Decision Analysis

Projects Management & Risk

By Almahdy Eltonsy

Definition of a project in accordance with DIN 69901:

A project is an undertaking which is basically characterized by the uniqueness of its overall preconditions, for example:

- Objectives.
- Parameters in terms of time, finances, human resources or other factors.
- Delineation in relation to other projects.
- Project-specific organization.

Putting Real Options to Work to Improve Project Planning - Project Analysis?

Climb the Decision Tree

Most strategic plans change in accordance with the magnitude of the uncertainty. By assigning a quantifiable value to uncertainty, real options valuation enables projects manager to gauge and react to risk over time.

Why use a decision tree?

For more than a decade, consultants and academics have been touting **r**eal **o**ptions **v**aluation (ROV) as a means of improving the decision making that goes into a project. To date, however, ROV has not been widely adopted as a planning tool. Many project managers worry that the esoteric Black-Scholes equations frequently used to evaluate real options would require the addition of expensive software and a specially trained finance expert to the project team.

The familiar decision-tree framework is well suited to many of the contingencies that arise over the course of a project.

Decision analysis can help PMs to address issues such as:

How to allocate resources to ensure that the project meets specific deadlines?

When to scale up or delay investments, and when to exit a project

To make it more clear, Deciding on in-house

A simple decision such as whether to develop a new technology in-house or acquire it from an outside party illustrates the utility of the decision-tree framework. In-house development requires three years and leads to three possible outcomes. In two of these outcomes, the firm expects to create significant value. But there's also a 25 percent chance that the in-house development would fail; obviously, this outcome would have no payoff. Figure 1 shows this decision using a decision-tree framework. The probabilities of the three outcomes are based on a combination of managers' experience and judgment.

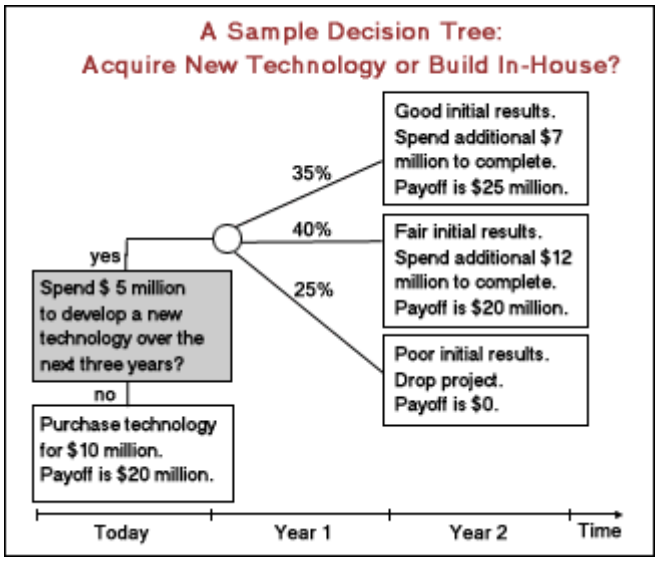


Figure 1

After calculating the value of each alternative, the manager is able to pick the highest-valued alternative. For the acquisition alternative, subtracting the $10 million cost of acquisition from the $20 million payoff yields a value of $10 million. For each of the three outcomes in the in-house development alternative, you have to subtract the cost from the payoff and then multiply the result by the probability of success. Thus, for the most successful of the three outcomes, the expected value would be:

($25 million - $7 million) X .35 = $6.3 million

An expected value calculation—the weighted average of the outcomes, with the probabilities used as weights—is used to blend the value of the three outcomes into a

single number. A 10 percent cost of capital is used as the discount rate. Performing this calculation reveals the value of the in-house alternative to be $7.14 million, or less than 75 percent of the value of acquiring the technology from outside.

As GPM : Make sure business managers and technical personnel are involved in creating the decision-tree diagrams.

The decision-tree framework is useful not only for "organizing multistage projects that are subject to uncertainty," it can also help you redesign projects "for even higher value,".

