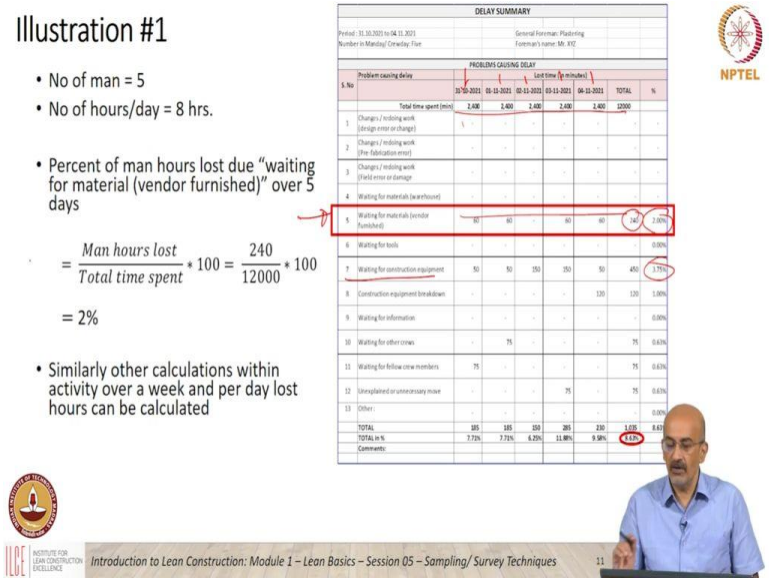
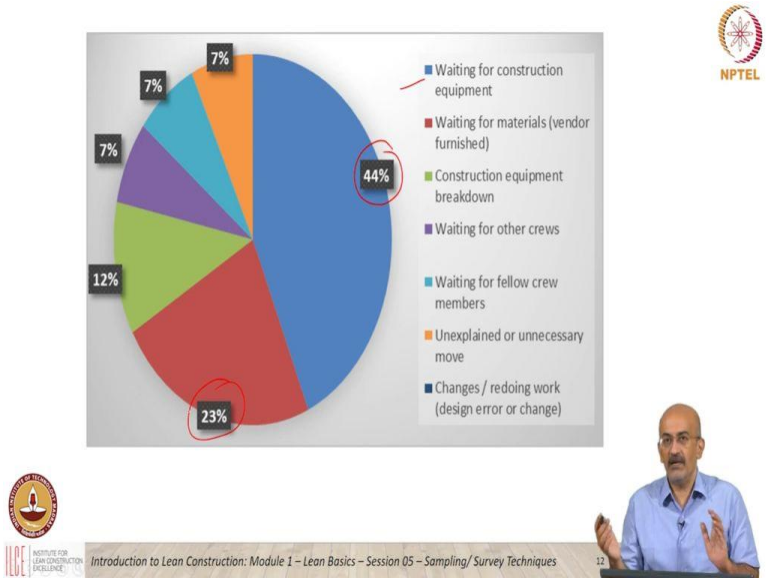
Introduction to Lean Construction
Professor Koshy Varghese
Department of Civil Engineering
Indian Institute of Technology, Madras
Module 1
Lecture 33
Foreman delay survey - Illustrations; Comparison - PMS vs WS vs FDS - discussion

(Refer Slide Time: 00:21)



