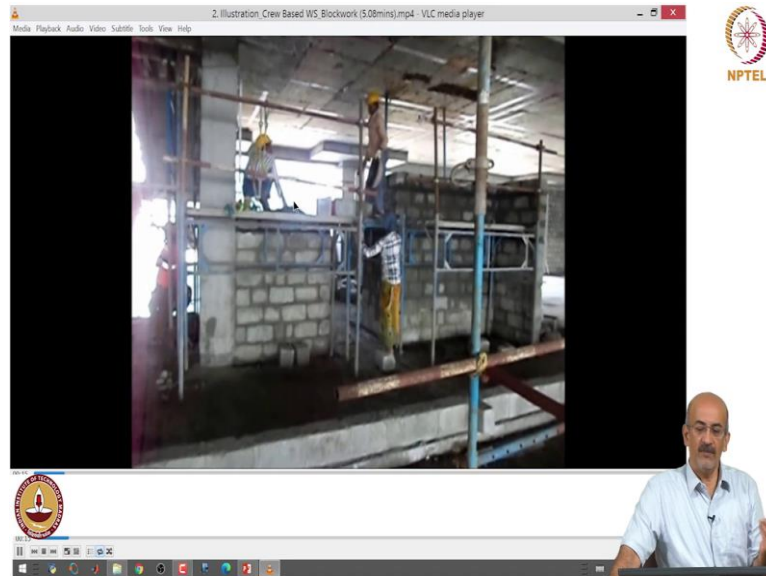**Introduction to Lean Construction**
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Module-1
Lecture 29
Illustration of crew-based work sampling approach

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Now, we go to crew based sampling. If we take crew based sampling, we are taking a block work and you can see here there are two masons and two helpers and what they are doing is a basic block work. And, again, it is work sampling where you are looking at, what the Masons are doing, you are categorizing the what the Masons are doing, you are categorizing what the helpers and as you know we discussed, helpers will always be doing either NVA or NVAN, the Masons will be in all three categories. And if we now use the same approach.

Crew-based Sampling – Illustration: Blockwork

Categories	Tasks
VA	Placing mortar between blocks, Placing blocks, Spreading mortar on the blocks
NVAN	Removing mortar (pan), Mixing mortar, Transporting mortar, Transporting blocks, Moving blocks, Shifting equipment (tools), Instructions
NVA	Waiting for mortar pan, Returning with empty mortar pan, Standing/ Idle, Sitting/ Idle, Walking, Talking
No contact	

Link to video: https://youtu.be/CHNrfj0DOEc

Introduction to Lean Construction: Module 1 – Lean Basics – Session 05 – Sampling/ Survey Techniques

Now, you will see that value added is much more detail, you are placing mortar between blocks, placing blocks spreading mortar between blocks, it is very masonry oriented work holding, the other case you had formwork rebar curing this that everything here is very direct stuff, or everything related. So much more specific.

And you also have a no contact category, is if somebody is gone away and you do not know what they are doing, this is what we add for when you do crew based sampling or no contact category also. Because you roughly know who the crew are, again, this varies, just be aware you can have a no contact category also, and form is nearly the same.

Crew-based Sampling: Random Time

Date											
Tour #		Start Time					Stop Time				
		Mason -1						Mason -2			
Sample #	Time in sec	Time in Video (h:m:s)	VA	NVAN	NVA	Time in sec	Time in Video (h:m:s)	VA	NVAN	NVA	
1											
⋮											
n											
Total											
Individual Categories (%)											
Categories at Crew Level (%)											

Link to spreadsheet (download to edit): https://tinyurl.com/ygeergkk

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Except that you are now identifying people if it is a specific group. If you are going to go to what we call modified grow approach, where you are looking at multiple locations, same type of work, you then almost can go to a tour based approach form, but with very much more detailed categories.

So let me say you are looking at masonry like this, block masonry across multiple floors. I might not say Mason-1, Mason-2, I may say Mason helper, and then I do not you know what are the, what is a mason doing? What is a helper doing? I might put location, I can modify it, depends on the variations can be there that is what I am kind of suggest.