Let's say that a manufacturing company is considering a $20 million investment to upgrade its existing plant so that it can introduce a new product line. This investment requires an additional $16 million in market research. If the research yields positive results, the company will proceed to launch the new product line. That launch is valued at $94 million (based on a discounted cash flow calculation). Both the infrastructure investment and the market acceptance have uncertain outcomes; those probabilities and a decision-tree diagram of the decision are shown in the top half of Figure 2.

Doing the calculations yields a negative Net Present Value (NPV) of $3.3 million for the project according to this initial design, which means that it's not worth doing.

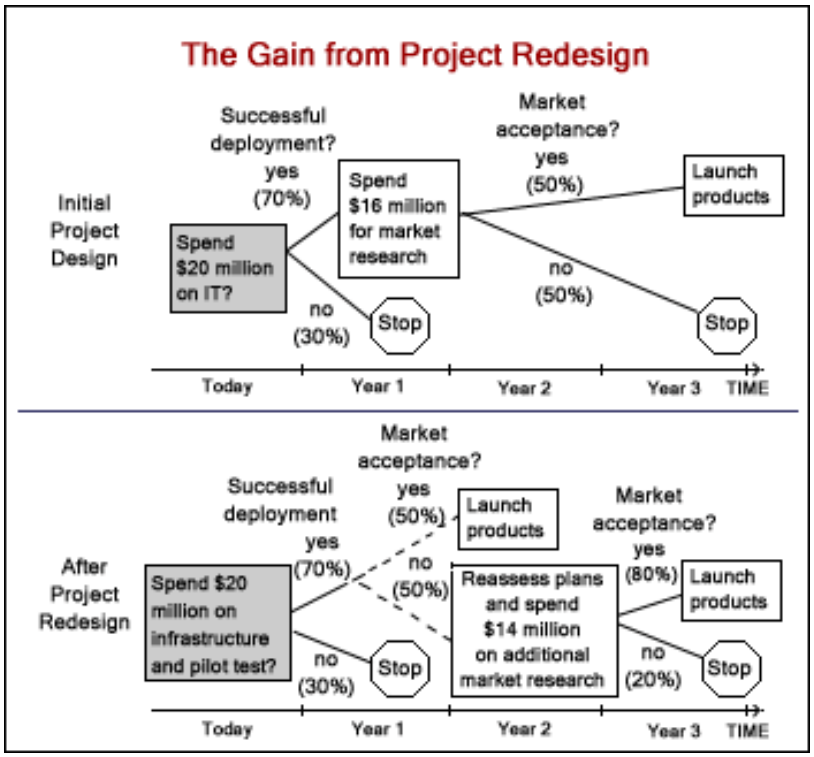


Figure 2

Another option is to redesign the project by running a smaller pilot market test while the infrastructure is being developed. Results from this pilot will help to resolve some of the market risk before the next decision point. If the infrastructure is successfully deployed, and the subsequent, comprehensive market research is successful, the project can move to product launch, saving time and money over the initial project design. The bottom half of Figure 2 shows a decision-tree diagram of the project after it has been redesigned along these lines.

The redesign enables the value of the launch and revised marketing plan to be folded back into the initial investment decision. The result, when you do the calculations, is an increase in the value of the project from a negative $3.3 million to a positive $5.5

million. In addition, with the redesign there is only a 37 percent chance that the project will be terminated, whereas the original design had a 65 percent chance of being scrapped.

Redesigning the project enables managers to learn more about the market at an earlier stage, thereby creating an opportunity to modify the marketing plan and increase the chance of market success. Under the revised plan, the project value increases because the follow-on investment is determined after some of the uncertainty has been resolved. The beauty of this decision-tree approach to ROV, therefore, is that it takes advantage of risk and uncertainty by tying expenditures more closely to the maturation of the opportunity. Breaking up the one market-research investment bet into two smaller investment bets enables the project manager to use options to improve his allocation of resources to the project as new information becomes available.

