Introduction to Lean Construction
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Challenges and Causes, Problem?, Lean, BIM?,
Traditional vs BIM, Tools/Technology Providers

Hello, everyone. My name is Dr. Ashwin Mahalingam. And I am a professor in the Department of Civil Engineering. And I am going to talk to you today for the next 25 minutes or So, on this topic of Building Information Modelling or BIM .

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So, let me just share my screen, and we will get started right away. I hope everyone can see my screen. So, what I am going to do over the next 25-30 minutes is I am going to talk about, first, a little bit about the challenges that we face today. What this building information modelling is and how it can help mitigate some of these challenges. And also talk a little bit

about how do you implement building information modelling in your projects, and of course, throughout this, I will connect it, I will make connections to lean construction.

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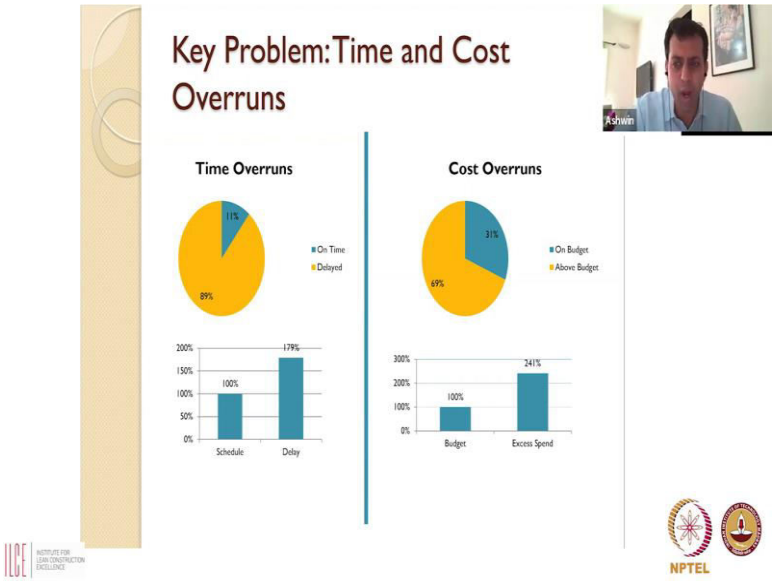

So, let me start off with a fact that I am sure most of you are familiar with. Construction projects feature a large amount of time and cost overruns. Roughly 90 percent of projects seem to be delayed and this is worldwide data backed up by data from India as well . And the delays are sometimes projects take as much as twice the amount of time that they are planning to take.

Similarly, at least two in every three projects have cost overruns and these cost overruns are on average, double or more than double project costs. So, construction projects very rarely finished on time and on budget, they are often delayed and finish about budget .

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When we start looking at why is this the case? Why do we have these challenges and problems in construction? There are several reasons that come up. Some relate to things like land acquisition, it is very difficult to acquire land, this causes delays, cost overruns, there are issues with regards to design and so, on, there are issues with regards to procurement, there are very often we pick the lowest bidder who is not necessarily the best person for construct, et cetera.

So, there are a number of reasons that are in the pre-construction domain, things like land acquisition, et cetera which in the construction domain, they cannot really control. But it turns out that quite a few of these inefficiencies exist in construction as well. So, in fact, 25 percent of project costs are often wastefully spent during the construction phase. In other words, you can reduce project cost by about 25 percent by constructing a lot more efficiently.

And if you add this up, and you look at the number of projects that India is executing, this is actually a significant number, when you look at it in terms of the country's GDP, et cetera. So, in other words, construction projects are delayed, not all the reasons are related to what happens during construction. But construction certainly is inefficient and can be improved .

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So, what happens in construction? Why are construction projects? Why are projects delayed during construction? What is the problem? There are several issues. In many cases people are ready to work for the drawing has not reached a construction site yet, or the drawing is reached the construction site. But there are some issues with the drawing and the ground realities on the construction site or the drawings are there, but the material has not come to site, the drawings and the material are there.