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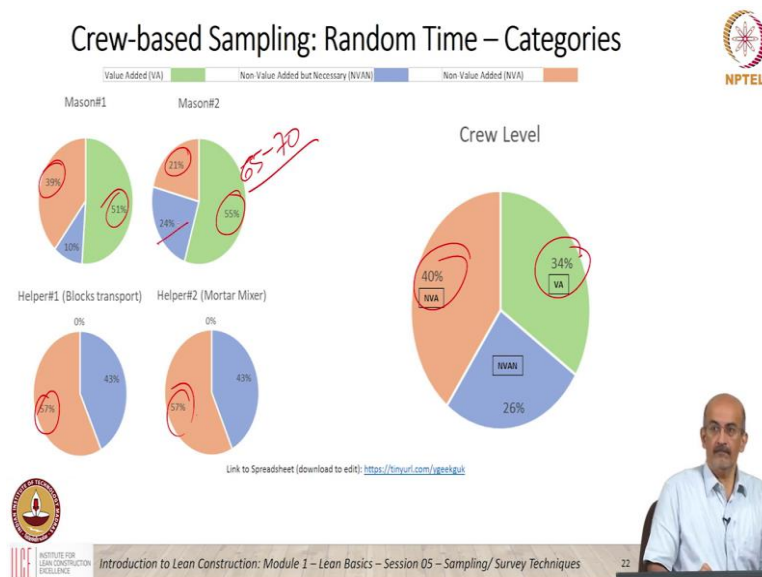
Now, when we look at this, this is the distribution we get. you can see that as far as the masonry crew are concerned they are doing, this is the level of non-value added, and a reasonable amount of value added. What do you think is a maximum amount you could get value added? How much would you? What would be a target?

Student: 60 to 65

Professor: Yes, 60 to 65, we will get 65 to 70, it is very good, you cannot get more than that. So, there is room for improvement, so, there is room for improvement. So, if you look at, from particularly from the Masons point of view, there is this is the advantage, you can do there is room for improvement.

But when you bring in the helpers into the picture. Now, you have to choose, do I want to help us to come in, you will see that a lot of the helper time is non value added, now I do

mean. You can look at this from a one from a totally financial perspective, how much is a helper get paid? How much is a mason get paid? If the helper Mason combination is helping the Mason to be more productive. So this is just throwing up data for you, for analysis.

If I looked at, you know, the crew level, ultimately I am getting 40 percent of non-value added and only 34 percent, because this has been brought down by the helpers.

It gives you a picture of what is there. I am not saying that we should immediately take action, this gives you a picture of what is there and actually how much of in a way I would put this, how much of waste there is on our sites because of more and more help requiring helpers for everything.

Student: Sir, in case of Mason-2, there is some non-value added but necessary, so it should be a combined within value added, so it will be more now.

Professor: I did not understand. Can you explain now?

Student: In case of Mason-2 the value added is 55 percent and Non-value but added but necessary.

Professor: Is 24 percent.

Student: Yes sir.

Professor: Yes

Student: So it will be combined in some percent…

Professor: No, let me put it let us go back. So for example, if he is removing mortar, you know, or transporting moving shifting tools or something here is what the Mason is doing, which is Non-value added but necessary, correct?
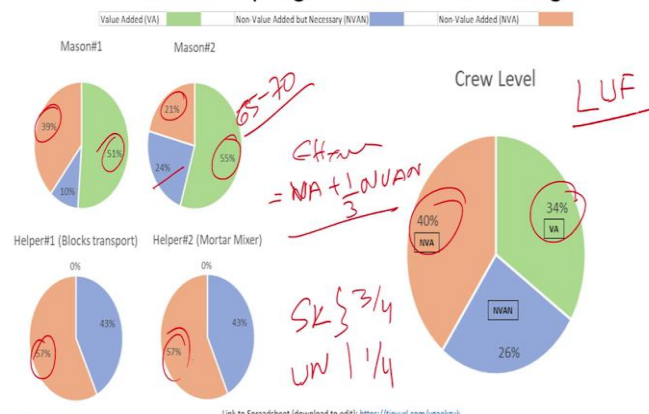
Student: Yes sir.

Professor: So why would you combine it? Because he is not contributing directly to the

Student: But it is contributing in some part?

Professor: No, that is why we are calling it Non-value added but necessary, we are having a separate category for it, so what, I will expand on what I think you are saying.

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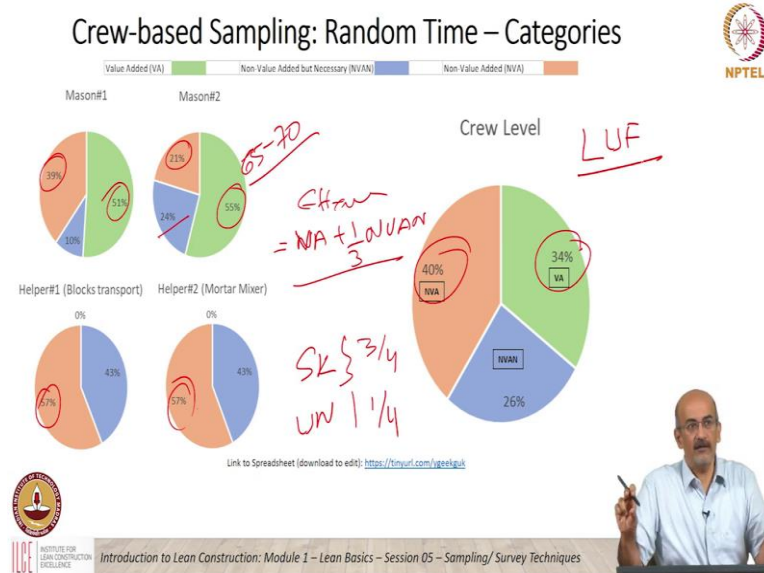
So, I can actually look at something called effectiveness is equal to non-value added plus one third NVA, there is a formula like this, which says look, I agree that it should be valued, Non-value added but necessary, but it is I am giving it less weightage. So in some company which wants to take this and do more formalization on this can say, you know, my skilled worker versus unskilled worker, I am giving this what do you say, three fourths weightage and giving this one forth weightage based on salary or this or that, and then combining this to a labor use, so this is called a labor utilization factor.

