Infrastructure Planning and Management
Flexibility and Options on Projects Part-2

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So the key learning is there is because all kinds of uncertainty that happens that all kinds of new things that come in there is this book we have already read a couple of chapters from strategic management of large engineering projects relatively small book by Roger Millar and Donald Lesard wonderful book really they have studied about 65 odd Mega project from across the world oil and gas water, transportation, petroleum and sort of synthesized you know what some of the key risk and what to do right, so certainly anyone interested in project management sort of must read but what they talk about is they say look over a period of time projects could face natural uncertainties.

So it could be climate change it could be earthquakes it could be whatever sea level rise you name it, so there could be natural uncertainties that fundamentally affect that infrastructure, so a coastal may be submerged at some point of sea levels okay it may not be a road at all you might write a contract till 2048 but by 2030 they may be no row, so their natural uncertainties and there all kinds of market and economic uncertainties the demand might go up might come down, so you know I do not know what the future of roads will be since we are taking that example because telecommunication infrastructure is getting better and better will we need to commute as much as we need to I mean even today I can get on a conference call or whatever and not necessarily need to physically meet somebody.

So in the old days you know you had to you know it had to train go to Delhi sit for a meeting come back in to you it might have taken you a two three day sort of effort today I do not even have to go for a meeting I can just sit here I can do my work exactly at the time of the call I can log in for 45 minute and I can come up and going forward with augmented reality virtual reality and all of these may be this just get better may be what happens is 15 20 year is we do not transport at all or the transportation demand reduces considerably because of increase in telecommunication and also ways in which people work at one point work was centralized everyone came to one sort of location today work is by nature decentralized a lot of work happens over email etcetera.

So you have these kinds of possibilities and therefore what will that do to your transportation infrastructure is something to think about maybe the demand for that infrastructure goes down because of all kind of market fluctuations there could be all kind of political risk that infrastructure could face we know all about that industry market are somewhat related, so I want sort of repeat what I said they can also be all kinds of technological uncertainties, so you know Harsh was pointing out that our technologies could change again to take the road example you know how far are we do we think of actually developing you know vehicles that do not necessarily need to go on the ground.

But can actually hover is some sort of height in the air because essentially what are the reasons traffic is congested it is because we are all using the one lane right if we have at some point table to invent device that can actually hover then you actually have air space that you can use and you can be congested today it sound like science fiction but today is technology sounded similar science fiction 30 year ago.

So again I mean will this happen will not happen we do not know but the point is as technology involves there is a chance that what you have today might become redundant, so today maybe we are dependent on thermal power for a lot of the country needs, so we have to build these relatively expensive thermal power plants spend a lot of money on importing coal and so on but also we understand that over a period of time our ability to generate energy from solar is sort of becoming you know far more efficient effective sot-effective all of that right.

So over a period of time we might find that thermal energy does not need to be a source of energy at all but you still build that plant you need to get a return out of it so there is technical uncertainty, so the point it the world does not say this thing stay the same all of this things keep evolving and therefore the project agreement cannot stay the same as well.

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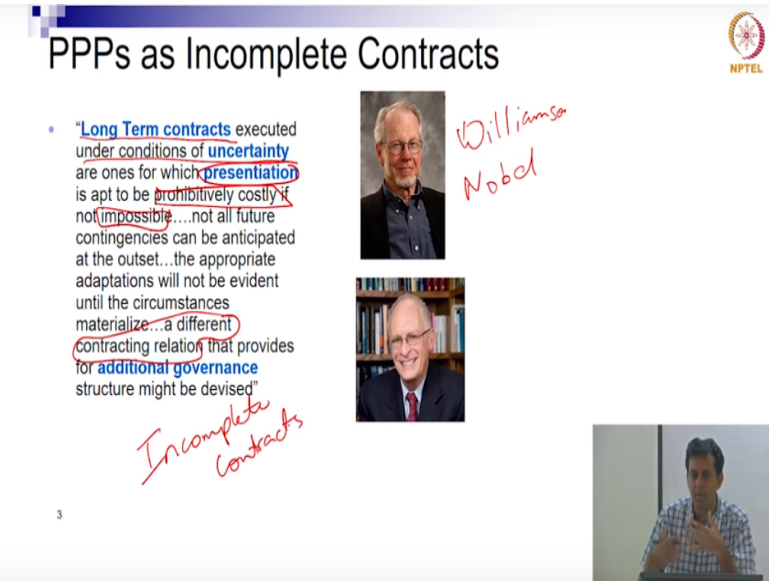

So it needs to keep evolving I do not know if you can recognize these anyone recognize these two gentlemen the one at the top is Professor Oliver Williamson he is a professor of economics at the University of California Berkeley about ten years ago I like to think 2008 but I might wrong by a year or two he won the Nobel Prize in Economics for something called transection cost economics which is sort of a theoretical framework that he developed I mean sort of others had also said similar things but he sort of really augmented that framework and below is professor Oliver Hart who was at cotton and who also does research and in similar areas but.

So this is Williamson from Berkley well, so they said and this is something that I picked out of one of Williamson's papers at strides in inverted commas, so he says long-term contract project our long-term contracts executed under conditions of uncertainty in our projects are executed under conditions of uncertainty are ones for which presentiation which is a word that means the ability to foresee all eventualities in the future is expected to either be prohibitively costly or impossible either not doable over the long term you just cannot foresee all the eventuality because there is so many and they are so uncertain in order to do it is just going to be extremely

expensive and therefore cutting to the chase you a different kind of contracting relationship needs to determined.

