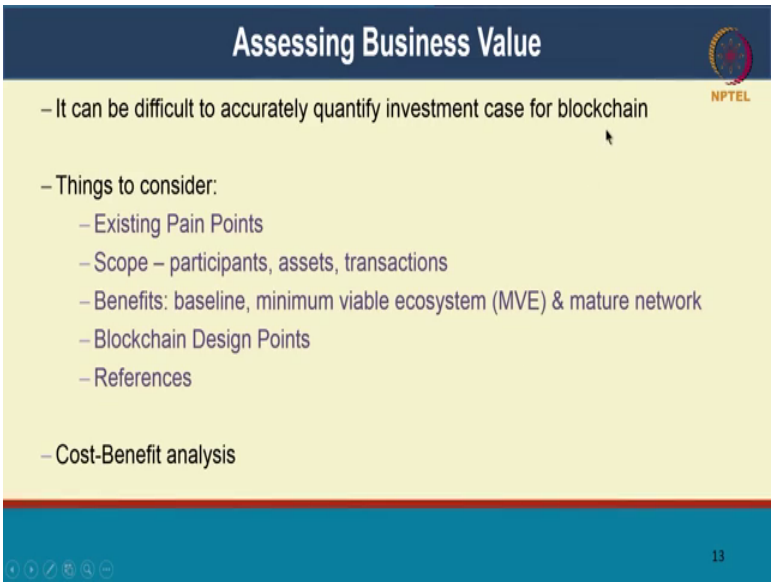

So, accessing business value is again a key step for you to be able to succeed in setting up your blockchain network and to grow it, what are the existing pain points, what is for the scope you have defined, who are the set of participants assets and transactions for each of them; each of the participants what are the benefits. And there has to be a minimum benefit right now with the minimum viable product your building, and of course there has to be a much bigger long term benefit for them to participate based on other use cases that you might solve for the same network.

We will talk about some of these networks and how we can start small with one use case and grow to solving many other use cases. And of course, after all this there has to be a cost benefit analysis. Almost always the blockchain system is going to be much more costly for you to implement than using the centralized system.

So, the benefit of using a blockchain system has to outweigh the cost of running that blockchain network. And often it has to outweigh it multifold, because these are disruptive in nature. You are asking people to throw away existing ways of doing work of doing business and to move to new ways, and that there will be a resistance if the benefit

does not significantly outweigh the cost. So, that is very important consideration for use cases. And with the use cases that we will see will be apparent that some of the benefits are significantly more than the cause what the cause are.

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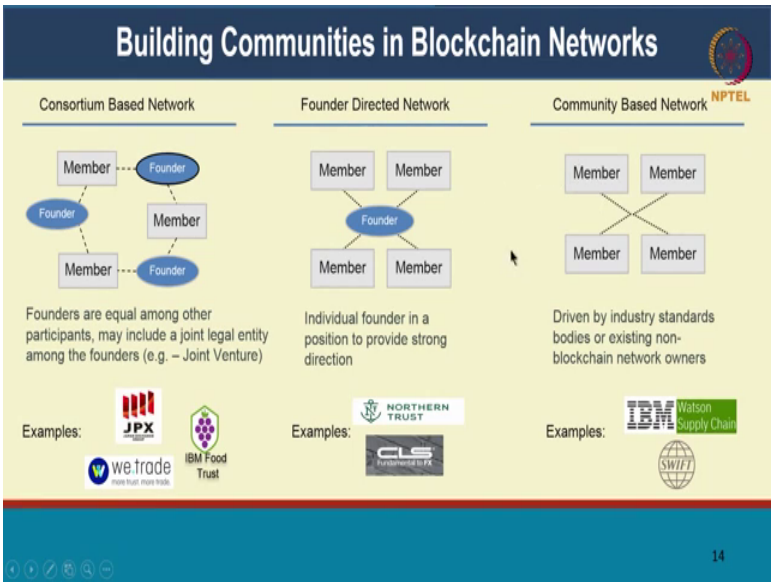

and how are some ways in which you can build a blockchain network? One way is a consortium based network, where there might be a existing consortium of banks or there might be a new set of banks new consortium that is formed among the set of banks.

