Technology Forecasting For Strategic Decision Making – An Introduction

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Maps of Contradiction for Forecasting

Professor Dmitry Kucharavy: Welcome back to our course strategic forecasting and supporting strategic decision making. Now we are going to discuss about a map of contradiction for forecasting. We already shown how those map can be constructed and now we are going to discuss how those maps can be used.

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Whether we're going to to treat, we are going to see our map of contradiction, we are going to see how we can build out of map of contradiction technological roadmaps, and how we can use them for strategic decision making and for strategic planning.

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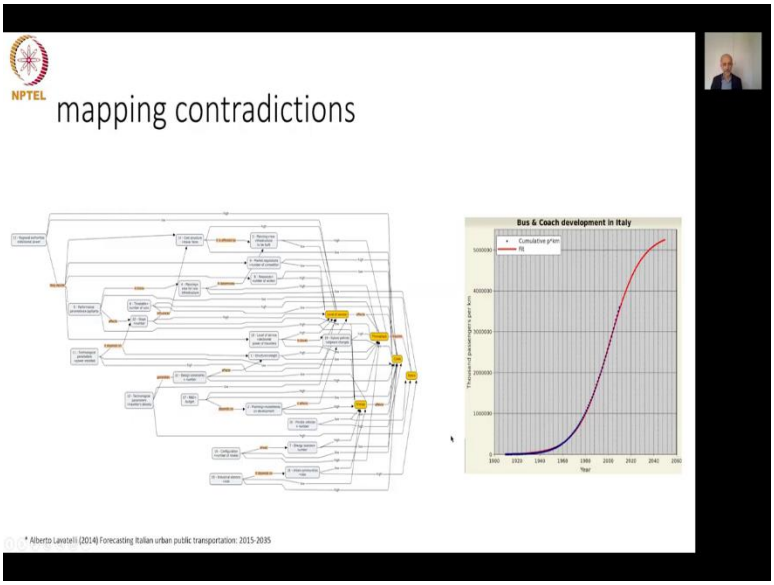

And do you remember we discussed already about the map of contradiction for public transportation system? In fact, when we mapping contradiction we do it in order to use together with results of a quantitative study about growth and evolution of our system. For instance, if I use as an example the evolution of public transportation in Italy, I use always the question, the roadmap in order to clarify the question what will be the next public transportation technology?

But I also have to take into account what are their tendency of growing in this particular case, this is a passengers per kilometers, 1000 passengers just per kilometers, by particular transportation means in particular region within a time. So, in fact the mapping of contradiction helps us to clarify the question what through the describing, what kind of problems have to be addressed in order to satisfy the tendency that we can observe using logistic curve.

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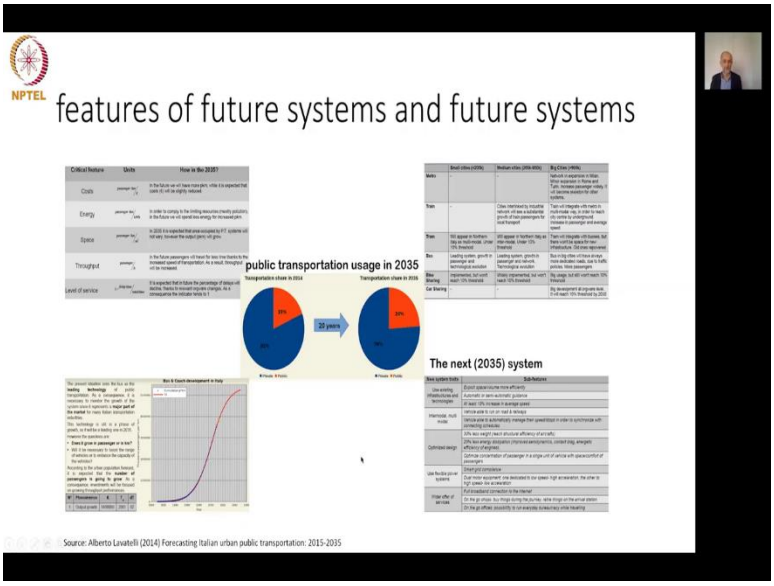

In fact, the map of contradiction allow us to formulate properly and more systematically the list of features of our future system, for instance in this case, in this project, according to the critical indicators it was formulated what in coming future, what will be the value required for these indicators and how we measure them? from another point of view the map of contradictions allow us to specify what kind of transportation means can answer formulated problems because on the map of contradiction we have system of problems in a which size of infrastructure like small cities, medium cities and big cities.