So you cannot have these sort oaky I agree that you do this and you agree that I give you this for a 30 year period because the terms and condition of what we are working on might not stay this same, so essentially again he says a lot of uncertainty you cannot have these kinds of rigid contracts you need flexibility, so the moral of the storey thus far is we have and so these are what they call sorry so these are what he calls incomplete contracts which means contracts that where every things is not filled in where things can be change where the contract can be completed later on and essentially incomplete contracts you know therefore our contracts that have some amount of flexibility that you can actually change them.

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So the background behind the first paper that was presented in the paper which I wrote with a colleague of mine Jessica said and who is now at the world resources institute but it used to be an adjunct faculty here the background behind that paper and why this fits in is some time ago the government of India said look we had a bunch of PPP's that we executed at one point you know India was one of the world leaders in terms of the number of PPP's that we are putting on the ground but somehow that has just dried up currently we have poor experiences with PPP's and people are internally government's or the private sector are not really willing to come from.

So they set up committee called the committee for I think revitalization and restructuring of PPP is or whatever the committee was called headed by a very eminent personality called Dr. Vijay Kelkar and the Kelkar committee was ask to essentially go and look at stakeholders across India understand what the issues with PPP were and what the country needed to do to revitalize PPP, so we are to revitalizing to PPP was a mandate of the committee this was few years ago after the Modi government Bureau came into power in the last election.

So the Kelkar committee interviewed a number of people among whom were Mr Krishnan, Mr Venkatesh who was heading at (())(07:41) at the time and myself as well, so and along with a number of other people who they felt had some knowledge on PPP's and one of the things that Jessica and Jessica of course and one of the things Jessica and I volunteered to do is we said look we will sort of I think one of the problem that you are having with PPP's and this is sort just us saying a lot of people were saying it is that your contracts are too rigid at the beginning of the project you guys spell out land acquisition you should be completed construction should start and finish here.

You have 18 year of operation this is sort of the demand that you expect and this is therefore the money that you will get at the end of the 20th year you will hand the concession back I mean you sort of seem to have a very sort of one you know one way of the future and obviously what experience is telling us that rigidity does not work you say it could take a years to do land acquisition it often takes more it you say it take X amount of time to do a construction but often it takes more for whatever reason we think the demand will be like this but it may not be like that sometimes the initial demand itself is wrong but sometimes the initial demand is what you predicted but that growth percentage that you had in 3 years-5 years those do not some to be.

So your contracts are extremely rigid and that is why these problems are running into these projects are running into problems because somebody has sort of they will work with this contract according to the contract they are supposed to make a certain amount of money but in year three or year four the demand for that road dips the tolls connections dip, so now that person is out of pocket they have already paid the money to build the infrastructure they are not able to get the loan to the tolls to repay the loan back.

So you know either they have to go and you know the bank takes over the asset or whatever it is a not a very happy scenario and because of this the private sector again is reluctant to come forward because of this the public sector is also reluctant to offer more of these PPP's and essentially that is what you are seeing today the investor confidence the developer confidence from what our confidence everything sort of come down, so the way to solve this is you have got to be able to put flexibilities into the contract.

So that the contract can readjust and then the question was that logical if you want uncertain if there are uncertainties you will have flexibility, so I mean that is just common sense it is like saying if there is a chance that it may or may not rain you give yourself the flexibility of taking a umbrella with you if it rains you can take does the umbrella if it does not rain and if you have got one of these really nice compact umbrellas that they make today just stuff it in your bags and you know I do not know it is what three hundred grams heavier but not really the end of the day.

The inflexible approach to that problem is to wear your raincoat or it to wear your duck pack raincoat which is heavy enough that you cannot really fold and keep it in and if it rains wonderful you are dry but if it does not rain then you are carrying a five kilogram or whatever I do not know what is raincoats way these days you know something that you cannot really adjust, so this is exactly the trade off, so if you know it is going to rain you are probably better off wearing the raincoat you are probably likely to be drier to be raincoat than with the umbrella.

Because the umbrella will always allow for lateral movement or there will be some driver who will drive by use splash onto a puddle and it splashes onto you so the umbrella is not foolproof the raincoat is, so if you know it is going to rain probably make sense to have a raincoat if you know that the information is not going to change, but if there is uncertainty there is 50 percent chance that is going to rain then you are probably better off taking the flexible solution which is the umbrella.

So it does not have to do infrastructure projects uncertainty inflexibility are just common sense it there is uncertainty you have to have some flexibility but then the question was all of this make sense but for infrastructure what does flexibility mean, so that is why we said okay and this was explain in the presentation there three kinds of flexibility we call them adjustment option and settlements.

So here is the thing and adjustment is something that you pre-program into that contract, where when a certain trigger exist the contract automatically changes very simple example that we see in construction contracts is something that we call a prices escalation clause so you and I agree when we wrote the contract that you know the price of steel is you know X and so this is the rate for steel you have so many kilograms of steel that you need to use on this project.

So this rate multiplied by this quantity is your cost that I am willing to pay but after we assign the contract the prices of steel goes up because the prices of steel can go up because of all kinds of dynamic, so contracts often have what they call a price escalation clause where they say you know up to less certain you know bad normally 10 percent if the prices of steel goes up by three four percent automatically the contract will readjust you do not have to say anything.

I do not have to say anything automatically the contract readjust and the amount of money that I should get paid will automatically go up that is an adjustability it is a flexibility I am not cutting ourselves down to one prices and then suddenly one of us gains and one of us losses if the price goes down or the price goes up I am allowing for some kind of flexible, so that is an adjustability.

