Carbon Accounting and Sustainable Designs in Product Lifecycle Management

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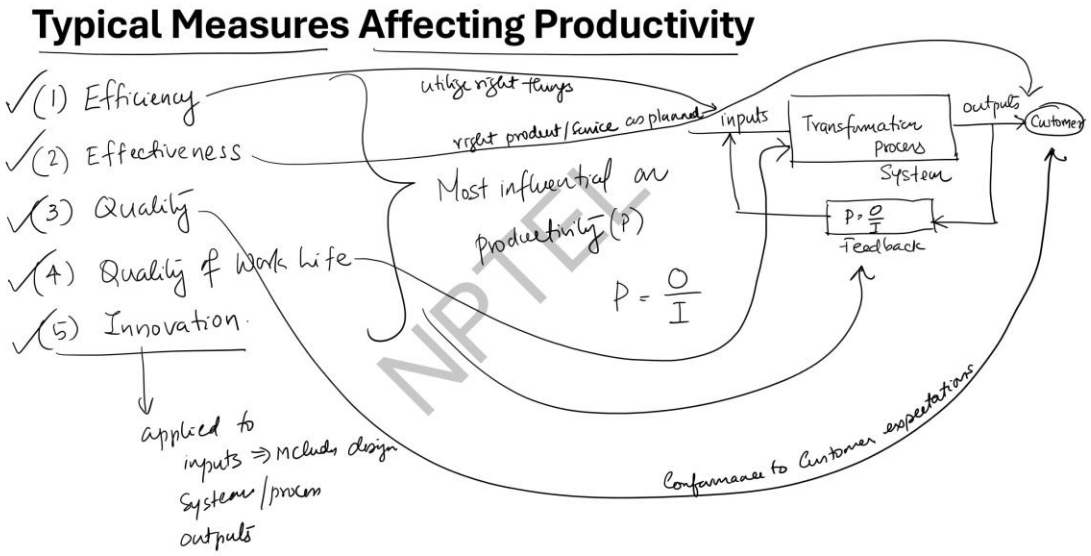
Week 01

Lecture3

Measures Affecting Productivity

Good morning, everyone. Welcome to yet another lecture of the course where we're talking about productivity and sustainability, which should ensure product lifecycle management or making sure that the product that is from the design phase all the way to the end, where after the usage we dispose and bring it back to the spare parts and reuse again.

So, that the environmental impact can be reduced to the lowest. That is the primary goal of this course and what are the models, tricks, factors, etc. associated with it. So, that is also being discussed in this course. So, yesterday we discussed the factors that are affecting. We were discussing on productivity and how productivity is one that has been driving the industry now, and we are moving more towards from productivity to sustainability.



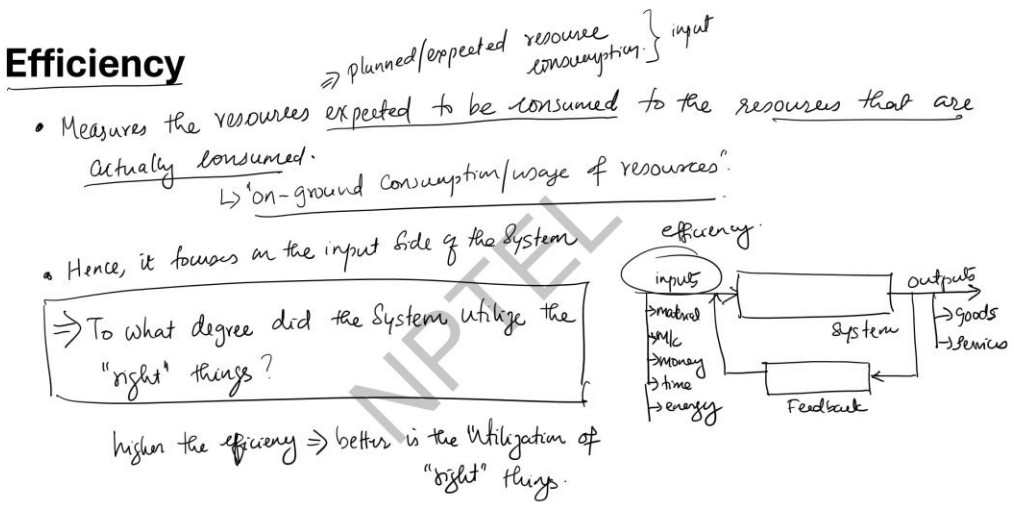
So, today what we will do is, continuing in that lecture, we will talk about the typical measures that affect the productivity. So, there are five major measures in this. There are other things also, but these five are the most critical one. Number one being efficiency.

