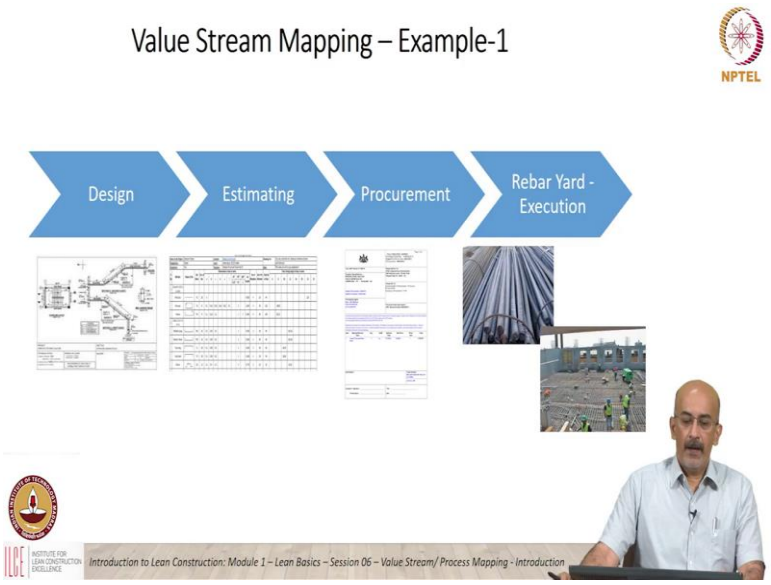
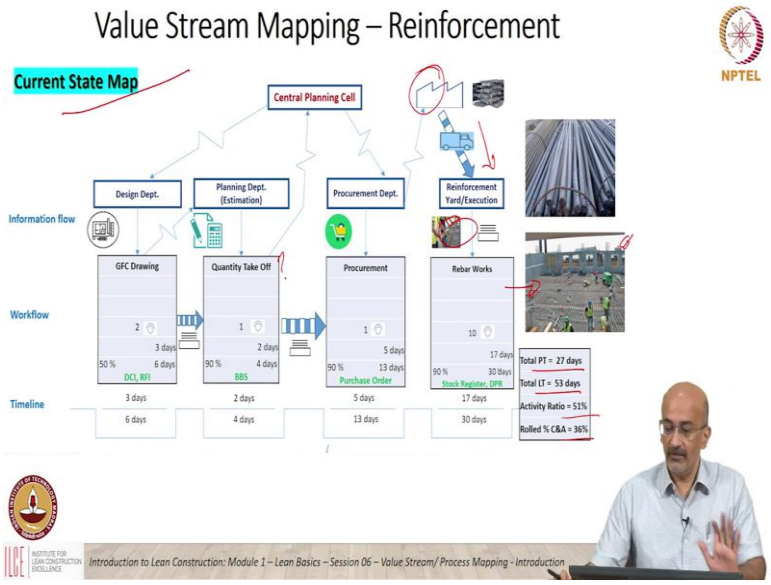
Introduction to Lean Construction
Professor Koshy Varghese
Department of Civil Engineering
Indian Institute of Technology, Madras
Module – 1 Lecture 38
VSM – Example 1 (Reinforcement)

(Refer Slide Time: 0:21)



Now, we go into an example. We are taking an example of where there is a process that involves design estimating procurement for reinforcement.

(Refer Slide Time: 0:37)



This is again given as an example to show a potential process and value stream in a construction example. Some of the specific numbers might not be relevant to it is not a

standardized number, it is a number which your group did a study and came up with. So, it is more to discuss and to illustrate how it can be how some elements of it can be used rather than to say that this is a specific case done.

So, keep that in mind. So, again we have a planning cell here which you know communicates your design department about what when reinforcement is required for a particular work. So, we are taking basically reinforcement work that needs to go on to a site. We have good for construction drawing being released by design. The GFC undergoes quantity takeoff, the quantity takeoff quantities go to procurement, so the bar bending requirements and the procurement places an order to the reinforcement delivery plus delivery group.