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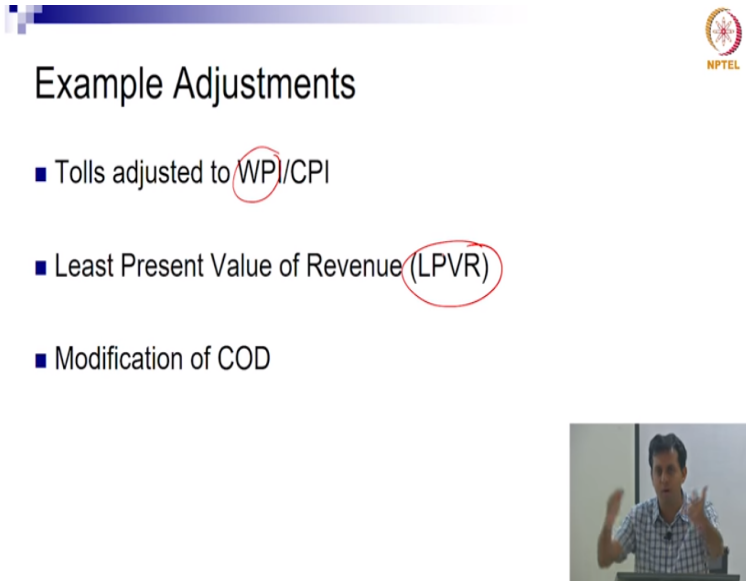

So these are some example so today when you look at what is told to be charged if you go on a toll road you will probably paying 45 rupees if you go buy a car 25 rupees if you take a bike whatever every six months this tolls get adjust they get adjusted base on inflation.

Inflation is calculated based on thing like the whole sale price index, so the wholesale price index will tell you what inflation is at the current time if inflation has if prices have inflated since the last time tolls will automatically inflate so after these correction you might have been paying 45 rupees the last time you may now suddenly be paying 50 rupees it is not something that that we discuss or negotiate it is pre-programmed in that into the contract and an adjustment automatically takes place.

What is the logic the logic is that if inflation increases the costs of material are going to increase your cost of maintenance is going to increase and therefore you deserve to collect more coal but rather handling over how much toll should I collect we have a formula the formula kicks it this is a very interesting one that they have used quite a bit in Latin America it is called the least present value of revenue contract and this is simply how it works sort of says all of you are bidding for my project alright what we are going to do is you are going to tell me what your expected revenue stream is over the course of this product project.

So you tell me so I and what your expected cost stream is as well, so you might say you know my construction wing things that it will cost me 300 crores to build this I expect these kind of revenues to come in over the next 20 years somebody else might say I expect might this

construction to take 280 crores I am a little bit more efficient with construction and I expect this kind of a cash flow with regards to revenue each of us submit a cash flow statement right this are my expenses and revenue from year one to 20 right we all agree that we do it for 20 I supply a discount rate 12 percent right I take each of your cash flows and I discounted by 12 percent and I arrive at what I feel is a net present value that you expect to gain out of this project all.

So all you are doing is just some sending me your cash flow I am doing the discounting using the same discount rate for all of you and I am saying for you the net present value comes 200 crores for you the net present value is 120 crores for you the net present value if 150 crore whatever right so o look at the person who is making the least present value or the person who is profiting the least from the project and I say you are the person who is most responsibly using public money because you are trying to profit the least right.

So you take the project alright so I have given you the project under an assumption that you will make a hundred crores of net present value of revenue now although we said 20 year I do not actually hold you to 20years I hold you to when you will make 100 crores of net present value of revenue so every year you tell me how much you have collected and what your expenses are and every year I will mark at the end of the year what is your net present value obviously in the first couple of years you will collect very little revenue you would have spent money building the project.

So you net present value will be negative right then slowly your net present value starts becoming positive because every succeeding year you start collecting from money from toll user you only have maintenance which is possibly hopefully less than what you are collecting, so your net present value keeps increasing right we keep going until you hit the 100 crores right if it turns out the traffic is far higher than expected maybe you will hit your 100 crore in year 16 or year 17 at which point at that point.

I stop the concession I take the road back and you leave and you got your 100 crores it could be that traffic is not as you know as expected and therefore after 20 years your net present value of revenue was only about 80 crores in which case I allow you to continue to operate the project, so you get to about 100 crores that normally I mean I can even define a bad I can say look I can

reduce 5 year I can go up to 5 year but you know whatever I mean you can do it indefinitely you can have a bad.

But what this does is that the contract duration automatically readjust you are not saying anything I am not saying anything automatically the contract duration adds a year on to it if demand was not expected, so today what is the problem many of these road right the demand is not as per expectations but still I have to give the road back after 20 years, so I am going to end up with a loss on the return that I am expected but am I still make some kind of a profit but it might be a lower profit than I expect right.

So in order to sort of guard against that we have this thing that says let us dynamically extend the contract but the extension is not a negotiation we are not horse trading give me two more years I will give you one more year none of that we automatically extend by one more year if you have not met that target we automatically extend the moment you meet that target whichever year it is 17 19 20 21 22 the contract gets cut.

So again the contract is flexible it accommodates scenarios where demand might be better scenarios where demand might be worse and allows people allows the private developer in this case to make a reasonable return you guys get the LPVR idea so that is another adjustability in other word adjust abilities are changes that happen automatically on projects the commercial operation date sometimes is inked in right to the beginning of the project and the because of land operation land acquisition delays your construction happens much later and your commercial operation date is much later.