And we will discuss one by one in the coming slides Efficiency. Then we have is Effectiveness. Number three is quality. Okay. And number four is quality of work life. Of work life. And finally, fifth is innovation.

There are other factors that are there, but these five factors are considered as the most influential on productivity. And we already discussed yesterday productivity (P).

$P = \frac{O}{I}$ and it's a relationship. Productivity is a relationship between the output over input. And we also looked at the systemic view of productivity where you have inputs and you have a system and you have outputs which is used by a customer and you have your feedback.

The feedback, we discussed this in the last class yesterday and this is the system is what we have the transformation process. And the feedback is your productivity that we discussed yesterday. And we have further details of this. So, we are talking about these factors, okay? That is affecting the productivity that we are talking about.



So, let us, without much delay, let us go through each one of these factors. So let us take the first factor which is Efficiency. So, there is many ways people define efficiency. But for this particular course, let us do it this way.

It measures the resources expected to be consumed. to the resources that are actually consumed. Okay. So, there is an expected consumption of the resources. Okay. We have a planned resource consumption or expected resource consumption.

Okay. So, the resource consumption is from the input side. And then, the resources that are actually consumed. Okay. That is the on-ground, consumption or usage of resources.

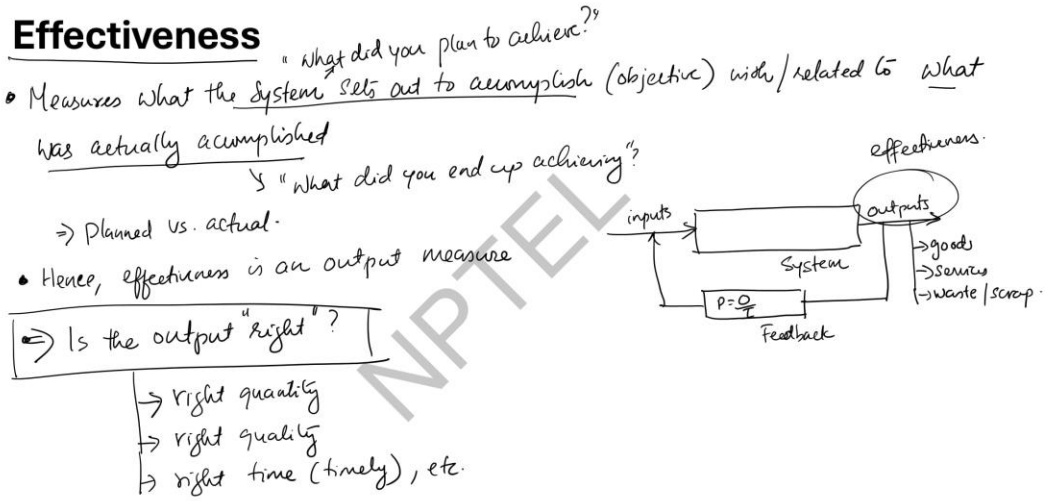
Okay. So, this is When you compare to both of them, if both are exactly the same, then you have 100% efficiency. If it is less, then the efficiency is the other way around. So, hence, because it is on the resources side, so, hence, it focuses on the input side of the system.

Okay. So, remember what I was discussing earlier. You have a system and you have inputs, outputs. Outputs are goods or services. The inputs are, we saw it as material, machine, money, time, energy, all of these things.

Okay. We have seen that part. And then we have what we call as I said earlier, the feedback. Okay. So, the efficiency is the focus.