Process concerns

Decision analysis is not without its implementation problems. For example, it can be difficult to get the relevant scientific and technical personnel to agree on the probabilities of failure or success for each stage of the project. In particular, managers who are invested in the success of the project often believe that the probability of success is close to 100 percent. Moreover, when a project is up and running, ***teams are frequently unwilling to discuss potential exit scenarios***. This problem is particularly acute when managers have incentives to meet deadlines and milestones at any cost. The result is that midstream discussions about project closure are often biased.

To avoid these difficulties, we make sure that you involve both **business managers** and **technical personnel** in creating the decision-tree diagrams. This will improve the buy-in that the project receives from both groups and will also make it easier to discuss plans for exiting the project if the outcomes are unsuccessful.

Make sure that the two groups' incentives are aligned so that they are jointly accountable for the profitability of the project and the overall ROI of the portfolio of projects under way in your group. For instance, by giving rewards to project members for killing unsuccessful projects sooner rather than later, you increase the likelihood that even team members who have a strong personal investment in a particular project will agree to pull the plug if it's failing.

Risk management: Prerequisite

The project goals and project requirements must be known/available. It is helpful to have a project structure with the work packages which have already been defined.

One of the first tasks in the project is to identify and analyze potential risks.

Risk management is one of the most demanding jobs in the project.
The number of projects which fail as a result of unsatisfactory risk management is very high and failure to allow for risks can have serious consequences.

Risk management means identifying and analyzing potential problems, adopting appropriate measures and controlling risks during the entire period of the project.

The main goals:

- Identifying potential risks at an early stage before they become problems.
- Increasing risk consciousness among project personnel and superiors.
- Focusing risk management activities on the principal risks in the project.
- Avoiding and reducing damaging effects by initiating suitable measures.

Risk

The term risk, used in connection with a project, means:

- the possible occurrence of negative events, whether expected or unexpected;
- the difference between the planned course of the project and the actual course which the project subsequently takes.

The more complex and innovative a project is and the longer it takes and the greater the scope of the services and deliveries, the greater will be the possible risks. In order to minimize their impact (or better still eliminate them completely),

- all risks must be identified at the earliest possible stage
- all risks must be assessed individually
- measures must be taken to counteract risks.

The offer phase – the defining phase in any project – accounts for between about 80% and 90% of all risks. However, the damage does not really become apparent until the end of the processing phase.

Before submitting a binding offer, it is essential to carry out an in-depth risk analysis based on the projected parameters.

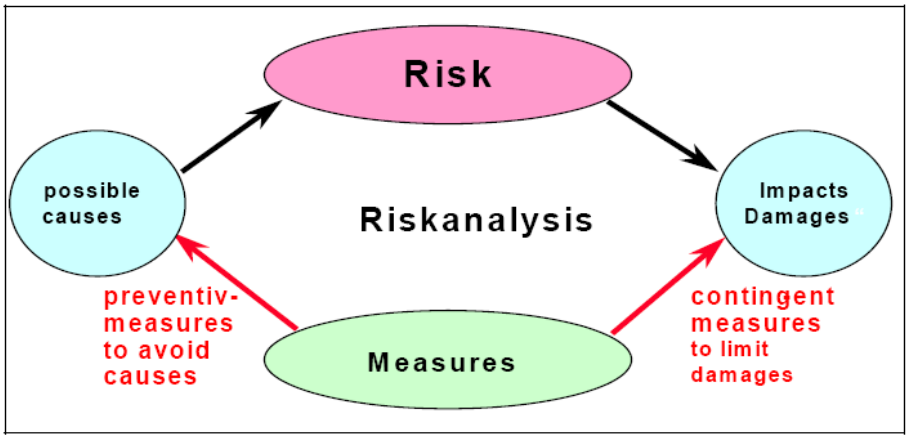
As the project progresses, keep a careful watch for changes in risks and for possible new risks arising from changes in the project or from new and/or changed work packages.

