**Project Management**

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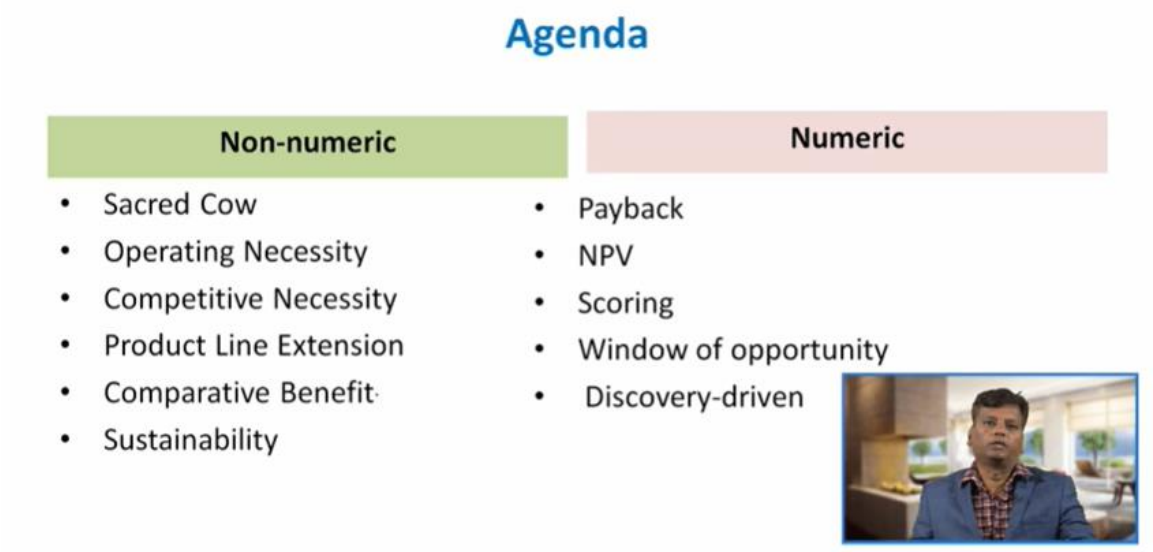
**Week: 1**

**Lecture 04 : Project Selection Models**

Dear students, in the previous lecture, I have started about introduction for the project management. In this lecture, I am going to discuss about project selection methods. The agenda for this lecture is I am going to discuss two types of techniques for selecting a project. One is non-numeric methods, another one is numeric methods. In the non-numeric methods, I am going to discuss about six methodology for choosing a project. One is sacred cow, then operating necessity, then competitive necessity, product line extension, comparative benefit and sustainability.




In the numeric methods, I am going to discuss about payback period method, net present value method, scoring method, window of opportunity method and discovery driven method. Generally, the meaning of non-numerical method is a qualitative method, qualitative method of choosing a project. Numeric means a quantitative method of choosing a project. The types of project selection models, there are two methods, one is non-numerical models and another one is numerical models.

## Types of Project Selection Models

- Nonnumeric models
- Numeric models

These can be used simultaneously

Sometime for choosing a project, we can have these combination of these two. For certain stages, we can go for a non-numerical method that is a qualitative method. For certain stage of selecting a project, we can go for numeric models. First, we will discuss about non-numeric models. Models that do not return a numeric value for a project to be compared with other projects is called non-numeric models.

## Non-numeric Models

- Models that do not return a numeric value for a project to be compared with other projects
- These are really not "models" but rather justifications for projects
- Just because they are not true models does not make them all "bad"

These are really not models, but rather justification for projects. It is in a qualitative method of choosing or selecting a project. Just because they are not true models, it does not make them all bad. Just because it is a qualitative method, we cannot undermine, and we cannot underestimate this method of choosing your project. In fact, many strategic projects, we go for only a qualitative method of, a qualitative way of choosing your project.

## Types of Nonnumeric Models

- Sacred Cow
  - Often suggested by top management
  - Maintained until completion or boss terminates it

Because many strategic projects sometime cannot be quantified. So, we will go with only qualitative factors. The first method for non-numeric model is sacred cow. In this method, often the project is suggested by a top management, a very senior person. Once the senior person says that we have to go for this project, we have to adopt that we have to accept this project.

This project is maintained until completion or boss terminates it. As long as the boss is working, who has suggested to go for project, that project, the project will continue. After the tenure of the project manager is over or top, not project manager, the top management is over, then we can drop that project. Generally, it is dropped. The next method is operating necessity.

## Types of Nonnumeric Models

- Operating Necessity
  - A project that is required to protect lives or property or to keep the company in operation

A project that is required to protect lives or property or to keep the company in operation. Just to protect the lives of the people who are in the organization, we have to opt for

certain project that method of opting the project is called operating necessity. The next type of project selection method is competitive necessity. The project that is required to maintain the company's position in the market. If you want to be competitive, if you want to exist in the marketplace, you have to choose the project.

