Blockchains Architecture, Design and Use Cases
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Lecture – 43
Blockchain in Government – V (Tax Payments and Land Registry Records)

Welcome back to the course on Blockchain. So, in this lecture we will take 2 more examples, 2 more use cases where government can get benefited by the utilization of this blockchain technology. So, we look into specifically the tax, taxation case where blockchain can be utilized to make the tax management simplified. And we look into that how blockchain can be utilized for digital land record management.

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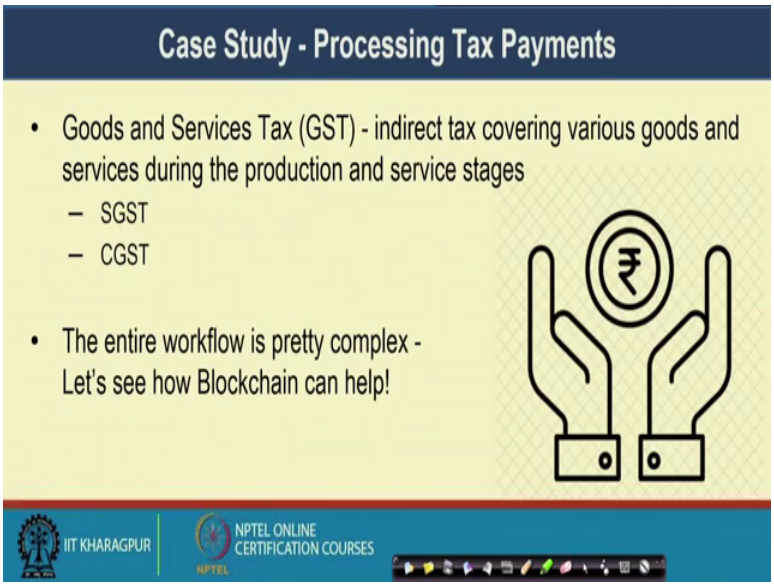

So, let us start with the first use case, the processing the tax payment. So, in this case these Good and Service Tax, GST that all of you know that, it is a indirect tax which covers various goods and services provided by different kind of service providers or vendors, during the production and the service stages. So, this GST is levied on different goods or services that you are procuring. And GST has broadly 2 components; the state GST and a central GST, SGST or CGST.

So, this entire workflow of GST collection and GST management it is very complex. So, let us see that how blockchain can help us in this particular perspective of managing this entire tax with the help of a decentralized ledger platform.

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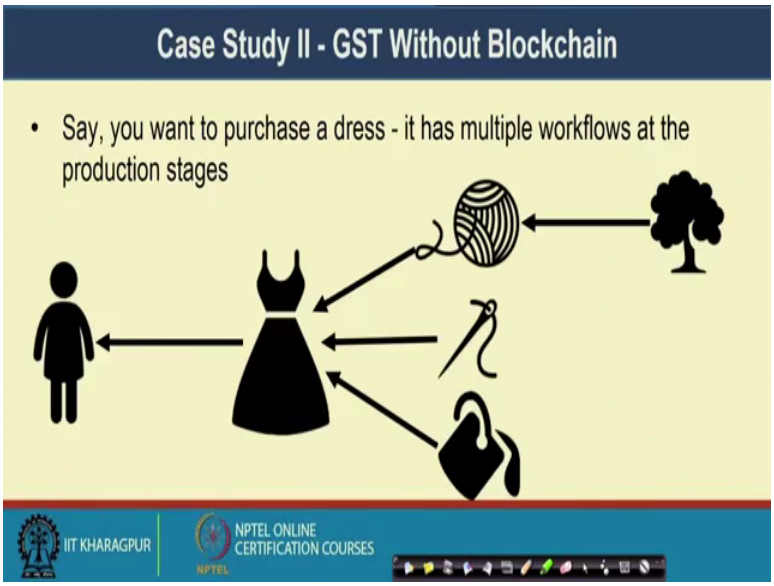

So, let us again start with a use case, start with a example; say, you want to purchase a dress. Now whenever you want to purchase a dress, it has multiple work flows at the various stages of the production.

So, initially the farmer need to produce the cottons. So, once the cotton has been produced, then these cottons comes from one vendor, then you require another other raw materials for producing a dress; like the needles, the sewing machine, the colors, all these different stages. Now, the production house they produce the dresses, and the dresses goes to some shopping center or some shopping mall, from where you purchased a dress.

Now, the question comes that at different stages of this production how the government will levy tax on individual components. So, this GST although it makes this taxation process more governed, but the entire stage is bit complicated. Say for example, what happens that whenever the farmer is selling the cottons or farmer is selling the raw curtains, they are providing certain tax to the government then the production house which converting the raw curtains to the cotton balls, they are levying certain taxes.

There are companies which are producing needles they are levying certain taxes. And that way whenever the entire dress is being produced by another company, which are purchasing these raw materials from different other vendors or different other companies, they are providing individual taxes to individual companies. And all these things are

getting added to the price of your dress. Now, whenever you are purchasing the final price, during that time you are also providing certain tax on the base cost of your dress.

In GST, the idea is that this tax is levied at every stage of the production, but ultimately only the final consumer, they will provide or they will give the entire tax. And the intermediate steps the tax will be refunded back to the corresponding production house and the corresponding companies. So, for example, whenever a company is producing a cotton, it is and they are using that cotton, or they are selling the cotton to some dress company, in that case the tax which is already levied on the cotton that will get refunded back; because the entire tax will then will be levied on the final customer or the final consumer which who is consuming the dresses.

