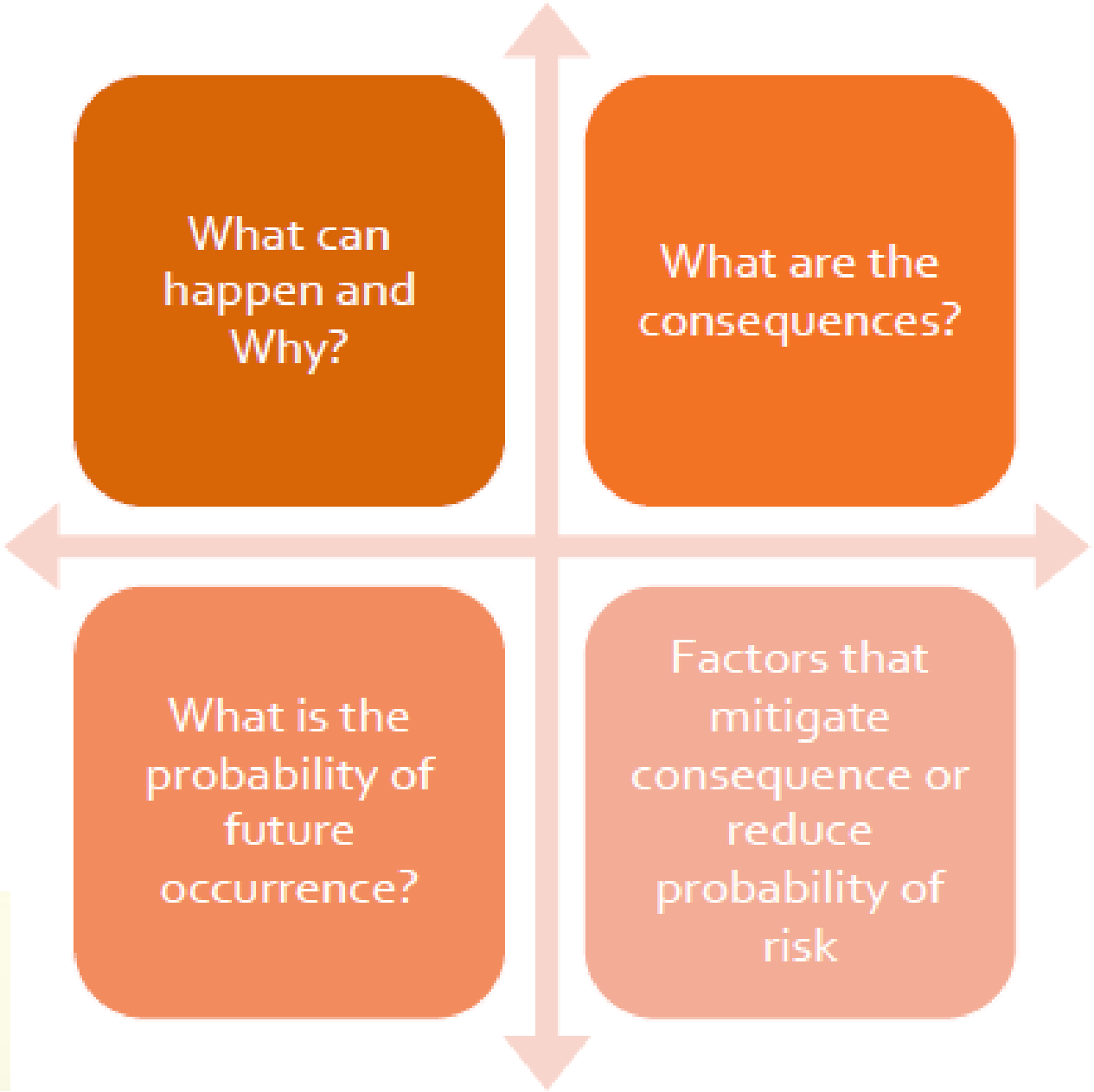
STR 665
Risk Management

Lec 2 : Qualitative risk assessment

Dr. Mona Abouhamad


Risk
Identification


What can happen and Why?
What are the consequences?
What is the probability of future occurrence?
Factors that mitigate consequence or reduce probability of risk

Are risks considered problems?

