Introduction to Lean Construction
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BIM and Lean, Implementation Framework,
BIM Execution Plan, Evidence Cases, Key takeaway

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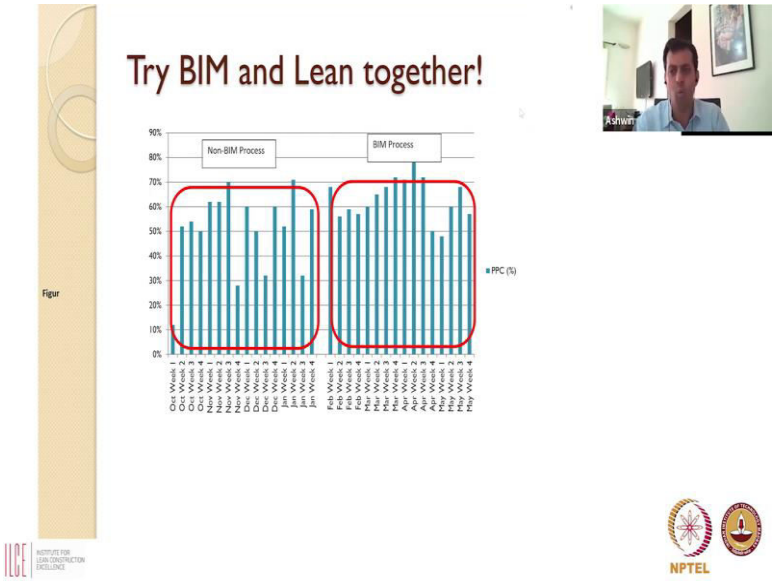

Now, is BIM different from Lean? I have been talking about BIM, how do BIM and Lean come together? Let me first give you an example. And then let me explain how BIM and Lean came together. We implemented a last planner process on a project here in Chennai. On the left hand side of this picture, where you see something called the non BIM process. We implemented last planner, and we tried to measure the PPC or planned percentage complete.

If you look at this figure, you will see a lot of variability, PPC goes from 10-15 percent to about 70 percent maybe the average is somewhere in the 45 to 50 percent range.

But when we started implementing BIM, all of a sudden, you find that the variability, this is not the right side, the BIM process, you find that the variability has come down, it is a much narrower range somewhere between 50 and 70 percent average in PPC at about 60 percent. So, things have certainly improved pre BIM versus post BIM. Plant percentage complete has improved? Why did it improve? How did it improve?

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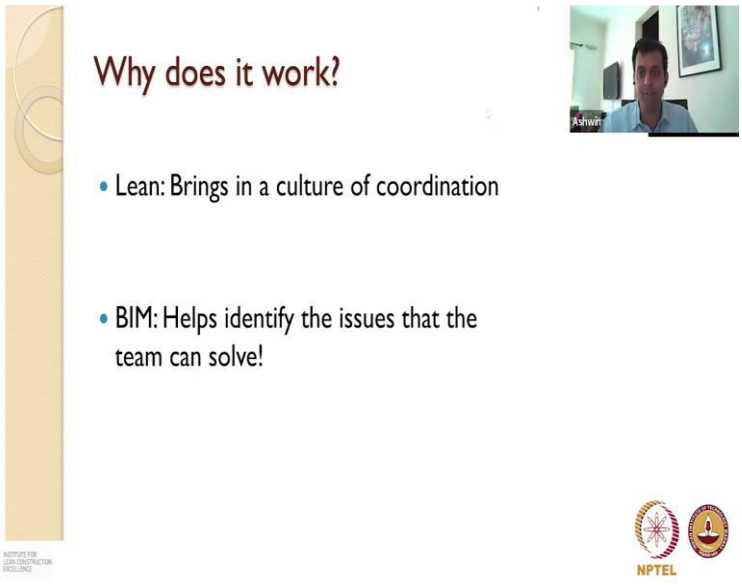

What essentially happened? Is that Lean brought in, of course, a culture of coordination, and brought in a culture of people asking each other questions, and BIM provided a very easy graphical platform on which to answer these questions. So, if you had a discussion in your last planner meeting, saying, what is it that we are going to do this coming week, immediately, people will say, pull up the BIM model.

