Perform Qualitative Risk Analysis

Introduction

- Risk analysis can be categorised into two broad methods. They are qualitative and quantitative in nature.

Purpose and Objective

- The Perform Qualitative Risk Analysis process assesses and evaluates the characteristics of individually identified project risks and prioritizes risks based on agreed-upon characteristics.
- Evaluates probability and impact of individual risk on the project objectives.
- Risks are categorized according to their sources or causes.
- Identifies areas of greater risk exposure (e.g., project completion date, budget, deliverable's scope) and facilitates risk responses.
- Methods of qualitative risk analysis are applied to the list of positive and negative risks created or updated by the Identify Risks Process.
- Quantitative Risk Analysis helps to determine the overall risks to project objectives resulting from the potential interactions and combined effect of all risks.
- Risk responses are more effective while addressing root cause (several risks originating from a common source).

Critical Success Factors for Perform Qualitative Risk Analysis Process

- Critical success factors are:
  - Use Agreed-Upon Approach
  - Use Agreed-Upon Definitions of Risk Terms
  - Collect High-Quality Information about Risks, and
  - Perform Iterative Risk Analysis

Several factors leading to successful qualitative risk analysis are summarized in **Figure 6-1.**
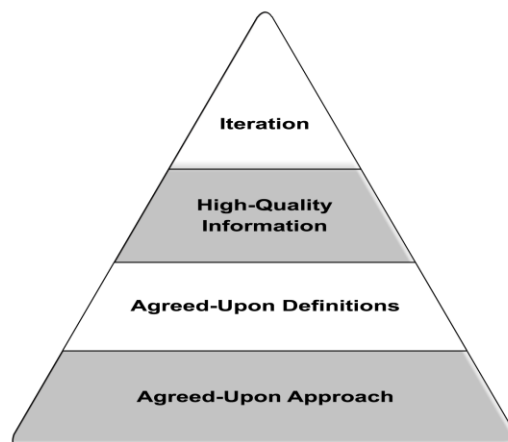
Figure 6-1 Building Risk Analysis Credibility

1. Agreed-Upon Approach:

- Agreement of the project stakeholders is a fundamental criterion and a common theme.
- High-quality information collected contributes to the reliability and credibility of process outputs.   This approach is the foundation of process credibility.
- Probability of occurrence, impact on individual objectives, urgency (proximity), and manageability are the risk assessment factors.
  - Urgency: Risks requiring near term responses may be considered more urgent to address. Indicators of urgency are as follows:

    - Lead time required for the execution of risk response

    - Clarity of symptoms, and

    - Warning signs triggering risk response (detectability)

  - Manageability: Some risks are unmanageable and attempting to address them is a waste of resources. So the project team may examine and decide to:

    - Go forward and establish a contingency reserve.

    - Stop or re-scope the project because of a high probability of unmanageable threat posed by risks and fear of missing out on opportunities.
    - Inform the customer of the risks and ask for a decision from their point of view.

  - Impact external to the project: The importance of a risk may be increased if it affects the enterprise beyond the project.

2. **Agreed-Upon Definitions**

- Risk assessment should be based on agreed-upon definitions of important terms, and they should be used consistently.

- Example: Levels of probability and impact on objectives helps to give realistic risk assessments, and facilitates communication of results between management and stakeholders.

3. **Highly Quality Information**

- It is gathered by interviews, workshops, and other means using expert judgment.

- Individual data subject to reporting or intentional bias should be identified and remedied, or else a different and unbiased source of information should be found and used.

4. Iteration

- Periodical analysis of individual risks of project enhances the success of qualitative risk analysis.

- The frequency of analysis is planned in the Plan Risk Management process, and events within the project also influence it.

Tools and Techniques for the Perform Qualitative Risk Analysis Process

Tools and techniques identify the risks that are important to the project's success. They are as follows:

- o Select Risk Characteristics that define Risks' Importance

- o Collect and Analyze Data

- o Prioritize Risks by Probability and Impact on Specific Objectives,

- o Prioritize Risks by Probability and Impact on Overall Project

- o Categorize Risk Causes

The tools and techniques used for assessing individual risks will identify the risks that are important to the project's success. This process is illustrated in **Figure 6-2**

Figure 6-2: The Perform Qualitative Risk Analysis Process

1. **Select Risk Characteristics**

- Helps to distinguish high level risk response from low level risk response.