## Types of Nonnumeric Models

- Competitive Necessity
  - A project that is required to maintain the company's position in the marketplace

Currently, that project may not be beneficial to you, but over a period of time, if you want to show your presence in the market. So, that type of project selection method is called competitive necessity. The next method for selecting the project is called product line extension. The project is evaluated on a fit with existing product line. Already we may have some product line, we are getting an opportunity to choose a new project.

## Types of Nonnumeric Models

- Product Line Extension
  - Project evaluated on fit with existing product line
  - fills a gap
  - strengthens a weak link or extends a line

So, the new project is exactly fitting with the already running project or running product line, we opt for that new project because there is a compatibility. Sometime the new project will fill a gap in the existing product line and sometime the new project strengthens a weak link or extend a line. So, these are the situation where we should go for product line extension methodology for choosing a project. Another non-numeric

method is called comparative benefit. Projects are subjectively rank ordered based on their perceived benefit to the company.

## Types of Nonnumeric Models

- Comparative Benefit
  - Projects are subjectively rank ordered based on their perceived benefit to the company

Certain projects, we have comparative advantage over other company, other organization. So, we can opt for that project. When we opt that project, we have since we have comparative benefit, we can execute that project very effectively. So, that method is called comparative benefit. The next method is called sustainability.

## Types of Nonnumeric Models

- Sustainability
  - Focusing on long-term profitability rather than short-run payoff

Focusing on long term profitability rather than short run payoff. When we go for choosing a project, we have to see the sustainability of the organization and we have to look for long term profitability rather than short run. So, that type of method for choosing a project is called sustainability method. So far we have seen non-numeric model. Now we will see the numeric models.

## Numeric Models

- Models that return a numeric value for a project that can be easily compared with other projects
- Major types
  - Profit/profitability
  - Scoring
  - Window-of-opportunity analysis
  - Discovery-driven planning

What is the numeric models? Models that return a numeric value for a project that can be easily compared with other projects. Suppose we have two projects, we will get some numerical value for project 1 and project 2. Based on that numeric value, we will choose that project. So this method is called numeric models. Some of the numeric model are profit or profitability method, scoring method, window of opportunity analysis, discovery driven planning.

## Numeric Models: Profit/Profitability

- Models that look at costs and revenues
  - Payback period
  - Discounted cash flow (NPV)

These are the numeric models for choosing a project. First we will see profit or profitability model. Models that look at cost and revenue are called profit or profitability models that is a numeric models. What are the method for choosing the project? One is the payback period, second one discounted cash flow that is net present value. We can choose a project by considering the payback period of that project or we can choose the project based on their NPV, net present value.

## Payback Period

- The length of time until the original investment has been recovered by the project
- A shorter payback period is better

About these two techniques, we will discuss in detail in the next slide. First we will discuss about payback period. What is the meaning of payback period? The length of the time until the original investment has been recovered by the project. So that duration is called payback period. Always we have to go for a project which has the shorter payback period.

## Payback Period Drawbacks

- Does not consider time value of money
- More difficult to use when cash flows change over time
- Less meaningful for longer periods of time (due to time value of money)

Suppose there are two projects, project A and B. We have to choose a project which has the shorter payback period because there will be a shorter duration to recover our investment. What are the drawbacks of this payback period? This method does not consider the time value of money and this payback period method is more difficult to use when cash flow changes over time. And this methodology is less meaningful for a longer periods of time due to time value of money. Since we are not considering time value of money, if the project duration is longer then this methodology is not suitable.

## Discounted Cash Flow

- The value of a stream of cash inflows and outflows in today's dollars
- Also know as discounted cash flow or just discounting
- Widely used to evaluate projects
- Includes the time value of money
- Includes all inflows and outflows, not just the ones through payback point

Next we will go for discounted cash flow. The value of stream of cash inflows and outflows in today's dollar is nothing but NPV, net present value. A project there may be different outflows. Outflows means the amount which goes out of our pocket and inflows means cash inflows the amount which comes to your pocket. So generally cash outflows is written in the negative term, cash inflows written in the positive term.

So what we have to do? We have to see the current value of cash inflows and outflows in today's dollar. That is the meaning of your net present value. Also known as discounted cash flow or just discounting. This methodology widely used to evaluate projects. The most important thing here is it considers the time value of money.

