Project Management
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Module No # 1
**Lecture No # 06**
Project Stakeholders and Risk Management

Hello and welcome back to all my students who are taking this course in project management see we have completed five lectures of half an hours each which is almost one week of classes and I am sure considering the different books I have suggested in the second slide of the first class. My students and people who are interested in taking this course have started reading course and for any queries as you know NPTEL has its own forum.

And they would be TA's and obviously I would be there to answer queries which are ever are being raised by the set of students who are doing this course. So in this is the sixth class for the second week second week first class which is the sixth lecture. So as I discussed so basically the idea was to for any project management work which is being done.

We discussed there was the sponsor the owner and also the user. I had also mentioned who are the stake holders and how the stake holder can be negatively and positively affected depending on the project which is being undertaken.

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Schematic diagram of Project Stake Holders
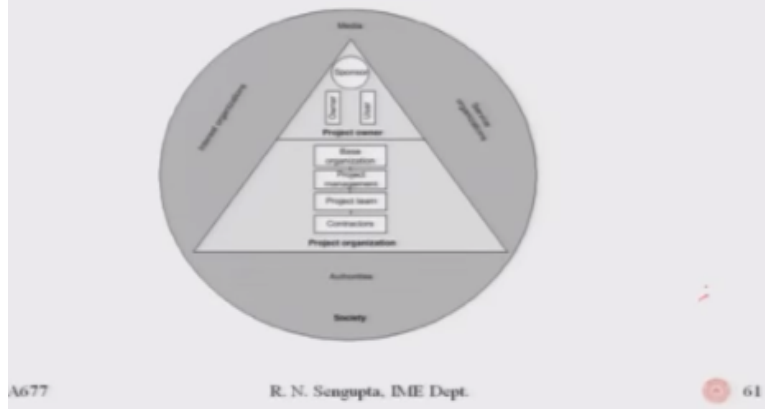
So if you look at this slide basically has a very holistic view of how the overall project management concept as such considering the stake holders the users the owner the sponsor who are there in the system they are affected positively or negatively pending on how things are put by the service organization depending on what type of project it is whether it is in the in the industrial area or in the service sector.

They would be interested organizations who would be positively or negatively affected by that. So if you can be either the organization itself it can be the ancillary units who are trying to get the benefit by being part of this project man work management team as such. They would be the media the society and as I mentioned the societal impact is very important.

So obviously the project organization as such if you see the lower portion of this slide where I am hovering the pen basically it consist of base organization the project management team the project management overall setup.

The project team how they are doing and the project team is if you remembering I said that the overall structure or the HR scheme would be both horizontal and vertical considering that it is part and parcel of the overall organization for which the project management team is working to implement the work. So they would be contractors subcontractors would basically work in

tandem to complete the project in such a way that it give the benefit for which it is basically being planned for.

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The base organization which is the permanent organization of the project personal basically they lend different type of people depending on their expertise to the project management team. The base organization is the indirect stakeholder since it will frequently define the frame and the overall conditions and the policies for the execution of the project.

So if TATA steel or TATA motors or say for example Reliance or L&T they are undertaking a project it would mean that the project basically is defined is based on the overall objective of what the companies planning to do or say for example on the other hand consider the government is is trying to do revamp the overall the public distribution system. Then obviously the public distribution system revamping work if it is taking as a project main organization which is doing that is the government of India.

And they will define the policy based on which the overall project would be taken the project management comprises the project manager as album as I mentioned or the leader of the project the management group and possibly the project office which is basically working in tandem with the organization.

The project team consist of all personal working on the project whether indirect or directly so it can be design department which you are doing some work which may be really too small part of the project of it can be say for example the procurement department who are totally involved. So how the overall structure of the project management team with respect to the organization is defined would basically give a feel that what is the success rate of the projects.

So if there are lot of conflict between the organizational structure and the organizational philosophy with respect to the project management team and the project management philosophy. So obviously at the end of the day the project management overall objective would not be met for the case for the organization and obviously they would be a conflict.

But if there is no conflict as such obviously it would mean that they are working hand to hand in tandem. Contractors are all the external supplies as I mentioned in the last slide of all the external supplies of goods so obviously machine tools whatever it is required to implement the project.