Let us do a quick 4D simulation of the activities that need to happen this coming week. And let us find out what are the activities? What are the sequencing that we are going to use? What are the preconditions et cetera? Can you please zoom in a little bit? Can you blow this part up? So, BIM allowed people to have visual conversations. So, it turns out that BIM and Lean work very well together.

BIM enables Lean allows you to be far more productive, and allows you to increase the flow on your production site. So, BIM is useful standalone, but BIM plus Lean is a very potent combination, and there is enough research that shows us.

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But it will not just happen by itself? If it was so, easy, everyone would be implementing BIM and Lean on their construction sites. Implementing BIM is not automatic? There are some challenges, what are some of the challenges, first of all, there is a cost, this is software so, you have to go and buy it, you also need some hardware, your typical laptop may not run some of these BIM software.

So, you have to make an investment, and sometimes people are a little bit reluctant to spend a lot of money so, that is one barrier. Second, we do not have as many experienced BIM professionals because this is a growing field. Of course, now this is getting better, most universities now teach some form of Revit or BIM or the other. People are coming out with modelling capabilities, but we do not have as many modellers as we have craftsmen, or craftspeople and therefore, that is a barrier?

I want to do BIM, but I cannot find the resources to develop my models. The industry is very, very fragmented? And so, everyone is asking the question, if you force me to use BIM in this project, next project, I will be working with a completely different client or a completely different contractor, subcontractor vendor, combination? Will they use BIM? And if they do not, am I just wasting my time learning this thing? Where I will not use it anywhere else?

So, the fragmented industry created creates a barrier. People are wondering, you have talked about the benefits? How much money will I make out of using BIM? Can you give me a return on investment, an ROI? Again, we do not have really good answers to this, although, as I have shown, there is a return on investment? Generally, there is an aversion to change, and so, people try to prefer doing what they have continually been doing in the past.

And therefore that lends itself to some difficulties of adoption. And we also do not have industry standards with regards to BIM. And when you do not have standards, adoption is key. So, there are a number of barriers because of which BIM adoption is not trivial? It is not something that you just immediately start off on your project. So, adoption requires some thinking, adoption requires a careful process.

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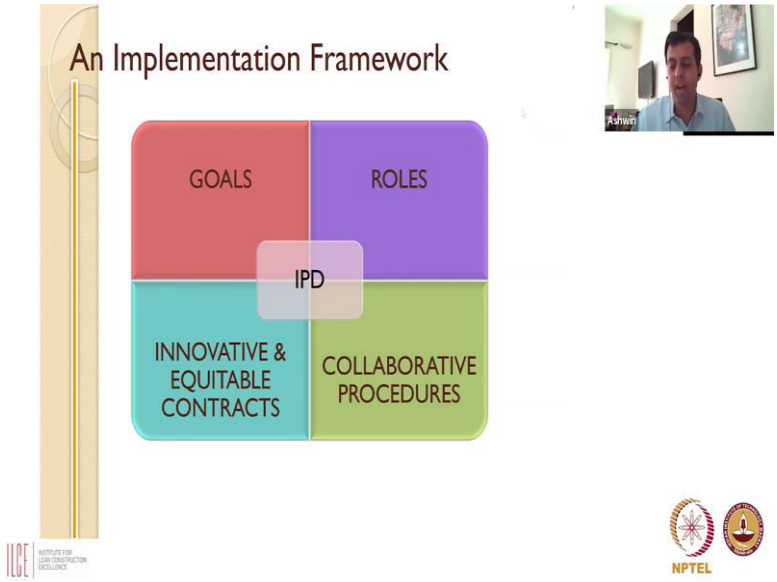

What process is that? In order to adopt BIM, you have got to do a few things. First of all, like I said, BIM has many uses, like that 25 uses and if you start sort of listing them down, you can even go up to 40-50 different uses. If you want to achieve all of those uses, you will get nowhere? It is very important that you start off by setting what is called a set of BIM goals, say on this project, this is what I want to achieve through BIM.

