

Introduction to Lean Construction
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Module – 1
Lecture 26
Sampling basics, Sampling in construction

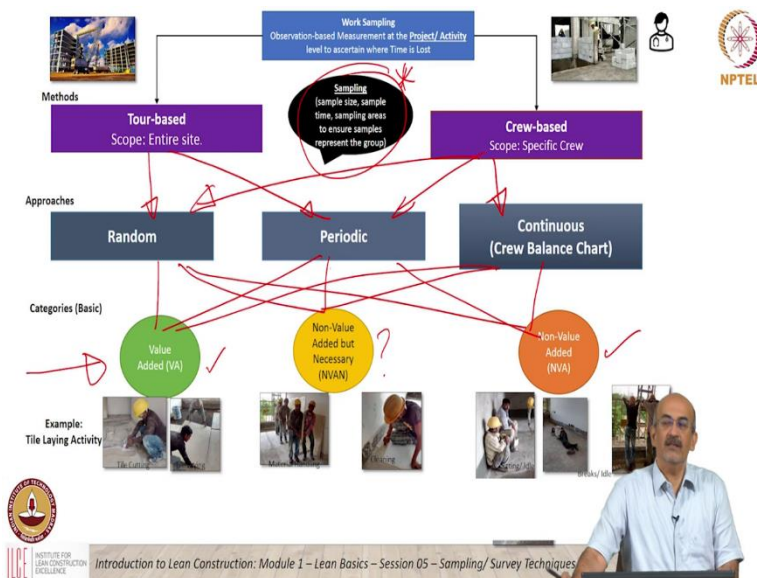
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Sampling - Basics



- Statistical basis

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Sampling - Basics



- Statistical basis
 - A *Representative Sample* is taken from a *Population*– will have some or all the *characteristics* of the group
 - To be *representative* of the group – formal sampling procedures have to be followed
 - *Sampling procedures* specify – sample size, sampling times and sampling areas to ensure that the sample is representative of the group



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



Professor: Now, like we mentioned, a lot of what work sampling is doing, especially random is based on statistical sampling. Now, when we take a statistical base, what we say is, if a representative sample is taken from a population, it will have some or all characteristics of the group, does this make sense?

Now I am going to go through and then come back here. Now, to be representative, formal sampling procedures have to be followed and when we go into formal sampling, it is a lot to learn and a lot to do. And, it will be things like your specified sample size, sample time areas, there are a lot of variables here, which has to be addressed when we do formal sample.

But coming back to this concept of sampling, can you give any everyday use of sampling, have you come across sampling in any context?

Student: Maybe, material testing.

Professor: Material testing is all sampling, when you do your concrete cube, you are not testing the whole truck, you know kind of ready-mix truck right, you are only taking a few samples and testing, and what is the assumption then? Exactly, whatever I test here, I will not take one, you will take some n samples, so n samples that you take is the representative of the population and whatever results this gives is holds good for the whole time good. Any other example of sampling?

Student: Surveys for a country, like about nutrition survey.

Professor: Surveys, a sampling, correct. We like, we will go, I mean, many things we do that we are sampling, when you do, even when you do a foreman delay survey, we are only doing a sample or you are doing, we get a lot of questionnaire surveys, social surveys, all our samples, correct.

If you are, if you are trying to estimate, you know some social cause, like you say, we do a survey, we do not survey the whole population, right? we survey only part. And based on that, we make conclusions for the whole population, so that is also a way of sampling. What about exit polls? so I am going to show you some examples here.

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The slide is titled "Common Use of Sampling" and features several images and text elements. At the top right is the NPTEL logo. On the left, there is a cartoon illustration of a person holding a sign that says "This is not my opinion. It's an opinion from a sample of people." Below this is the text "Post-poll survey: The method behind the sampling". In the center, there is a red cross symbol with the text "Health Care" above it. To the right of the cross is a concrete cube with the text "Indian Standard METHODS OF SAMPLING AND ANALYSIS OF CONCRETE" above it. At the bottom left is the IIT Bombay logo and the text "IITB INSTITUTES FOR LEAN CONSTRUCTION INTELLIGENCE". At the bottom center is the text "Introduction to Lean Construction: Module 1 – Lean Basics – Session 05 – Sampling/ Survey Techniques". On the right side, there is a small video inset of a man in a light blue shirt gesturing with his hand.

Professor: So for example, exit polls, how do they do exit polls? what is that that mean?