It also allow us to support result of our quantitative study, according to the public transportation in Italy was concluded that the amount of people who are going to use public transportation within a coming future will not be more than half, in fact for the Italy, the quantitative study showed that, most of the people even 20 years later will use private transportation not public one, because in Italy like in most of the European countries we have just few big industrial cities and a lot of small one, which represents most of the population of the country.

The map of contradiction help us to interconnect all those data and information around the problems, in fact we built the problem-based vision about feature, we are more focusing about what problems have to be answered and those knowledge guide us and indicate us direction of the technology. So, it allows us to build a consensus, a competent and consensus conclusion about the next system which will satisfy requirements that we ask from our existing system in the future.

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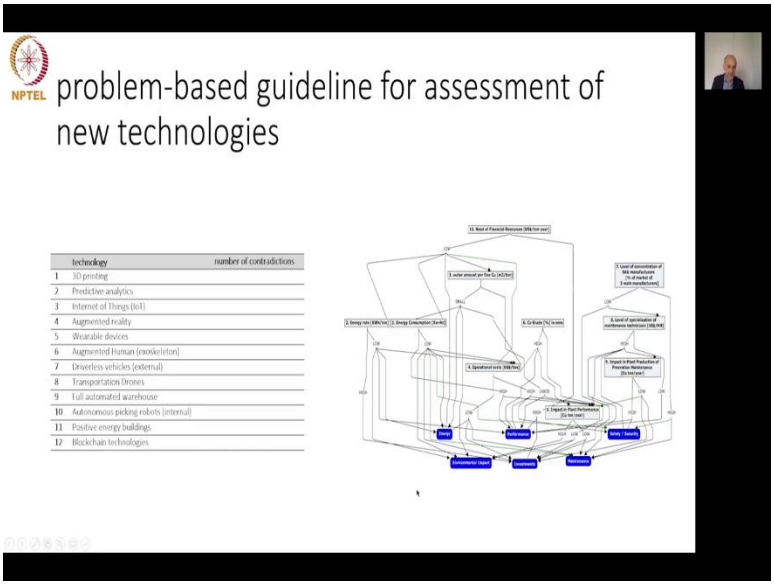

On the basis of the knowledge of problem, we can also make assessment of new technology how it works. Here, I am sharing with you another roadmap which was built for the mining industry for copper mining industry in particular, and if for instance we need to decide are we going to use some of the technology from this list, and this is a list of most discussable technologies today like wearable devices like internet of things augmented reality and so on, how do we decide is it worth to invest into the into the technology or not?

Because when it is discussed it is very popular it it seems so so attractive, so interesting to play with, but how do we decide to invest or not to invest? We look to the our map of problems, map of contradictions and we see how many contradictions from this map we can answer with those technology, out of such assessment we can arrive that even technology looks like very interesting it does not address so many problems on our roadmap, it does not satisfy the requirements that we will have in the future because the contradiction map of map of contradiction, it represent what future technology will satisfy.

This way or another way for lower cost of a higher cost, but it will satisfy. There is no doubt that those problems they have to be answered, so that is why when we for instance make assessment according to the number of contradiction or according to the critical what our criticality of our how the problem is important to be answered, we can see what are the technology works to be implemented, like using some robots or using some driverless vehicles and other things. This is

how can we use our map of contradiction before using it for the road mapping on the level of assessment and of technologies, emerging technologies and on the level of strategic decision invest or step out.