Secondly, you need specialised roles for people to deliver all those goals. Everyone in the construction site is already busy working from, 6 or 8 in the morning until 10pm. If on top of what they are doing, I also asked them to manage BIM, they have no time. So, I need specific BIM roles that I need to sort of put together.

And then I have to have some mechanism that facilitates people to collaborate, either innovative contracts, collaborative procedures, like the last planner system, whatever, but I need these three things, I need specific BIM goals, I need specific BIM roles, and I need collaborative procedures that I put together, and this is called IPD, or Integrated Project Delivery.

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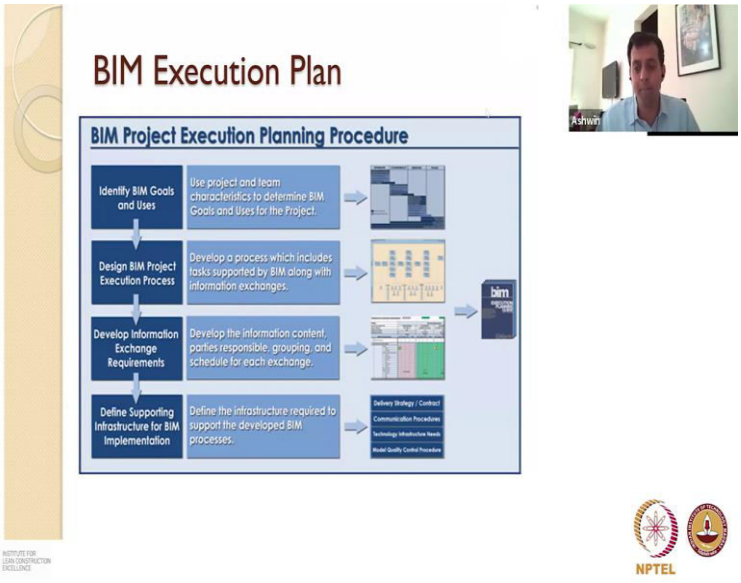

Very often, this is put together in what is called a BIM execution plan, which is a document that is created right at the start of the project, where you put in here are my BIM goals, here are my BIM roles, here are here is the BIM process, this person will supply this kind of information to that person in that format with this frequency, this is how we will, this is the level of detail of the models that we will have, this is how we will exchange information.

We will use this server, here is the supporting infrastructure, these are the kinds of laptops we will buy, these are the kinds of server systems that we will buy, everything is put into a document, it is sort of big document can only be about 10 or 15 pages. But it systematically says here are our BIM goals, here are our BIM roles, here are our BIM procedures, here are, here is the backbone infrastructure that we are going to use and everybody signs off on this. \

And once you have signed off on this, then you can essentially start executing the BIM plan, and people start falling in line, and you see the benefits of it. So, BIM execution planning, is a very, very critical part of the whole BIM adoption process, it is something that you really need to have.

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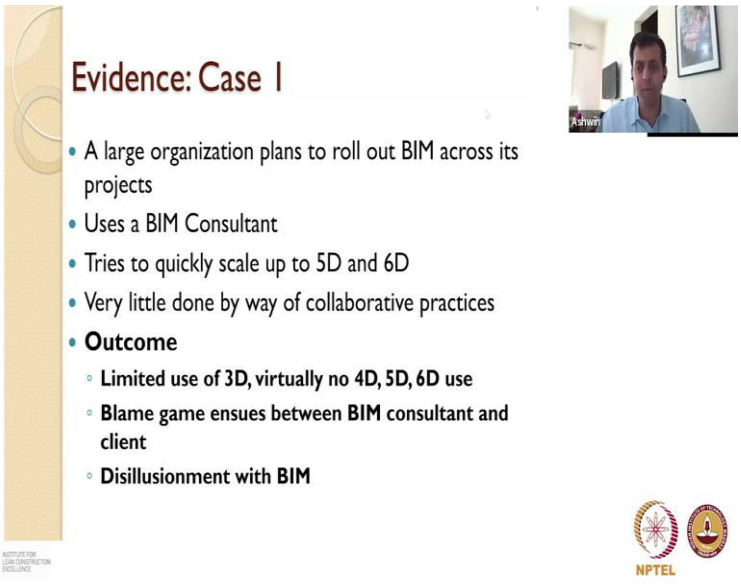

