Technology forecasting for strategic decision making
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Why do we need technology forecasts?
Questions in Lecture 2, part 2

Professor Bala Ramadurai: Question, I have a question Dmitry on the chart that you showed about the planet where you showed all the countries and the colors were green and red, based on how much resources they consumed. So, you remarked that at the beginning of the 19th century, pretty much the entire planet was green, whereas at the turn of the 20th century, they were all 80 percent of them were red.

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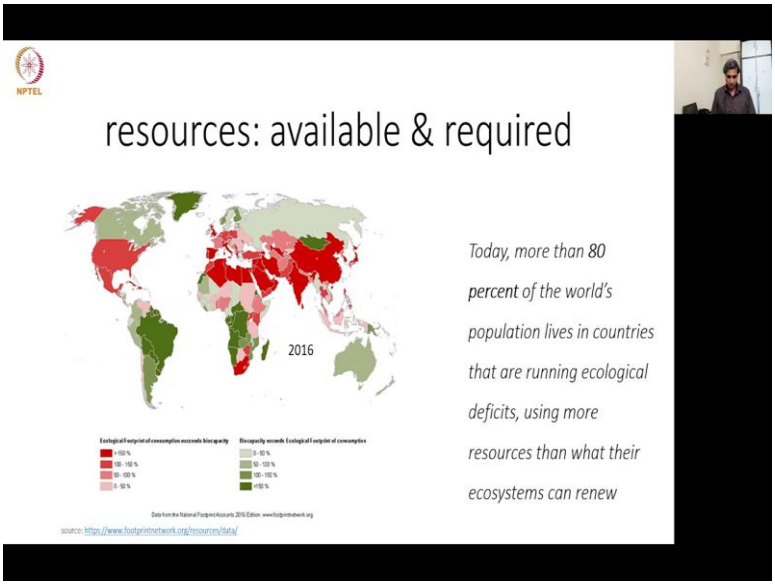

Professor Bala Ramadurai: So, a naive question here is, can it, can this whole change be attributed to a singular event? For example, could it be the invention of internal combustion engine, for example, or something like that? Is it possible that it is a singular event, which triggers a whole bunch of related events? Again, like I said, it is a naive question.

Professor Dmitry Kucharavy: According to my limited knowledge, it is not triggered by any one singular technology. It is triggered by interaction of different technology, but to what it depends, it depends on the efficiency of solutions that we use, because look carefully at the efficiency of steam engine, the maximum thermodynamic efficiency of steam engine is just 8 percent. What does it mean?

We have what we are asking from just 6 percent and 94 percent we produce waste and pollution. They are one of the main engine that we use today for private transportation and for delivering the goods internal combustion engine, the maximum, I would like to emphasize thermodynamic efficiency, for diesel 34 percent, for gasoline, this is a 27 percent. What does it mean? It means 73 percent, we produce waste, we are wasting.

So, in fact, the next and if I took our energy generation technology, this is even worse. How do we produce electricity? Today, this is a very difficult to from point of view of efficiency is absolutely not efficient. So that is why in fact, to satisfy our needs, for one side, we need to improve efficiency of our technologies. But from another point of view, we need to change the way how do we use them?

Because the well-known phenomenon, when we obtain some technology, which has greater efficiency than previous one, we start to use it absolutely different look to the computers, the more computer power we have, the more we use it the way that before we watch TV, today we watch streamed video, which consume much more resources for similar functionality. So, this is a not one technology trigger. If I try to answer short,

Professor Bala Ramadurai: Sure, sure. Thank you so much. Yeah, this makes a lot of sense for me. Definitely, that we cannot say it is it cannot pinpoint and say that this is what it costs, but it is actually a chain and network effect of many things. And I agree that it is a contradiction of sorts to solve that - we need it to be sustainable; we need the resources to go down. But on the other hand, we have these technologies which seem to be guzzling more than what they give you. So, it is definitely we are to work towards making it sustainable while extracting work efficiently. And oftentimes, I, we had this kind of a conversation again, the past is that, people will immediately say, oh, we should run electric cars.

But then the bigger problem is the energy generation is so inefficient, that you are using electricity for cars, of course, it does not produce any pollution, but you have energy leakage and the losses somewhere else. So, you have to look at it from a systems point of view, not from just one component part of it. Yeah, I agree.