So, it is just like that the final consumer who is consuming certain goods or certain services, they will provide the tax, not the intermediate one who are providing who are actually collecting that raw materials and producing the dresses.

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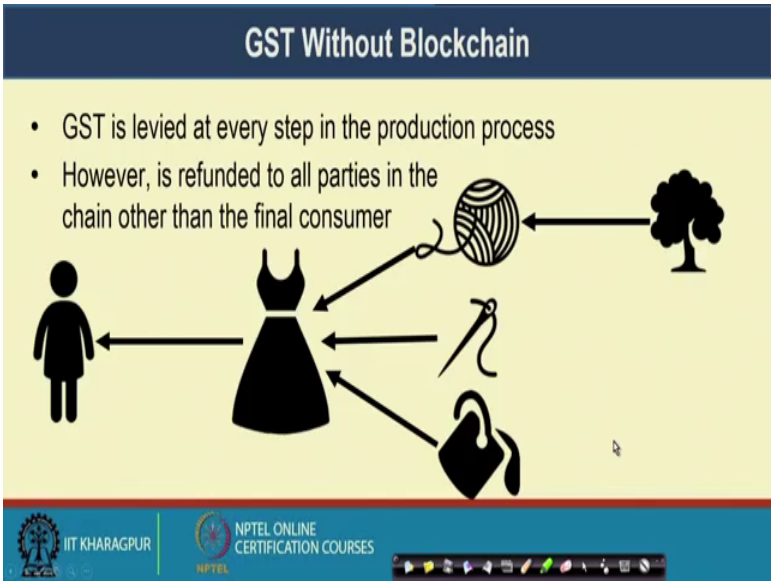

So, this entire idea in GST is like this. So, the GST is levied at every step in the production process; however, it is refunded to all parties in the chain other than the final consumer. So, the final consumer will pay the entire GST; whereas, the intermediate production houses and the companies, the intermediates at the chain, they will get refunded of the amount of GST that they produced, or they provided whenever they purchased the raw materials.

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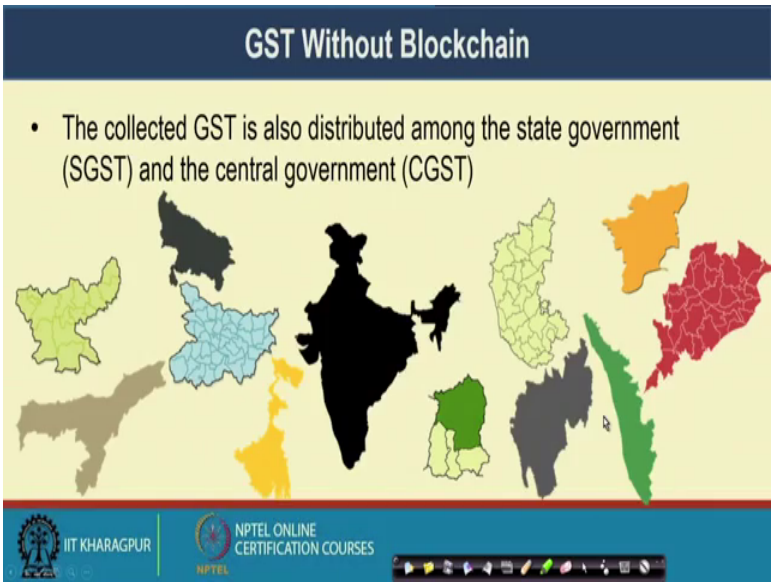

Then again the entire things becomes complicated, because the collected GST over a particular product, that is get distributed among the state government and the central government as per the Indian GST rules. So, whatever GST that is getting collected based on where the production was there. Say for example, if the initial cotton was produced in Andhra Pradesh, then the Andhra Pradesh government is subjected to get certain tax out of it, certain money out of it from that state component of the GST, the SGST component.

On other hand the central they get its own component of the GST which is the CGST of the central component of GST. So, that way whatever amount whatever tax amount that is being collected from this entire GST procedure that need to be get distributed among multiple states and the central government.

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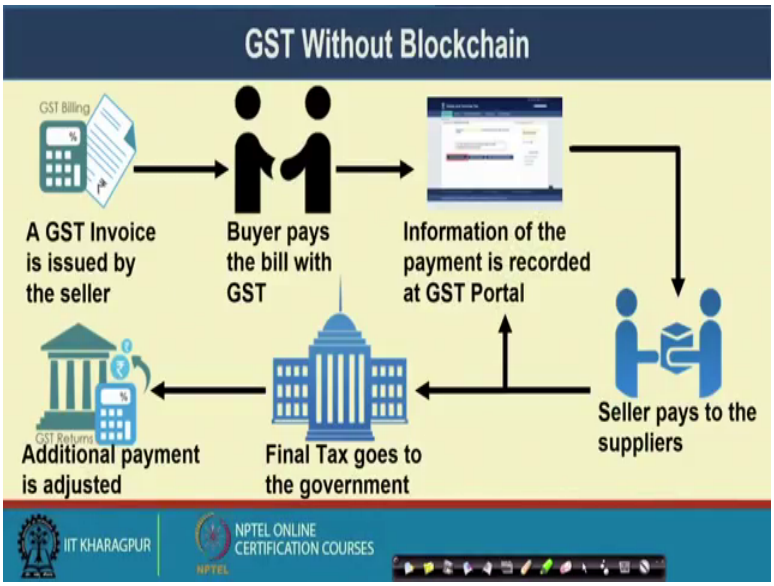

So, this makes the entire procedure very complicated. And let us see that without the blockchain environment how this GST payment works. So, whenever you are going to purchase certain things during that time, GST Invoice that is being issued to the by the seller. So, the buyer pays that bill along with the GST. So, this information about that GST that is entered by the seller to a GST portal that this amount of GST that he was collected over say a fortnight and the seller if he pays this entire collected amount to the government, at the same time it happens that the seller can actually working as a production house just like a dress company which is purchasing multiple raw materials.