And we have seen cases where there is an organisation was very interested in rolling BIM, they brought in a BIM consultant, who quickly said, did not put any BIM, plan or whatever, he talked about the 4D BIM where you integrate the scheduled. And he said, 5D BIM, let us integrate the cost, came out with all of these ideas, did very little, by way of setting up those collaborative practices, and turned out that there was very little impact on BIM, and there was a lot of blame game that was being paid.

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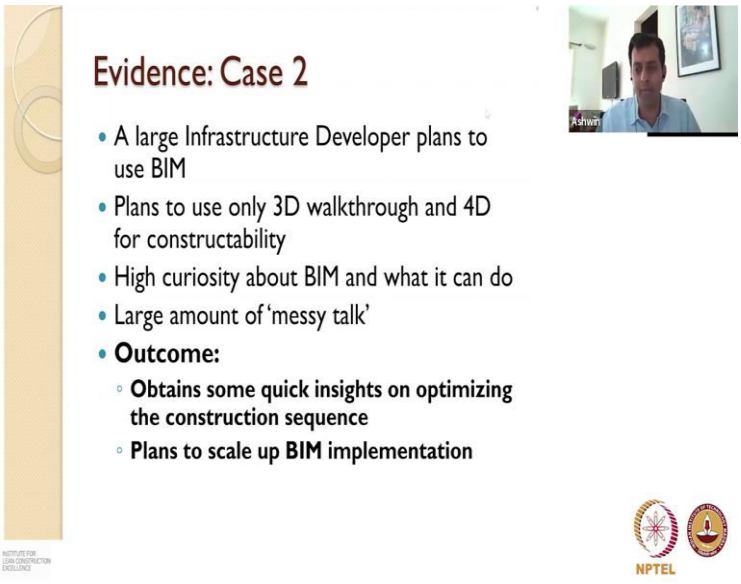

But on the other hand, we have also seen other cases where infrastructure developers looking to use BIM, set specific BIM goals, created, curiosity about what BIM can do create a collaborative practices created a BIM execution plan, which everyone could follow, which

led to a large amount of what we call messy talk, my colleague at the University of Washington, Carrie Dorsey, coined this term messy talk, where people had a lot of informal conversations, exchanged ideas, exchanged information so, that the BIM model was always current. And they got some very, very good insights and value at?

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So, essentially, what this tells us is that BIM is a software, but it is really not, it is more of a process, you need to put in place a BIM process, and also you have a little bit of technology, then you actually have this environment where people are coordinating, putting information together, you are using the power of that of the computer to analyse information, and make better decisions that help your site become more Lean. So, this is essentially what building information modelling is all about, and how it can actually have impacts on your sites.

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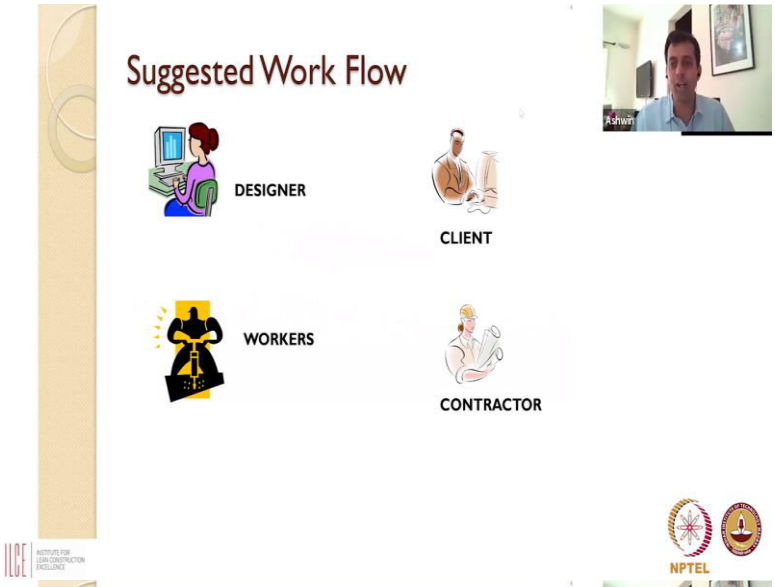