It gets delivered, it goes to the reinforcement yard where the cutting and bending etcetera is done and then the assembly is done at site. So, this is the process, starting from where the drawing I know quantities are taken off to the final reinforcement being placed on the site. So, what is there value addition in each step?

Student: Yes.

Professor: What would be the value at the drawing GFC drawing creation?

Student: It is giving an idea of what exactly you suppose to do.

Professor: Right? So, who is the customer? Who could be the customer? Of course, there are internal customers but who could be an external customer?

Student: The end user.

Professor: Who is the end user? And let us take this process let us not talk to the owner of the building because that is ultimately yes, ultimately the owner of the building is the ultimate customer. But for this process who is the internal customer? It could be the project manager, it could be the person who is actually wants to do this reinforcement on time, somebody here communicated and say look, I want the rebar to come and I want to be able to finish my slab reinforcement and finish it or even the supervisor in charge of that block who has to finish the bore it could be an internal customer. What is the quality, what is the value they get that customer gets order design?

Student: Because it is safe or not whether it is.

Professor: Safe as one

Student: Qualities.

Professor: Quality in terms of the quantity of draw off, take off you know all the drawings should be good so that the quality, quantity takeoff is?

Student: Less.

Professor: Is correct. First of all correct accuracy, I should not get the wrong.

Student: Yes.

Professor: Wrong rebar delivered to me, I should not get the wrong sizes, wrong this, wrong that wrong type of rebar. So, there is value addition which is just saying conformance to my requirements itself value added or like what you are saying my quantity I could do GFC growing or I could do constructability but might not be this particular situation might be able to go above ahead of the stream to be able to optimize my reinforcement is that etcetera. But in each of this step making sure I get the right numbers with the right dia, all of that is definitely a value addition which happens everywhere. Even in my procurement I can give wrong quantities, I can make an error anywhere.

Student: Even when delivering the material there also some error.

Professor: So, there is value added to this whole process and how do you and each stage of this process and how do you ensure that what the person wants is what is delivered is one of these is looking at the value stream. And here we have so I think that is very important. Here we have rough numbers of processing time and lead time.

And here you have the process time and lead time which you can calculate based on the same formula or the same calculation, the activity ratio and the percentage C and A. So, now if I want to improve this and this is my current state. I want to do some improvements of this, what are the options?

Student: You can remove the quantity take apart first?

Professor: How do I remove the quantity take?

Student: Value from drawing we can?

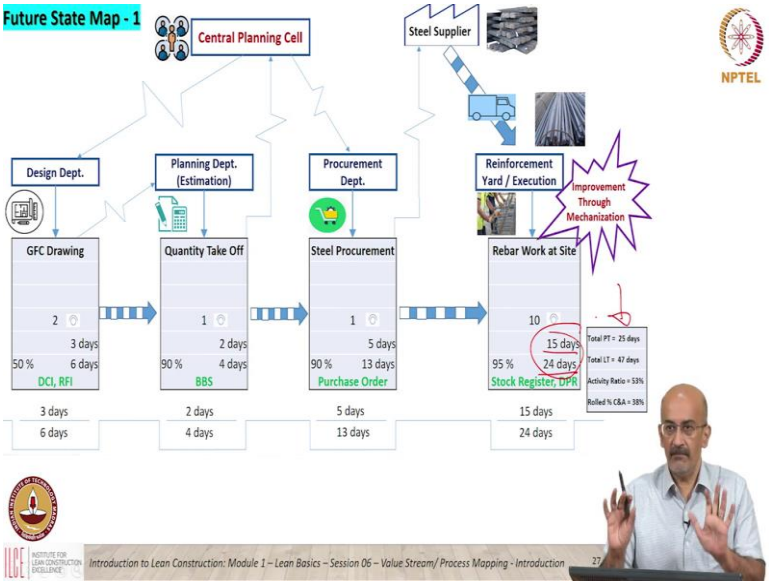
Professor: Correct. So, you want to be able to somehow get it from drawing to procurement. That is one idea. Any other ideas?