And whenever they are purchasing the raw materials, the seller also pays the certain tax the GST to the suppliers. So, that way here there is a kind of loop. So, everyone in the production house, they collect a certain amount of GST and this entire amount of GST goes to the government. Now the task of the government is to make this huge calculation like which part of the GST need to be refunded back to the intermediaries of this production chain, and which part would be finally, collected and get it distributed among the central government and the state government.

So, this entire adjustment is done by the government employees who are connected with this tax department. So, this government tax department they have to manually do this entire calculation or with the help of certain software's. After doing the calculation they may adjust the amount of GST at individual production stages, and the entire final

amount which is being collected that gets distributed among the state government and the central government.

Now, as you see that these in this entire process there are multiple parties who are being involved and as I was continuously trying to convince you that this blockchain platform is very useful whenever you have this kind of multiple authoritative domains, or multiple parties who inherently does not have a trust relationship but they wants to come to a common platform. Here you can see that all these individual parties they are actually relying on the government that, whenever or whatever tax they are paying while purchasing the raw materials and they are collecting certain taxes from the consumer.

So, it is not like that certain kind of double spending is been happened on the same cotton, it is like that the same cotton when it is sold as a cotton during that time certain taxes has been levied, and whenever it is sold just like a dress as a part of that is another component of the tax has been levied. So, GST makes this process simplification that the tax should be just like a one-time tax, it is not like that at every production stage you have to provide certain tax which claims that well with the help of GST, it may happen that the price of the certain goods can go down.

But the complication comes here that everyone need to trust to the government at least that whatever adjustment that will be there at the intermediate steps of the production house, intermediate steps of the production, those amount payable that will get adjusted, and that will transfer back to the individual organization or the individual companies. So, the companies can submit one refund form, GST refund, form through which they will get refunded after doing this tax adjustment.

So, the tax officers their task is to calculate all these things and then adjust it accordingly. Now in this entire process, there are multiple authorities or administrative domains who are getting connected. And you need to have a trust relationship that whatever additional amount you are paying. So, it is just like that you are giving the tax to the government at the same time you have giving certain tax whenever you are purchasing the raw materials, it is just like that if you are giving the tax to the government then whatever tax you have used or you have paid for purchasing the raw materials that will come back to you.

So, this kind of trust relationship is there and based on this trust relationship the entire GST model works. But what if this trust relationship breaks? So, under this kind of scenario, blockchain can be a platform where you can make or you can make a simplification of this entire tax payment process; where all the things will be done automatically with the help of a smart contract.

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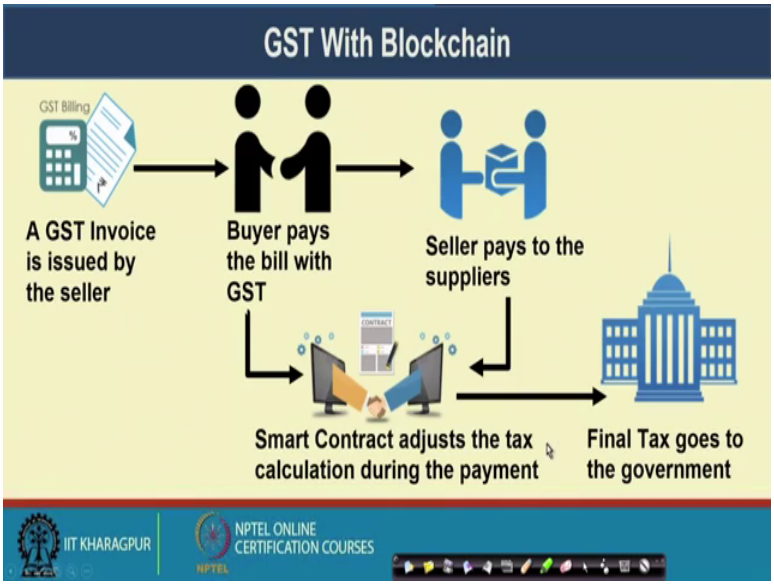

So, let us see how it happens whenever you have this blockchain environment, or how you can make this entire process simplified with the help of a blockchain. So, similarly the GST invoice is being issued by the seller, and the buyer pays the bill with GST. The seller then pays it to the suppliers, and all these payments they are done now with the help of this smart contract platform.

So, this smart contract platform which is there in a blockchain environment, the smart contract platform it automatically calculates this tax; because ultimately entire thing is a mathematical calculation based on from where the goods are coming, from where the raw materials are coming, how that raw material is being utilized, and at what level of the production process the taxes are being collected.