These are happening already, banks are one of the foremost ways foremost players in the market who are forming this consortium, but consortium can also be formed by other providers; there are healthcare consortium coming up, there are consortium in the supply chain world. They are all getting built today because they all have a common business problem they want to solve. And there is an incentive for them to participate in this consortium and leverage the benefits of blockchain. So, some of the examples I can site IBM is involved in some of them. IBM there is a food trust that we are working in partnership with WALMART, any other supply chain players. We have ongoing project with the japan stock exchange. So, this is to bring in some of the securities in trading, capabilities use to use blockchain.

And again we dot trade is a consortium of banks that have come together for trade finance. It is a those are some of the consortium based networks. The other network kind of network could be a find founder directed network. So, there could be a large company,

sometimes even a regulator brings together several other members in the ecosystem and convinces them to come on and join our network right. So, there will be an individual founder this is usually a strong player or a big entity in the ecosystem today. And they influence a lot of other smaller members to join the network and we have a couple of examples we will talk about that in when we talk about some of the use cases.

Again primarily in the financial services ecosystem, third could be a community based. So, this could be already a set of set of entities using some existing system. For instance, swift is a community in some sense right; swift is a message exchange mechanism amongst banks. So, it is a secured way of exchanging messages. And there are many banks that are already part of the swift ecosystem. So, those set of banks they are already using swift to communicate to each other. It may be easy for them to come on to blockchain and use blockchain for their information exchange and for sharing processes. Well, likewise there is also supply chain ecosystems, supply chain communities. They are already a community that there are using some form of a system today to exchange messages.

It might be a centralized system today, but then they have an incentive to move to a decentralized model. So, that could be a community based network and there many of these examples and hyperledger fabric gives you some of the governance mechanisms for initiating and building some of these networks.

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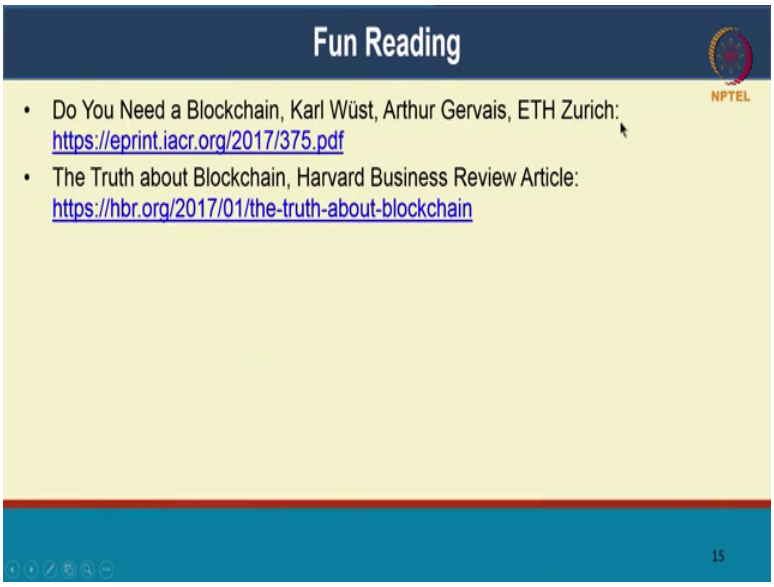

So, with that that gives you the overview of how to go about setting up a network, how to go about thinking about a blockchain use case. And there are some very nice articles that kind of explain the same principals. It was a nice article from eth Zurich that by it has title of do you need a blockchain. So, they have a nice way of explaining when to use a blockchain, when not to use a blockchain; they actually have a nicer flow chart where they take you through different questions, and based on whether you answer yes or no you should you should and should not should or should not use a blockchain.

So, it is a nice read, it is fun read, it is also have a business review article about the truth about blockchain. It talks about again when to use blockchain, but they are also talks about some of the some of the aspects I talked about how it is going to be disruptive, some of the things you need to think about before jumping to use blockchain. So, it is a nice read as well with that; I think over the next few lectures we are going to dive into some of the industries. Specifically, financial services first then supply chain and finally, the public sector and government use cases. We just going to use these is as highlights for how a complete industry can be transformed using blockchain and there is a host of applications in each of these industries.

So, see you soon on some of these lectures.

Thank you.