- The criteria that make a risk important to management are agreed upon in advance and implemented in the tools used.

- Output includes a listing of risks in priority order or in priority groups such as high, moderate, and low.

2. **Collect and Analyze Data**

- Assessment of individual risks is based on information collected about them.

- Data collection, evaluation tools, including interviews, workshops, and references to databases of prior projects require management support and attention.

- Intention bias should be avoided while relying in expert judgment for the information.

3. **Prioritize Risks by Probability and Impact on Specific Objectives**

- Helps to distinguish a risk's priority in terms of probability and impact on project objectives.

- It is useful since it is common to have uneven impacts on various project objectives.

4. **Prioritize Risks by Probability and Impact on Overall Project**

- The reason behind constructing a measure of a specific risk's response is to ease communication with management and other stakeholders.

- The organization should be explicit about the single risk prioritization index, if needed, which reflects the establishment's preference among objectives.

- It should be documented in the Plan Risk Management process.

5. **Categorize Risk Causes**

- Brings improvement in analysis of the probability and magnitude of project risk and effective responses.

- Identifying common root causes of a group of risks reveal both the magnitude of the risk event and effective strategies that might address several risks simultaneously.

- Better understanding of the chain of risks lead to the implementation of risk for the project.

- It provides a realistic picture of problems of risk mitigation using scarce resources.

- Combined results of the Perform Qualitative Risk Analysis and risk breakdown structure shows clusters of priority risks arising from specific sources and high risk areas.

- Assessment of high priority risks' impact on one objective reduces the uncertainty of that objective.

Documentation of Results

- It adds structure to the list of undifferentiated risks into categories of priority.

- Priorities are based on probability of risk occurrence and impact on project objectives.

- The information is stored in risk registry and is easy to use and update.

- List of prioritized risks is posted to the project participants for improving the plan and risks having high priority are segregated for further analysis and monitoring.

- Low priority risks are placed on a watch list and are less often reviewed for changes.

APPENDIX

- The Perform Qualitative Risk Analysis process prioritizes the further analysis of the undifferentiated list of risks identified in the Identify Risks process.

- Organizations apply resources to "high risk" based on their priority indicated by risks' probability and impact characteristics.

TECHNIQUES

1. **Root Cause Analysis:**

   A root-cause analysis identifies basic causes of risks that may point to fundamental forces; it also identifies common sources of risks. Risks that may be related because of their common root causes may also be identified. Preventive action may be taken according to the details that are arrived at through this technique. The success of this technique depends on the willingness by management to accept and address the root cause rather than adopting partial workarounds. The root-cause analysis technique reduces the instances of problems occurring instead of reacting to problems when they occur.

   Disadvantages: Root causes cannot be identified in risk management techniques that are organized by individual risk.

   Other potential causes of risk may be overlooked in this technique. Moreover, there may be no valid strategy to address the root cause once it has been identified.
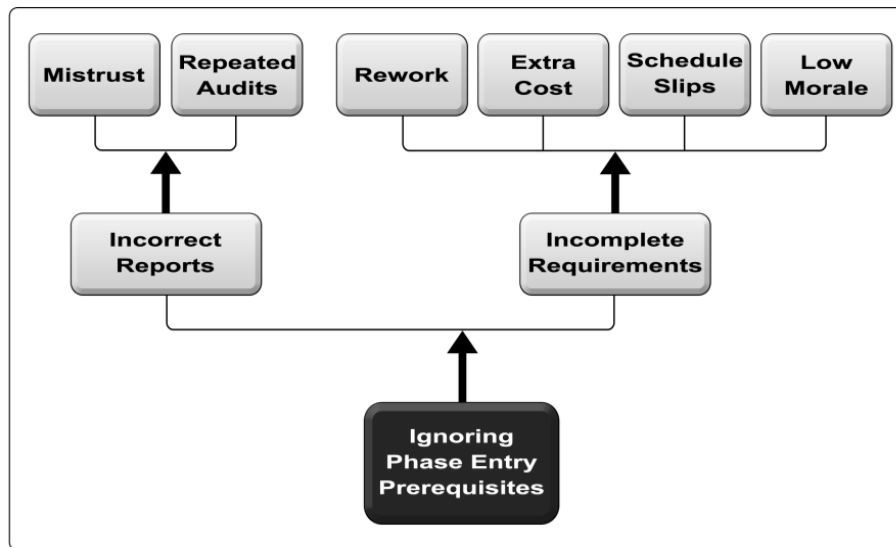
Figure 6.3 Example of a Root Cause Analysis