So rather than fixing the commercial operation date right one could just say that commercial operation date is 18 months from the date at which land acquisition finishes, so irrespective when land acquisition finishes automatically a you know a COD a commercial operation date is set, so again the contract automatically adjust, so adjustability are automatic you they are if then clauses that you put into the contract if this happens then that happens and that is neither the government nor the private sector can say anything about it.

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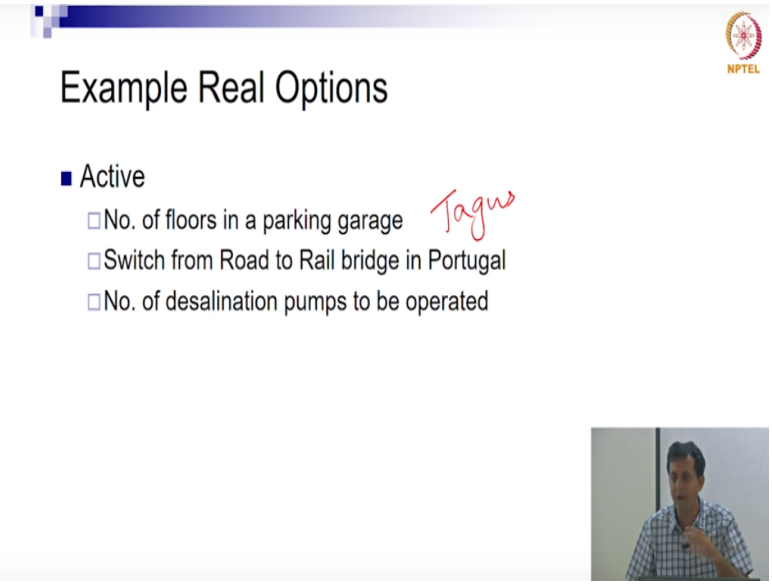

Real options are a bit different who understands what a financial option is in the world of finance someone quickly explain to me what a financial Harsh yeah correct so yeah so essentially the logic is this I buy a share of I do not know some stock of company X I buy it at 60 rupees now if the price goes up tomorrow to 65 great I can sell it I can make I profit but my worry is that the prices might go down to 55 in which case I make a loss.

So what I can do is I can buy an option to sell it at 60 tomorrow it might cost me one rupee to buy that option we would not talked about who gives you that option all of that, now if it goes up to 65 tomorrow I do not exercises this option at all I sell it at 65 if it goes down to 55 tomorrow I exercise my option and I sell it at 60 right, so if it goes up to 65, so either way I have spent one rupees buying that option if it goes up to 65 made a five rupee profit one rupee I paid for the option which is now wasted four rupees I have made my profit if it goes down to 55 I sell it at sixty.

So I made no profit no loss but I paid that one rupee to the option so I am actually what so like it could have been five minus five I have now made it plus four minus one, so I have slightly curtailed the upside but I have really curtailed the downside so it is the, so that is what we call an option of financial option that kinds of there is what we call a put option a call option whether on whether you are buying an option whether you are looking at an option so sell a stock or an option to buy stock right you might have the same option to buy a stock.

So and option is defined as a right but not the obligation to exercise something so in by buying that option you have the right to say I will sell it at 60 but you do not have obligation to sell it at 60 it people want to buy it at 65 you sell it at 65, so real option are the use of that strategy in the real world financial option are in the world of finance real options are in the real world, so let us say look at some real option.

So again there was this example I do not know which of you who talked about it was the parking garage now if you looked at the if you listened to the parking garage storey it is very similar to the stock store, so what is the problem the problem is I want to build a parking garage today I have demand for three storey's for sure demand might go up for six storey, so I can build six storey parking garage today I can spend all that but there is a chance that demand might not take up in which case I wasted money all or what I can do is I can build three storey today but strengthen my foundations and my columns to be able to six storey later thereby I am giving myself the option to build up to six storey and there is no automatic trigger point that says okay go up to six storey I noe make a decision.

I look at cars coming in and I find that you know every day there are many cars parked on the street there for my parking garage need to go up and I go up one storey or I find that the number cars being parks in the street and increasing so quickly that I say let me go up three storeys, so I know have a lot of flexibility but it is not my choice do I stay at three go from 3 to 4, 3 to 5, 3 to 4, 4 to 4, 3 to 6 I mean there are number permutation combinations.

So that is an option again there is a cost to that option the cost was strengthening the foundation so I paid a bit extra if demand did not go up the I have lost little bit but I probably lost less than if I build all six floor and similarly when the traffic picks up obviously it is a bit more expensive to build three now and three later because I have to remobilize formwork scaffolding etcetera if I had done it then and there I would have a gotten some sort of benefit, so going from three to six is a little bit more expensive than going zero to six directly but I am able to time it better I am able to minimize my downside all and therefore that is what we call a real option.

So it gives me strengthening that foundation gives me the right but not the obligation, so it could have been that I have never use that option, so that is the parking garage there is this sort of famous bridge in Portugal called the it is a bridge over the river Tagus, so again they decide this

for road traffic but the always shad a feeling that road traffic may not really pick up or after a while you know road traffic may not really provide you know revenues and therefore they actually strengthened it to be able to take rail traffic and at some point in the middle.

