Technology Forecasting for Strategic Decision Making
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Forecasting & Forecast

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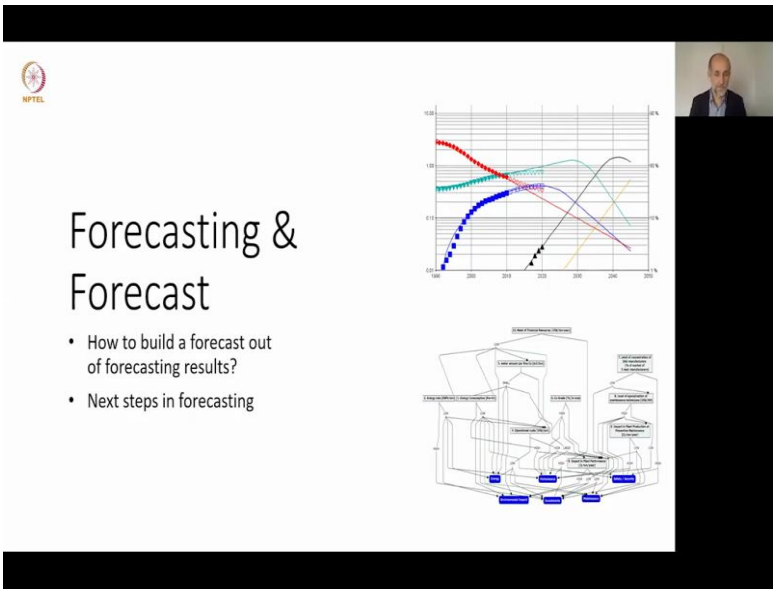

Professor Dmitry Kucharavy: Hello, everybody. Welcome back to our course about Technology Forecasting for Strategic Decision Making. And today we are going to discuss about forecasting and forecast. How to build a useful result out of forecast? And, in fact, we are interested to know about what can be the forecast at the end? And in both of these sections, we also will discuss the question what are the next step of forecasting.

When we look to the forecasting practice by itself, we can see that this is always a part of the process which is supposed to prepare variable outputs for strategic decision making. So, in fact, the answer for the question: "What is a forecast?" entirely depend on the question that has to be answered in context of strategic decision process.

So, that is why the forecast can be presented in many different ways. It can be purely numerical for instance like logistic substitution model which can answer the question or it can be purely quantitative sort, purely qualitative by using map of contradiction or it can be combination of them. But how do we transform what had happened within forecasting into the forecast?

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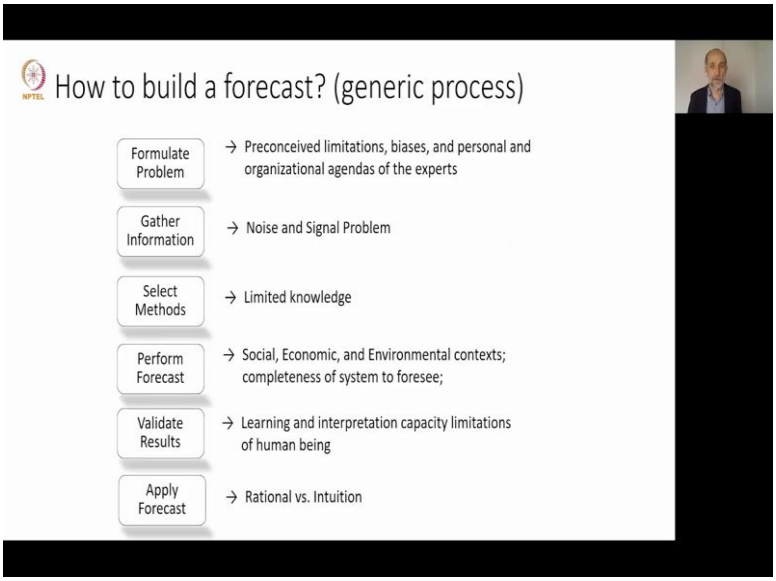

Let us see first the very generic process of forecasting. Any forecasting process start with formulating problem. When on this stage we are faced with problems: how to bypass our preconceived limitation, biases, our cognitive limitation, our professional agenda and so on. So, how to formulate right problem?

The next stage we gather we start to gather information according to the formulated problem. And on this stage, the main difficulty is how to distinguish between noise and signal. What are the noise information and what is a useful data? The generic process next includes the selection of the method.

And the main obstacle here is because we have just a little idea about hundreds of methods which exists, we can master one or two methods and not so many. So that is why company, very often they invite some consultant who are experienced about different methods of forecasting in order to take decision, what kind of method will be appropriate to formulated problems.