So, this entire procedure, the entire workflow can be managed with the help of the smart contract. So, the smart contract will have this set of codes, and that of that set of codes will automatically get executed by checking that who is paying what, and at what step of the production stage it is the final product is, whether the person is a final consumer of

the service or the good, whether or is it like that you are just consuming that things at a and you were the end consumer who is responsible for paying the entire tax. So, this entire workflow, the entire chain can be controlled with the help of a smart contract by writing certain set of codes. So, you can consult with a domain expert with a tax engineer, who can help you to build up this entire smart contract code, with the help of different rules which are there for tax regulation.

Now, this smart contract it can automatically do all the adjustments. So, if you have purchased certain raw materials, and utilize that raw materials for producing a dress, then this smart contract, it will find it out, it can find it out and it can accordingly do the tax calculation and the additional amount that you have paid for a purchasing the raw materials, that can automatically get adjusted on the ply.

And the remaining amount which is the actual taxable amount, so, this net taxable amount can be directly credited to the account of the government. So, in this entire process the process is getting simplified, and the process is getting real time. So, it is just like that, you are, you do not need to send everything to the government, and then government will do the calculation refund it you back, rather in the production stage itself the things are getting adjusted at every individual steps.

So, that way the blockchain can make this entire process very simplified and at the same time reliable. Reliable in the sense like whenever it is just like that once you have already paid the tax, you need to wait certain amount of time to get it adjusted. Because the government tax authorities they will check the entire ledger, they will find out whether there is certain discrepancies are there or not, and accordingly they will find out whether the refund claim that you have made whether that claim is legitimate or not and then they only they will initiate a transfer.

But here in the smart contract everything can be verified automatically in real time. That is the first advantage. The second advantage comes from the fact that it becomes very difficult to fraud anything. Because if you want your tax to get refunds so whenever you are purchasing something from say from the raw materials, the supplier say you are purchasing the cotton balls, and you are purchasing the needles, you are purchasing the sewing machine, you are purchasing the say the colors for coloring the dresses. So, during that time you are paying certain tax.

So, you are you assume that those suppliers they are not fraud they are correct suppliers. So, you have to pay the tax there. Now, whenever you are selling the item selling the dress if you are not making a correct entry to the blockchain, first of all you are the person who may have certain kind of loss in terms of the amount that you are provided for taxation purpose.

On the other hand, the interesting fact come from this point that this entire entry need to be there in the blockchain. So, no one will be able to tamper with these entries. So, it is just like that, it will also give a nice record of all the stages in the production for auditing purpose. So, the auditing becomes very easy in this case. So, that way the blockchain can simplify this entire process of tax regulations from manifolds.

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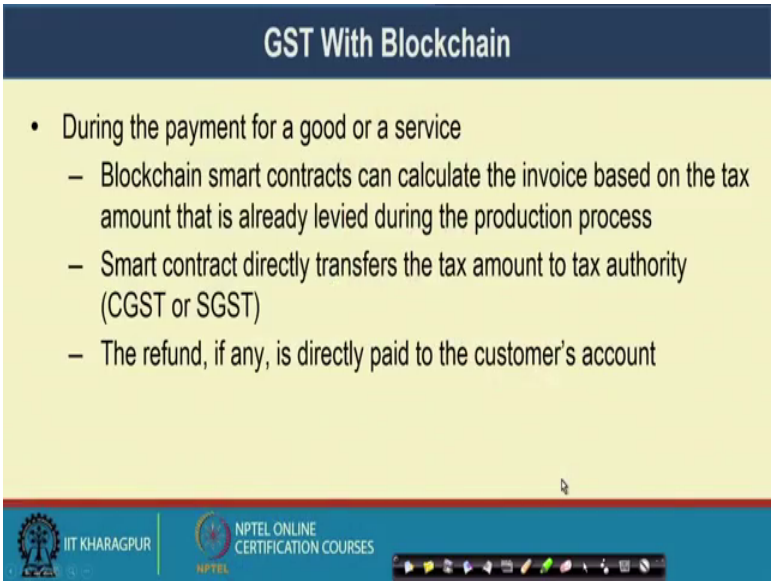

Well, so the advantage that we have here so, during the payment of a good or a service, the blockchain smart contracts they can calculate the invoice, based on the tax amount that is already levied during the production process. The smart contracts they directly transfer the tax amount to the tax authority, if it is SGST it can transfer it to the state government, if it is CGST it can transfer it to the central government, and the refund if any is directly paid to the customer's account. It is not like that you have to wait for a refund, and this entire audit log is there which can be verified to check the correctness.

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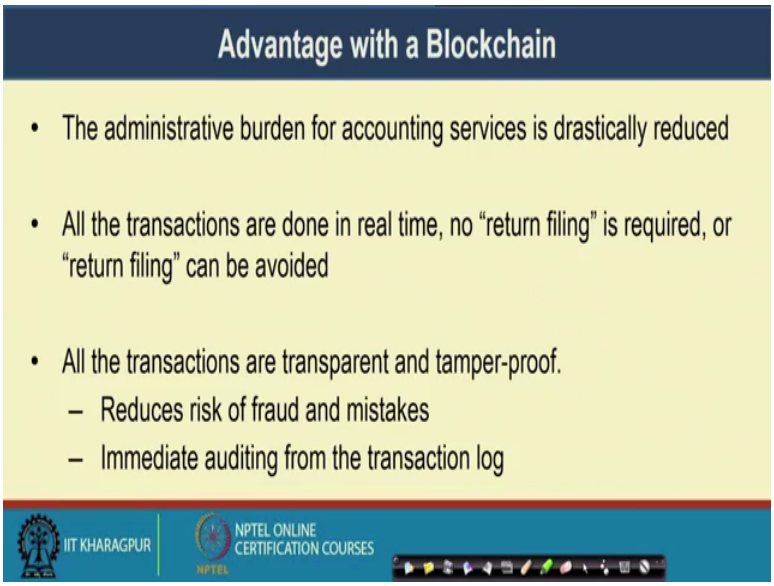