Analysis of project risks: Risk analysis

The **steps** to be taken in **risk management** are as follows:

- Making a note of the risks
- Determining the effects
- Risk assessment
- Finding out the causes
- Adopting countermeasures
- Regular controlling

The **Work Breakdown Structure** is a useful basis for risk analysis. In addition to the global risks, the risks connected with the individual work packages must also be determined and analyzed.



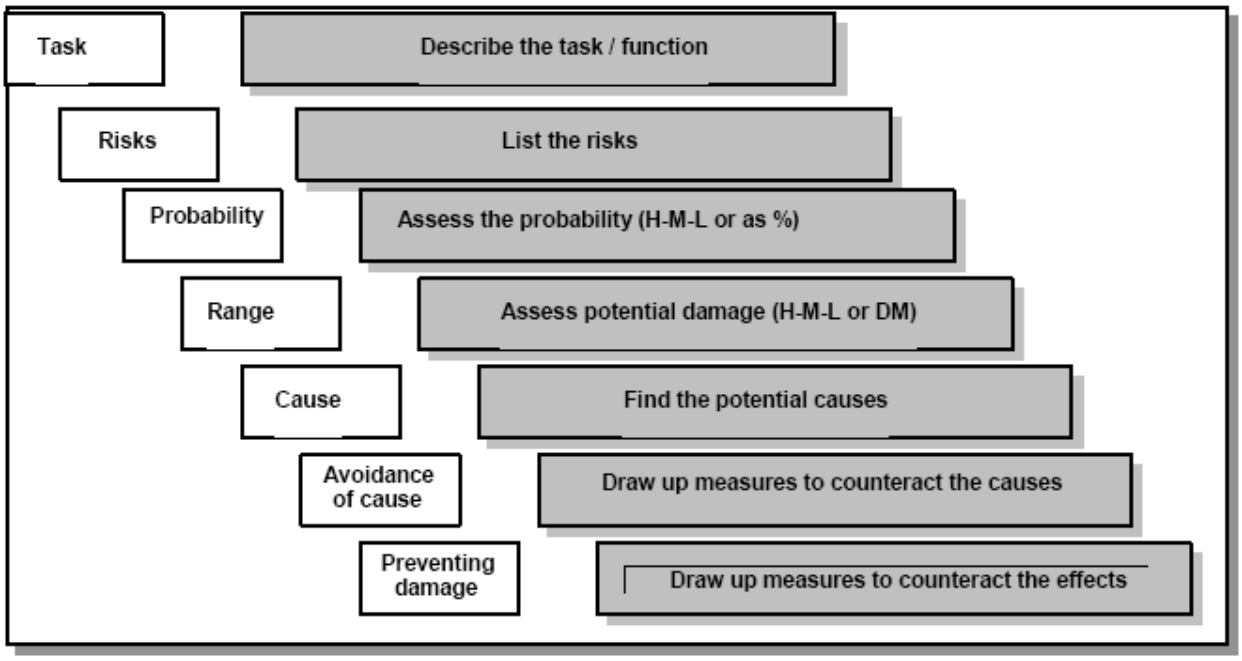
Measures

The following are typical measures for avoiding or at least reducing the possible negative effects of risks:

- Insurance policies
- Risk analysis
- Contractual conditions (force majeure clause, warranty, exclusion of indirect/consequential damage, exemption from liability, etc.)
- Procuring business information (customer, subcontractor)
- Bank guarantees
- Safeguarding exchange rates (in the case of foreign orders)
- Export controls
- Forwarding contractual regulations to subcontractors
- Subcontractor audits
- Quality assurance measures
- Specifying the project requirements
- Arranging for stand-in personnel/subcontractors (in case required)
- Allowing for buffer times (i.e. reserve time)
- Passing on contractual penalties to subcontractors
- Feasibility studies
- Alternative solutions

Risk analysis

The risk analysis examines the following aspects of tasks/work packages:

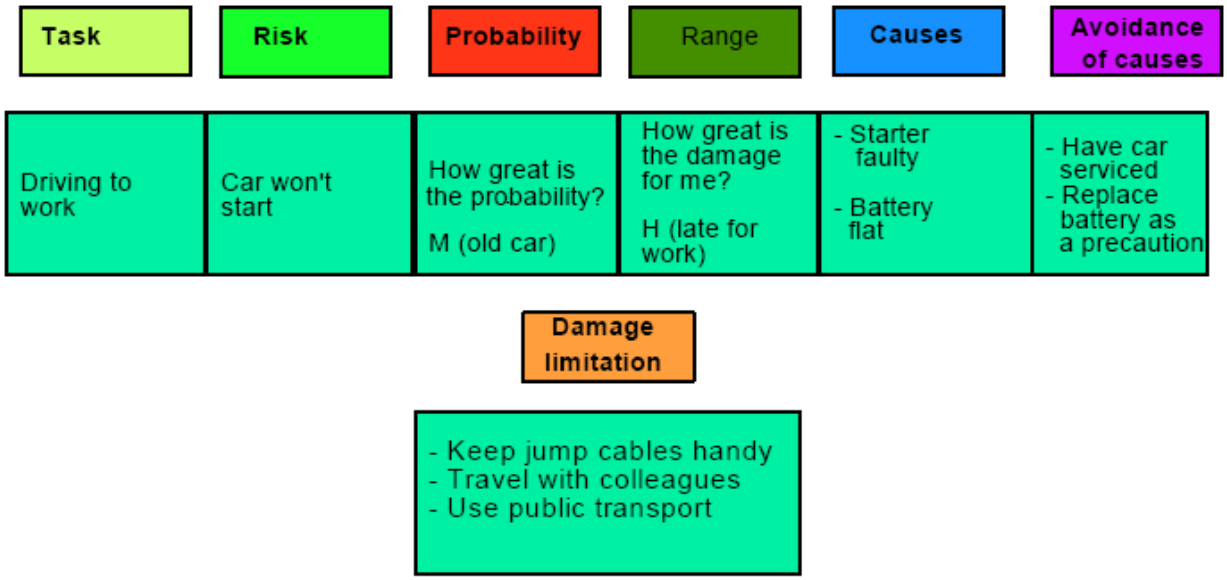


Begin by listing all recognizable risks and assess them according to the likelihood of their occurrence and their possible range in relation to the project. Then work out the causes of the principal risks (approximately 20% of total risks) and the measures which might be taken to avoid the causes of the risks and/or to limit the damage they may entail.

Work out which of these measures will be the most effective. Decide whether this measure will be implemented or whether the risk will be accepted. Remember that measures which are adopted may well result in new work packages in the Work Breakdown Structure or changes to the logical project schedule. Adapt the Work Breakdown Structure or network diagram accordingly.

Example of risk analysis

- Keep jump cables handy
- Travel with colleagues
- Use public transport



Most of the risks we face on a project are independent of other risks. These types of risks are easier to identify and easier to manage. However, there are times when risks are connected. That is, it's possible that certain risks will only appear as a result of actions taken as a result of managing another risk. That's where the decision tree is used. A decision tree is a technique for determining the overall risk associated with a series of related risks.