But the work front is not free, somebody else is working, you are having to wait and this is causing delays and rising costs, or you have the drawings, the materials, the work front, but labour is unavailable, you do not have the right quality of labour with the right qualification on site. So, these are the kinds of challenges that you typically find on construction sites that lead to delays and cost overruns .

And if you were to really look at all of these, you will find that all of these relate to the challenge of coordination. Essentially, the issue is we have soo many different people on a construction site, soo many different contractors, subcontractors, designers, design consultant, vendors et cetera that coordinating so, that everyone appears on site at exactly the right time to execute their work is a big challenge.

And very often you will find that the designers are ready, but the subcontractor is not, the subcontractor and the designers are ready, but the vendor is not ready. So, essentially, what you have on construction is a coordination problem. And because of this coordination problem, you have error, you have delays, cost overruns. Now, lean construction, essentially says this is the problem that we are trying to solve. So, lean construction is all about coordinating, all about solving the coordination problem.

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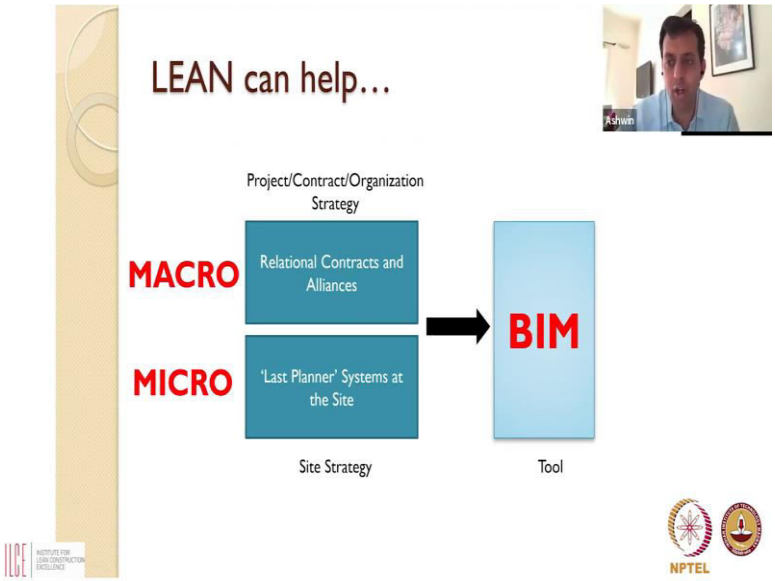

And lean says there is a couple of things that we can do, on the one hand, we can talk a little bit about contracts and try to figure out how we can write contracts that allow or enable people to coordinate, this is at the macro level. Second at the site level lean talks about a number of systems and I am sure you are learning several of those in this course, last planner,

value stream mapping, et cetera. Things that you can do on site to identify waste better minimize them and therefore coordinate.

But an important third component for this whole lean puzzle is the use of digital technology as a tool to enable coordination. And that digital technology, in many cases, is building information modelling or BIM which is going to be the subject of what I am going to talk about. So, now I am going to move on to my next slide, where we are going to talk a little bit about building information modelling, what it is, and then we will try to come back and see how it helps with Lean construction.

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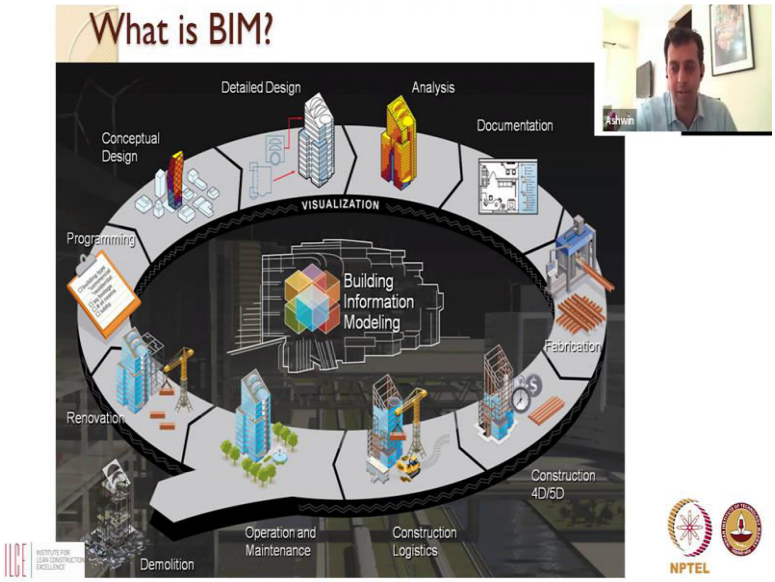