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An example can serve to illustrate the concept of risk management was considered that you are constructing a house we are about to pour concrete for the ground floor. When you are trying to basically build up a house first what will do is basically have a design of the house and before that obviously will procure the land and get all the official documents ready.

So that that if you consider the project is basically starting from inception stage where you have the idea of trying to build the house but considering that all those things are over. So your main focus of trying to build up the house would be to have the base build up that means dig and do all the concrete laying work then you will basically build up the ground floor or the basement and once the base is start and the over framework is built up you basically go from floor to floor the first floor the second floor the third floor and once it is completed.

Obviously we will finish the electrical work then basically finish the water work you will put on the lift you will finish the wooden work and whatever the work as are needed. We have already ordered say for example the concrete on the June tenth however it might be rather the piping installation of the floor may not be finished on time. Am just giving an example so just few minutes or few seconds back what I said.

What the broad major macro level work which needs to be done for building the house. So let us assume as stated in this slide that there is ninety percent probability that the piping will be finished in time and the pouring can start as planned on June tenth. Now till now we have not used the concept of probability so whatever we have been discussing on a very qualitative framework always meant that whether for the concept of precedence diagram or for whether for the CPM which is the critical path method will considered.

Even if time was important we need to find of the time because scheduling was the main focus of the project management concept as such. The time was always deterministic in nature later on we will see as we do the PERT which is program evaluation review technique. Time is non-deterministic it has a distribution beta distribution and as if you remember we did mention about the most pessimistic most optimistic time and based on that we would be doing the calculations and the study.

So if probability comes into the picture it means that in a very simple sense that out of the hundred such works which we will be able to do there would ninety such incidences that the work is done. So obviously that would have some implication that what would be the end the

time now being calculated would be based on the fact that they would be probabilities for each and every stage.

So if you are considering the stages as I mentioned for building the house basement being done concrete being poured in the basement the framework being build, First ground floor first floor, second floor third floor being built then the electrical connection the water connection the left wooden works so on and so henceforth.

So it would mean that if there is probability of trying to finish each and every work a different stage the overall probability of trying to finish of the whole project would now depend on each individually probabilities. Considering that they are dependent on each other so dependent structure would come into picture and we will try to find out how we can find out the overall probability of trying to finish the work on time.

Now if there is a probability concept for time would also mean that the resource constraint or the resource utilization would also depend on what is the probability of trying to finish the work on time. Now let me give you a very simple example even though actual solving of the problems will come later on consider that you are planning to finish building the house or the bridge consider the second example being a bridge in a in a time frame of say for example ninety days.

So if it is ninety days that means you will need three months no now if it is consider that if it is three and everything is deterministic. So any utilization of resources would be deterministic in nature in the sense that if I want to basically finish my work less than ninety days then per day utilization of resources whether man, material or an amount of money or trying to utilize a separate cement mixing machine or trying to basically bring more truckloads of cement or more stone chips or trying to break up more bring more laborers more engineers would basically entail would increase in the cost.

But at the same time it will also ensure the work is finished in a deterministic framework less than ninety days the example which I just gave. But now if the probability comes into picture it would mean that on an average with some probability that probability would basically be the

combination of the probability for each and every events which is happening there to built up whole project would basically be certain mean value and unexpected value to finish that work.

So these probabilities would mean that they would be some standard deviations because you have a probability it would mean for a probability distribution they would be mean value median would also come into the picture will consider mean and median separately and for the beta distribution which I just mentioned from the beginning of the lecture for the PERT case and then we will see that how standard deviations will affect that if there is a resource constraint or the resource have to be utilized in a much bigger way to finish the work much before the ninety days.

Then the probability would also be utilized in order to calculate what is the overall resource utilization which is being done in the probability sense. So we will we will consider that later on. So continuing that in the case of the pouring of the concrete there is a ninety percent probability as I just mentioned in the in the fourth bullet point.

So in case the pouring in the concrete must be cancelled or postponed due to some reason like whether the cement mixing machine was not working properly or the cement did not arrive on time or whether the base work as not been finished or the person who was employed to do the work did not arrive and one time or was sick. So there can be different reasons for that so there is a cancellation fees of Indian rupees two thousand.