So, the advantages that we have here, first of all the administrative burden for accounting services that is drastically reduced. So, you do not need to do anything offline, everything will be done online during the payment itself. Then all the transactions they are done in real time. So, as such no return filing is required, or return filing can be avoided. And the third advantage that we have that all the transactions they are transparent and tamper proof.

So, everyone can validate the transactions, that how this individual goods they have been moved from different stages of the production house. It makes the life of auditor very easy. It reduces that is for fraud and frauds and mistakes that may happen. And finally, the auditor will be very happy, because they can see everything from the transaction log, during the auditing time and they can verify whether some frauds has been happened or not.

Indeed, the smart contact platform itself will help you to prevent many of the frauds or mistakes that can happen during this entire production process.

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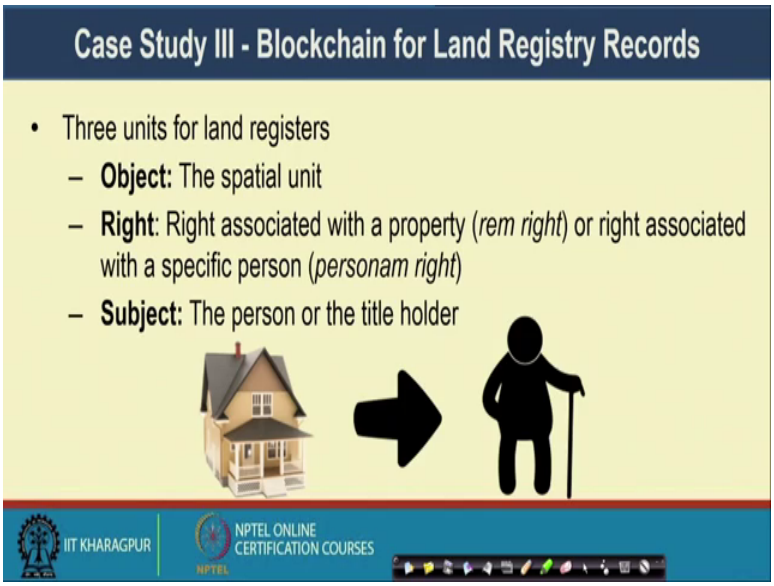

Well, now let us come to the final case study for the government perspective; where you can use blockchain for land, maintaining land registry records. So, whenever you are having certain kind of assets in the form of a land or in the form of a house; so, this kind of registry they have 3 different units or 3 different components.

So, these 3 components the first component is the object that is the special unit, the land that you have for the house that you have. The right, the right means the right which is associated with the property; which we call as a rem right or the right which is associated with a specific person, we call it as a personal right.

So, the difference between the rem right or the personal right is something this; in case of a rem right it is just like the right which is observable or which is true for the world. And you do not have any kind of personal relationship based on which you have that kind of right, we call it as a rem right. So, the term rem comes from a roman word whereas, in the personam right or sometimes we call it as a personal right. So, the personal right comes from the fact that you have certain personal relationship with a person based on which the right is being levied.

So, one example of this rem right and a personal right can be in case of rem right; say, you hold a house say, it is just like that you have the right on that house and no one else can claim the ownership of that house, you are the sole owner for that particular house. So, that is the example of rem right that is true to the world that you are the only owner

of that particular house. Whereas, a personal right can be like you have given your house for rent to another person, and you have the right to get the monthly rent from that person.

So, it builds on your personal relationship between yourself and the person to whom you are giving rent for your house. So, this any kind of rent any kind of right is associated can be associated with the object and the final component is the subject. So, subject is the person of the title holder. So, as an individual you are the subject who is holding certain kind of assets like a house or like a land.

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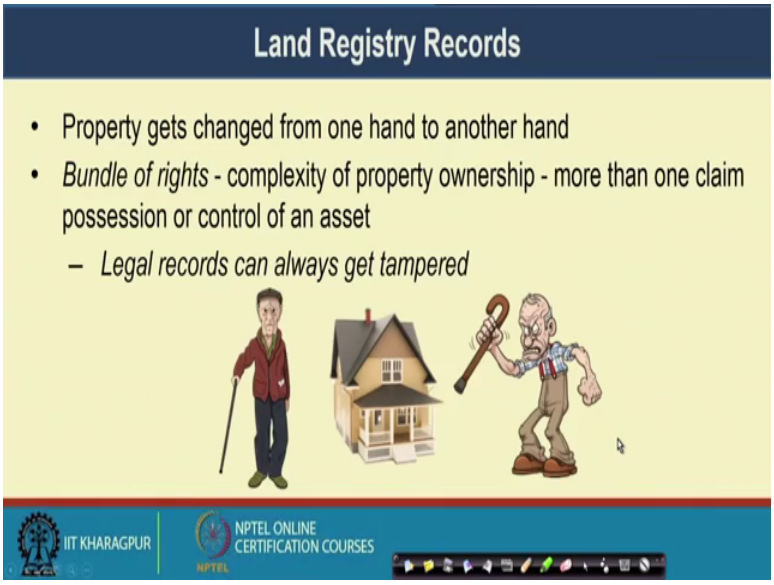

Now, these properties they gets changed from one hand to another hand. Like, you can sell your house or you can today you are giving a rent to your house to one person, tomorrow you can give it to another person. So, that way these rights gets change over time, and the government they maintains this entire land registry records to make a lock of this entire rights to validate that no unauthorized claims is being made on a particular asset. So, this we call as the bundle of rights.