When the concessionaire found that the road traffic was not really increasing to the level expected and they were not getting enough revenues they actually change that bridge from a road bridge to a rail bridge, so excited they re-engineered the bridge they actually build the piers and o on such that essentially they could do that very easily and started running freight on it and all of that freight was of course paying for the use of that bridge and freight traffic growth much higher and as a result of which right the project was actually in good shape because if they had only been a road bridge the guy would have lost money because demand was not picking up.

So again that is an option there is no obligation unlike in the adjustment where if inflation increase your toll rate increase there is no decision made here there is a decision option is given to somebody that person needs to exercise that option and they can exercise it whenever they choose to based on whatever parameters they are thinking about, so in our desalination plants for instance we have these desalination pimps so you can have a large number of desalination you know pumps that pump in water into the desalination plant and depending on the requirement of water you can operate more or less pump.

So there is no need for you constantly produce 100 MLD of water a day if right after the monsoon season there is enough water and people are not really looking for desalinated water whereas if you design a system that has to produce 10 MLD a day then you get to this situation what do I do with all this excess water it whereas if you design it in a modular fashion it gives you the option of saying let me produce 50 MLD for a while then when ground water gets used or whatever let us start ramping up production but again it is not automatic I design, so that is what an option is so you can put in option or infrastructure.

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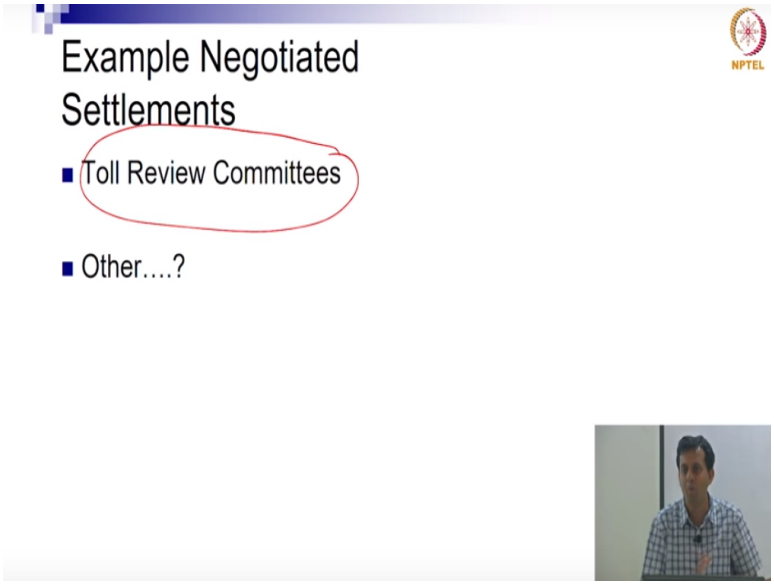

Active option passive option we would not get into that and then the third, so the first is adjustments contract automatically adjust second is options it does not happen automatically somebody switch the option on but once they switch the option on exactly what will happen is data so if I go to any of these so once I switch the option on I go from three to four stories or I go from a rail bridge to a road bridge I can decide when to switch it on but what happens when I switch it on is pre data okay and then the third part of a flexibility is to look not only do you not decide you know when to switch it on you also do no decide.

What happens when you switch it on and so you have these things like toll review committee they essentially are presentation but the Kelkar committee was to say you need flexibility on project and flexibility is need to be of these three type you have time you could have some adjustability switch automatically kick in you have some real option that you give to various people on the project some could be vested with the government some could be vested with the private operator let them exercise those option if the prevailing scenario turns out to be different from the anticipated scenario and then there are set of flexibility where look we cannot even anticipate.

We need to sort of have way of bringing people back to the drawing board at redrafting the contract was essentially the submission to the kelkar committee and of course their response review you can go either the committee's reporters online and you will find that you know me

being acknowledged in the first page and all of that but the key things is you have got to turn to page I do not know 137 or whatever where it essentially sort of say that even though you know Ashwin and Jessica or said Anne and Mahalo or whatever they say the problem with flexibility is that.

How do you know that the flexibility is being used wisely you know for instance if we say this least present value of revenue the lesser revenue you are making the contract will extend how to you know this crooked guy he is not giving you know Dr. estimates of traffic maybe he is making X amount of money but he is showing only 50 percent he is collecting in cash he is not giving receipt etcetera so how do you sort of monitor that.

So every time you put in a flexibility it has to be used wisely we have to have trustworthy people to use it otherwise this guys is nicely milking sort of a cash cow but representing that it has lover cash flow revenue he is getting more and more time to continue to milk it, so how do you govern all of then what is the mechanism in today in India be ready for all this so this is sort of a debate going on.

So essentially therefore the question then becomes how do we convince them because not being able to put in flexibility does not seem to be a smart option projects need to be flexible al right so you cannot sort of say because there are concerns with corruption let us go back to rigid inflexible contracts because we know that they do not work.