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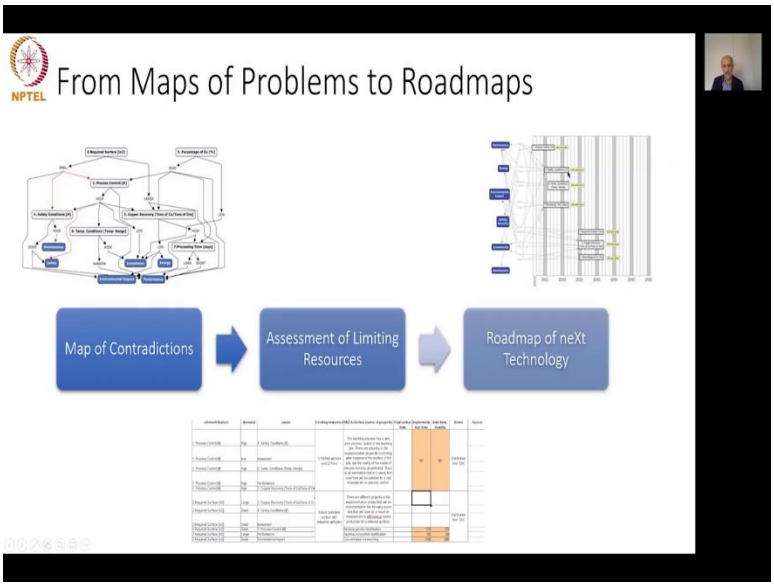

But how can we go from the map of contradictions to the roadmap. When we have a map of contradictions, we can make assessment of limiting resources and one of the most limiting resources, more generic limiting resources, this is a time, the time that we need to answer the questions from our map of contradictions. So, we can arrange the boxes which here are connected just to the critical to x fissures, we can arrange them in a time, that time which is necessary to answer certain problem. On this diagram you can see that the right border of the box corresponds to the our assessment of the time which will be necessary to answer those those problem.

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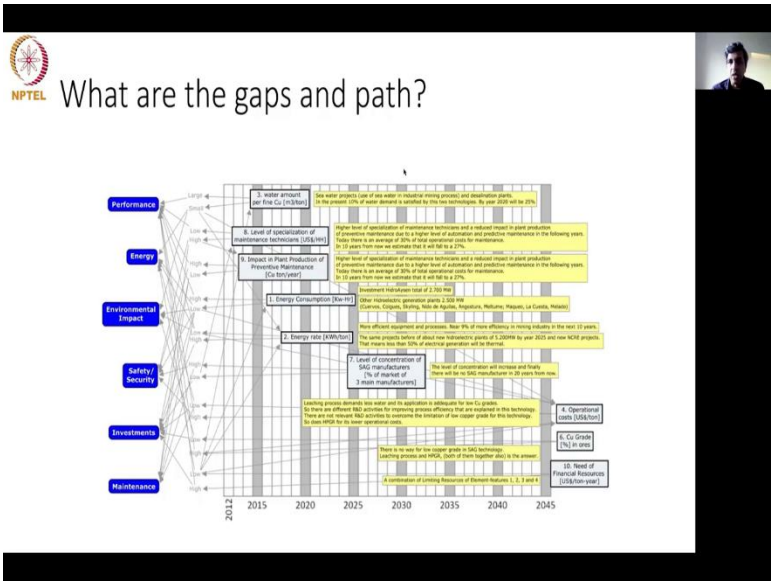

Please allow us to build what can be considered as a problem-based roadmap, because here we have the time and dimension and here we have a interconnection of problems which comes not only from technological context, some of them they come from financial context, someday some of them they come from environmental context, some of them they come from social context. So, in fact we have a kind of roadmap which represents several layers and arranged according to the time x, which help us to monitor.

If for instance energy consumption for the technology that we try to predict the future will be answered before the time that we suppose it has to be answered, we can shift our box and we can see how other boxes which are interconnected with this one will be rearranged by time or we can postpone it. So, in fact what you can see on this slide, this is a kind of road map which use as a source material our map of contradiction that we built as a result of study future. Why those kind of road maps or those kind of map of contradiction are interesting?