So, building information modelling is essentially a platform, a digital platform which allows you to bring all kinds of construction related information together on a single platform. So, it involves the development of what we call a parametric 3D model. So, we have a three dimensional model, which has geometric information about the structure that you are trying to build.

But on top of that geometry information, we also have all other kinds of information, information regarding fabrication, information regarding construction, information regarding the material specification and all of that. So, all of that is brought under one single platform. And that essentially, is what building information modelling.

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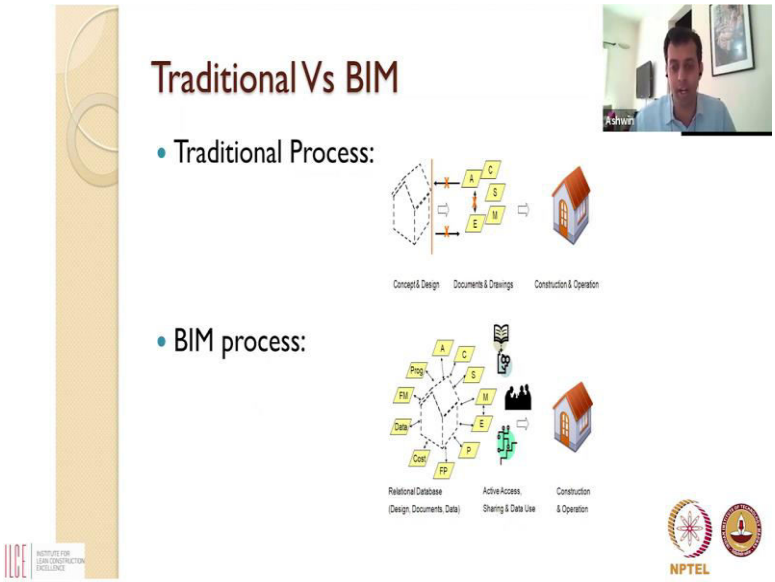

So, here is another diagram that maybe explains this a little bit clearly, traditionally, you, if you want to build a small house, you have architectural information, construction information, structural information, mechanical information, electrical information, all kinds of information that are all stored separately, in separate files, in separate documents. In building information modelling, all of that is stored on the same platform all interconnect.

So, the construction related information, the architectural, the structural, everything is on one platform. And in order to put all of this on one platform, it clearly requires coordination. So, if you can implement BIM properly, then naturally you will be coordinating well. So, this essentially, is what BIM is, it is a platform, where you bring in geometric 3D information about an object, about the structure, but also are all other kinds of information.

So, you have a single source of truth, a single source of digital information for the entire project, which allows people to coordinate better, because they are all putting that information in the same repository. If there is any mismatch in that information becomes very easy to find out and very easy to coordinate and rectify. So, that in essence is one building information model.

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Now, this is not new, this is not research, this is commercially available. There are a number of technology providers who provide building information modelling software that you can buy and use off the shelf. Perhaps some of the more famous ones are Autodesk, some of you might have heard of a tool called Revit, which is Autodesk building in one of Autodesk building interface based modelling platforms.

Then you have another company called Bentley, Bentley has again a suite of tools. So, the point I am trying to make is you can go ahead and use these right away, they are all readily available. But the question that you might ask me is why should we use it? What is the benefit that we get?