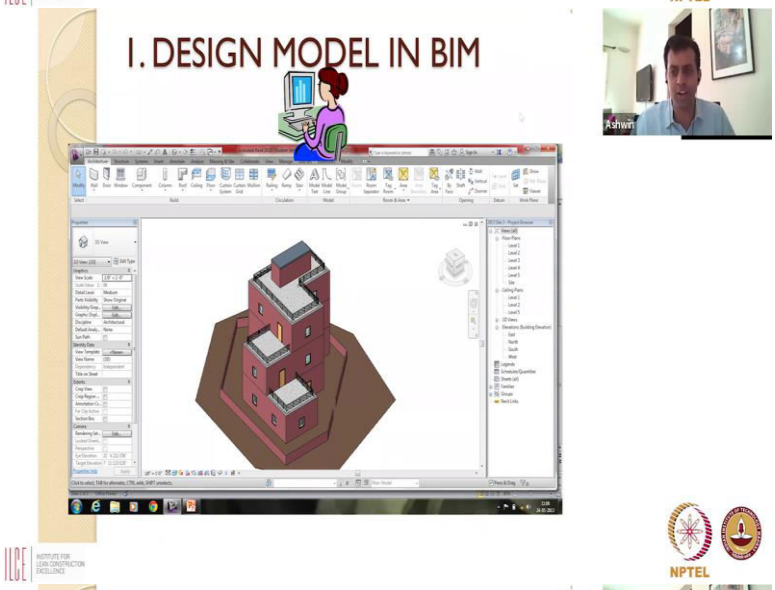

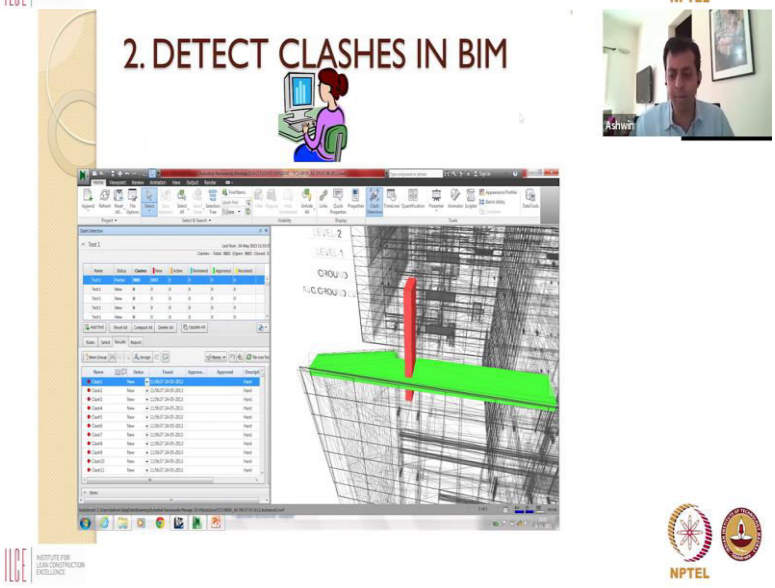

So, ideally, going forward, this is what we would like to see construction sites look like? We would like designers to design in BIM? Open up a BIM interface and come up with your models with your design, architectural design, structural design, whatever. And before you release the design, detect all the clashes that are there, and detect clashes and make sure that we have a clash free design. So, you do not have this issue of some column and some BIM whatever are clashing, figure all of this out and come up with good for construction drawings.