Student: Selecting some peoples from every area

Professor: Correct, you do an exit poll based on a, so you do not take opinion of all the people who voted, right? you take the opinion of only selected people, so that is also sampling. Our exit polls are always, right? when are they wrong? if the sample is not representative of the population, then the exit poll becomes incorrect. Okay, so here is a cartoon which says, okay, everyone has an opinion, everyone has a poll, if I take wrong sample size or wrong, you know proportion of population or wrong demography of point, then I will get wrong results.

So, a lot of it, so when you do health care, you go for a medical check-up, you take a blood sample, what are the variables there? or you take a covid test, you might get it positive, there are there are a lot of variables, you might not take it in the right time or let me put it the other way they look at, they go to an area and they take random samples of people to find the Prevalence of the virus, right? Yes, zero surveys are taken, on what basis is a zero-survey taken, it is a random sample and trying to indicate if what is the presence of the virus in the population, but again, it is a population which they are making conclusions on but sample which we are taking.

So I guess all of you have understood that sampling is means you take only a selected part of the population, if the sample is wrong, you cannot make any conclusions from it. If the sample is right with much less size of survey or evaluation, you get, you can make conclusions for the whole population.

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Sampling in Construction

Statistical-based ❌

- Several aspects to be addressed for accuracy.
- *Not advised as intent here is for use as an indicator of waste*
- Required for Formal adoption
- Supplementary Materials

Heuristics-based ✅

- Timings ✓
- Route ✓
- Trades ✓
- Other factors ✓

Percentage of VA - NVAN - NVA to Identify WASTES in a Project/ Activity

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Now if you go back, so if you take sampling, there is like we are seeing here, what we call the statistical-based sampling, which is the formal way the statisticians will do it if you are doing a really good experiment, this is the way you are supposed to do it. If I am doing my exit polls, if I am doing a zero survey, if I am going to do.

So, the theory of work sampling says that we have to do proper statistical-based sampling. Now, if I want to do proper statistical based sampling on a construction site, the variables are so high, okay, it will take me time to design that, and by the time I design that statistical based, the uncertainties in construction might have changed my parameters.

So, a lot of times, you know, we put, I mean, it is well, this is scientifically irrelevant, what we have found and what people have found a more heuristic base is okay for construction. Okay, that is one, number two, we are not trying to get so much of accuracy out of our sampling in construction, we are look at this at the point here, we are using it as an intent as an indicator of waste. we are not trying to make any payment decisions based on work sampling, we are not trying to make any measurements based on work sampling, it is only an indicator of waste.

So, a lot of times, when I go to a construction manager or a project manager, what is the extent of waste on your site, they are not able to give me any figure. Okay, is it high, is it 20, 30, 40 percent? Now when we do a work sample, the project manager is able to see non-value added is at this percentage, now that number itself is a formalization of what is either thing, little, lot, more, so that is the intent we are doing.

So the reason we do not go in detail into statistical-based sampling here is because of these factors and our usage does not require this, our usage is only as an indicator of waste, it is not as a measurement. Now, like I said, there is a lot more theory on this, those of you are interested should read up the supplementary material.

Now, when you go to the heuristic-based approach, it is not that I just go and look and classify the way I want, you have to look at timing, I cannot, for example, I have to if my work day is from say, 8 to 6 pm, I cannot do my sampling only at 8 to 9 pm every day and say I am done. I have to be reasonably judicious in sampling round the clock, or I can even be selective, I can say my peak work occurs from, I do not know, 11 o'clock to 2 o'clock and I

will take my best sample at the peak work and find what the extent of waste during my peak hours, and if I extend the ways during my peak itself is high, then I should be concerned.

So a lot of times you have to bake it on objectives or the objective of what your survey of your survey is, I can say, I am going to measure for peak hours, but you should then be a sample based on that. I can say, I am going to measure for the whole day in which case, you have to take more effort into spreading your sampling throughout the day.

And then you had to look at the routes, I cannot just sample the area close to the planning office or to the project office, I have to be know, where the work is going on, make sure things are taken care, I visit all areas if I am doing a tour-based sample, I have to visit all the trades, I have to look at many other factors, including the fact that sometimes you have multiple observers, and each observer should not categorize way the work in their own way, there should be a certain understanding, a certain standard by which you are doing the work sampling. It should not be, you do your way, I do my way, and you put all the results together, it will be one mix-up results.

So that is what we have, any questions on this? And ultimately, what we are trying to get, like we said, is a percentage of all of this to identify waste, this is where we are headed.

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Quiz



1. True/ False: A sample is representative of population ONLY when satisfies all the characteristics of the population?

- a) True, because a representative sample should have all the population characteristics
- b) False, because a representative sample need not to satisfy all the population characteristics
- c) False, because a representative sample and population are exactly the same

b) False, because a representative sample need not to satisfy all the population characteristics