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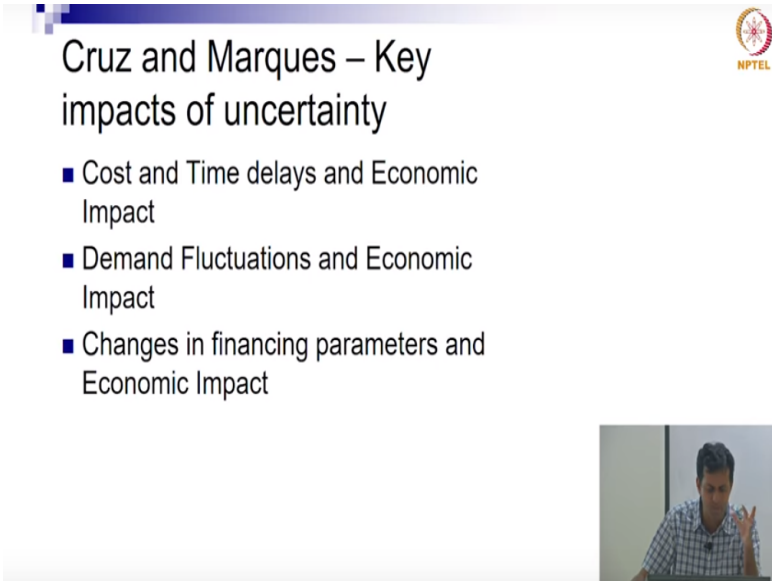

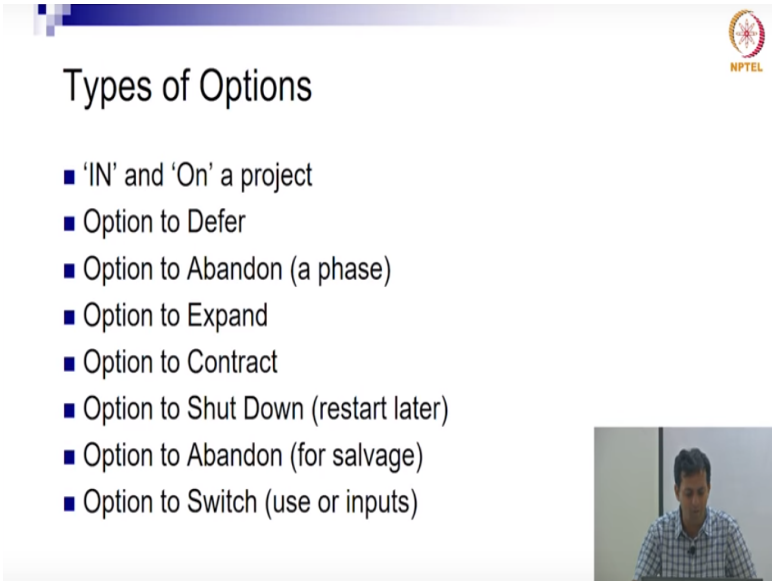

So how do we sort of convince them and that is where in fact Carlos cruz was here at IIT Madras about six months ago some of you have, so Carlos talks about well some of this is similar and he has you know all of these sort of kind s of option that you can have on project you can option to expand the scope option expanding is the going from three stories to six option to contract, so going from 100 MLD desalination to 50 option to abandon option to differ investment by the Enron power plant also had an option built in remember they did not build all 200 Megawatts up front they built it in phases etcetera, so that giving themselves option as the demand you know grows it so he talked about all of these etcetera classification.

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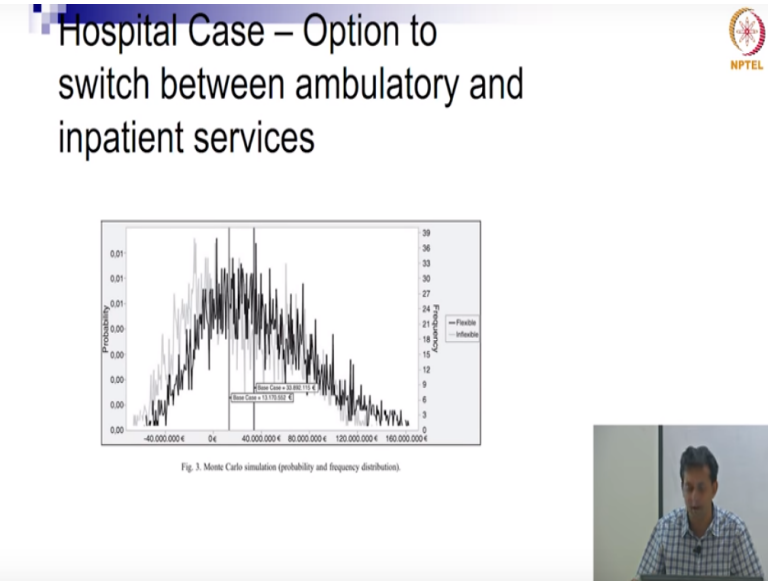

But what he does is he shows this methodology where you can actually value the benefit of an option you can actually have scenarios and using those scenarios you could see what happens in the inflexible case and what happens in the flexible scenario and show that you are likely to get more benefits in the flexible scenario that the inflexible scenario and all of this works because of a fundamental principle that is called the flow of averages, so the flow of averages like this, so a canonical example and again this is part of Richard Annoy Phil's book.

Let us say you have a hotel, you have a hotel with a hundred rooms you expect 75 people 75 rooms to be occupied at a certain point of time but that is an expectation it can go up it can go down and let us say that is just a mean of a normal distribution, so let us say it could go up by 50 percent it could go down by 50 percent it goes down by 50 percent what happens to your revenue it increases but how much, so instead of 75 rooms you get 37 rooms it is go down by half what do you expect to happen to your revenues decrease by half right I mean half the people are going to come and pay.

So the revenue go down by half your the number of people wanting rooms goes up by 50 percent what is going to happen to your revenues where does it remain the same but remember you have a cap of 100 rooms, so it cannot ever go beyond below 100 so the point is even though the distribution is symmetrical on both side the return are not symmetrical on both side so this sort of

a fundamental principle which we can call the flow of averages etcetera the reason that sort of applies here is it sort of say look there are certain scenario.