I can bring about labor utilization factor and use that as a benchmark that is possible. And if you feel that look, this crew is required for your conditions to work in, fine, but then benchmark based on the labor utilization factor. These like I said, variations are possible, this is only a core one way of looking at it, the variations are big can be adapted, so that is why work sampling is also adaptable to whatever makes it work for you.

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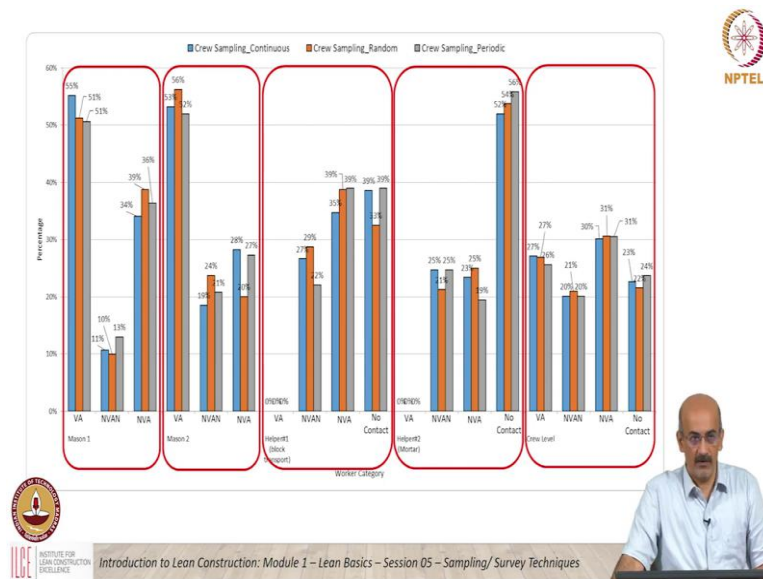
Let us move on. So, again, when you look at the comparison here, very similar comparison you will find that, one minute, this is random time, you will find that whether it is random periodic or continuous, so, the one difference in crew based work sample is, I can do continuous work sample.

What is continuous mean? I will not call it continuous work sampling, I can do continuous observations. What is continuous meaning?

Student: From 5 second to 10 second this worker is doing

Professor: Yes, I will take only time, I will not take samples. Each time a person changes doing something I will note down and my total I might have observed the crew for say x minutes for x one minutes they were doing that. So, x one divided by x will be value added, it will not be sample based.

What does the percentage of accuracy on that?

Student: It is more evident.

Professor: 100. It should be 100 if my observation is correct. You can use that as a benchmark, to see whether my random sampling is become okay or not.

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Crew-based Sampling: Comparison – Random vs Periodic Time vs Continuous

- *Random time approach* is very much close to Continuous time approach in identifying the percentage of VA, NVAN, and NVA categories, compared to Periodic time approach
- **Random time approach is recommended**
  - Compared to Continuous time approach because it takes observations at random times
  - Whereas, Continuous time approach requires close observations comprehensively, which is extremely time consuming and not desirable

Introduction to Lean Construction: Module 1 – Lean Basics – Session 05 – Sampling/ Survey Techniques

So, there are so, this is we would I would also say as a part of this class, I think, you would have done the continuous observation also in your part. So, that is what we would do. So, you will see that if you are able to now, again we go back, why would I not recommend continuous sampling where everything?

Student: Takes too much of time.

Professor: Takes too much of time. And if a random sample can give you within 5 to say 6 percent of the same result, I would rather spend less time and get the random sample. So when you look at this, this is what this slide says that, you know, we might as well do random sampling, if we do it properly, you are going to be able to get very close to the result.

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Quiz

1. Consider the following statements and select the correct option: with respect to crew-based work sampling method

Statement 1: Random time approach is recommended over periodic time approach

Statement 2: Random time approach is recommended over continuous time approach

Statement 3: Continuous time approach is not recommended over random because its time consuming

Statement 4: Periodic time approach is not recommended over Random because it takes observations at periodic

   a) All Statements are True
   b) All Statements are False
   c) Statements 2 and 3 are True
   d) Statements 1 and 4 are True
   e) None of the above

a) All Statements are True

Supplementary Module

Link (to read and contribute)

https://tinyurl.com/yjmab26s

40