So which means that if it is delayed by one day they would be a extra cost of two thousand rupees. So extra cost as I am just considering as a bulk it can be divided by different components also. So probability that the fee will apply in a ten percent because ninety percent probability is it will finish ten percent it would not finish and the consequence would basically be on a rate of two thousand rupees the risk associated.

Risk means now if you remember I have been mentioning risk time and again in the first five classes and I did mention that risk in the probability sense in the variation variations of the risk dispersions of variations. So there are different risk measures also but when you convert the risk

concept into the for the project framework and even in every decision making actually what we want to understand is that what is the implication of the risk it has on the overall bottom line.

So does risk mean that I am going to lose ten rupees does risk and that I am going to basically lose one crore rupees or does it means that I am going to basically lose hundred dollars or two hundred euros. Whatever it is depending on what which ever currency denominations am using. So in these case if ten percent probability that it would not be finished it means that for the each day it is two thousand.

So it will basically mean that it will entail the cost of two thousand into two point five now if the number of days increases. Obviously it will mean that if each and every day are independent if each other then I will very simply calculate the sum of all the probabilities multiplied by the per day cost and try to find out the cumulative one. So let me just very briefly give you that how dependence and independence will come into the picture.

Considering that all my students are decently where are aware how the expected value the covariance's the standard deviations are calculated. So say for example if I consider the one day cost as two thousand. So this is not an exact problem but I am trying to basically expand the thought process of the students. So that they appreciate that how the calculations would be taken up later on.

So it was two thousand multiplies by the probability which is PI of failing which was ten percent. Now say for example if the number of days was say for example DI considering there are ten days. So obviously the sum would be starting from I=1 to 10 but based on the fact that the probabilities days and the rate of payment are independent of each other this may not be the case why let me consider it in details.

Say for example you are dealing the project so it may happen to whom you are trying to deliver the product may have a clause in the contract that for the delays of first five days the cost is two thousand rupees per day. So if you have basically delayed your project for five days and less then this calculation which is shown here considering the dependent structure is therefore the

probability and the delays or the number of days is as given here. But say for example the contract says that after five days the overall cost increases from two thousand to three thousand rupees.

So which means for the five days the calculation will be based on the fact that is two thousand rupees per day for the first five days and if I go into say for example for the for the next case that this submission was basically for done for five days for the sixth seventh eight and so on and so henceforth days depending on the contract the calculation would be calculated based on the fact it is three thousand rupees multiplied by the probability consider still it is ten percent.

Even though it may not be true multiplied by the number of days but remember this number of days here and this number of days here is different in the first instant which is number one the number of days would be maximum five because as per the contract in the second case the number of days would be calculated starting from the sixth day. So if the total delay is ten number of days the first five calculations would be based on two thousand rupees second set of calculation would be based on the fact that is three thousand rupees.

That was the first number of point which I want to highlight next consider the probability are changing which is absolutely possible considering that the delay which I have said or ninety percent which is due to the fact it is delayed. Say for example for the first instant but it may so happen that due to the non-arrival of say for example the cement or the problem with the cement mixture or for the different type of problem which I have mentioned.

The probability may increase on or may decrease and in that case the concept of the calculation the problem it is even though I have used the symbol of PI in both the cases. The value of the probability would be different hence the total cost of the risk based on which you are try to find out what is the overall risk for the project would depend on the probability would depend on the number of days.

And will also depend on the rate of the loss of particular project will face for each and every number of days which in the first instance for five day is two thousand in the second instead is

three thousand. Next to extend the discussion forward consider the cost of two thousand which is given for the example which I just finished was in a conglomeration way in a collated way.

But now consider that two thousand is has been broken down in say for example for stage one, stage two, stage three which are the stages in the project and the total cost in each stages are say for example one thousand rupees five hundred rupees five hundred rupees. So total collective values two thousand rupees and in the next instant three thousand has been broken down in to.

Say for example it is one thousand one thousand and one thousand, so the second and third are increasing by five hundred. So five hundred become one thousand and five hundred become one thousand so basically it means that one thousand remains one thousand for the first days and for the number of days greater than five. This is five hundred as I mentioned and this is five hundred so that total cost if you see is two thousand which is matching here.

In this case second case if it is one thousand one thousand one thousand it means three there are three thousand which means basically means three thousand. Now if that is the case then slowly will understand that the probability which I have mentioned PI in the first equation and PI in the second equation where for the overall delay of the so called the cost which we are incurring. But it may so happen the probabilities are so defined for each and every units.