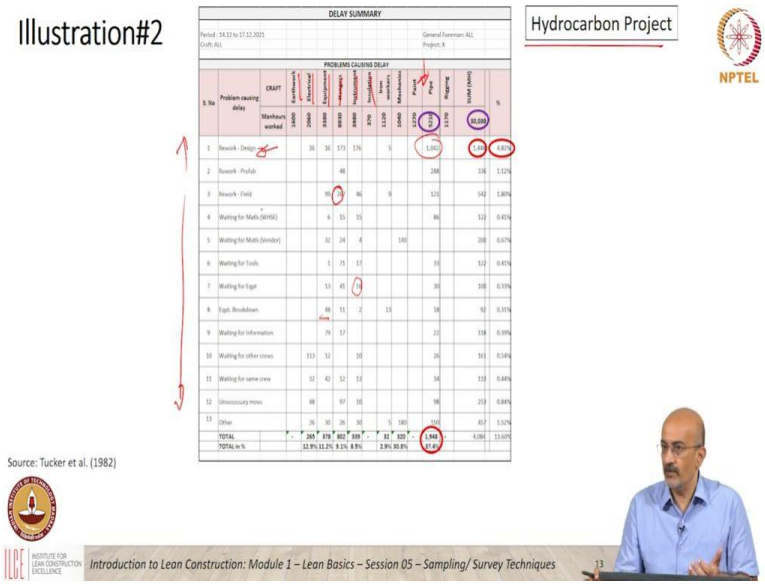


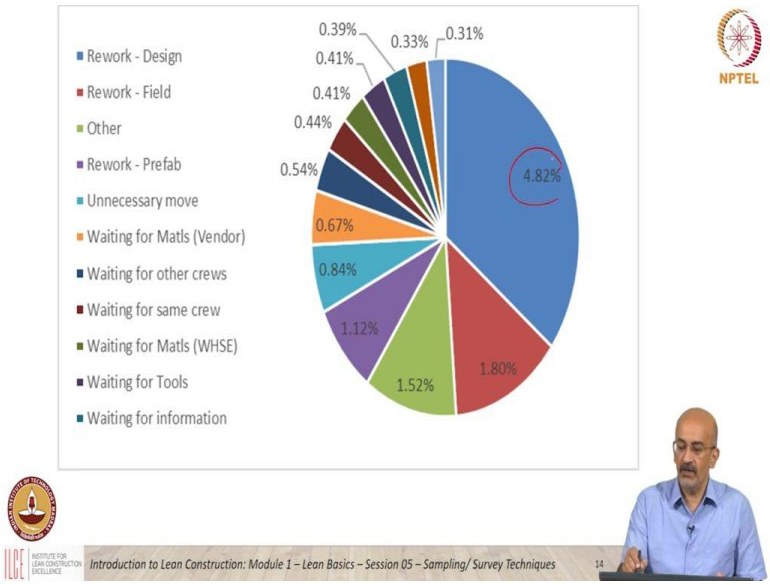
Now, here is another illustration on how the summary of the delay summary can be looked at. So, here is where we, I mean here is one version where you have for example, again waiting for

materials on one, two, three, four, five days of the week. And here is the total time in minutes, it is been quantified, and here is the actual delay. And again the total delay and the percentage delay is given is kind of quantified here. Waiting for construction equipment, this is the quantification.

The calculation here it is a very simple calculation it is shown; and these can be discussion points as to why it happened. How do we, how do we ensure it does not happen again? What is required to remove these delays? And I mean so, this gives you more of a visual on what are the aspects of delay. So, here you can say 44 percent is waiting for construction equipment. Waiting for materials is 23 percent. So, these are points for discussion, to be able to generate in brainstorm ideas.

(Refer Slide Time: 01:31)





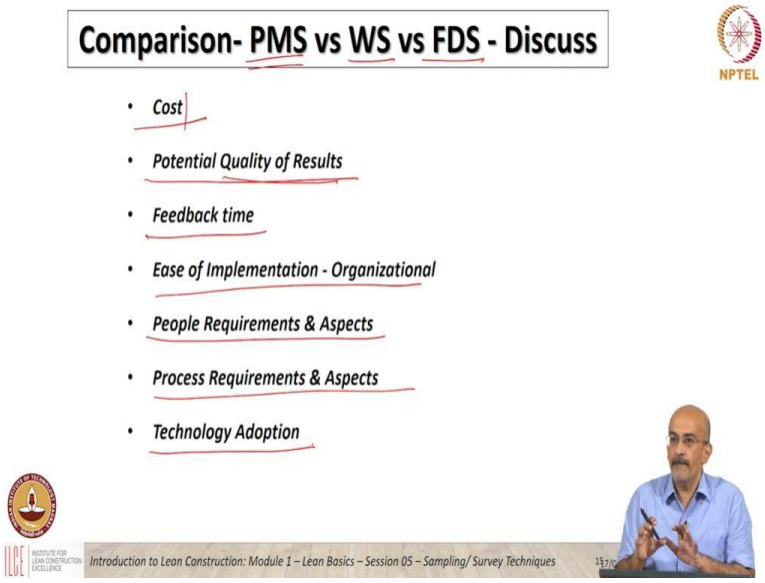
Here is another illustration; this is for a hydrocarbon project. And you can see there are, so, this actually talks about, categorizes the delays into. You can see this earthwork, electrical, equipment, hangers these are the different trades. Instrumentation, insulation these are the different trades; and these are the categories of delays. From rework waiting, the waiting categories and the rework categories; and each cell contains the delay due to an electrical trade due to rework. The delay due to equipment breakdown in the insulate, insulation equipments.