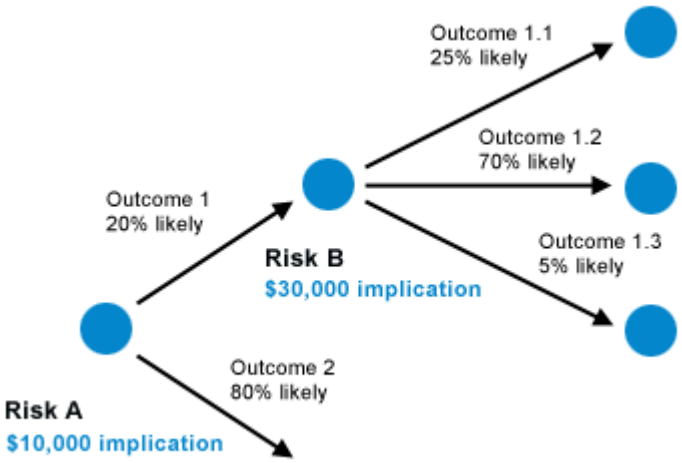
For example, let's say your project is going to need to place a large equipment order. You think there is a 20% risk that your primary hardware supplier may not be able to provide all the equipment you need for a large order in a timely manner. This could be risk A. As a part of the risk response plan, you decide to talk to a second vendor to see if they can help fulfill the equipment order on short notice. They normally have the equipment in stock. However, you also discover that there is a 25% possibility that there may be a disruption in their plant because of a potential strike. This is risk B.

Do you see how the two risks are related? Risk A is the primary project risk. If you can successfully manage Risk A, there will be no reason to work with the second vendor and therefore risk B will never enter into the project. However, if risk A comes true, then your risk plan will need to deal with a second risk B.

Of course, what you really want to know is what the chance is that risk A will come true (your primary vendor cannot fulfill the entire order) AND risk B will also come true (the backup vendor goes on strike). That would be the worst case scenario for you. The total risk is calculated by multiplying the individual risks. Since there is a 20% chance of risk A, and a 25% chance of risk B, the probability that both risks will occur is 5% (.20 * .25).

You can use risk trees to come up with financial implications as well. Let's look at the following generic decision tree that is slightly more complex.

Figure A



This decision tree shows two risks--A and B. Risk A has two outcomes. Outcome 1 is 20% likely to occur and outcome 2 is 80% likely to occur. The monetary value of Risk A is $10,000. If outcome A occurs, a second Risk B is introduced and there are three likely outcomes, 1.1, 1.2 and 1.3. The monetary value of Risk B is $30,000. Using the decision tree, you see that the financial risks of the various outcomes are as follows:

- Outcome 1.1 has a financial risk of $9,500 ($10,000 * .2) + ($30,000 * .25)
- Outcome 1.2 has a financial risk of $23,000 ($10,000 * .2) + ($30,000 * .70)
- Outcome 1.3 has a financial risk of $3,500 ($10,000 * .2) + ($30,000 * .05)
- Outcome 2 has a financial risk of $8,000 ($10,000 * .8)

What this tells is that we should try to achieve outcome 1.3 if possible. It has the smallest financial risk impact. If you don't think you can achieve outcome 1.3 (and there is only a 1% chance you can (.2 * .05)), you should try for outcome 2. There is an 80% chance you can hit outcome 2.

We can see that this process can get complicated. Fortunately, most risks on project are independent of each other. However, when we discover that one risk leads to another dependent risk (and perhaps more dependent risks), the decision tree can help to determine the probability and impact of each risk combination.

Case Study:

Tender Go / No Go:

A tender for supplying, installing and commissioning of Medical Equipment for Hospital.