2. Estimating Techniques Applied to Probability and Impacts:

- Addresses both key dimensions of a risk, namely its degree of uncertainty (probability) and its effect on project objectives (impact).
- Terms for probability (e.g. probable, almost certain) and impact (e.g. insignificant, major) are ambiguous and subjective.
- Impact can be represented by a range of values that can not be put into specific impact level such as "moderate impact on time."
- Critical success factors such as agreed definitions and terms reflect stakeholders' risk tolerance and thresholds.
- Values used in the definitions represent the same level of impact across objectives as perceived by the management or stakeholders.
- Consistent use of agreed-upon terms and definitions across all identified risks.
- The probability of a risk occurring can be specified by assigning levels of risk probability by ranges of probability.
- Risk estimation in terms of probability and impact helps the subject experts to assess a risk's probability within a range rather than as a specific value.
- Impact level definitions are project-specific.
- The values used to specify the level of impact from very low to very high (if a 5*5 matrix is being used) should be:

    - Higher impact, for threats and opportunities, as they move from very low to very high for a specific objective.

o Levels are defined by the organization as causing the same amount of pain or gain to the project for each level across objectives.

o If a risk's possible impact is uncertain and could be assigned to more than one level of impact (e.g. from moderate to high), the analyst may choose to assign the risk to the impact level that represents the expected or average impact.

o The risk may be flagged for extra analysis in order to reduce the range of uncertainty to fit within a single range.

An example of impact level definitions is shown in **Figure: D11.** These definitions should be tailored for opportunities and threats and scaled by stakeholders to the specific project.

SCALE	PROBABILIY	+- IMPACT ON PROJECT OBJECTIVES		
		TIME	COST	QUALITY
VHI	61-99%	>40 days	>$200K	Very significant impact on overall functionality
HI	41-60%	21-40 days	$101K-$200K	Significant impact on overall functionality
MED	21-40%	11-20 days	$51K-$100K	Some impact in key functional areas
LO	11-20%	6-10 days	$11k-$50K	Minor impact on overall functionality
VLO	1-10%	1-5 day	$1K-$10K	Minor impact on secondary functions
NIL	<1%	No change	No change	No change in functionality

Figure 6.4: Example of Definitions for Levels of Probability and Impact on Four Specific Objectives Used to Evaluate Individual Risks.

Note: Opportunities are to be treated as representing a positive saving in time or cost, or increased functionality. For threats, each impact scale is interpreted negatively, i.e. time delays, increased cost, or reduced functionality.

3. Post-project reviews/ Lessons Learned/ Historical Information:

• The review of risk databases of previous projects, such as those that arise from post-project reviews or lessons learned exercises or historical information within an organization or industry can reveal information relevant for a current project.

• This technique leverages previous experience, and prevents the occurrence of the same mistakes or missing the same opportunities again.

- Participation of previous project team members and a well-structured project lessons database increases the effectiveness of this technique.

- Disadvantages:

  - Only those risks that have occurred previously can be identified.
  - The information available may also be incomplete with no details on ineffective strategies, lack of details of successful resolution etc.

4. Probability and Impact Matrix (P-I Matrix):

- Allows the organization to prioritize the project risks for further analysis (e.g. quantitative) or risk response.

- Reflects the organization's level of risk tolerance.

- Critical success factors include clear and unambiguous input data for assigning levels of probability and impact.

- Effective estimation of impact and likelihood of risks.

- Organizations should be careful to assess the combinations of probability and impact that qualify a risk as low, moderate or high risk so that the method used reflects the organization's risk attitude.

- Definitions used to designate the levels of impact (L, M, H) for each objective should represent the same level of impact as perceived by the organization's management or project stakeholders as reflecting the organization's utility function.

- Drawbacks include inefficiency in handling risk ranking factors such as urgency or manageability and the range of uncertainty in the assessment of a risk's probability or impact overlapping a boundary.

Probability and Impact Risk Ranking										
Probability	Threats					Opportunities				Probability
VHI	L	M	M	H	H	H	H	M	M	L	VHI
HI	L	L	M	H	H	H	H	M	L	L	HI
MOD	L	L	M	H	H	H	H	M	L	L	MOD
LOW	L	L	L	M	H	H	M	L	L	L	LOW
VLOW	L	L	L	L	M	M	L	L	L	L	VLOW
	VLOW	LOW	MOD	HI	VHI	VHI	HI	MOD	LOW	VLOW	
	Impact (Threats)					Impact (Opportunities)				

Figure 6.5: Example of Probability-Impact Matrix Used to Sort Risks (Threats and Opportunities) into High Risk (H), Moderate Risk (M), and Low Risk (L) Classes.