The efficiency is this side. The focus is on the input side of it. So, the measure here is the simplest way to think about is to what degree did the system utilize the right things. This is the main measure of efficiency or this is the motivation behind efficiency. To what degree, okay, how much did the system utilize the right things?

So, if you utilize the wrong things, your efficiency will reduce. So, higher the efficiency implies better is the utilization of right things, okay. That's what the efficiency is all about in this point. So, as we saw in the previous factor, we are now done with the efficiency.



Now let us talk about Effectiveness, okay. What is Effectiveness? So, there is many ways people look at effectiveness but for the purpose of the course, we say it as, it measures what the system sets out to accomplish, which is, you can always call it as objective, okay, with or related to what was actually accomplished, okay.

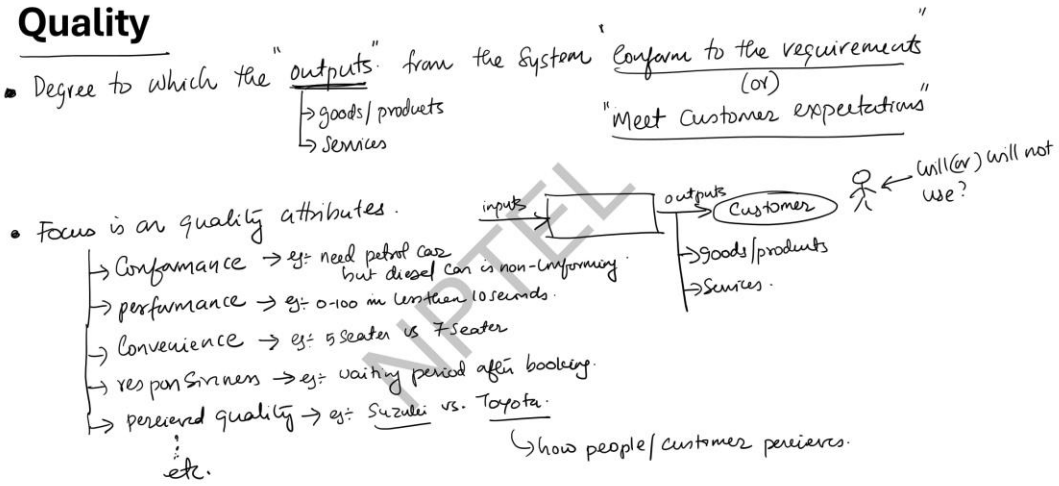
So, in a simple way what the system sets out to accomplish? What did you plan to achieve this? Is the one side of the question with or related to what was actually accomplished, okay. So that means that part, okay, this will be what did you end up achieving, okay. So, this is the second part. So, the simple way to think about it is this is planned versus actual. You plan to do something and it actually ended up being the something else.

So, the other main part of this is that the hence effectiveness is an output measure. So, if you think about the system again, you have the inputs, you have the system, you have the outputs and you have the feedback where your productivity is the ratio of outputs over inputs. But the outputs, you have two things mostly, not two, three. Goods, services, and you have waste or scrap, you want to call it as something like this.

So, the effectiveness, this focuses on the output side of it. So, like for example, if you intend to manufacture a car and you ended up manufacturing a scooter, you may do it efficiently, but your effectiveness is not very good. So, the main question here is, is the output, right. That is the fundamental question, right.

So, this is what effectiveness focuses on. The question is like right quantity. You plan to produce 200 scooters. You ended up producing 10 scooters. So, that is not the right thing to do.

Right quality and right time or timely production, etc. These are all part of the effectiveness. So, if you imagine efficiency is on the input side, to what degree did the system utilize the right things? That is the question that you try to answer there, whereas in this case is the output or the effectiveness focuses on the output side of the system. So, we are now done with two of these and now we focus on what we call as Quality.



And many of us have heard so many things about Quality and you will probably find so many definitions of the Quality. But for the purpose of this course, the premise that we would follow will be degree to which the outputs, okay. So, the outputs in this case is two types of outputs for us. That is goods or products. And the other one is services. So, we have two outputs.