So if you know if you had N number of scenario half of which were this side of the mean half of which that side of the mean you are average them you will get the mean but the thing is you do not have scenarios that are exactly going to be you know mirror images of each other and very often you will end up with if you do sort of a probability distribution you might end up with more just like in the hotel case you might lose money but you may now end up in the downside you may not gain as much in the upside.

So we have as inflexible contract every time you have a downward scenario you lose money every time you have an upward storey you do not necessarily gain back that money and therefore overall your expected net present value is a little bit lover the expected on the other hand if you had a flexible sort of scenario whereby for instance you could expand the hotel from 75 rooms based on demand etcetera then you are although the cost are higher and we have talked about the cost of expansion being higher your ability to service larger amounts of demand might actually exist.

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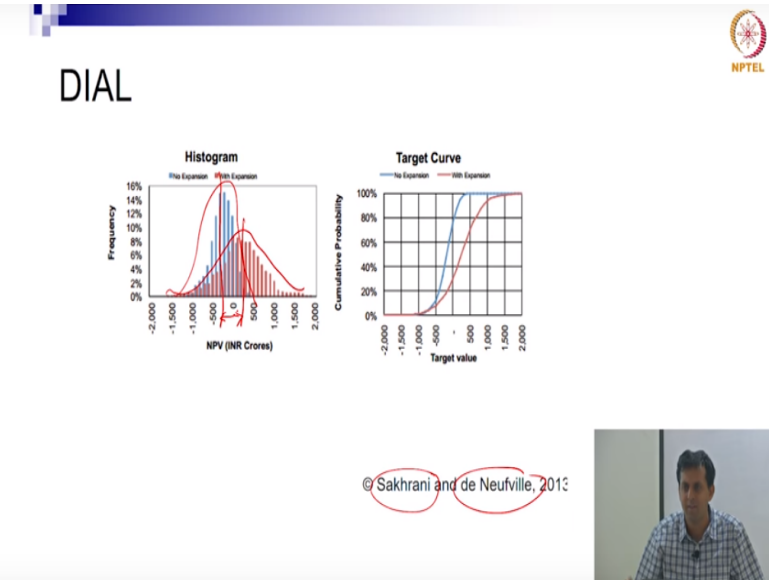

So this is essentially what he is tried to do here and this is a very similar exercise that Rechard De Neufville and Vivek Sakrani who is a PhD student at MIT did on the Delhi airport and they said Delhi airport you have two option you have to build the whole airport the huge airport that

you see right now or you build a smaller airport and then you expand when the time is right so do you need 85 gates today probably not will you need 85 gates 30 years from now possibly but why build all 85 gates now why do not you build 40 or 50 or whatever and then depending on when you need to expand you expect.

So they build one financial model which said 85 gets and they had some revenue distribute I mean some football number of people would come number of airplanes therefore number of gates that you need etcetera and they had sort of all kinds of the sample distributions etcetera and they came up with this red so they came up with this and as you can see the net present value is a little bit on the left of zero in other words you are likely to lose money as a result of this.

So then they said but scenario two is you initially build only a small number of gates and the if three successive years and remember your sampling probability distribution but for three successive years if your demand increase a is it exceeds a certain threshold or something like that then and only then expand and your cost of expel expansion excuse me sis a little bit higher but expand later so you are expanding only when your demand is being met right.

So all the cases where you wastefully build the infrastructure have been eliminated you are only looking at their cases where you are actually building infrastructure to cater to the needs and therefore your cost is always being offset by some revenue yes your cost are a bit higher but they are always being offset by some revenue then when you do that analysis and we look in the class at how we do that look at where this finishes the mean is they are a little bit on the positive side of zero.

So this is sort of a methodology that sort of says, let us model flexibility model inflexibility, let us randomly look at what are demand scenarios over 30 years, let us randomly sample you now Monte Carlo simulation essentially means two thousand of random samples run your analysis and average and all of that and oftentimes you will find that the inflexible scenario perform far more poorly than the flexible scenario.

And so these are now techniques that I think we need to use to convince people that flexibility has value I mean that is the fundamental takeaway here is that while people are afraid that flexibility can be misused the point there is that flexibility can add value because you can time your extra investment in this case to match myth when you are getting demand and as a result of

which the return on your project are likely to be much high you do not need to get into cases at the end where you are saying extend contract period and exit.

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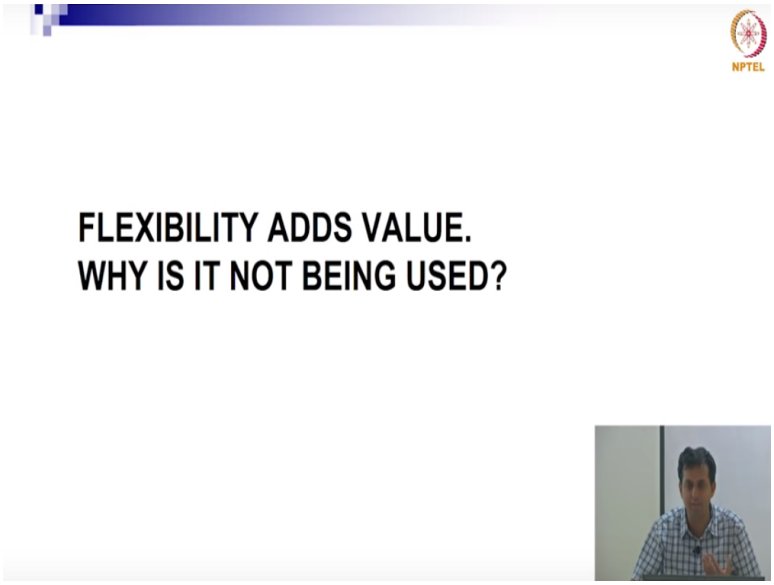

So that is this thing so flexibility adds value it is this coming through you guys are convinced flexibility adds value and again you will be when we do it on excel you can actually see it for yourself yeah.