Professor Dmitry Kucharavy: So absolutely, Bala. This is exactly why technology forecasting in multi-dimension, we have to run in order to be more systemic, not just to rely, like we rely on the past. Oh! we still have abundant of resources! We have no abundant of resources.

Professor Bala Ramadurai: Yes.

Professor Dmitry Kucharavy: I did not tackle the question about clean water, which is also the resources which we use. I did not tackle the question about sand that we use for construction. But all those resources, they are really something which we use. Not wise way, let us say like that. Thank you.

Professor Bala Ramadurai: Thank you so much. One additional question is regarding the wisdom, knowledge, information and data, the pyramid that you showed me?

Professor Dmitry Kucharavy: Yeah.

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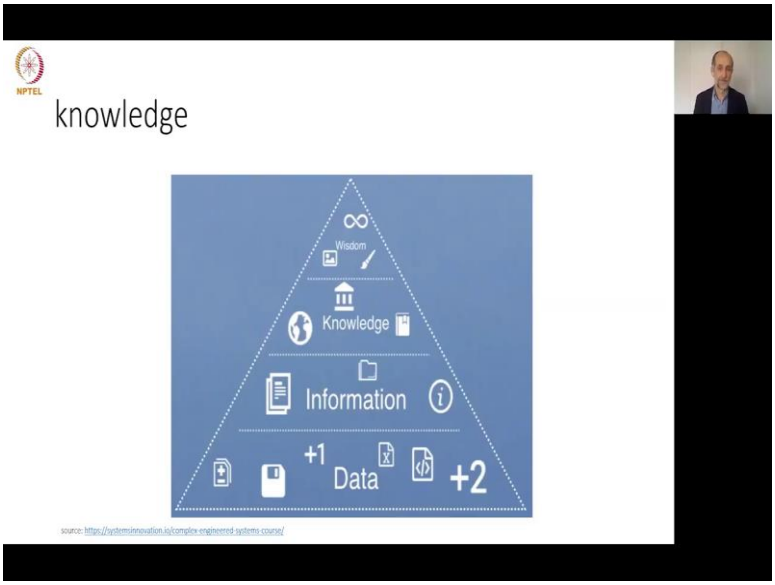

Professor Bala Ramadurai: So, for me looks like from this. Do I, can we conclude that data is the basic building block of, in order to understand how technology really evolves? How technology really, potentially to know about the future? Data is absolute, absolute basic building block of anything. So, we need to have that in place before we can even think about the future. Is that something that you would recommend studying? Or you would say, No, no, no, you should know about something and then go with data. How does it work?

Professor Dmitry Kucharavy: Yeah, today. Yeah, thank you very much for the question. Today, we had a lot of discussion and a lot of noise about big data concept, and so on, and so.

Professor Bala Ramadurai: Yeah.

Professor Dmitry Kucharavy: But in fact, what we need about data, we need relevant data. We do not need a lot of data; we need a relevant data. And what are the data which are

relevant depends on our present knowledge. In order to get reliable knowledge about future, the main idea is, we need to identify what are the relevant data.

And this depends on our cognitive limitations, on our biases, on our cognitive inertia and other issues, that we need to find the way how to manage them properly. But of course, yeah, the data and the information, this is something the building blocks, which we are going to use, but how to use them. It depends on our knowledge and our wisdom.

Professor Bala Ramadurai: Fair enough. Thank you so much. That definitely answered my question. Because data science and big data is something that many learners who will be taking this course, would have been familiar with. So, thank you so much, that was interesting.

Professor Dmitry Kucharavy: Yeah, this is important. But just to tell you the real story about big data. Recently, I learned that for Earth observation data, in border of Copernicus project, this is a project European project, which we have several satellites on the orbit, which collect in permanent every day, every, every minute, they collect data.

So, the huge number of data is generated, very precious data, very high quality, but in reality, we use less than 5 percent of these data. We use just less than 5 percent of this data, and the question is not the data. The question is, how to use it.

Professor Bala Ramadurai: Okay, fair enough. Thank you, thank you so much.

Professor Dmitry Kucharavy: Okay.