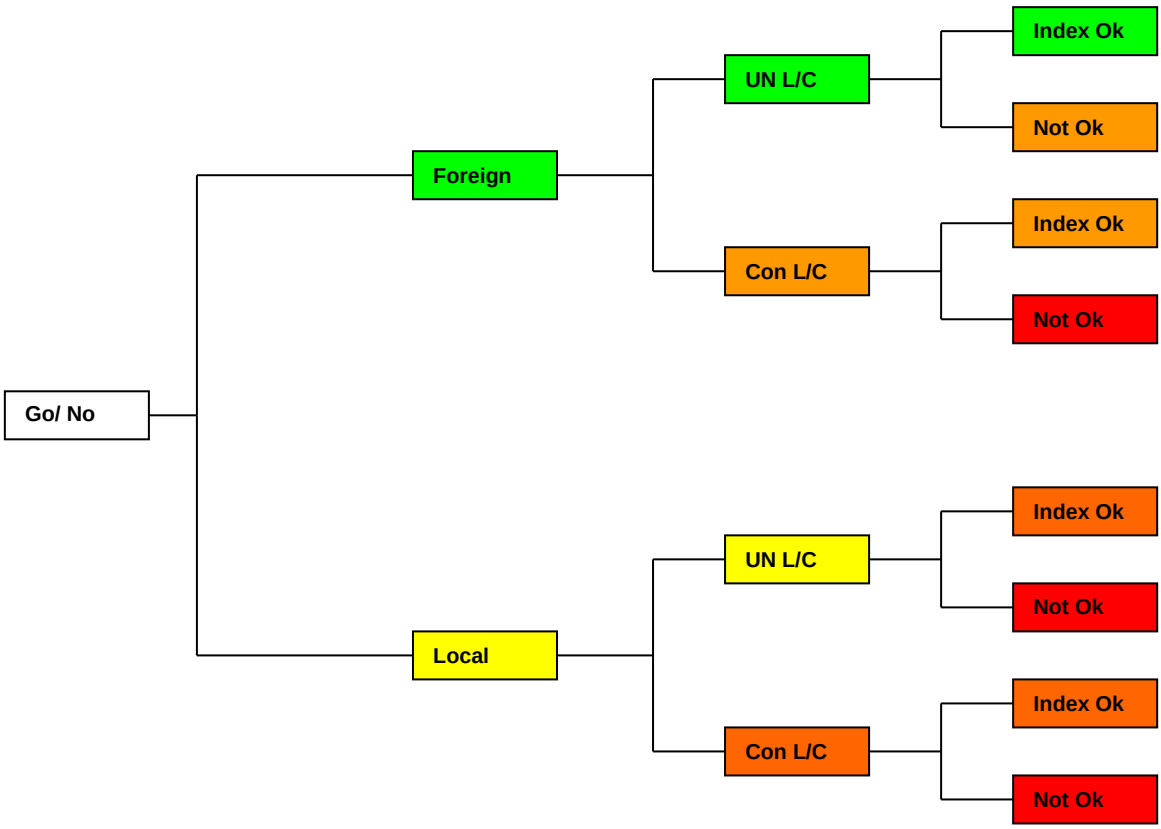
Tender Type: International Tender
Currency: US$ / Euro
Terms of Payment: L/C

Company (N.N) Want to make a decision:

1- Go / No Go.
2- Tender / No Tender.

Typical steps:

1- State the following factors:
- Tender in foreign currency or local currency
- Terms of payments
- L/C conditioned / not conditioned (customer dependable).
- Country Index (Corruption level).



Assume the decision is Go:

Then Company (N.N) Purchase tender book and start to study the tender and that lead to the next phase which is:

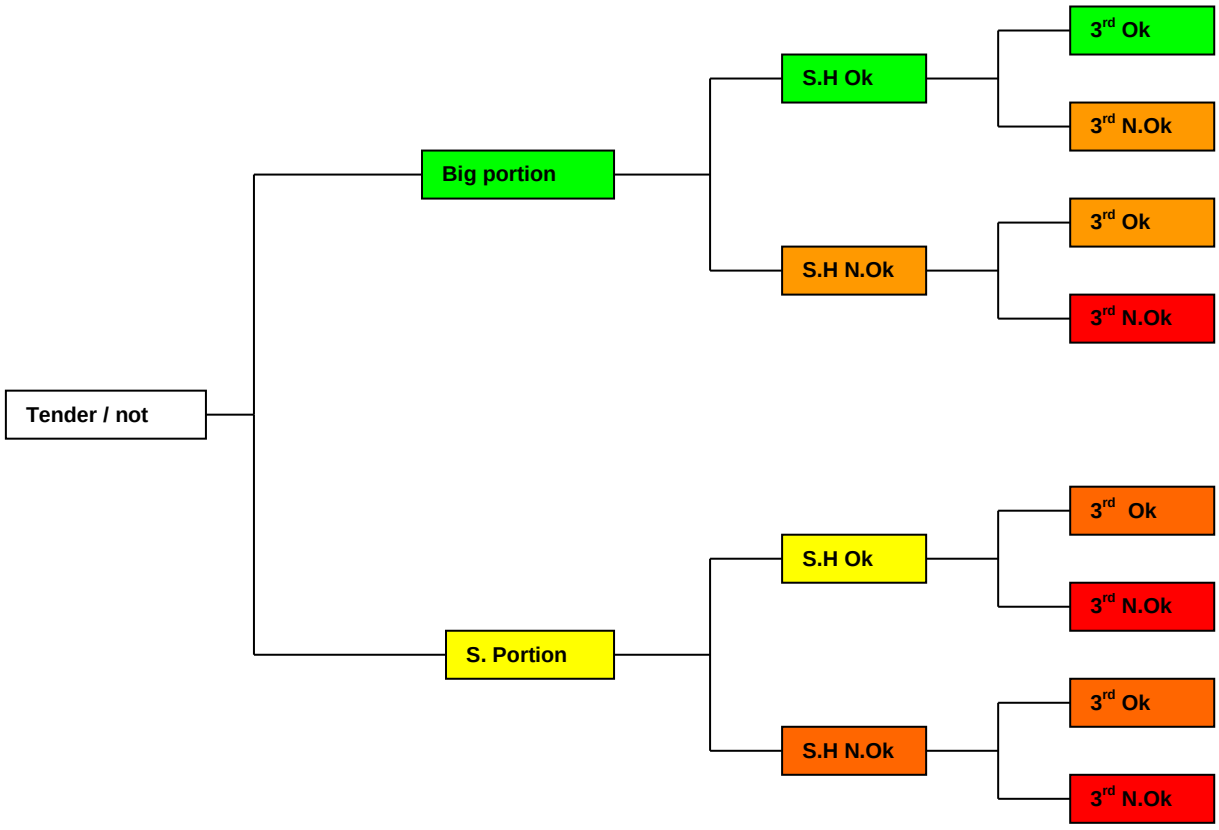
Tender / No Tender decision, based on the following factors:

- Portion of (N.N) company in the tender, the portion of N.N Brand in the bill of quantities.
- Strength of stakeholders.
- 3rd party companies involved in the project.
- Requested time schedule.

The above mentioned give the decision of Tender / no Tender. Weights of each task is assigned based on:

- Business Management
- Project Management
- Technical Management

With the Acquire / Not Acquire another level of decision tree is built which reflect the Risk of the project and different routes to minimize the risks and eliminate them



About the Author

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Almahdy Eltonsy, IPMA – B is a Senior Project Manager in the HealthCare industry, and the first healthcare PM granted the IPMA-B certification in Egypt. Starting with Siemens in 1993, Almahdy has extensive technical and managerial experiences, gaining the ability to work cross-functionally in a time-intensive environment. One of the most important milestones in Almahdy's project management career is Children's Cancer Hospital in Egypt (57357) (www.57357.com), a 30 Million Euro Project. As a GPM for this strategic pivotal project, the scope was not only project management but also the service management, in addition to work with accreditation bodies.

In 2012 Almahdy moved to GE HealthCare to work as a product service manager for Surgery – X-Ray – Intervention – Ultrasound – Life Care solutions, using his experience in leading the service team with project management methodology. Almahdy's motive to change is to take a new challenge and exposure to new cultures and discipline, taking advantage of his technical and managerial skills and using the project management tool box in general management aspects.

In addition to his work in healthcare, Almahdy worked as an IT project developer with one of the largest media and advertising groups in Egypt. Almahdy was able to realize a new methodology and software for Media planning and advertising campaign planning. Almahdy holds a B.Sc. in Systems and Biomedical Engineering from Cairo University - Faculty of Engineering, and passed many specialized courses in Siemens, GE and Microsoft. Linkedin: Almahdy Eltonsy. Email: Almahdy_eltonsy@yahoo.com