5. Analytic Hierarchy Process (AHP):

- Assists in developing a relative weighing for project objectives that reflects the organization's priorities for time, cost, scope, and quality for the project.

- Assists the creation of an overall project priority list of risks with respect to individual objectives. This prioritization determines how trade-offs affect different objectives.

- Critical success factors for the effective application of this method include: it acts as an expert facilitator in the process, agreement by management that it is useful to develop a consistent set of priorities among objectives, and use of proper method or available AHP software.

- Weaknesses include organizational decisions often made by committees than individuals and difficulty in gathering information about pair-wise comparison of the objectives from high-level management.

A spread sheet implementation is given below:

Preference Factors	
1	Equally Preferred
2	Mildly Preferred
3	Moderately Preferred
4	Greatly Preferred
5	Always Preferred

Input Matrix (Preference Factors)				
	Cost	**Time**	**Scope**	**Quality**
Cost	1.00	0.25	0.33	0.20
Time	4.00	1.00	1.00	0.25
Scope	3.00	1.00	1.00	0.25
Quality	5.00	4.00	4.00	1.00

Note: Preference factors input is given in Blue color. Principal Diagonal is 1.0 by definition. Other cells calculated as 1/ preference factor for same objectives.

Calculated Factors (Preference Factor / Column Total)					Weighting Factors
	Cost	**Time**	**Scope**	**Quality**	**Average of Row**
Cost	0.08	0.04	0.05	0.12	0.1
Time	0.31	0.16	0.16	0.15	0.2
Scope	0.23	0.16	0.16	0.15	0.2
Quality	0.38	0.64	0.63	0.59	0.6
Sum	13.00	6.25	6.33	1.70	1.0

Figure 6.6: Example of Analytic Hierarchy Process Computations to Determine the Relative Weighting of Four Project Objectives.

Terms and Concepts

1. **Contingency reserve**: The amount of funds, budget, or time needed above the estimate to reduce the risk of overruns or project objectives to a level acceptable to the organization.

2. **Effect**: Conditional future events or conditions which would directly affect one or more project objectives if the associated risk happened.

3. **Impact**: A measure of the effect of a risk on one or more objectives if it occurs. Also known as *consequence.*

4. **Implementation**: The realization of an application, or execution of a plan, idea, model, decision, specification, standard, algorithm or policy. Various steps involved are often overseen by a project manager using project management methodologies set forth in the Project Management Body of Knowledge.

5. **Iteration**: The act or repeating the process usually with the aim of approaching a desired goal or target or result.

6. **Likelihood**: See *probability*

7. **Objectives**: Something toward which work is to be directed, a strategic position to be attained or a purpose to be achieved, a result to be oriented, a product to be produced, or a service to be performed.

8. **Perform Qualitative Risk Analysis**: The process of prioritizing risks for further analysis or action by assessing and combining their possibility of occurrence and impact.

9. **Prioritization**: Identification of project priorities which allows clarifying ranking of tasks and understanding how these tasks will be executed throughout the life-cycle of the project. It helps the project manager and team to clearly see the project goals and objectives.

10. **Probability**: A measure of how likely an individual risk is to occur. Also known as *likelihood.*

11. **Risk**: An uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives.

12. **Risk Breakdown Structure (RBS)**: [Tool] A hierarchically organized depiction of the identified project risks arranged by risk category and subcategory that identifies the various areas and causes of potential risks. It is tailored to specific project types.

13. **Risk Register**: The document containing the results of the qualitative risk analysis, quantitative risk analysis, and risk response planning.

14. **Root Cause**: An initiating cause that gives rise to a causal chain which may give rise to risks.

15. **Scalability**: It is the ability of a system or component to accommodate greater demand while maintaining an acceptable response time for users. It is an important factor for project management anticipating for future growth.

16. **Stakeholder**: Person or organization (e.g., customer, sponsor, performing organization, or the public) that is actively involved in the project, or whose interests may be positively or negatively affected by execution or completion of the project. A stakeholder may also exert influence over the project and its deliverables.