So, this bundle of rights are actually the complexities which are being associated with the ownership. It may happen that more than one are claiming the position at the control of an asset. Because of certain legal records based on certain legal records, you can find out whether this person, among these 2 persons who are claiming the ownership of this house; whether this person owned the house or this old man own that house.

But the problem with this land registry record is that, whenever you are putting this land registry record in the paper format, the land registry record can always get tampered. Now if the land registry record gets tampered, it becomes very difficult to prove that who is the owner of that particular house or sometime it will happen that multiple owners are there for a particular land which is possibly coming based on a say that land was in posses of their father and after the death of their father, all the sons have got the position of that land.

And that way these things get propagated, and certain time there is a dispute case with the land like among this multiple people who are claiming the ownership of a land, you need to find out that which part or which share of a land belongs to which person. So, making this kind of decision at the judiciary level it becomes very difficult. So, it happens that you have seen that dispute regarding this kind of land registries, they goes to the court and this kind of cases that goes on year after another.

Sometime a person can file a case so, when he was 25 years old and it takes sometime more than 30 years to prove that actually that person owns that particular land, or sometime it may happen that the person may not even be able to prove that land is he is in his entire lifetime. So, this kind of disputes in land registry records we are seeing in everyday's newspaper and these are a very common case that land fraud because land is a very valuable asset that people consider and because of this entire process gets complicated.

So, the question comes that can you utilize blockchain to solve this particular problem. So, let us see that how a real estate transaction happens today.

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Say, Mr. Holmes wants to Mrs. Holmes she wants to sell her property sell her house. So, she contacts a real estate agent, and a real estate agent checks with the land registry office, that Mrs. Holmes is the legal owner of that particular property.

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Then the agent makes a announce if the agent is able to successfully check with the land registry record, office the land registry office that Mrs. Holmes is the owner of that particular house, and she is authorized to sell her house. Then the agent can make an announcement that the house is for sale. And then multiple buyers may come or some

dispute case may come, say if certain dispute cases comes like if someone claims at that time that well you have made a advertisement for selling this particular house, but I also have a share in this house, because it was it belong to my grandparent and the property was not legally divided.

So, this kind of dispute may come during the announcement for the selling announcement, but assuming that there is no such dispute, if there is certain kind of dispute then; obviously, you have to go to the court to solve that dispute and you have to prove your legal ownership on that particular house. Sometime, it becomes difficult to prove whenever you do not have any kind of position record or registry record of the house in your name, rather you are by heredity you have owned that particular house.

But assuming that there is no such dispute cases; say, one buyer here Mr. Watson he wants to buy this house. Now when Mr. Watson wants to buy this house Mr. Watson approaches to a bank for a house loan.

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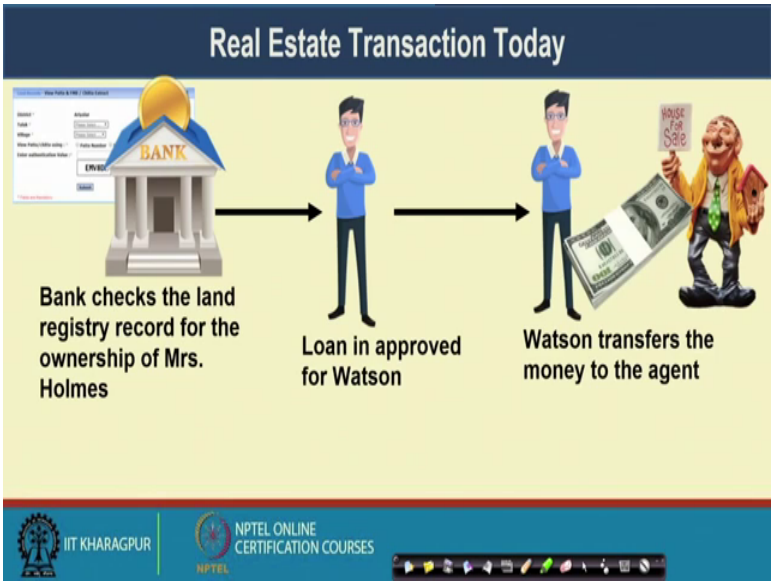

And then the bank also makes a check that whether for the house that Mr. Watson is going to buy, whether that house is actually belongs to the property owner who is claiming like here Mrs. Holmes; who is claiming that she is the owner of that property whether said that belongs to that property or not.

So, that every stage different organization like, the agent office, the bank they can validate about ownership of that particular house. Now if again there is no such dispute cases then the loan is approved to Watson and then Watson can transfer the money to the agent.