## Discounted Cash Flow

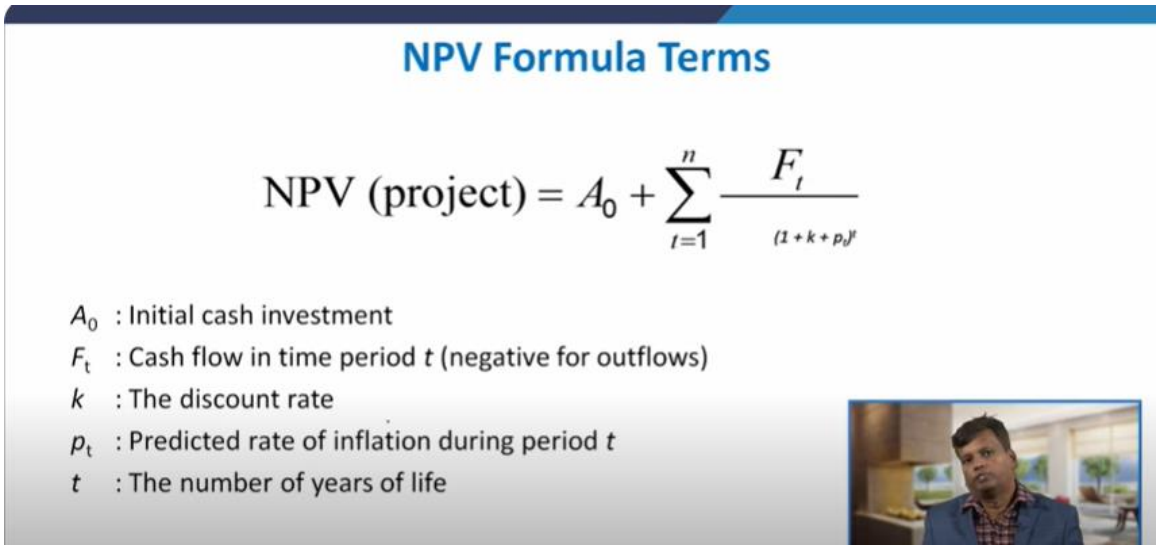
- Requires a percentage to use to reduce future cash flows
  - This is known as the discount rate
- The discount rate may also be known as a hurdle rate or cutoff rate
- There will usually be one overall discount rate for the company

It considers all inflows and outflows not just one through the payback point. Previously in the payback period we consider only the cash inflows what we get out of this project. But here we can consider both cash inflows and outflows. This methodology requires a

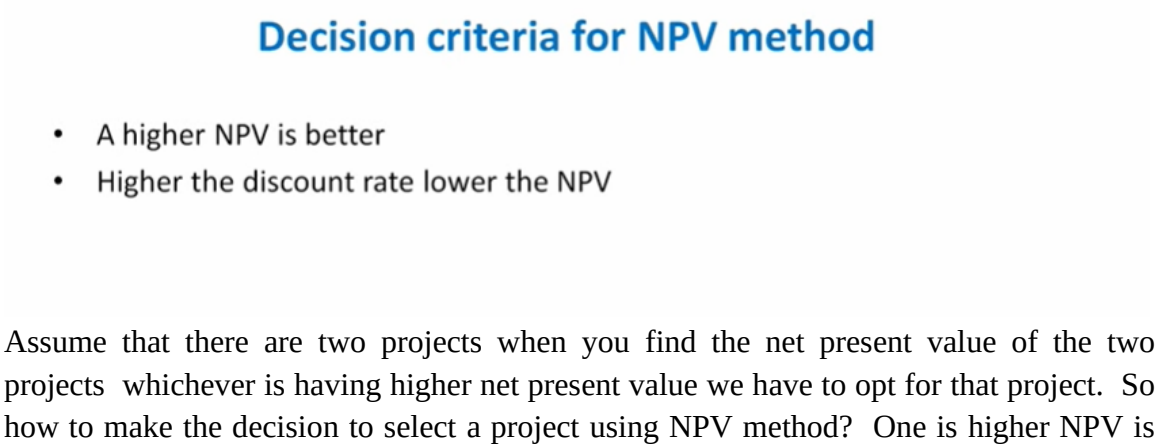
percentage to use to reduce future cash flows. That percentage is called discount rate.

Discount rate may also be known as the hurdle rate or cut off rate. There will usually be one overall discount rate for the company. The company may have different projects but when we go for discounting we will use the same hurdle rate or discount rate for all projects. And what is the formula for net present value? Net present value of the project is A0 that is your initial cash investment plus sum of the present value of cash inflows.

NPV (Project) = $A_0 + \sum_{t=1}^{n} \frac{F_t}{(1+k+p_t)^t}$




So ft cash flow in time period t. We use negative sign for cash outflows. For example A0 is the investment we use negative sign there. Here k represents the discount rate and p represents the predicted rate of inflation during the period t. The "t" represents the number of years of life. So when you discount cash inflows and outflows to present value so that method that NPV is used for comparing 2-3 projects.




Assume that there are two projects when you find the net present value of the two projects whichever is having higher net present value we have to opt for that project. So how to make the decision to select a project using NPV method? One is higher NPV is better. Similarly the higher discount rate lower the NPV. So that is the relation between your discount rate and NPV because it is comes under the interest rate comes in the

denominator. So with the higher the interest rate lower the NPV.

The next method of choosing a project is called scoring method is very popular method. It mimics how managers evaluate investment. The advantage of the scoring method is we can use multiple criteria. We can utilize both monetary and qualitative factors. So what we do we will find a weighted factor scoring model for all our alternatives.