Because those are the systematic representation of results of forecasting results of the study, in fact when we are forecasting the future of technology, we try to predict what will impact on the changes, but when we have results we need to find a way how to represent it. And this is a one of the way which are appreciated by company companies and not only companies but research institutions because what happens for instance what had happened within this particular project,

we identified several problems which were no project, science and technology or R & D projects address those three problems.

In fact, those three problems looks like critical to be addressed in order to reach the goal, that we try to reach on the company level and in order to see what will be the future of this technology on the market but not only on the product line. Thank you, thank you very much for this part. Do you have any questions?

Professor Bala Ramadurai: One one question I have is regarding this chart itself, how do we arrive at the best estimate of the time, is it through intuition, discussion or research on the internet, how do we, how do we make sure or convince ourselves that, yes, this is the best possible time that this problem could possibly be resolved?

Professor Dmitry Kucharavy: Thank you, we take when we make assessment of limiting resources, we take a problem from our map of contradiction and we look what are the limited resource, it can be energy, it can be material, it can be knowledge, it can be financial resource and others, what are the limiting resources which cause our problem? And the second we try to identify what are the existing R & D activities all around the world or in European projects or in Asian projects what are the R & D activities that supposed to answer those limiting resources?

And usually when we identify such project each project has duration, this is a exploration time we put our exploration time inside and after a problem can be answered on the level of prototype, we know that the implementation time takes more or less this is exactly expert estimation, how long it will take for implementation, we aggregate this two times and we make judgment about how long time it will take in a total. So, we use this final result in order to put our box properly in on a time dimension, did I answer your question?

Professor Bala Ramadurai: Yes, most certainly you did, yes. So, R & D activities of world over anybody like what you cited in those 4, 6 and 10 in the right-hand side tells us that how important they are and how much of effort is going into resolving this itself. So, my next question is around the resolution of such a problem of any problem actually, is how do we model the effect of I know this this is a snapshot say as of now, but say a year or two years down the line we find that one of them has been resolved, how do we model that effect into this this map, or how do we reconcile

that in the map or how do you find the effect of that resolution? I do not know if I made my question clear.

Professor Dmitry Kucharavy: On this slide you can see the roadmap which was constructed at the end of 2018, almost 10 years ago, and in fact we made according to estimated time we put our boxes, but I assume that our problems they are interconnected, the solution of one problem cause advancement or vice versa, some slowdown of speed of advancement for another problem whatever box we change position on this map the position of other boxes are going to be changed also so that is that is help us to change for instance priority, flexibly in a time.

For instance, on this roadmap, even we see that since 2012 we already have more than about 10 years past we see that the one problem is still not answered, this one becomes critical if those 3 problems are not answered also, we cannot arrive to the satisfaction of future requirements because the contradictions on the map they represent what will be required in the future.

Let me show this through the example about public transportation, for instance if the cost of passengers kilometers divided by Euro in the future will not change so the new transportation system will not satisfy what is required so that is why in this case either we will keep the old one going or either we will need to find absolutely new one which are not even emergent on the time of forecasting, it was my trial to answer, I am really not sure did I satisfy you or not, but I tried.

Professor Bala Ramadurai: No, thank you so much this certainly addressed what I was looking for in, because these are so interrelated one effect could one or even resolution which we think is a will take the technology for, it will act as a driver now suddenly becomes a barrier for another because of the level of connectedness in the system but, this really helps us in even figuring out what kind of connection there are in affecting of one parameter, one contradiction to another one somewhere down the down the line. Thank you so much. I I really understood what how this works.

Professor Dmitry Kucharavy: Very very clearly seen on this map how they interconnected, for instance if you resolve for instance regional authorities' decisional power, it will affect immediately several several problems, you see including level of service, which is our goal or if we for instance resolve the level of service plus decisional power of travelers, it will affect future

policies probably, yeah exactly exactly what you said, thank you for this precision, if there are no other questions let us close this part of our discussion thank you very much.

Professor Bala Ramadurai: Thank you.