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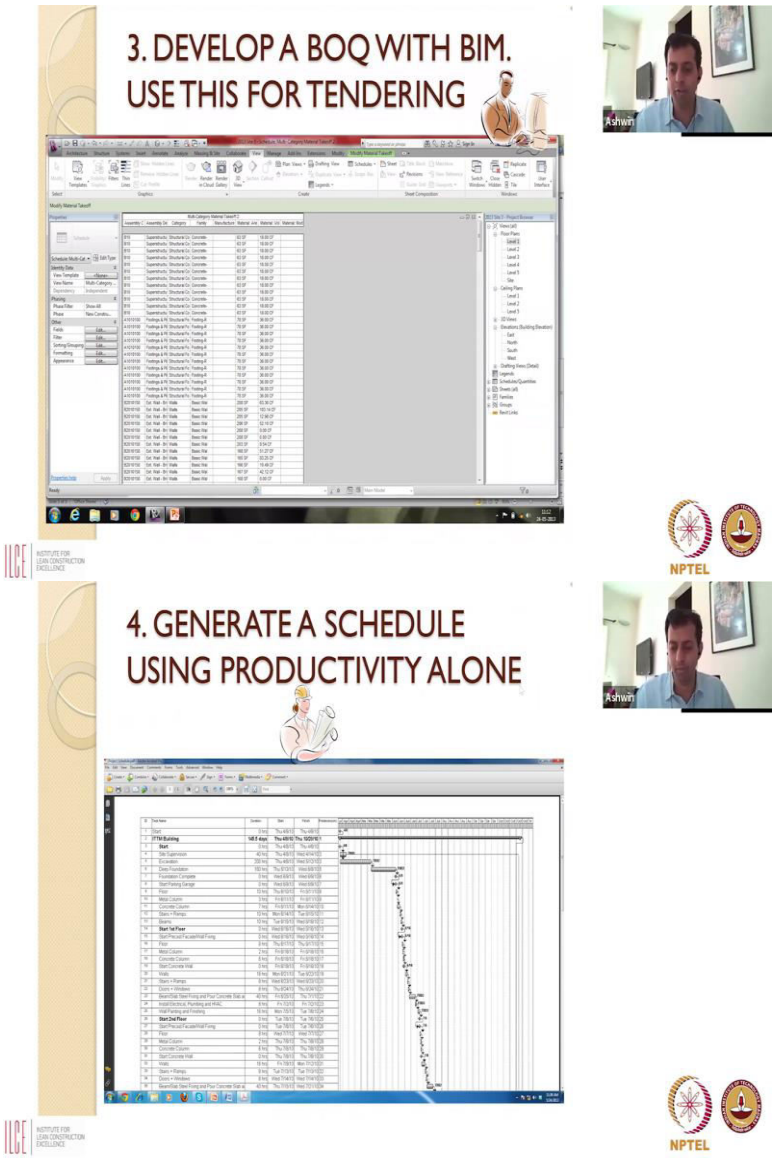

Use these good for construction drawings for tendering, for development of the BOQ. So, that, again, the same information is being carried forward and it becomes very quick to develop a bill of quantities. Once you select a contractor, your building information model already tells the contractor what they need to do, what all the activities are, as long as they

give you the productivity is that they are going to use you can very easily excuse me come up with a schedule.