## Numeric Models: Scoring

- Mimics how managers evaluate investments
- Uses multiple criteria
  - Can utilize both monetary and qualitative factors
- Weighted factor scoring model

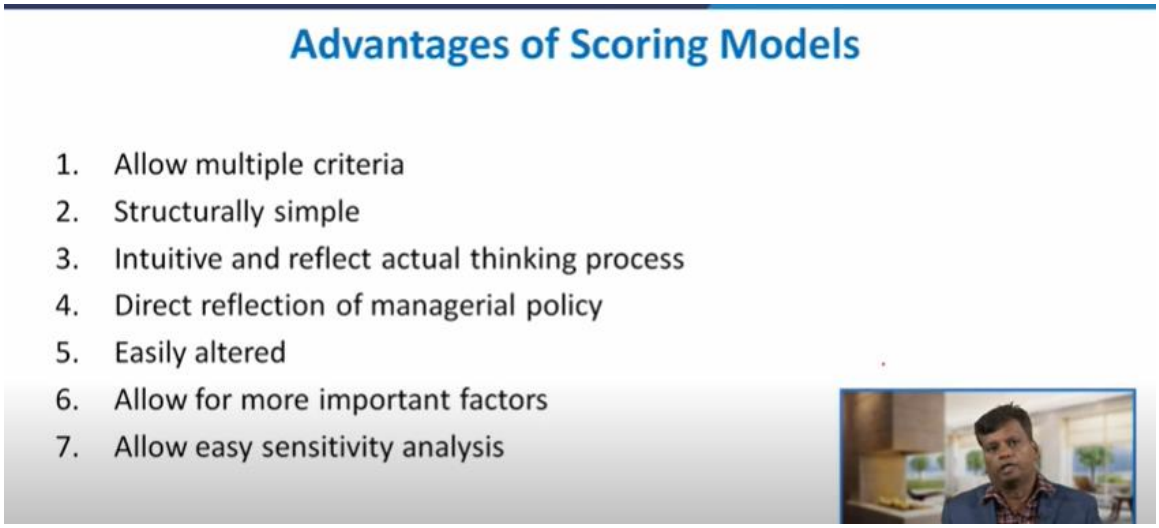
So whichever is the higher score that project will be chosen. We will discuss about weighted factor scoring model. First we will find out the factor or criteria for choosing the project. Then each factor is weighted relative to its importance. Choosing allows important factors to stand out in the sense some criteria may be very important so we can give the higher weightage.

## Weighted Factor Scoring Model

- Each factor is weighted relative to its importance
  - Weighting allows important factors to stand out
- A good way to include non-numeric data in the analysis
- Factors need to sum to one
- All weights must be set up, so higher values mean more desirable
- Small differences in totals are not meaningful

So that choosing a project that factor will play a important role for choosing that project. A good way to include non-numeric data in the analysis by using this weighted scoring model. The factors weightage when you add it the sum should come to 1. All weight must be set up so higher values means more desirable. Small differences in total are not meaningful.

Total of your overall score. So we have to see there is a significant difference between the score of one project versus another project. What is the advantage of this scoring model? We can go for a multiple criteria. It is structurally simple, intuitive and reflect actual thinking process, direct reflection of managerial policy, easily altered some criteria you can drop it or you can change the weight of certain criteria. It allow for more important factors.




It allow easy sensitivity analysis. Meaning of sensitivity analysis mean the meaning is suppose if you change the weightage for one criteria you can see what is your final outcome. If there is a sudden change then that methodology is not the robust method. So what will happen sometime even keep on increase the weightage for one criteria even though we change the weightage our final outcome is same in the meaning in the sense that our methodology is the very robust methodology. Why I am saying it is robust? Even though there is a slight variation in the weightage our final outcome is not affected. So that kind of sensitivity analysis can be done by using this scoring model.

## Disadvantages of Scoring Models

1. Relative measure
2. Linear in form
3. Can have large number of criteria
4. Unweighted models assume equal importance

What is the disadvantage? It is relative measure because it is a linear inform because we are finding weighted sum but it is not necessary in the linear inform. It can have large number of criteria that will become very complicated and unweighted models assume equal importance. Suppose you are not giving any weightage to the criteria what will happen every criteria will have a equal importance that was not the purpose of this model. The next method is window of opportunity analysis.

## Numeric Models: Window-of-Opportunity Analysis

- A Window of Opportunity Analysis is a strategic assessment that identifies and evaluates a specific time period during which favorable conditions exist for pursuing a particular action, project, or strategy.
- This concept is often used in various fields, including business, politics, and economics, to make informed decisions about when to take advantage of a unique opportunity.

This is the another numeric models. A window of opportunity analysis is a strategic assessment that identifies and evaluate a specific time period during which a favorable condition exists for pursuing a particular action project or strategy. So we are going to see the assumptions of the project over a particular time period. In that particular time period it is very favorable to you then we will go for choosing that project. So this concept is often used in various field including business, politics and economics to make informed decision about when to take advantage of unique opportunity. Here the

meaning of window of opportunity means a particular time period we are going to see what is the benefit of this project.

## Numeric Models: Window-of-Opportunity Analysis

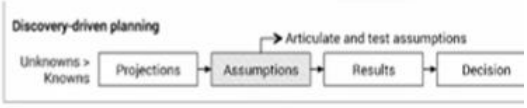
Here are the key elements of a window of opportunity analysis:

- **Identification of Opportunities** The analysis begins with identifying a potential opportunity.
- **Time Sensitivity:** A crucial aspect of a window of opportunity is that it is time-bound
- **External Factors:** External factors, such as changes in the market, regulatory environment, technology

There are the key elements of window of opportunity analysis. First what we do identification of opportunity. The analysis begins with identifying potential opportunity. The next we will go for time sensitivity. It is a crucial aspect of window of opportunity is that it is time bound.