When we are performing the forecast, we need to merge the information and data from different contexts from social, economic, environmental context, technological context, in order to satisfy the completeness of system to forecast because any technical system, any technology evolves according to the feedback from society, from economic and from environmental context.

So, this is also the problem of forecasting: how to merge this data which naturally represented differently. I will answer a question a bit later. Let me finish the process. And the next when

we validate results, the main problem how to present exactly, what can be the output of our forecasting which will be presented because within a forecasting we accumulate a lot of data, a lot of information.

We gain some knowledge. But which one will be useful to present in order to satisfy formulated the very beginning problems? And application of forecast in a strategic decision making this is exactly what the board of generic process of forecasting we say; this is a kind of end of the process. It is the end of the process but this is the beginning of the next forecasting.

Because application of the forecast, this is exactly we use, learnt things in order to take strategic decision. And when strategic decision is taken, we have other things to be to be answered. So, we go back. So, on this slide, it is presented as a linear process but in fact it has never been linear one. It is always kind of cycle. Please, what was the question that you would like to ask me, Bala?

Professor Bala Ramadurai: Well, thank you for this. My question is regarding the knowledge level and skill level of the people in the team who are going through this forecasting process. So, one part I understand, the first part which says limitation due to biases and agendas but the other extreme is people who are limited in their own experience and some of interpretation of this will require some amount of skill.

So, what do you recommend in terms of the skill level or the experience level that the team should have while going through a process like this?

Professor Dmitry Kucharavy: Yeah, this is a real question. This is a real question to organize a forecasting process because there are different ways how it is organized. Sometimes it is given just to the consultant company; consulting company and the forecast is ordered. Sometimes it is organized by initiative of some kind of consortium of the company. Sometimes it is run inside of the company through the participative process.

But in any case, we have a multidisciplinary team who are working for the process of forecasting which include people with different backgrounds. With background not only from technology, technology background but also from economic background, also from social science background for marketing department, for instance, if you organize it and from supply and procurement department of the company, if it is organized.

Around the table, we have at least 6 persons with different expertise. So, and in the plus, we have to have a person who has experienced to run a forecasting process. And so that is why we have a really; for the forecasting one of the problem which is underlined on the process of performing the forecast: how to merge, how to build an integral result from different experiences of different participants of the forecasting, forecasting process.

Unfortunately, there is no simple answer for the question that you asked, Bala. Usually, how do we answer for this question is defined by formulated problem? And formulated problem defined by what kind of strategic decision we have to support? And I do not know did I answer you or not.

Professor Bala Ramadurai: Yes, yes. That did answer my question.

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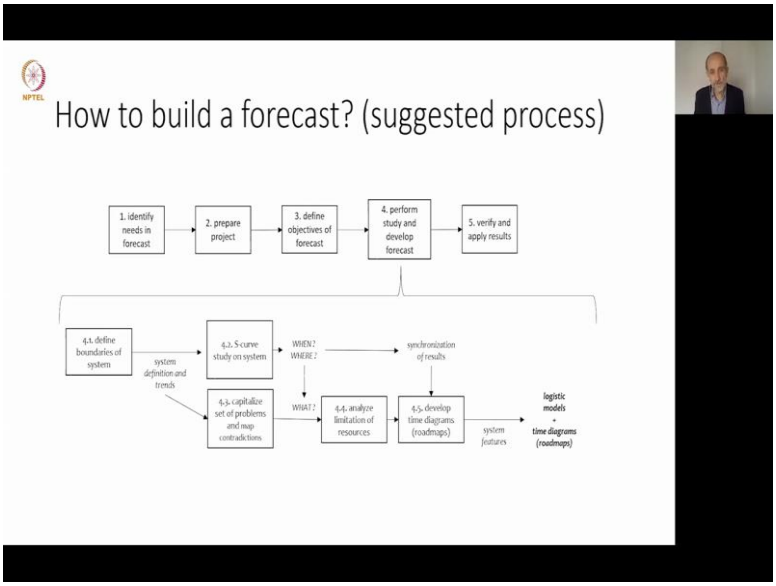

Professor Dmitry Kucharavy: But in fact, if I shift from this generic process to the process that we shared within this course when we introduced the suggested approach, the suggested approach has some similarities and some differences. We start with a definition of the problem viz preparation of the problem, arranging the resources, planning viz purifying and clearly identified the objectives of the study.

But when we start the study, we already use more or less the same models. But sometimes we do not use all of them. It depends how do we define objectives of the forecast. But when we perform the study, we pay attention to define the boundaries of the system. And the boundaries

of the system gives us output about clear definition of system of the level of the function and its key features.