Outputs from the system, confirm to the requirements or meet customer expectations. So, to what degree, how much the outputs, whether it's a goods or products or services from the system, confirm to the requirements or meet the customer expectations. So, because if you remember this, what happens is, the originally, if you remember this system, you have the inputs and then you have the outputs. But you have a bubble after the outputs, which is the customer. So, the customer is the one who is supposed to use the goods or the products or services.

So, the customer won't use it. The question is will or will not use. This will or will not use depends on how much it actually meets the customer expectation. So, quality for this purpose in this course is the outputs, whether it's goods or products or services from the system meets the customer expectations. So, the focus here is the focus is on quality attributes. Okay.

The quality attributes will be conformance. Other one is performance. Okay. Then there is other things like convenience. Then responsiveness, perceived quality, etc. So, one aspect is the quality attributes that we are looking is conformance.

Conformance to what the customer wants. So, customer says I want a petrol car. So, then a diesel car is not conformance to that. So, like an example is need petrol car but diesel car is non-conformance, or non-conforming. So, if I say that I want to buy a petrol SUV and the company says I don't have a petrol SUV, you have to buy a diesel SUV, then that's non-conformance.

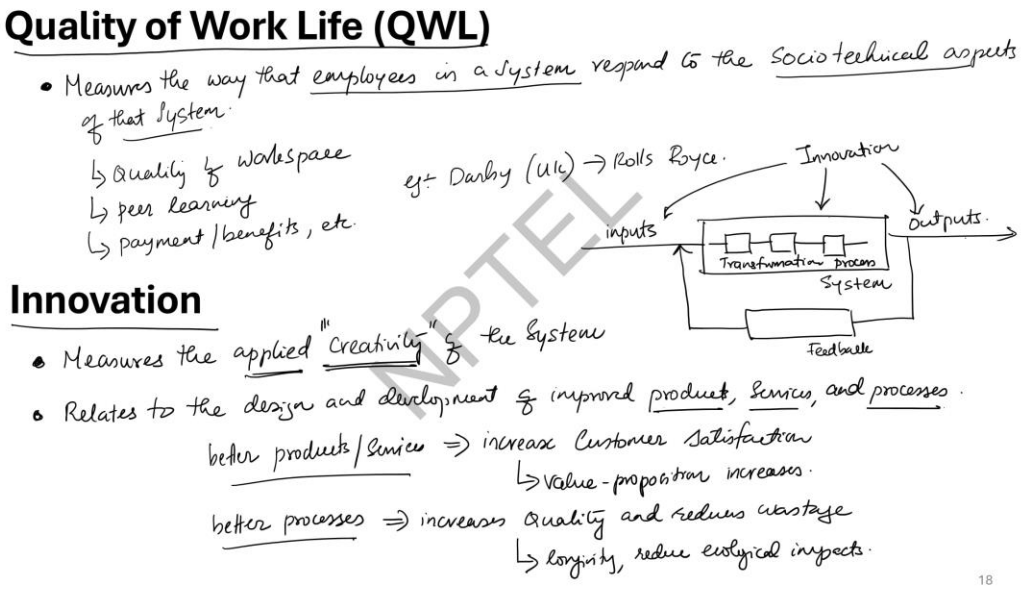
So, performance to a large extent is an example is 0 to 100 in less than 10 seconds is the customer's requirement or expectation. And a car that actually does in 15 seconds, doesn’t confirm to that performance requirement. Convenience is an example is five-seater versus seven-seater. That's an example of convenience. And responsiveness is one example is waiting period of booking. Okay.

After booking is an example. I want to go buy a car today and somebody says I have to wait for two years to get the car. That's another one. And then perceived quality is more

like how do you say, is that you can say Suzuki versus Toyota is an example of this. Though both of the companies make reasonably good quality products, people perceive that Toyota actually has a superior quality in comparison to Suzuki.

So, that is the perception, okay. This is how people or customer perceives, okay. So that is the third aspect. So, this is the conformance of the outputs with respect to the customer expectation. So now we have covered the three most important things, efficiency, effectiveness, and quality.

