Project Decision Analysis Process

Intaver Institute Inc.
303, 6707, Elbow Drive S.W.
Calgary, AB, T2V0E5, Canada
tel: +1(403)692-2252
fax: +1(403)259-4533
sales@intaver.com
www.intaver.com

Project management is the art of making right decision. Project managers are faced by huge array of choices. Should different supplier be used to improve the quality of a product? Should additional team member be brought in to improve the development performance? Should the work be outsourced or done in-house?

In addition to project management, decision analysis is used in strategic planning, operational management, and other areas of business. Decision analysis helps oil and gas companies to determine optimal exploration and production strategies with uncertainties in cost, prices, and exploration prospects. Lawyers are using decision analysis for assessment of complex litigations with the uncertain outcomes. Decision analysis helps medical professionals to make a correct diagnosis and prescribe a most effective treatment.

Most important components of decision analysis are integrated into project management processes in all knowledge areas. Analysis of potential alternatives is the part of each stage of the project. Assessment of uncertainties is the part of project risk management process. New computerized project management tools utilizing quantitative analysis help project managers to make informed decisions. Recent research shows that well-established decision analysis process integrated into overall project management significantly improves organizational performance.

Among the diverse problems that impede accurate decision analysis, those inherent in human mental processes are the most important and most difficult to deal with. Psychologists have discovered a number of patterns in the way people are selecting alternatives, assessing probabilities, identifying and managing risks, and making decisions. The knowledge of such patterns will help decision-makers to avoid potential mental traps and ultimately improve quality of their decisions.

"3C" Principle of Project Decision Analysis

The decision making process is a framework that helps project managers solve a variety of decision-making problems. There are no exact recipes for how decision analysis should be structured. The process can be tailored for different companies, types of projects, and the types of decisions that must be made.

Any decision analysis process is based on three main rules, which can be called **3C** principle (see figure 1):

1. **Consistency**: It is important to standardize the decision analysis process for similar kinds of problems and opportunities to enable consistent decision making over time.
2. **Comprehensiveness:** Decision analysis processes should include a comprehensive assessment and analysis of the business situation. Missing or incomplete information can lead to incorrect decisions.
3. **Continuity:** The value of decision analysis will significantly diminish if it is done only in discrete situations during the course of a project. Decision analysis is a continuous process of making and refining decisions during a course of a project.

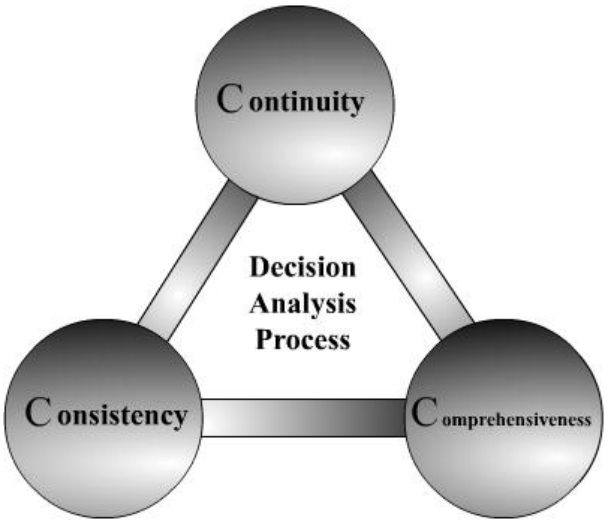

Figure 1. 3C principle of decision analysis

Steps of Decision Analysis Process

To illustrate the process (figure 2), let's analyze a hypothetical example. A software development project is in its final stage, a deadline is looming, and there is a chance the project will not be completed on time. Let's examine how a decision analysis process will help identify the best solution for the problem.