So, an equipment here is the project equipment, not the construction equipment. Instrumentation and waiting for equipment, what is the delay? So, this is how you know. So, it gives you a big picture within a week as to where the delays occurred, and what trades under what categories. Now, you can analyze this, you can look at for example, rework and design in; and if you look at piping. In hydrocarbon piping is a very important aspect; there was a lot delay due to rework in design in piping, contributed to 4.82 percent.

So, definitely the design, the project manager has to look at the design aspect, beyond the control of the Foreman. Or if we look at that way you can look at the numbers, discuss it; and look at where what action needs to be taken. So, there are other numbers that will come out; we can look at, we can discuss some of the other numbers. For example, here is another large number loses looking at pipe hangers, and field rework. So, there seems to be a lot of rework due to in on pipe hangers. And again, is it is it a tolerance issue? Is it a quality issue? Is it a drilling issue? All of these questions can be asked at the meetings and resolved.

The same data is put in the form of a pie chart here with different proportions. And it is just a way of visualizing and to have more discussions on it.

(Refer Slide Time: 03:45)



Now, when we compare to kind of summarize; so we talked earlier about productivity measurement systems, we talked about work sampling, and now we are talking about Foreman delay survey. All of these are techniques for us to be able to find out to monitor what is happening on site to understand if there is waste, to understand if things are going as planned or not. And, in many places, so, we sometimes come up with this topic as to there are if all these techniques are there, what should I use? In many and so here are some of the dimensions which we have identified to see if I am going to compare.

For example, if I use cost; which of these is do you think is. Now, what is the cost implication of productivity measurement system versus work sampling versus Foreman delay survey? Something to think about. Similarly, the quality of results which gives you better results?

Student: Productivity.

Professor: Okay. So, if you think productivity measurement system gives you good results, assuming that the inputs are correct. And we know that in productivity measurement system, for example, we have to quantify even quantifying output can be tricky; if you remember level of effort might have to be used in some cases. So, if I do not quantify my work hours and my

outputs correctly, I am not going to get the quality that I need in terms of numbers in terms of formulae, yes.

The error should be small. But are my measurements accurate? Measurements are not accurate; the productivity measurement system does not give you a good quality. My work sampling also has errors. But, it probably costs a certain amount of money, which probably is less than a formal productivity measurement system; but, so the trade off between quality of result and the cost of implementation. So, which of these do you think is a least cost to implement?

Student: work sampling.

Professor: Least cost would be Foreman delay survey. Because there is no additional resource, other than the person who is already kind of helping you with productivity improvement.

Student: But, I think work sampling I am just doing the work sampling.

Professor: Work sampling is normally done by a team of people; so you have to you need a team to do the work sampling.

Student: It usually gives snapshots,

Professor: It only gives snapshots.

Student: what are they gives you the analyzed.

Professor: It gives you more disturbances; but, then if I look at again. So, if I look at people requirement, in which of these techniques is the buy-in of people very important in foreman delay survey. If the foreman are not going to cooperate with me or they are very skeptical of this; and they are not giving me proper feedback on the FDS. Then, FDS is not going to be worth implementing; how much our little bit costs. If I look from, from for example, feedback time, there are certain advantages to FDS and work sampling; because the feedback comes much faster.

But, then balancing into the productivity measurement system might be which run well, my productivity measurement system is more accurate. Another issue to look at quality of results, is that with FDS, I potentially get there is. See the cost is not only for the getting the feedback; but also for the time I am spending in discussions this that, which should ideally be part of my

weekly meetings and everything. But, part of my FDS I might also get solutions to my problem; and I am also getting implementation pathways.