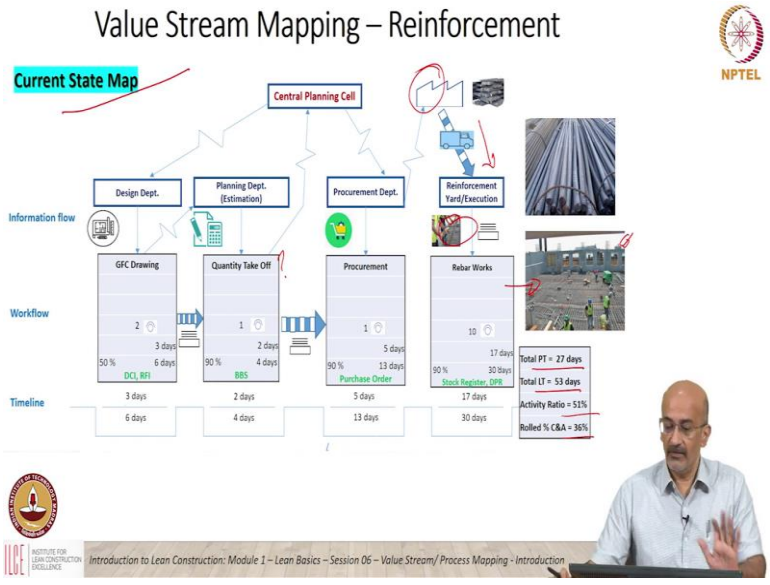
Student: standards?

Professor: Yeah, that is also, so this one idea that we will work on this site, anything we can do here? So, here you look at 17 days, lead time is 30 days.

Student: We can actually plan to reduce the lead time.

(Refer Slide Time: 05:48)