Hence the rate of change of the probabilities plus the number of days plus the cost would basically be independent interdependent sorry interdependent on each other. Such that try to find out the overall loss of the risk would be complicated that is true but if that is use some simply question you will able to understand how the overall cost can be found out in a very simple manner.

(Refer Slide Time: 20:06)

Risk in Project Management

- The technical and economic risk of a project fall into four categories:
  - ❖ Scope of work
  - ❖ Quality
  - ❖ Schedule
  - ❖ Cost

So the technical and economic risk of the project fail into four categories even though I gave a very simple not solved example but I try to basically first start off trying to inculcate some interest in the students we will try to solve the problems later on. So the four categories of the economic risk are the scope of the work, quality of the work if this is over exceeding of the schedule time and the cost so depending on the cost structure which I mentioned.

If you basically overstep your schedule penalty is there but obviously on the other side would also be there that if you are able to finish of your well before time you will get some benefit. So in that case the loss would be considered as negative which means a profit is coming into being coming into the picture. So that can be considered at a sort of negative risk which is profit.

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Uncertainty and Risk in Project Management

So uncertainty and the risk in the project management concept would be basically they said there is uncertainty for both the product from the point of view of the probability of completion from the prompt view of the cost structure per day which you incur for each and every event or job which are being scheduled in the project.

There would be delay number of days so depending on the delay on a number of days the cost per day may also change. So obviously what I mentioned about the two thousand rupees and three thousand rupees it may be linear in some of the case the cost structure may be non-linear where in the non-linear part trying to find out the overall cost may become a little bit different.

So uncertainty basically have the risk factor the opportunity factor which is the opportunity cost lost it will have basically the implications in the risk in terms of money. As I mentioned in terms of Indian rupees and the impact which you are trying to find out. Even though I have mentioned time and again they are independent in the general case they may not be independent they would be independent.

So if they are dependent obviously apart from the overall expected value to find out the loss you will try to find out what are the correlation matrix or the covariance matrix existing between the different type of jobs in the overall project such that they would have a negative impact or much more expanded impact and trying to find out of the overall loss for the project.

So types of risk to continue operate they can be as I mentioned operational risk they are connected to internal circumstances in the project can be controlled by the project team. They can be strategic risk the prospective impact on earning of the capital from adverse business circumstances.

Say for example if a competitor is coming to the market based on the similar type of project and obviously there is a demand of such products considering that you are trying to basically float a product which may be either a washing machine or a or try to basically come up with a car or a new design of the car or new design of a moped or try to come up with a different type of medicine whatever is.

There is a competitor in the market so obviously the decision on the competitor would adversely affect the decision making process which you are going to have for a overall project. So they may be apart from the competitor effect negative effect they can be improper implementation of decisions or the lack of responsiveness to the industry change. So it would mean that the industry is not able to basically accept the overall technology or accept the overall product which you are trying to float in the market or the customers is not able to appreciate the product.

Obviously you will face a loss then the overall project for the organization point of view for or for the organization which is trying to basically come up with the project may boomerang and may have definitely a huge impact in the negative sense. They would be contextual risk it is connected to the circumstances outside the project that means influence the scope of the work and the performance of the organization.

So if the overall energy is diverted into different spheres which is not related to the project as such obviously it will have an negative impact. Probably speaking the risk management requires us to ask the following questions. So we will ask or try to answer these important questions which will definitely try to solve many of the risk problems which projects face. So the question are what is likely to happen? What is the probability of the impact of say for example resource constraint being there.

Or say for example political uncertainty be there or say for example competitor coming up with different type of product or say for example technology changing rapidly or say for example the economy or the political situation affect being effected in a very drastic sense consider for Intel chips. The technology development is so far that try to basically come up with the project where you want to plan to build up some chip building factory would not suffice because the competitors are always much ahead then your team.

Or say for example if you want to build up or a designer or drug and considering there are different type of competitors. So the sunk cost for any medicine is very high so they are considered pfizer then mark Abort. So these are the three companies just an example they are trying to built up a drug in in tuberculosis or say for example HIV or Dengue.