So, we are talking about technology not how it will operate but we are talking about what kind of value technology to bring today. And what kind of value it has to bring tomorrow. We start from this one. And we already use predefined models. We use a logistic S-curve, which is a quite rich family of models for forecasting.

But we do not spend a lot of time by choosing the method which will be used because we are working in context of strategic decision making. And we are using the contradictions model for formalizing our knowledge about problem because the approach that we introduce you within this course is based on the idea that the knowledge about problem is more important than knowledge about solution.

Assume that solution becomes sooner or later obsolete when knowledge about problems will serve much long time. So, that is why in order to predict the technological future, to support strategic decision making, we integrate the results of quantitative analysis using logistic S-curve and results of qualitative analysis using map of contradiction in order to clearly understand what are the limiting resources which prevent which separate us between present and future.

So, on the basis of this knowledge we try to build consistent picture and those picture can be built on different ways. For instance, one of the most welcomed way to present result of forecasting, this is in the shape of time diagram on the shape of technological roadmap. In our case, we built their problem-oriented roadmap. There are different kinds of roadmaps. We have already discussed within our course.

But in our case, the forecasting using suggested approach is useful in order to build problem-oriented roadmaps. So, the synergy of logistic models and time diagrams, according to our experience suggests us the solid and reliable ground in order to answer our question which are critical to be answered within a technology management for supporting strategic decision making, which technology we need to invest in or which technology we need to step out in a in a coming future.

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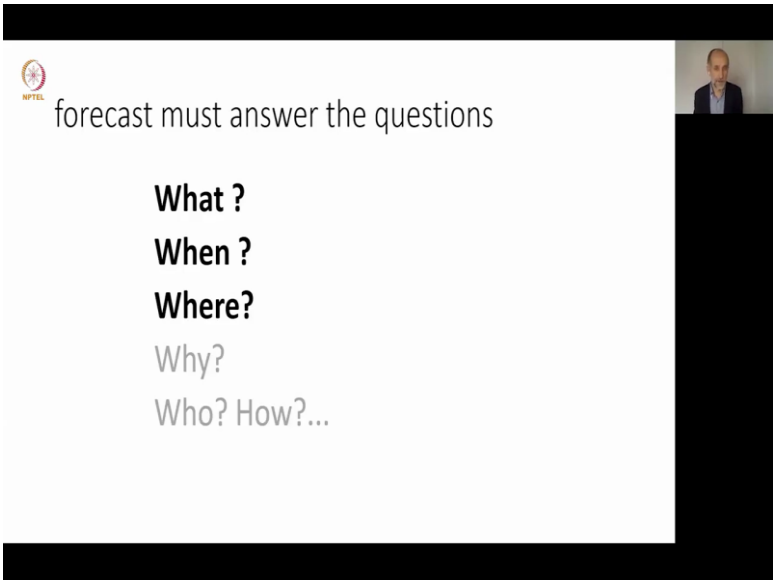

In fact, whatever, whatever you are going to build your forecast, I am going to build it in the shape of a roadmap. You are going to build it in the shape of a simple set of features of future technology. You are going to build it any kind of diagram. Those representations should answer the 3 most relevant questions: “What will happen?” “When it will happen?” and “Where it will happen?”

Where it means on which market or in which, in which place? Of course, when we look at these 3 questions, inevitably we arrive to the question: “Why it will happen?” But not always in the mode of forecast we are capable to answer for this question. And what can happen? Really, that our answer for why today, in the future will be will be different.

But the 3 first question, what, when and where, they have to be answered inevitably because if we answer just one question ‘what’ it will be not a forecast, really. It will be just vision about some changes on the technology. “What? When? And Where?”, those 3 questions helps us to support our strategic decision making.

Of course, from practical point of view, we are interested about question: “How?” and “Who?” is going to do things and many other questions can be answered. Once again it depends how do we define the problem, the problem? How do we define the question to be answered? In fact, if we compare the strategic decision making in different companies, different companies, even they work in the same domain of technology, they will ask different kinds of output as a forecast.

Because they; to support the strategic decision making, it depends also also on the process how the strategic decisions are made at different companies, at different institution by or if you are talking about the governments for the policymaker. So, we need to answer the question. Forecast. From forecasting process is to extract the answer for this question and present it clearly.