## Numeric Models: Discovery-driven Planning

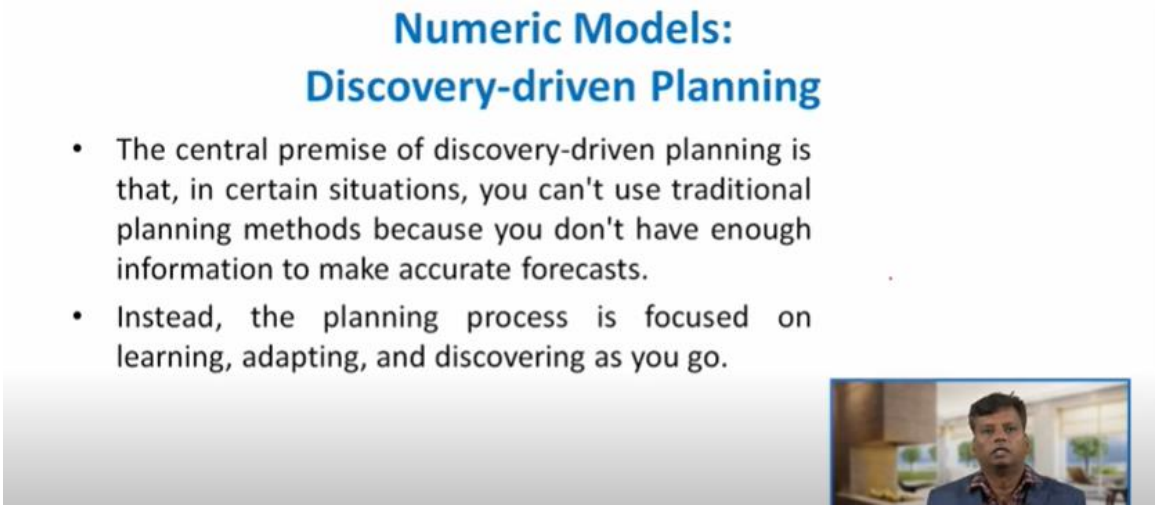
- Discovery-driven planning is a strategic approach to planning and decision-making that is especially useful when dealing with high levels of uncertainty and innovation.
- It was developed by Rita McGrath and Ian MacMillan and introduced in the Harvard Business Review in 1995.



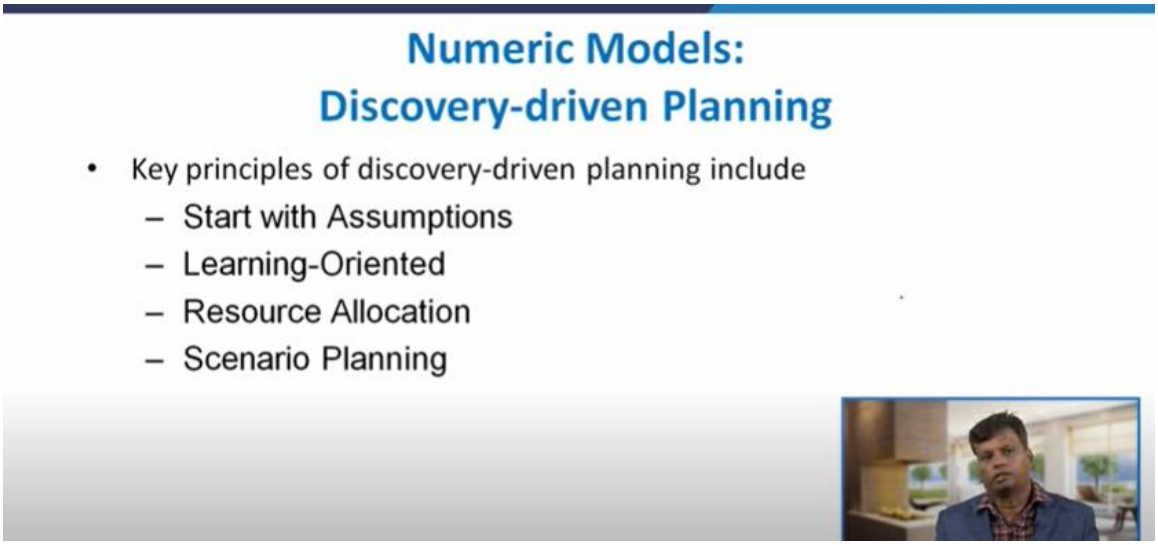

Then we have to see what are the external factors. External factors such as changes in the market, regulatory, environment and technology. These are the external factors. Discovery driven planning is a strategic approach to planning and decision making that is especially useful when they are dealing with high level of uncertainty and innovation. Suppose a project which is having high level of uncertainty and innovations then the discovery driven planning is used. It was developed by Rita McGrath and Ian

MacMillan and introduced in the Harvard Business Review in 1995.