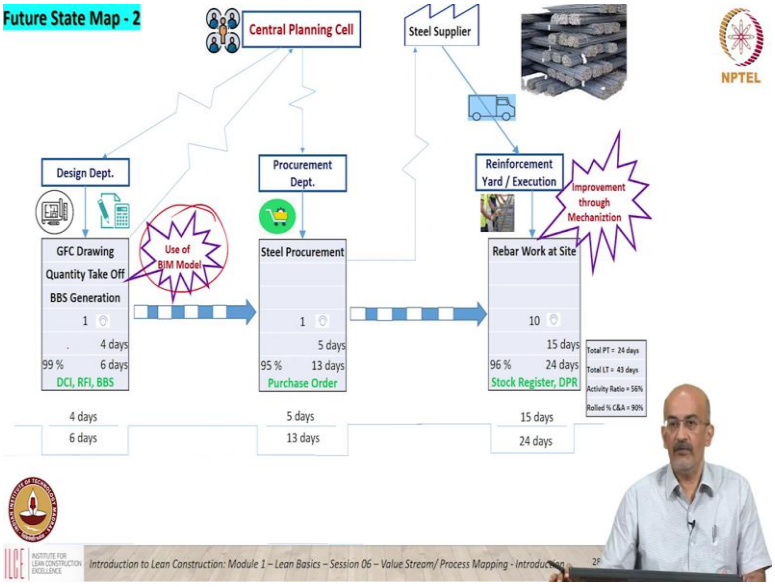


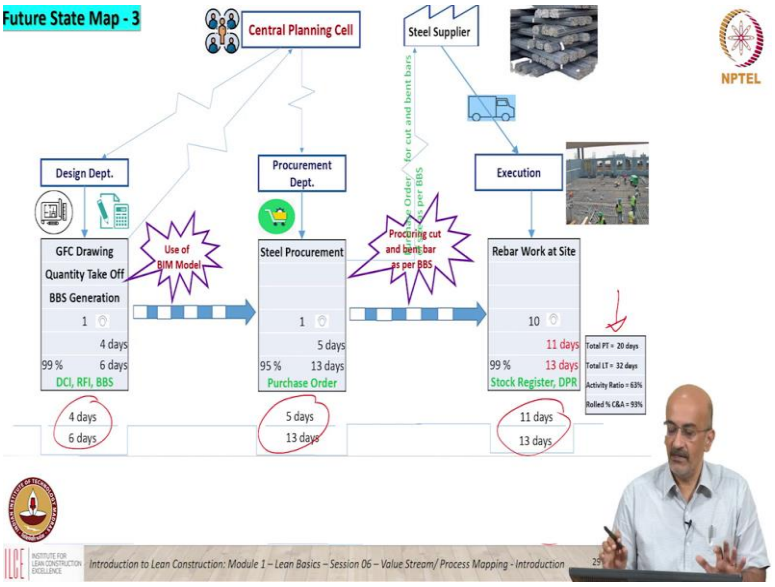


Professor: We can plan to reduce the lead time we can plan to reduce the processing time, we can say look so, so then I have ideas I can use some ideas here. So, let us look at the first proposed idea, future state map one. They said, you are going to mechanize the work here. Not much improvement, through mechanization things happen. So, this went from 17 to 15 and this way to 24. So, there was some improvement in everything else remains 5, 13, 2, 4, 3,

6. 3 6, 2, 4, 5, 13 remains the same only year there has been a change and that is reflected in the metrics. So minor change, so some.

(Refer Slide Time: 6:25)





Then we go to a next change this is future state map 2 like you suggested we said, we use a BIM model. So, if I am going to do BIM, I then all my quantity takeoff is taken care of by BIM model I am assuming, so this activity goes off. So, this process goes off and I go steel freight to the procurement. Now, can this be done either can which is this a micro level or macro level?

Student: Micro.

Professor: Improvement through mechanization, because

Student: Mechanization in micro but overall BIM model is macro.

Professor: BIM model micro, I need top management buy in. So, but then again, now I have, for, I have actually clubbed these 2, but increase the days but reduce the number of people by the way, this is the number of people that reduce the manpower but increase the days, might be there is some BIM training. So, if I start improving BIM, training automation, I could even potentially reduce the days.

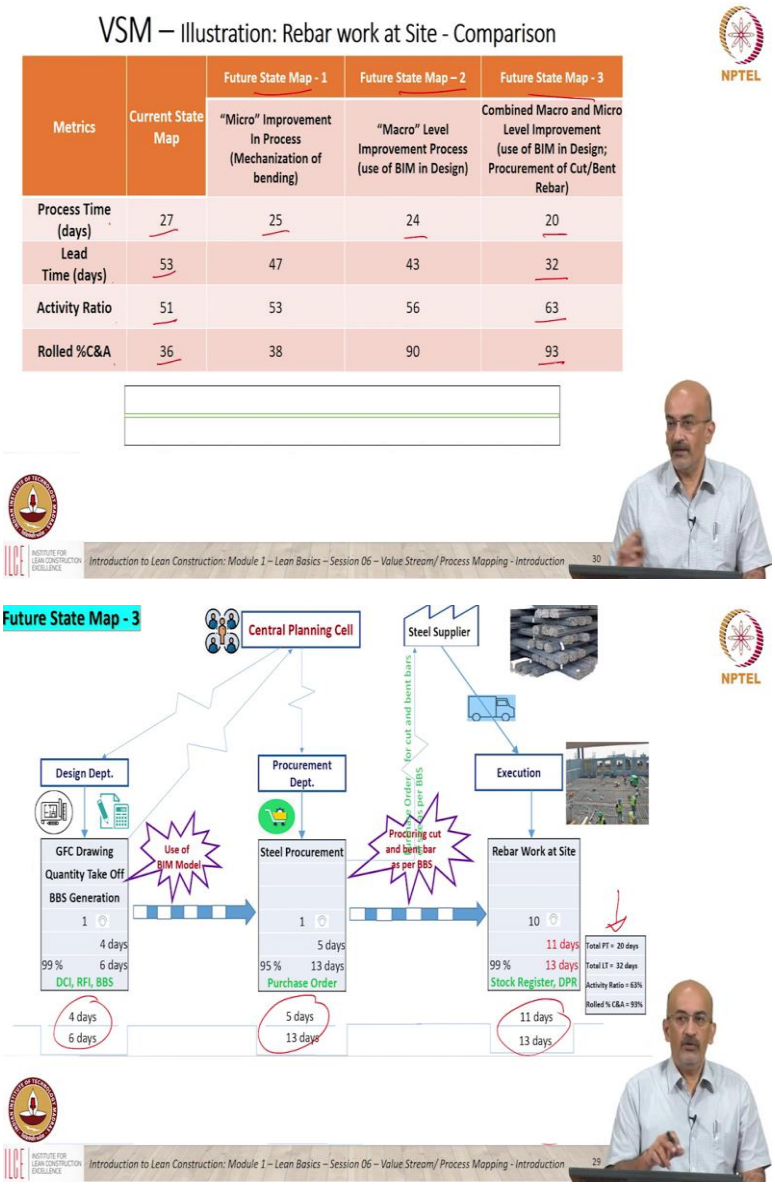
Student: Yes.

