Introduction to Lean Construction
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Module 1, Lecture 5
Measuring Output – Level of Effort (LOE)

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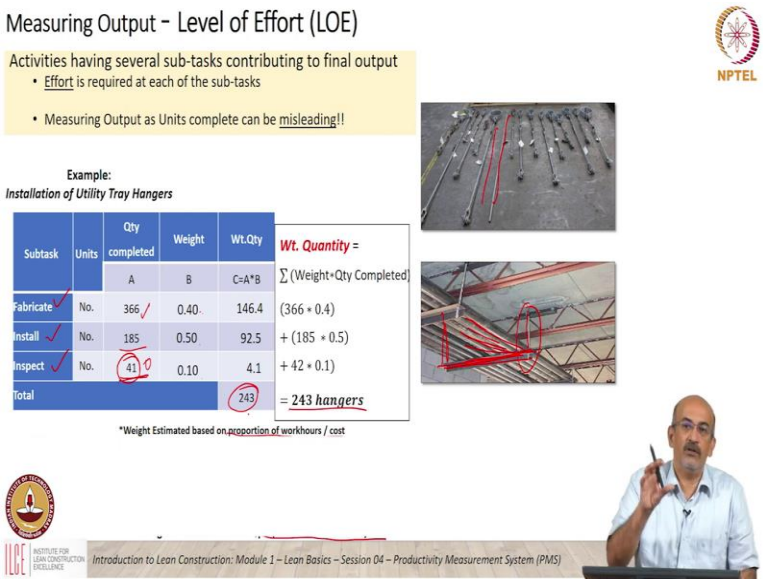

We talked about, now we come to this form of measuring output. This is called level of effort. It is not used that frequently but it is something that is relevant to have an understanding of, because when a lot of activities have several sub activities which contribute to the final output. And effort is required at each of these sub activity levels or sub-task levels.

And if you take this illustration, so we have a illustration where you have a utility tray hanger. So, these are the tray hangers here. And these go on to the ceiling as you can see here and using, the support here the utility pipes run on it. So, as you can imagine there will be one hanger here, another hanger here, and you will have the support here with pipes running.

So, to be able to install utility hangers is definitely a requirement before the utility pipes can be run, and here we have a, that activity has three sub tasks, it is fabricate, install inspect. Very simple, three sub-tasks. And if I take a measurement at one stage, I get 366 units have been fabricated, 185 have been installed and 41 have been inspected and

passed inspection. Now, if I am supposed to take output of this activity based on this data, what would be my output measurement?

Student: It will be one of the inspected 41.

Professor: Yeah. So, if I would take, I would take only the inspected 41. But we can see that fabrication effort has gone, installation effort has gone, there is been significant effort, so how do we account for these…

Student: Apart from effort, cost is also there.

Professor: There is cost, there is money, there is, everything has, it has gone, and you have paid for it, you have paid for labor, all that has gone. And if I take output only as 41, then there is, it seems low because I have actually spent a lot more effort on it.

So, what level of effort does, I mean kind of the concept is you weigh these different subtasks appropriately, we will get back to what the weightage is based on, and then you find the weighted sum. So, here we have taken the weight as 0.4, 0.5, 0.1, and these weights are typically based on proportion of work hours or costs.

So, I take a proportion, let us say it is work hours, these are the weightages. I multiply the quantity complete in that category by the weighted, by the weight and I would get the weighted quantity. And I add up all of this and I get the amount of effort that is gone into this fabrication works. So, in this case my output would be 243 hangers instead of 41 hangers, which in many projects and in many companies, they find is a more realistic way of measuring output rather than just say 41.

So, there are many nuances in measuring output, and one has to be careful as to, and understand what you are actually measuring otherwise your productivity measurement system can yield incorrect results for monitoring purposes because if your output is not measured correctly, definitely your productivity numbers will show, will be incorrect. Is there a question on this?

Student: Sometimes the inspection also depends on clients, right?

Professor: Absolutely.

Student: So, if there is some like, extra time or extra something is there, so how will it affect the overall project span?

Professor: No, so, so inspection depends on client. If there is delay in inspection it does not count to output, but here even if I have a 0 here for inspection it still counts towards my effort. So, that is 1. Now, that is one aspect. Number 2, I have seen several activities where you will find beginning of the week the outputs are 0000 towards the end of the week the output is almost hundred percent. What does that mean?

Student: The work is not complete in the beginning.

Professor: Yeah, at the beginning of the week, it is, all the sub-tasks are being done, towards the end of the week, the, the whole thing gets fabricated. So, you will get a way, if you are trying to measure daily productivity on that you will get a very, very, kind of you know incorrect view of what is actually happening on site. That is, it if you take a daily view.

If you take a weekly view, that might be okay. But similarly, need not be weekly. It could have remained, the sub-task could extend over two weeks, three weeks. So, it is important that the planning and the execution team understands what output measurement is required, and use it appropriately.

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