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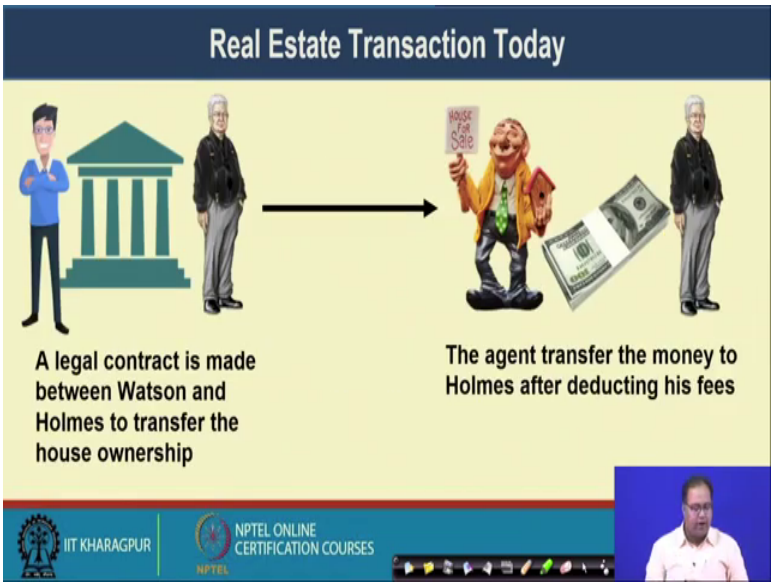

So, once Watson transfer the money to the agent, then a legal contract is made between the Watson and Holmes to transfer the ownership of that house from Watson from Holmes to Watson. And then the agent he transfers the money to Mrs. Holmes after deducting his fees.

Now, in this entire process as you understand that if there is no such dispute case, maybe the processes much easier, but at any level if there is certain kind of dispute case the entire process becomes very complicated. And it is become difficult to prove the ownership of that particular house, or particular land or particular property. Now, here blockchain can make the entire thing very simple.

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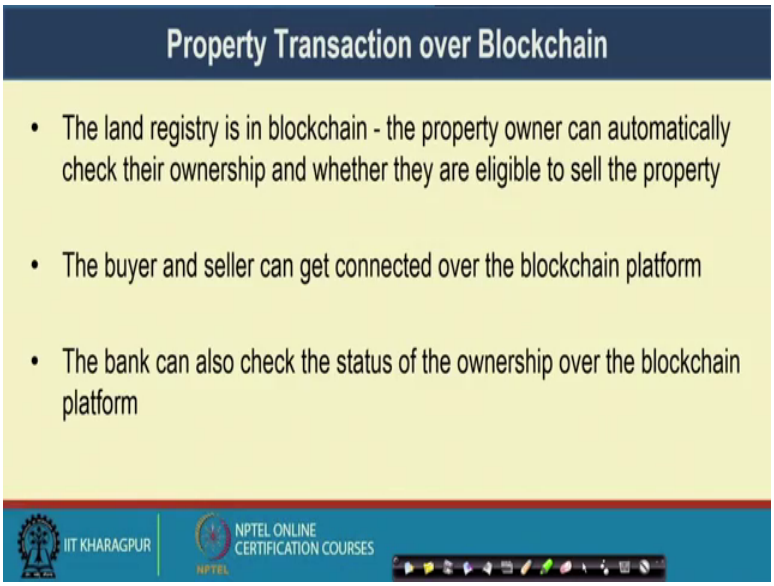

So, let us see how? So, if you put this land registry record or at least access to the land registry record by a certain block chain, so, the property owner they can automatically check their ownership and whether they are eligible to sell the property by contacting with this online blockchain based power platform.

Now, again the buyer and seller can get connected over another blockchain platform as well where it is a kind of a business to business platform; b to b platform or business to customer b to c platform. So, over that platform you can get connected the buyer and seller can get connected. Now, the seller they can automatically check based on this blockchain platform whether the buyer is actually the owner of that particular house, and there is certain kind of dispute cases.

Similarly, the bank can also check the status of ownership of that particular house over this blockchain platform. So, verification becomes easy with the help of smart contracts. So, once this verification is done again you can execute the purchase over the smart contract platform itself.

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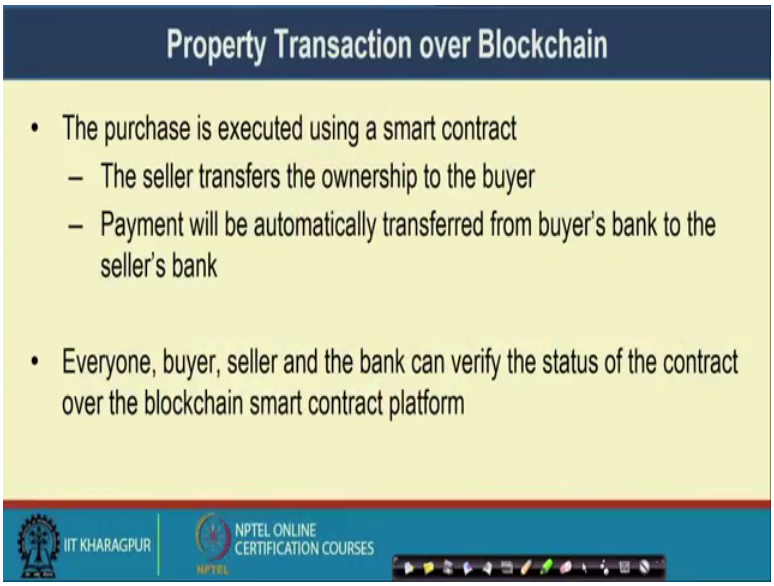

So, over the smart contract platform, the seller transferred the ownership to the buyer. So, you made a contract as as code through which this transaction will happen though. So, the seller transfer the ownership to the buyer, and the buyer they payments make the payment. So, the payments can automatically get transferred from the buyer's bank to the seller bank.