Look at the picture on the right hand side about discovery driven planning. So there are unknowns is there, unknowns is there. So there is a project. So there are assumptions and we have to articulate and test the assumptions. So that is the important element here in the discovery driven planning.

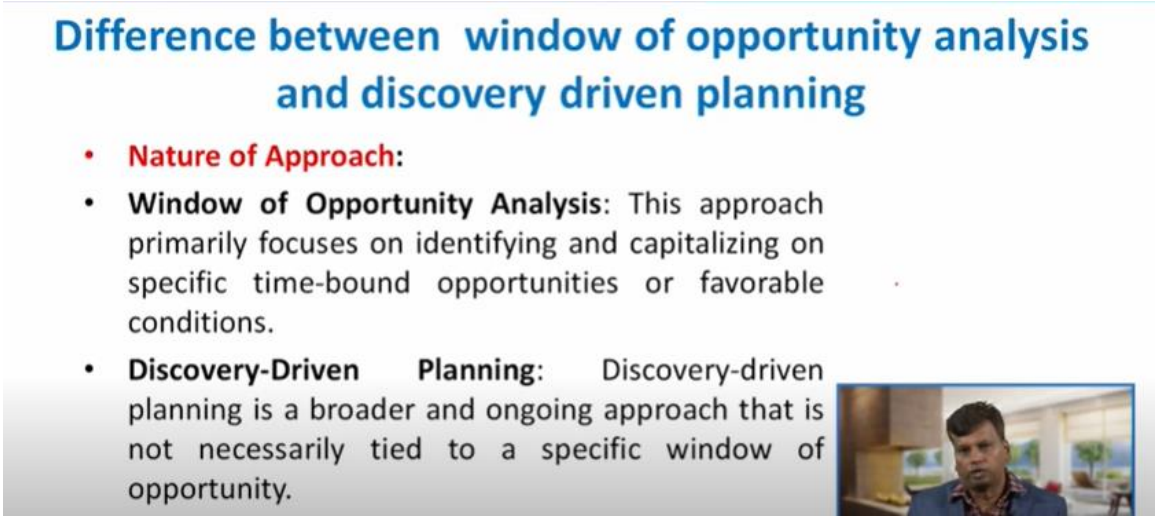



The central premise of discovery driven planning is that in certain situations you cannot use traditional planning methods because you do not have enough information to make accurate forecast. Instead, a planning process is focused on learning, adapting and discovering as you go. The key principles of discovery driven planning include start with assumptions, then what is your learning, then resource allocation, then scenario planning. Now we can see the difference between window of opportunity analysis and discovery driven planning.

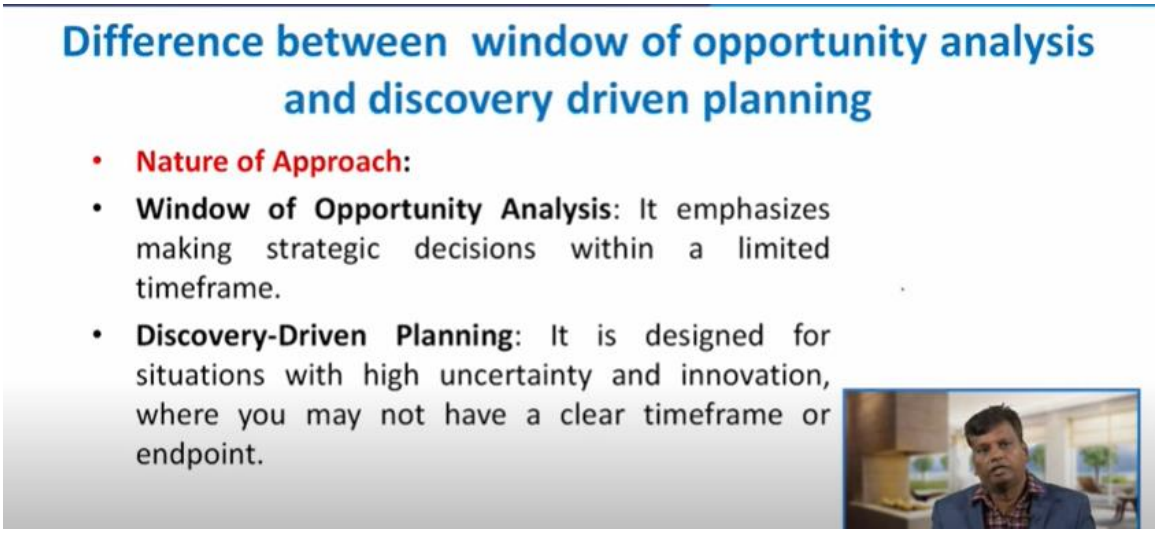



First we discuss about windows of opportunity. Here what we will do? We will see a

particular time window. Then we can see the possible conditions of the success of that project. If it is favorable, then we will go for that project. That is called windows of opportunity. The discovery driven planning is we can see what are the whether our assumptions are we are able to achieve that assumptions.