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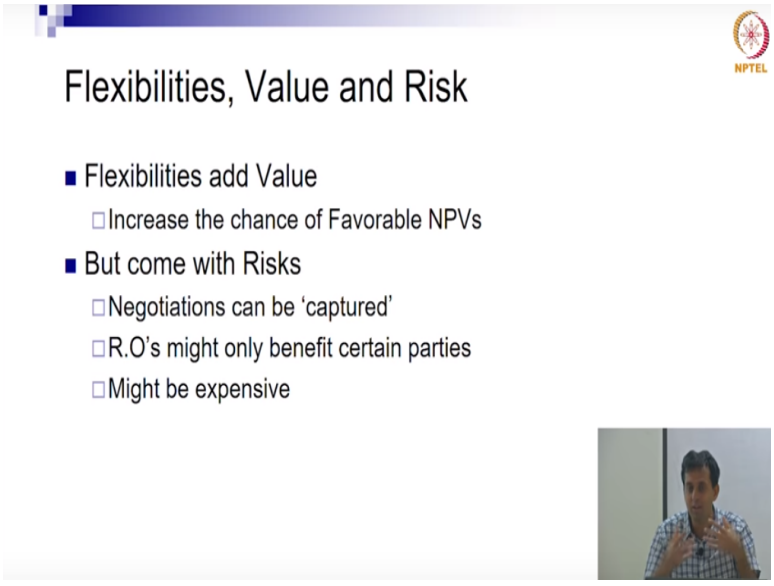

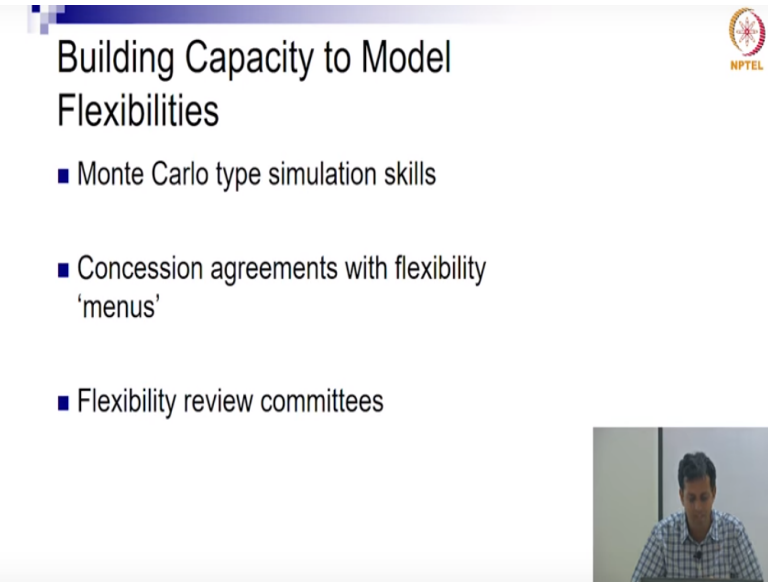

So flexibility is add value but they come with risk negotiation can always be captured, so I can say let us have a told review committee but who knows who is influencing that committee remember the case of the Chad Cameroon pipeline where there was a committee looking at the environmental management plan seven out of the nine people were part of Indris Debbie's cabinet, so yeah I mean you can have processes but who know whether they will be captured or not all of that.

So I mean these are the some of the challenges Monte Carlo type simulation skills we will talked about this going forward nut maybe the fundamental thing is I think we need to realize that in the past we have had rigid contract rigid project arrangement which always run into trouble because over a 30 years period things will change whether it is natural political technological market industry whatever it is the only way out of it is if you have flexibility and we need to plan for flexibility in the convent you are designing the contract you have got to say here are the eventualities that I can foresee and therefore I want to out in these kinds of adjustability these kinds of option and these kinds of negotiated settlement or whatnot.

So this whole process need to be thought through in the planning phase, so you develop a contract with flexibility in it which can then last the test of time and by the way this is not new stuff you see enough papers here I have not done adequate research on this but one of the area where there is a lot of uncertainty is an oil exploration clearly because you do not know if there

is oil or not and we have already seen a couple of case studies, so I am told that the Norwegian oil industry in the Black sea whatever the Baltic sea.

So the Baltic sea not the black sea so anyway up there up north oil exploration contracts I have apparently a lot of flexibility is built into them because everyone realize the uncertainty not only the geological uncertainty but also uncertainty is with regard to regulation suddenly things are possible things are not possible these are areas that you can go in and explore oil these are areas that you cannot you know market change the kinds of shipping trawlers or all of that changes.

So much changes that happen in that industry there is so much uncertainty that they have apparently evolved what we call hierarchical contracts and there was an academic (())(37:12) who are on with Carol Rymer wrote this book on hierarchical contracts and oil exploration in the you know is sort of Norwegian offshore oil exploration so these are ideas that have been there in certain industries question is how do we bring them to infrastructure because that is one way of solving this problem of I expected X I am getting Y now I need to abandon the project if you can reset the project then that could help make a lot.