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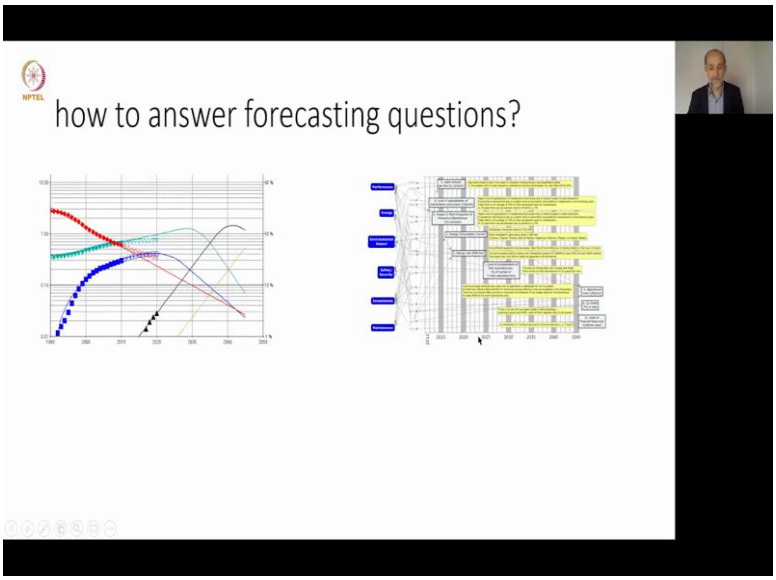

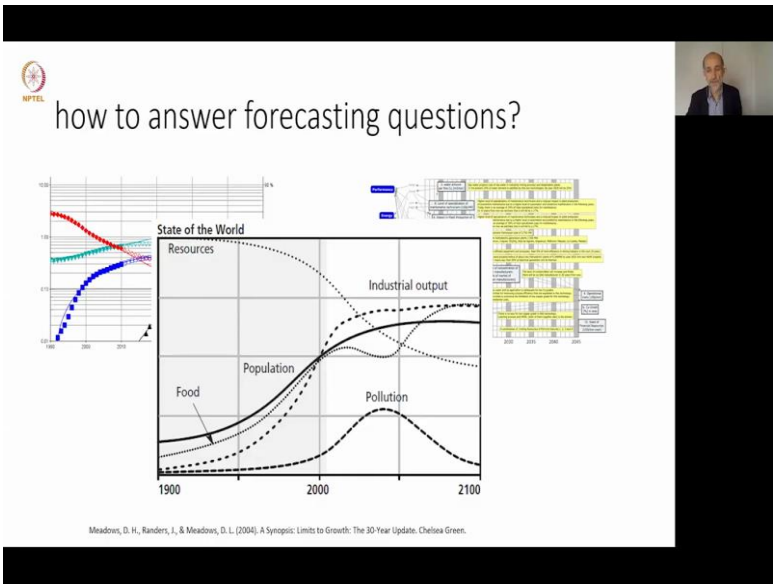

If you look for instance to the practice in the projects that we run with the companies, in most of the cases, the companies are well satisfied when we present the well-coordinated conclusion out of numerical models like logistic substitution model, for instance. Here we can see how technology will substitute each other within a time on the particular market.

So, we can answer the question when and where. And then the roadmap, the roadmap of technology when we can connect this qualitative, this qualitative analysis with this quantitive part because on the roadmap, we can answer the question, what are the gap between present and future and how these gap has to be fulfilled.

Of course, it can be it can be answered differently. For instance, if I took the results of forecasting using models which were done more than 50 years ago, we can we can have just a simple graph which will clear represent what is a present situation and show us how different characteristic will change in the future.

For instance, here, we can see a result of one of the models about industrial outputs, resources, food changes and pollution changes for industrial civilization that we are experiencing now. So, it is up to team, working team who are performing, technology forecasting process, how it will be presented.

The forecast once again, I would like to just to repeat this idea that I already shared with you, the forecast has clearly answer for the question what technology substitution will happen, when and where in order to support, in order to support the strategic decision about emerging technologies. Thank you, thank you very much for this part. If you have a question, we will be glad to answer them within our webinar or later on my exchange.

Professor Bala Ramadurai: Sure, yes, I have question Dimitri, so as always. The quick question I have is regarding the limiting resources. This is something that we have not covered in in our course in detail. We have mentioned it in past modules but not in the detail that I know when we discussed we did go about it in detail.

So, what would be your suggestion, if somebody is interested in highlighting the limiting; first of all, finding out the resources and then finding out which are the ones which are limiting resources so that they can relate and define?