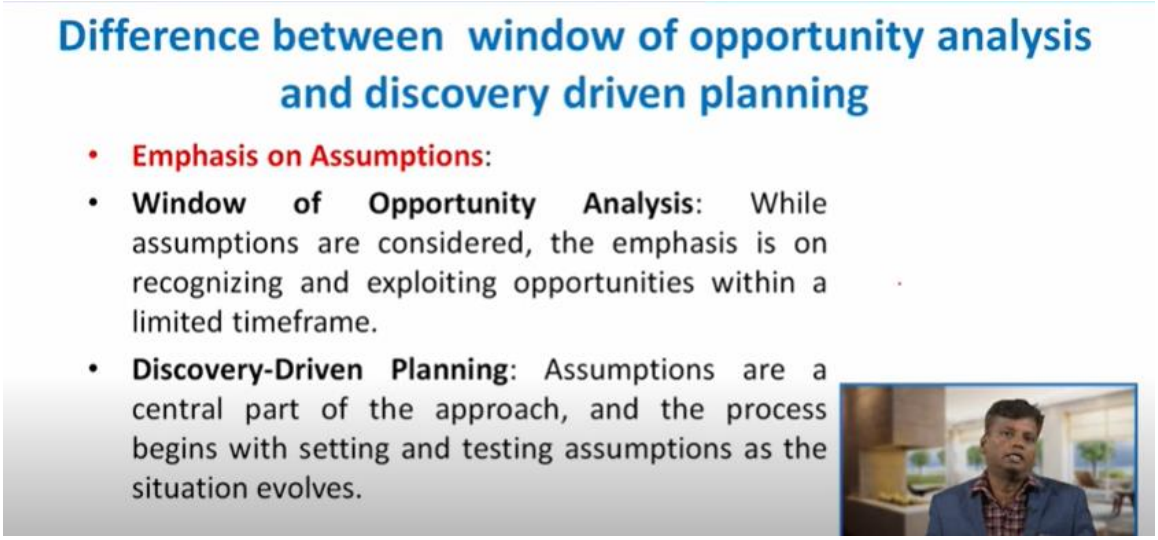



So we will discover that whether our assumptions are going very well or not. Is it possible to achieve our assumptions and our expected benefit? That is the meaning of discovery driven planning. Now we will compare these two methods. First one is the nature of approach.




First we see window of opportunity analysis. This approach primarily focuses on identifying and capitalizing a specific time bound opportunity or favorable conditions. That is why we call it as window of opportunity. Here the time bound is more important. The discovery driven planning, discovery driven planning is a broader and ongoing approach that is not necessary tied to a specific window of opportunity. Then window of opportunity analysis, it emphasize making strategic decision with a limited time frame

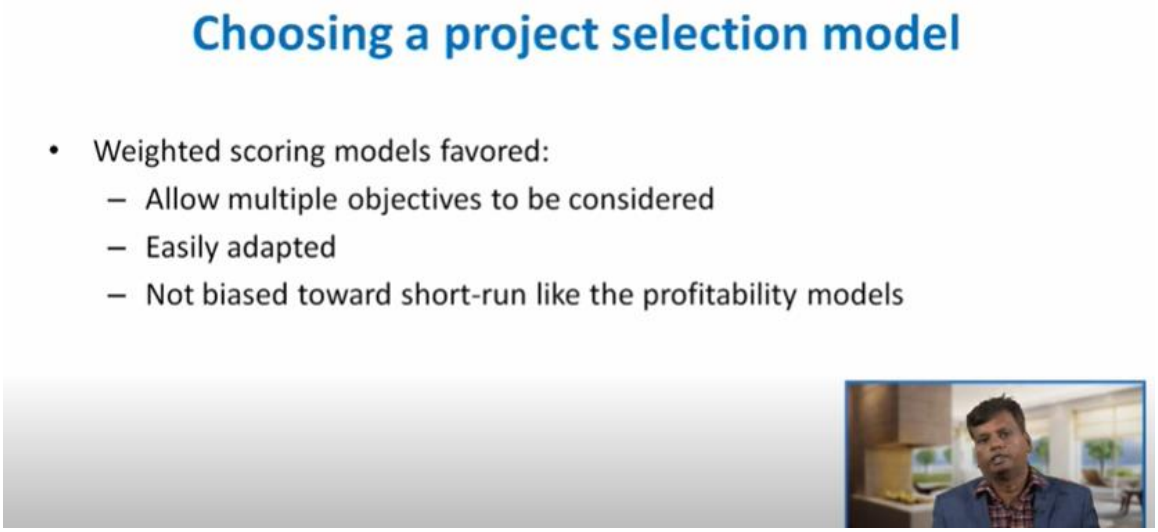
but another method discovery driven planning method, it is designed for situations where high uncertainty and innovation where you may not have a clear timeline, time frame or end point.




That is discovery driven planning. Then with respect to assumptions, window of opportunity analysis, what is the assumptions? Well assumptions are considered the emphasis on recognizing and exploiting opportunities within the limited time frame. But in discovery driven planning, assumptions are a central part of approach and the process begin with setting and testing assumptions as the situation evolves. So in the discovery driven planning, over a period of time we can see whether our assumptions are valid or we are able to achieve our expected result. But in the discovery in the window of opportunity analysis, the time is limited. So within the time period we can see whether able to achieve our expected benefit or assumptions.