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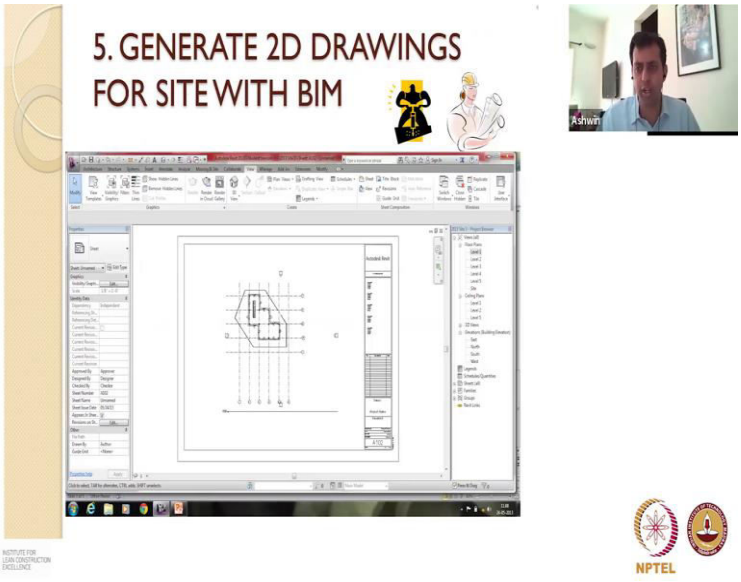

And once you have a schedule, if you want, you can print out 2D drawings and give it to construction sites.

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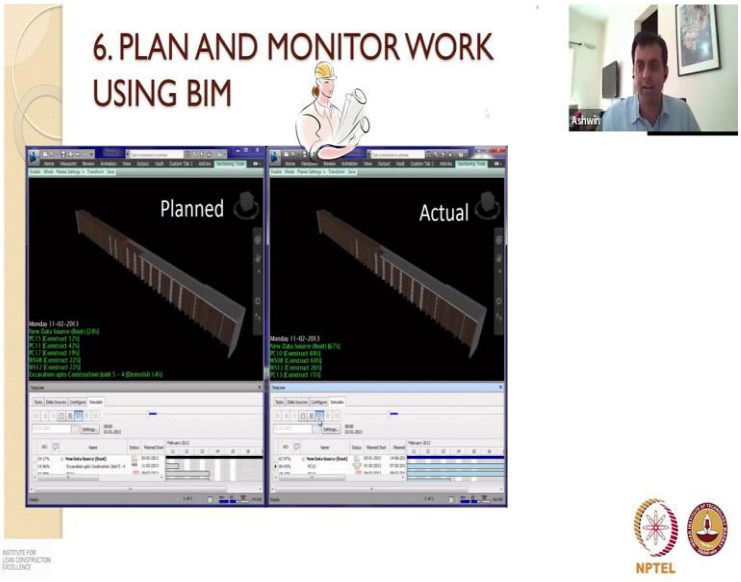

And more importantly, as your sites run and develop, you can monitor using BIM. So, it is now very common that in weekly reports, people sort of say here is what we have, as of today. And here is what the BIM model visually shows us, we should be at in say a week from now, that is a week from now, this is what the site should really look at. So, this is our target and then let us sort of see this is what our target is, where are we today?

What did we actually achieve? We can actually start using BIM to visually analyse planned versus actual. So, in other words, we can now migrate our project management completely into the digital platform, and make advantage, take advantage of synergies, et cetera to make our sites far leaner and involve people in a way in which the coordination is much better.

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And by the way, this is not something that is new in other parts of the world, BIM has been adopted. There are policies that force the adoption of BIM, it is almost compulsory in many parts of the world in many sectors, I just put up a flags of a few countries that have really seriously undertaken policy reforms, that promote the use of BIM, the US, the UK, Norway, Denmark, Finland, Hong Kong, Singapore, South Korea, et cetera.

So, if you look at this natural trend and progression, sooner or later, you are going to have to see an India flag there as well. And once you have an India flag, and you are forced to do this, it is important that you understand what BIM is, what are the benefits that BIM can bring? And how do I implement BIM and that was essentially the essence of this brief lecture was to give you an idea of those concepts.

And sort of to tell you that if you do all of this, then naturally, your site will be leaner you will meet your targets better, and you will be far more successful in terms of what you do.

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So, thank you very much again, I hope this was somewhat enlightening, and that you had a little bit of an idea of what BIM is, what it can do, and how it integrates with Lean. But of course, this is just the beginning, there is a long way to go and you can skill yourselves on BIM to become BIM experts and really take this to the next level on construction sites. So, thank you very much for your attention.