And in that case if the cost structure for three different companies as I mentioned are different it may mean or if the scientific advancement of one team is much higher than the other or much faster than the other. The other two basic players in the market would may face a huge loss in trying to implement the project.

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Project Management Risk

- Broadly speaking, project risk management requires us to ask the following questions:
  - ❖ What is likely to happen (the probability and impact)?
  - ❖ What can be done to minimize the probability or impact of these events?
  - ❖ What cues will signal the need for such action (i.e., what clues should I actively be looking for)?
  - ❖ What are the likely outcomes of these problems and my anticipated responses?

So our next question would be what can be done to minimize the probability of impact of these events. So should we scrap the project? Should we take up the project? Is it necessary to come up with the project management concept as such or we can but the product on the market and sell it in the market.
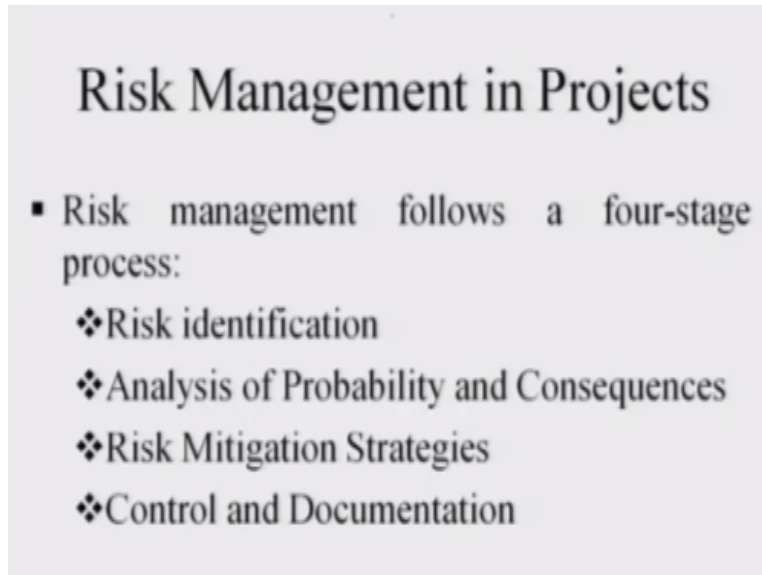
Consider this if TATA motors is flying to build up build a radiator of the car so is it necessary that I invest my overall money in trying to build up a radiator a car or I can get it from a vendor at a much cheaper price. Because there is a lock in cost labor cost which the TATA motors have to basically incur for that. I am just giving TATA motors as a example it can be any other car manufacturing company.

So we will also a question what cues will signal the need for such an action so is it that a the competitors as I mentioned just few minutes back all the relevant which are there which basically have an overall impact on the decision making process. So if it gives us some signal that things are not going as planned so we will definitely try to adjust or overall decision making process and go back to the drawing board and trying to understand whether that decision of trying to take up that project as such in a project management phases is really relevant.

We will consider or ask questions to our self that what are the likely outcomes of these problems and what are my anticipated response. So anticipates response maybe I want to invest more try to

finish the work much faster or may try to scrap the project or try to delay the project or try to pass on the project to the vendors they can be different consequences for the decision.

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Risk Management in Projects

- Risk management follows a four-stage process:
  - ❖ Risk identification
  - ❖ Analysis of Probability and Consequences
  - ❖ Risk Mitigation Strategies
  - ❖ Control and Documentation

Risk management follows a four stage process so one is basically risk identification the next stage is analysis of the probability of the consequences what are the probabilities are the discrete are the conscious what is the joint distribution for the them whether the concept of variance should be used or whether the concept of the covariance should be used or the correlation coefficient is important.

So that would be important for us for the next second stage then we will also consider what are the risk mitigation strategies. So how we can reduce the risk should be try to basically a put a money in not in a one project or in different project is basically trying to put all your eggs in different basket not in one. Such that your overall risk mitigation is there then we will try to basically control and document how the risk mitigation has been done.

Such that it could be a learning process for us for different type of project in later on and for different type of organizational structures or organizational work which we are doing. So with this I will end the second lecture and definitely I will urge myself students to have look at the slide and as well as read the books and for the books references again I am mentioning is also

being given in the first slide and for any queries students can as per the norm definitely contact the forum and get their clarification done thank you very much.