Whereas, with the productivity measurement system or work sampling, I am only getting with a productivity measurement system; I am only getting productivity, I am not even getting waste. With work sampling I am getting a little more of waste; but I am not getting any solutions. Then FDS, I am not only getting waste, but potentially also getting solutions to tackle. So, if you look at it, there are, if I look at it again, ease of implementation, people ease an organization ease. If I am starting fresh a productivity measurement system is quite a task to implement, because the process requirements are very high.

There is a lot to do, we had to do this, I have to measure productivity. I have to kind of do my analysis. I have to lot of things have to be in place for the productivity measurement system to yield results. But, the advantage of a productivity measurement system is most large sites. Already have something to do in their cost control system, or in their; productivity measurement is already being done. The numbers already there; I have to take my quantity measurement. I have to take my input measurement, whether its work hours or cost. It is only a question of how do I translate that into a productivity requirement, measurement requirement.

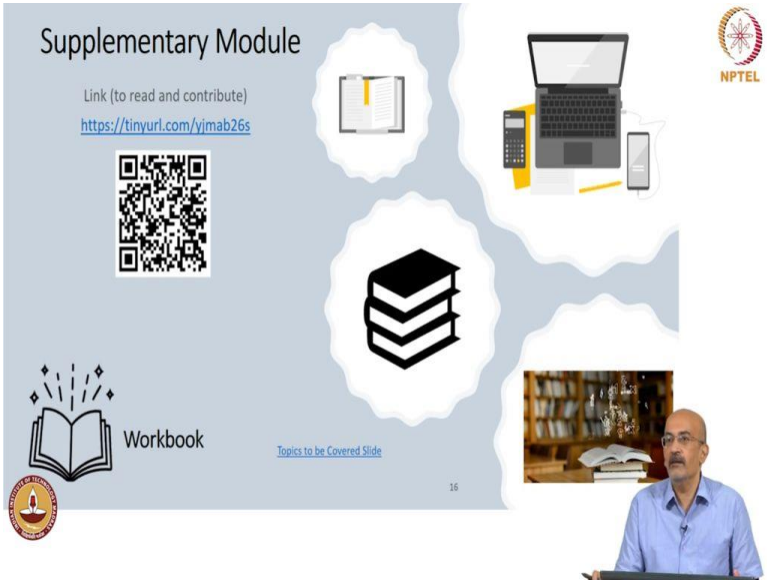
So, when we talk about process if I have to initiate a process, definitely productivity measurement is not; it is kind of a high overhead initiate. But, the fact is most sites already have some form of it; we just start to fine tune it to get use. And when we look at technology adoption, in all cases technology can be used to enable this process. So, because in the earlier years, just the paperwork of doing this was a big barrier; today, we need to adopt technology. And we are able to adopt it, to be able to make all the computations, the data, this that accessibility much easier.

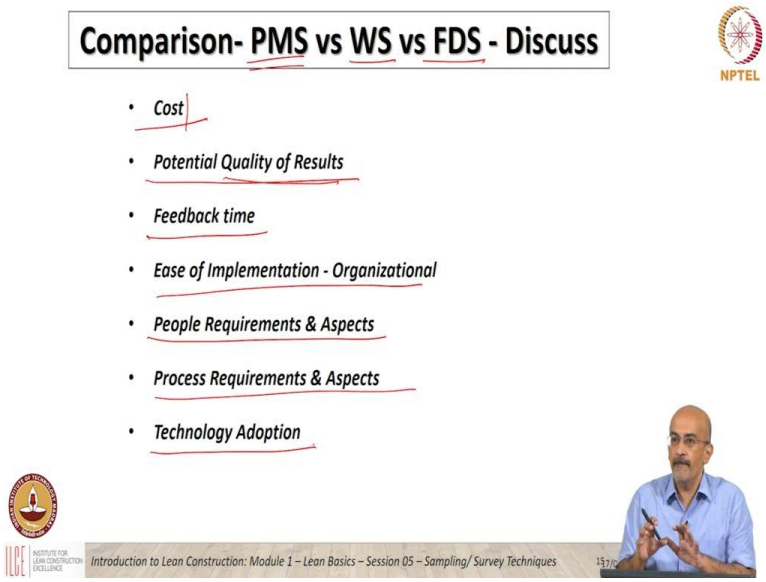
But ultimately, when we look at this question of when we do the comparison, it is not to say productivity measurement or work sampling or FDS. But, we have to see how we can use all three, as parts of the same toolkit, parts of a toolkit. And which one do we use? So, normally a productivity measurement system is already in place. How do we fine tune it to actually get better measurement between work sampling and Foreman delay survey? You can either choose or choose to do work Foreman.