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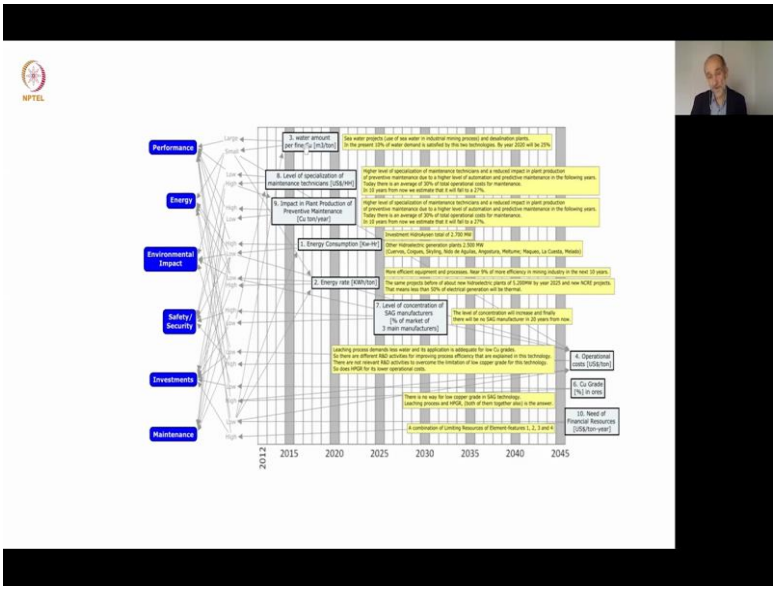

Professor Dmitry Kucharavy: Yeah, in fact, in mode of suggested approach, the story about limited resources is clarified when we map the contradictions. Because behind of each problem, the main the chief reason of each problem that we are limited by some resources. In fact, the question to answer which resources we are limited within time of lifetime of technology is not so easy question to answer.

Because the limited resources in within a time in dynamics they are changing. In one time we are limited by available fuel for instance for our engine. In other time, we are limited by pollution and the third time we can limited just because we have no space anymore. And how in a time it is changing, can be clarified when we study our contradictions. And when we put contradictions into the map of contradictions, and in this case, we can see what are the limited resources in different time of evolution of our system.

I suppose the clear answer, the practical answer for this question how to know limited resources we can build together within next course with that we believe to suggest when you will make practice; when you will make practice. Because for the technologies, the main categories of resources that we are limited, we are limited by energy, we are limited by material, we are limited by available space, we are limited about available time.

But also, also we are limited by knowledge. How to satisfy our needs using technological way? We are limited about data, about information also. How to be more precise and more specific

with each group of these resources? We can look through the through the practice when we make assessment of our problems and formulate them as contradictions. Great, thank you.

Professor Bala Ramadurai: One last question, I suppose this is the last question of our entire course itself; at least of the recording, is you have worked with many companies in the past, consulted with many of them, you applied them, you have helped them look at what, how they can apply this. So, one really important example I remember of a company using it and using it very well is IBM.

Are there any other important ones that our learners can sort of say, "Oh, they have also use it. That is, that is nice!" So, do you recall some from your own experience?

Professor Dmitry Kucharavy: Yeah. In my case, I used, in both of my courses some examples from IBM. But unfortunately, I had no chance to work IBM with those people. But with the companies that we worked each time the end of the forecasting process, the output has been presented differently. And this is a one of the interesting lessons to withdraw from the practice because each specific company needs different kind of information at the end.

But what is important to understand that their forecast by itself is not so much important as a process of forecasting. The main output comes from the forecasting process when people are learning about knowledge, about the futures. And when we notice this within our projects, it was kind of interesting result because sometimes the stakeholders on the companies, they said that: "Okay! We do not, we are not clear.

It is not clear how your forecast is reliable but what we are happy to see that our specialist shift from national to international level within a time of project. We know that it takes usually longer time and we were happy to see that it happens within the product." I would like us to underline once again that from the beginner's point of view, the most interesting thing, what is at the end.

And what our diagrams are showing to us and what are pictures shown to us. But from practitioners' point of view, the most valuable result what people learned within a forecasting process. Because in this case, they can use obtained model in order to take decision and in order to correct decision according to the changes, changes of the situation. This is I would like to, to make clear as a result of the forecast.

Professor Bala Ramadurai: Thank you so much. I one one last comment, a quote that I remember you sharing with me is: “Those who know, do not forecast. Those who forecast, do not know.” So, for me that sums up what we are doing in forecasting itself which is what you said also. Thank you so much.

Professor Dmitry Kucharavy: Yeah, this is very old wisdom which counts more than 5000 years ago.

Professor Bala Ramadurai: Wow!

Professor Dmitry Kucharavy: Yeah. Okay, thank you.

Professor Bala Ramadurai: Okay, thank you so much. Yeah. See you. See you next time.