Professor: So, these are just indicative numbers right now. My procurement is taking place, I have improved this through mechanization. I have a new set of metrics. That I go in now with another future state map 3 where I am using the BIM model. And I am not going to do rebar cutting and bending at site I am going to use a rebar center to supply cut and bend rebars. And then I am again ready again, I have improvements in my processing. Now, the only time I will require is to actually place the BIM.

Student: There also we can again improve.

Professor: Improve, so, such improvements can be brought in a lot of times when you look at it, we are now looking at the whole process and these improvements will continue to change. So, these metrics we have to keep in mind, and of course, what is happening in each of these. We get the quantification is sometimes not the main focus, the main focus is the process, understanding the values in the process, the discussions and all of that, that takes place. But ultimately, we need to also quantify where we are bringing improvement.

(Refer Slide Time: 8:37)



So, if we look at the summary, you will see that what it talks about this future state 1, 2, 3 the process time, lead time, activity ratio, and the percentage C&A and all of these values were as we discussed in each of these maps. You can see with each future state that has been improved. So, current state was 27 for processing time 25, 24, 20. The lead time reduced from 53 to 32, which means activity ratio went up from a went from 51 to 60.

And complete and accurate percentage went from 36 to 93. Now, here you can see a big jump and a jump has come because we are saying when we do a BIM model, we are getting very accurate output whereas when we do a GFC based manual thing their output, the accuracy is less. This is a proposed now, any questions?

Student: Sir, who will take the decision or how you will tell the decision how much you need, because there is a monetary effect regarding we are getting.

Professor: Yeah, so, this is where we, so, the question now, so, which change we are talking about?

Student: Talking about the procurement cutting and bending

Professor: The procurement of the, so, if you want to do so, this is a common problem. So, we can look at this in 2 ways. One is there so, the same issue was faced several years back when we went from site mix to ready mix, is there enough when are other enough vendors to give me readymix at the time I want?

Student: Otherwise there will be monopoly also.

Professor: Am I getting you know is here. So, if you have to do an analysis to see whether the tradeoff was worth it, but you will find that as more and more rebar centers come up in cities or in your area, you will find you get much more value by just placing the order and getting what you want rather than cutting and bending on site and having usages and all of that but it is a case to case basis. It is not a you have to decide. Same thing between batching plant one side versus this thing. These are all you got to look at the tradeoffs and decide.

Student: Is not the same value stream mapping, can we look at with the dimension of flow with the principle of flow?

Professor: If you can look into the principle of flow but there is more advanced I do not want to bring in that concept here. You can look at more there are more metrics value stream mapping, takt time. And you know how there are many more metrics value stream mapping, which is also there in the process, when you talk about operations management in a manufacturing facility.

Several of those parameters can be brought in, we can look at it from a from, so ideally what is the they meant when something. from a flow perspective, when the input comes in there should be lead time should be equal to processing time, then the flow is perfect. And the processing time should also try to be as minimal as possible, then lead flows there. But to get into that level of analysis requires probably a more advanced terminology. And requirements not typically in the VSM alone that comes with more of operations management kind of aspects, but definitely a more a topic that should be there in the future.

Student: one more thing about the metrics, right now we talked about a broadly 2 metrics. That is the processing time and lead time, activity ratio, it is related to those. So, in construction specifically, we supposed to use any other matrices as maybe like a cycle time.

Professor: So, that is what, so the again, I have not defined the use of cycle time here but the terms of these would be related to cycle time.

Student: Yes.

(Refer Slide Time: 12:48)