Foreman are already there and on your worksite; little bit of training, a little bit of enabling the Foreman delay survey, kind of discussion during the meetings is not so difficult. Add in a little bit of work sampling on a periodic basis to see how what is the data you are getting; and try to correlate these, try to. So, what happens with we and where is my work sampling; non value added decreases. Why did it decrease? What is its correlation to productivity measurement? Now, what did the foreman have to say? What delays did they identify?

This kind of a collaborative say a multipoint look into the project is actually required to be able to analyze; and be able to get monitor project. Identify the waste from multiple dimensions and then try to remove the waste. So, in summary, we have covered these techniques. I think all of them are potential techniques for waste identification, reduction; and ultimately to look at productivity, and how productivity can be improved. And they have to be used synergistically to take the project form.

(Refer Slide Time: 11:14)





With that, again, there is a quite a bit of supplementary material which needs to be read; and, so do take up these readings to learn more on this.

Student: In the Indian contracts instead of saying foreman's, we could even say frontline supervisors.

Professor: Frontline supervisor or anybody who can give information on the on the what is happening at the frontline and quantify the delays. Or, is aware of what is happening at the work phase and is responsible for it.

Student: You do not have people call directly for nowadays.

Professor: We do not have to; but we just use the term Foreman delay survey; because that was the original term that was used by the authors. And it is commonly referred to as FDS.

Student: Some of the parameters what we compared with PMS, work sampling and Foreman delay survey; that is the Cost parameter. So, just looking at doing the process any PMS or something FDS that cost part of it. Other than that, there is a hidden cost part. What I am saying is if we do not use it; there is a hidden cost. So, are not we ready to pay that; so maybe the different kinds of waste in terms of the Lean thinking,

Professor: right. So that is a very good point; so there is a hidden cost. It is not a so or so. So, I mean, almost all medium to large contractors will have some system in place; mostly productivity based systems. We are cost based systems, I would say not even they are low cost

measurement in some way. You have to fine tune that to start measuring productivity. Now, the cost of not fine tuning it, is very high. Because then you are basically, you are going or you are going on a trip, to taking your project on a trip without a map, without a speedometer, without a fuel gauge, without anything.

You are just flying blind; you know, you are driving blind. So, these tools and techniques are like I said, the, if you do not implement, you are actually paying a much higher cost.

Student: Exactly.

Professor: And the cost of not implementing has never been quantified. A lot of times people ask how much does it cost. Is there ROI? But rarely, no analysis has been done on what is the cost of not implementing? But this is a management decision people have to take.

Student: Just one more questions. So, who is supposed to use the productivity measurement system or work sampling or Foreman delay survey? Project manager or?

Professor: No, no the productivity measurement system is a combination. If you remember, there is a it is an interface between the planning team and the execution; so, it comes at that interface. I think most of these tools, the implementation of the tools is that interface between planning and the execution team; it is in that interface. The project manager will be given summary reports or so for example, a work sampling report. I mean, if a project manager is required to drive it and implement it, yes.

But, the usage of work sampling results, all of that should ideally be at that planning, execution interface, more towards execution; because it is a short cycle monitoring. It is not a long cycle monitoring, but in cases where the client or project PMC everybody gets involved with the short cycle monitoring; which seems to be the situation inside today. Yes, everybody can get it. But organizationally speaking, this is typically at the execution and in the short cycle, it could be the project management team along with the execution. Thank you.

(Refer Slide Time: 14:46)