And we have seen how this is, one is to the input side, one is to the output side, and the third one is the conformance of the outputs to the customer expectations.



Now let us look at the next two of this. The first one we take is the QWL (Quality of Work Life). So, the QWL, what it does is, there are many ways people talk about this, but the main thing is, it measures the way that employees in a system respond to the socio-technical aspects of the system. Okay.

So, how does the employees in a system respond to the socio-technical aspects of that system? So, like an example, a quality of workspace. Okay. Then things like peer learning. Okay. You have things like the, what do you call, payment and benefits, etc. These are all kind of things you can talk about. Okay.

So, some of them will be the social aspects. So, you are working for a company like, for example, Darby in UK is known for Rolls Royce. Okay. So, somebody in Derby working for Rolls Royce is a big thing and it's a social, something that is acknowledged and respected in the society. And then it would be somebody like I am working in the marketing side or I am working in the engineering or the fan manufacturing, the turbofan manufacturing side. So, both of them have two different outputs or two different outlooks within the society.

So, there are finer details to it, but the idea of this whole thing is that the quality of work life also to a large extent promotes the output of the or the productivity of the system. Because remember the productivity is measured as a ratio of output to input. So, the better quality of work life then the worker will be able to produce better products in this regard. Then comes the last part. So before doing this, we are now done with the fourth one.

And we are now going to do with the last part, Innovation. And this is a factor that has been added recently with the productivity. But there is some aspect to it and it is also an important factor. So let us talk about how innovation is considered as part of this course. What it does is it measures the applied creativity of the system. Okay.

Applied creativity. That is the key word. Okay. So, that means you have creativity, but it needs to be applied in the system, okay. So, if you would imagine in this, I am just drawing right here, okay. So, you have inputs, as I said earlier, and you have system, you have outputs, okay. So, we have already seen this.

But now, the innovation can happen, if you take the innovation, it can happen in the output side, it can happen in the input side, it can happen in the system side also. So, the transformation process inside this that we talked about, like what I drew yesterday, like a system like this, okay. So, this is the Transformation process. You can bring innovation to the transformation process. You can come up with a new way of doing things so that you can increase your efficiency or effectiveness or quality.

That's also one aspect of it. So, all of that amounts to the applied creativity. So, what it does is it actually relates to the design, and development of improved products, services and processes. So, you have the products, services and processes. So, the aim is to either improve or you can say, better products or services means increase customer satisfaction.

When the customer satisfaction is increased, what happens? Your value proposition increases. When your value proposition increases, the happiness of the people with the or happiness of your customer increases. Better processes. This increases quality and reduces wastage. So, again it increases the value proposition, but what happens is it improves the longevity, reduce ecological impact, etc. are all part of this.

So, you can come up with better processes or better products. And all of them, as I said, you have the innovation that can be put in the input side and an output side the transformation side, and all of them would actually end up making the system somewhat better. So, as we mentioned in the earlier, so this is the fifth latest last part that is added. All of them are on different aspect of it.

So, as I mentioned earlier, the efficiency is to the input side, the effectiveness is to the output side, the quality is to the customer side. So, as I said earlier, here the efficiency is utilized right things. Effectiveness is the right product service. So, it is more like a plant. Okay. So, it's what we actually accomplished is, what it is there? And quality is conformance, to customer expectations or specifications, whatever you want to call it. Okay.

And quality of work life, it is more of an organizational thing. See the system. Okay. And innovation can be applied to all the three. Okay. As I said, applied to inputs, system, or process, and outputs. This also includes design in this regard.

That's also one important aspect of the whole system. Okay, so I hope you guys understand, we had a complete discussion and with this particular component of the course is over. Now we will move towards the productive from productivity. We will move towards the next aspect of it which, in the previous, the beginning of the slide, I have told you that we were talking about Productivity and Sustainability. So, we have completed productivity and now we are moving towards Sustainability. So, this will be the next part of the lecture.

Thank you for your patient hearing.