Next we will compare with respect to key performance indicator. First we will see what

will happen in window of opportunity analysis. The emphasis may be less on predefined key performance indicators and more on capitalizing on opportunity. But in the discovery driven planning, key performance indicators play a critical role in the approach helping to track progress and adjust plans based on data and insight. Now we have seen numeric method, non-numeric method. In the numeric method we have seen various project selection techniques.




In the non-numeric method we have seen so many project selection techniques. But how to choose a right and appropriate project selection model? The best method based on the experience of the people is that the weighted scoring model is the most suitable method. Because in the qualitative method there are more subjectivity. In the quantitative method even we study NPV payback periods because there is a lot of assumptions.

There we consider only one criteria whether it is a cost or benefit. But the manager suggest that the weighted scoring model is most favorable method for choosing project. What are the reasons? This methodology allow multiple objectives to be considered because we are considering different criteria, multiple criteria and easily adapted, easily modified and not biased towards short run like profitability models. One important assumptions in the profitability model is like payback and NPV method is so we are considering only short duration of the time, maybe 5 years, 6 years. But what will happen after that? So, this method the weighted scoring model is the most favorable method. The another point when you go for your project selection is some risk because always the methodology which you use, the project which you selected we have to consider the risk of the project also when we choosing a project.

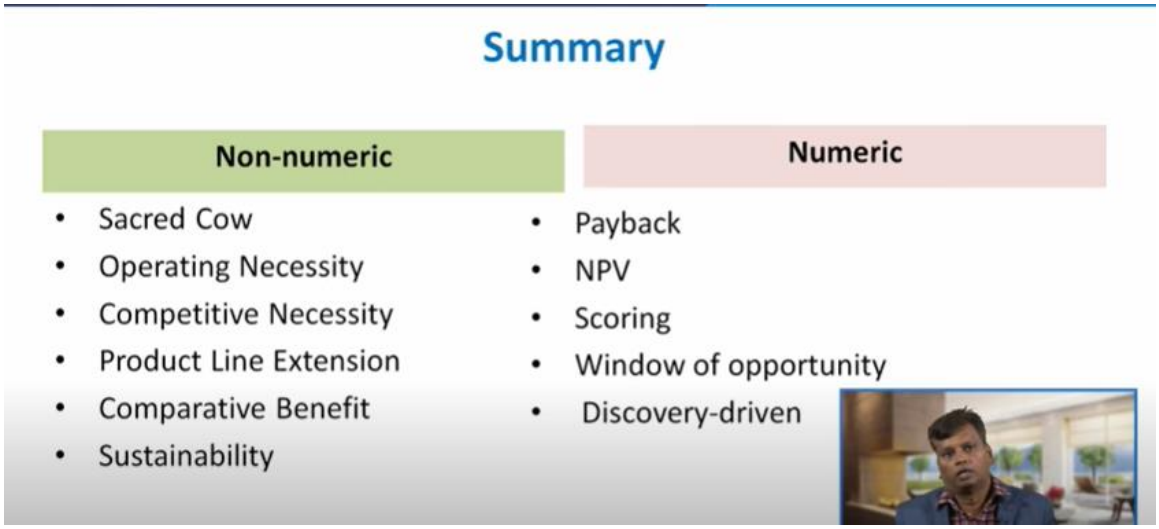
## Risk consideration in project selection

- Both costs and benefits are uncertain
  - Benefits are more uncertain
- There are many ways of dealing with risk
- Can make estimates about the probability of outcomes
  - Subjective probabilities
- Uncertainty about:
  - Timing
  - What will be accomplished?
  - Side effects

The first one is both cost and benefit are uncertain. Many techniques we have studied most of the time we choose a project based on the cost and benefit but these are uncertain. But see the benefits are more uncertain than the cost because that is the future benefit you may not know. There are many ways of dealing with the risk. We will be studying in detail about project risk analysis. We can make estimates about the probability of outcome instead of going for only one numeric value to choose a project.

We can see the probability of that one outcome how it is behaving over a period of time. Based on that we can choose the project. For example, we can use a subjective probabilities also and what are the uncertainty you have to consider when we are using this project selection method is one is a timing. You are considering that the project duration maybe 5 years, 6 years but that is highly uncertain. The second time that project maybe there is no demand it can be finished within 2 years or it may exceed also.

So that consideration of timing is one important uncertainty. The second one is what will be accomplished. Generally project managers we may promise many project scope but we have to take care whether that can be accomplished or not because that is one important uncertainty and many projects there will be many side effect there is a negative externalities with respect to projects that factor that uncertainty also has to be considered while choosing the project. Now I am going to summarize what we have discussed in this class so far. I started with project selection methodology one is non-numeric models another one is numeric models. The numeric models are discussed about the sacred curve, operating necessity, competitive necessity, product line extension, comparative benefit and sustainability.




In the numeric methods I discussed about the payback period, net present value method, scoring method, window of opportunity method, discovery driven method and I have compared discovery driven versus windows of opportunity. Thank you. Thank you very much.