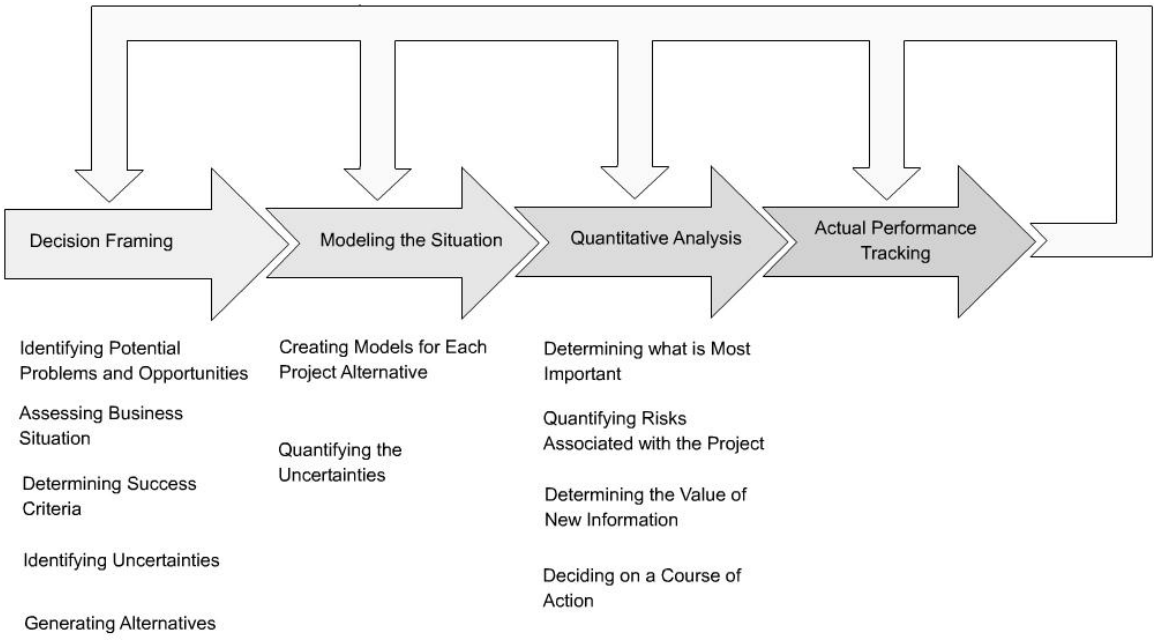

Figure 2. Steps of Decision Analysis Process

1. Decision Framing

Decision framing is based chiefly on subjective expert judgment. Experts provide their own beliefs in the form of their answers, which can be biased. There are many forms of biases: cultural, organizational, motivational, cognitive, and others. Motivational and cognitive biases are most common in project management.

a. Identifying Potential Problems and Opportunities

In some cases, it is difficult to identify the problems and opportunities. For example, what is causing the different projects within the organization to go consistently over budget in relation to the different specific corrective actions that were undertaken? In our software development example, the project will be delayed if certain actions are not taken.

b. Assessing Business Situation

Before attempting to make a decision, it is important to assess the business environment and define the constraints related to the problem. The assessment may also include an analysis of markets, competition, prices, or anything that can be related to the problem or opportunity. In our example, it is the availability of an additional resource.

c. Determining Success Criteria

In our software development example, it is the chance that project will be completed on time. Very often project managers have to make decisions based on multiple criteria, including project duration, cost, scope, and other parameters.

d. Identifying Uncertainties

Understanding of uncertainties is the key to the decision analysis process. In our example, there are uncertainties in task duration, start and finish times. Potentially, there could be many different types of uncertainties including uncertainties in cost, resource allocation, and others.

e. Generating Alternatives

First, let's identify what cannot be changed, or project constraints for making the particular decision analysis. In our software example it is the deadline. The project scope is a constraint as well. However, there is the possibility of bringing additional resources (software developers) to accelerate the development. As a result, we have three potential project scenarios:

a. "Do nothing". In this example, it means that additional project resources will not be added to the project team.

b. Bring a developer from another team within the organization.

c. Hire an external contractor.

2. Modeling the Situation

A mathematical model helps the analysis and estimation of future events. During the modeling stage, project managers rely on heuristics or rules of thumb to make estimations and create the model. Under many circumstances, heuristics lead to predictably faulty judgments or cognitive biases.

a. Creating Models for Each Project Alternative

Project managers constantly create mathematical models of projects, in most cases this is the project schedule. Sometimes, more elaborate models are required. For example, in the analysis of a complete product lifecycle, comprehensive models will include not only product development, but also marketing and sales efforts.

In our example, it is possible to create three simple slightly different project schedules associated with each scenario identified at the decision-framing stage: "do nothing", add a resource from another project team, and hire an external contractor.

b. Quantifying the Uncertainties

The uncertainties, identified through the decision framing process should be quantified. One of the ways to quantify uncertainties is defining ranges for parameters. For example, define low (optimistic), base (expected), and high (pessimistic) duration estimates for each task.

Another way to define uncertainties is to list all the potential events, which could affect the project schedule and quantify their probabilities and impact. In our software development example, there is a 50% chance that external consultant will not be familiar with subject area for the software project, which may delay the development by 20%.

3. Quantitative Analysis

The analysis should give project managers enough data to make an informed decision. Even with most advanced analytical tools and techniques, interpretation of the results of the analysis is the subject of multiple mental traps.

a. Determining what is Most Important

A model of a project may include a considerable number of variables: large numbers of tasks, resources, risks, and other parameters. For example, certain risks will cause failure of the project, while others risks will have no noteworthy affect on the project. To determine which project parameter is the most important, project managers can use sensitivity analysis.

In our software development example, the duration required for the training of the external contractor in one of the potential project scenarios can be very uncertain because the experience of the contractor in the particular subject area is unknown.

b. Quantifying Risks Associated with the Project

Uncertainties associated with input parameters were already quantified during modeling step. Now it is important to analyze how the combination of all these uncertainties could affect the project. A number of analytical techniques can be applied for this analysis.

In our example, quantitative analysis shows the following probability that project will be completed on time:

a. "Do nothing" – 32%
b. "Bring resource from another team" – 95%
c. "Hire external contractor" – 65%

c. Determining the Value of New Information

One of the useful decision analysis techniques is to assess a value of new information. For example, the goal is to select new development tools for the software project based on performance. Tests can be done to determine performance, but it could be costly and time consuming. Alternatively, it is possible to select the tools based on specifications, without specific tests. The analytical technique helps to establish the value of new information, which in this case would be the testing results, and to determine whether the money should be spent on the test.

d. Deciding on a Course of Action

In many situations, selection of alternatives is not so trivial. Sometimes, decisions are made using many criteria, which complicates the selection of the most efficient alternative. In our example, it is clear that according to our success criterion, we should select alternative (b) "Bring resource from another team".

4. Actual Project Performance Tracking

Now a decision has been made and a selected course of action is under way. However, in the middle of the project, an unforeseen event occurs that causes the selected plan to derail. For example, because of other commitments, the new software developer cannot move to the project. Luckily, there is a quantitative model of the selected project alternative and the project manager can update the model, perform a new analysis and

make a decision. It is very important to constantly track project performance and analyze all potential pitfalls and opportunities.