Now, here with the help of this blockchain platform everyone in the loop, like the buyer, the seller, the bank everyone can verify the status of the contract over this blockchain smart contract platform. So, the entire thing becomes very simplified, and the advantage is that you can automatically execute many of the legal steps with the help of this smart contract platform; where the smart contract will help you to do all this validation about the ownership, and the transfer of the assets from one person to another person.

And also it keeps a record; that once the house transfer is being done, then that information is already there in the blockchain and the blockchain being it is a tamper proof, it becomes others to make a change in that particular information. And that history can be utilized later on for verification of the ownership of another person for transfer of the properties.

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Now, this particular fundamental concept of land registry record utilizing blockchain; so, interestingly Andhra Pradesh Government they have made a partnership with ChromaWay. ChromaWay is a Sweden based startup who is working on this blockchain platform for land registry maintenance. So, Andhra Pradesh government they are interested to maintain the land registry records on the blockchain platform and they are working towards this direction.

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And as I have mentioned that this ChromaWay, they are working on this maintaining land registry platform with the help of a blockchain. So, I encourage all of you to browse their sites, their ChromaWay website. There you will find out multiple interesting use cases which are there in the Sweden and in many other countries, and along with they have their whitepaper, on which you can find out the way or the steps to which a ChromaWay follows for maintaining these land registry record over a blockchain platform.

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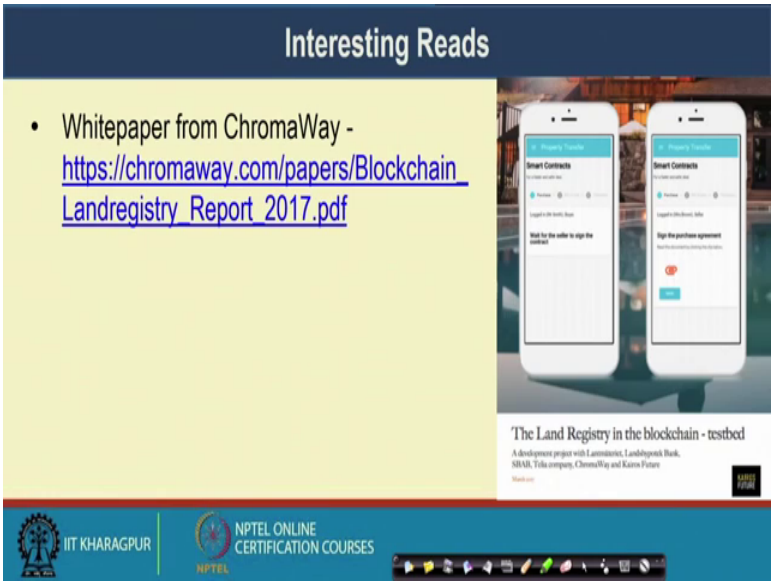

So, this is the interesting read for this talk. So, I encourage all of you to look into the whitepaper for ChromaWay. So, in summary this entire talk for today, it has given you multiple use cases of blockchain usage for government. And we have discussed that whenever there are this kind of multiple authoritative domains or multiple parties who are trying to get connected over a common platform for maintaining the assets; that assets can be the digital identity, the land registry record, the taxable amount, any type of assets that need to be transferred among multiple service provider or multiple authoritative domains, their blockchain can play a very good role. And you can solve many of the security problem as well as management problem with the help of a blockchain.

So, that is why people call blockchain as a disruptive technology, which actually solves many of the problem in life. So, it is like that on one hand it is providing a complete

secure platform and on another hand it is making the management of the entire system very easy. So, that way many of these aspects or many of these systems can be ported over this blockchain platform, and recently Indian government has taken certain initiatives to maintain information or at least to maintain the access information with the help of a blockchain platform.

And the advantage that it gives you that the every information becomes transparent, which is the major advantage like say for example, whenever you are putting it in a central database, the entire information is not available to the third parties. If I want to verify certain thing, I will not be able to verify do the verification rather I need to get certain access to that central database to get the verification. But here the public can get the verification, so, the entire movement of the government can become transparent, and we can solve all the debates that are going on nowadays regarding this different kind of disputes which are there in the public sectors.

So, many of such disputes can be solved with the help of a blockchain platform. And at the same time you can make the information secure and tamper proof; that once the information is entered in this platform, no one will be able to tamper with this particular information. So, that was the broad use cases for blockchain in government.

So, Praveen has already given you certain other use cases from the industry perspective, and he will also talk about few other use cases from the financial domain and a few other domains. Hopefully that will give you a broad idea about how we can utilize the blockchain platform, and give you a nice motivation to develop your own blockchain application for the service of the nation.

So, with this I conclude this particular topic where we have discussed various aspect of blockchain use cases for government usage. After a few other lectures of Praveen, I will come back again with certain research challenges, certain advanced topics in this blockchain domain, so.

Thank you all for attending this course.