- The likelihood of the risk event must have a probability that is less than 1.0. *Team members often try to associate risk with something that has already occurred (i.e. likelihood=1.0).*
- An event that has already occurred is an issue/problem.
- An event that will surely occur (anticipated delay) is a problem.
- *A risk has the potential to occur; it has not actually occurred.*

Risk is the process of identifying, analyzing, and responding to project risks. It includes max. probability and consequence of positive events and minimizing probability and consequences of negative events.

Risk Causes (Triggers)

- A risk has a cause/ trigger .. That if occurs, has a positive or negative effect on project objectives.

Example:

Limited personnel assigned to project

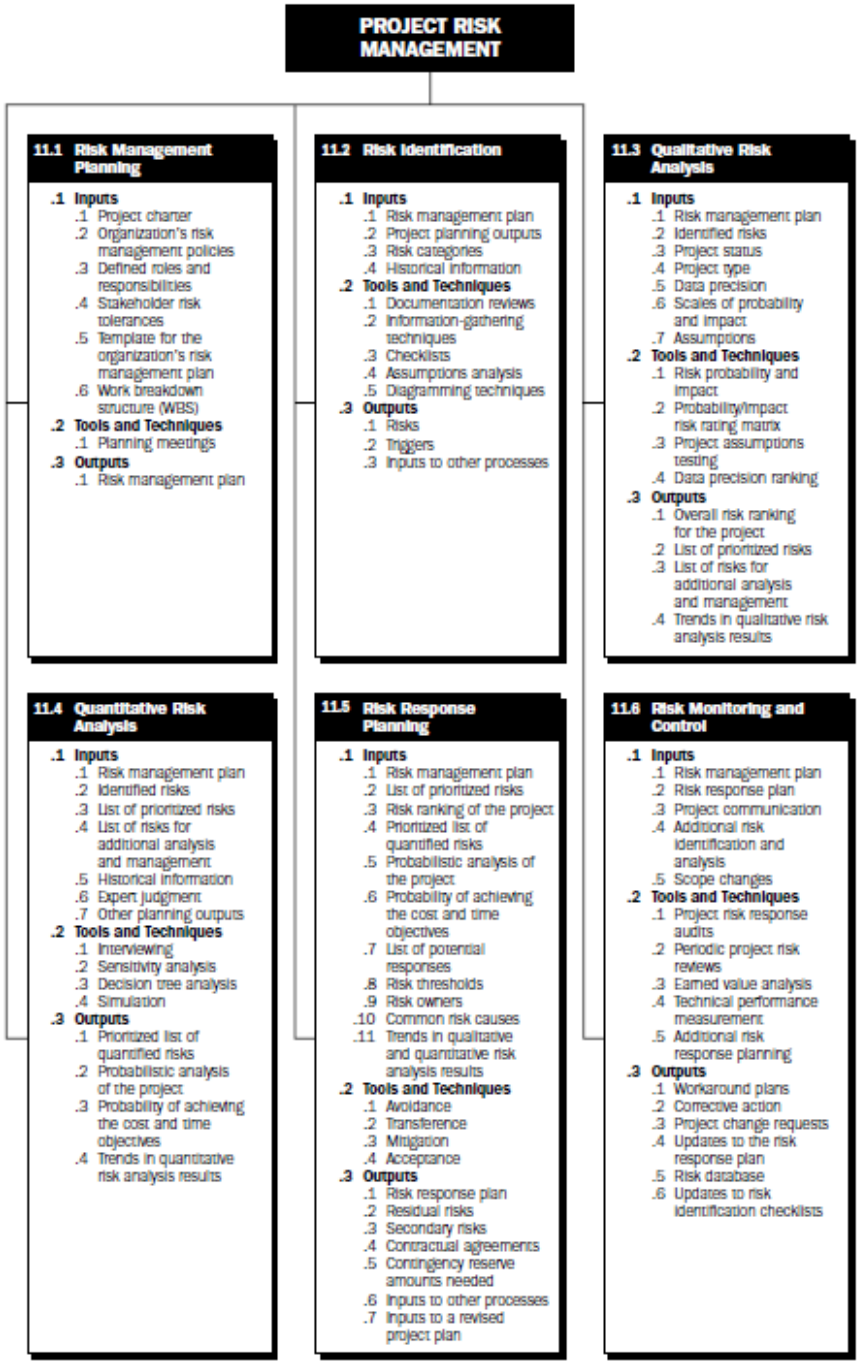
Late delivery of equipment shipped from overseas

Delayed permit

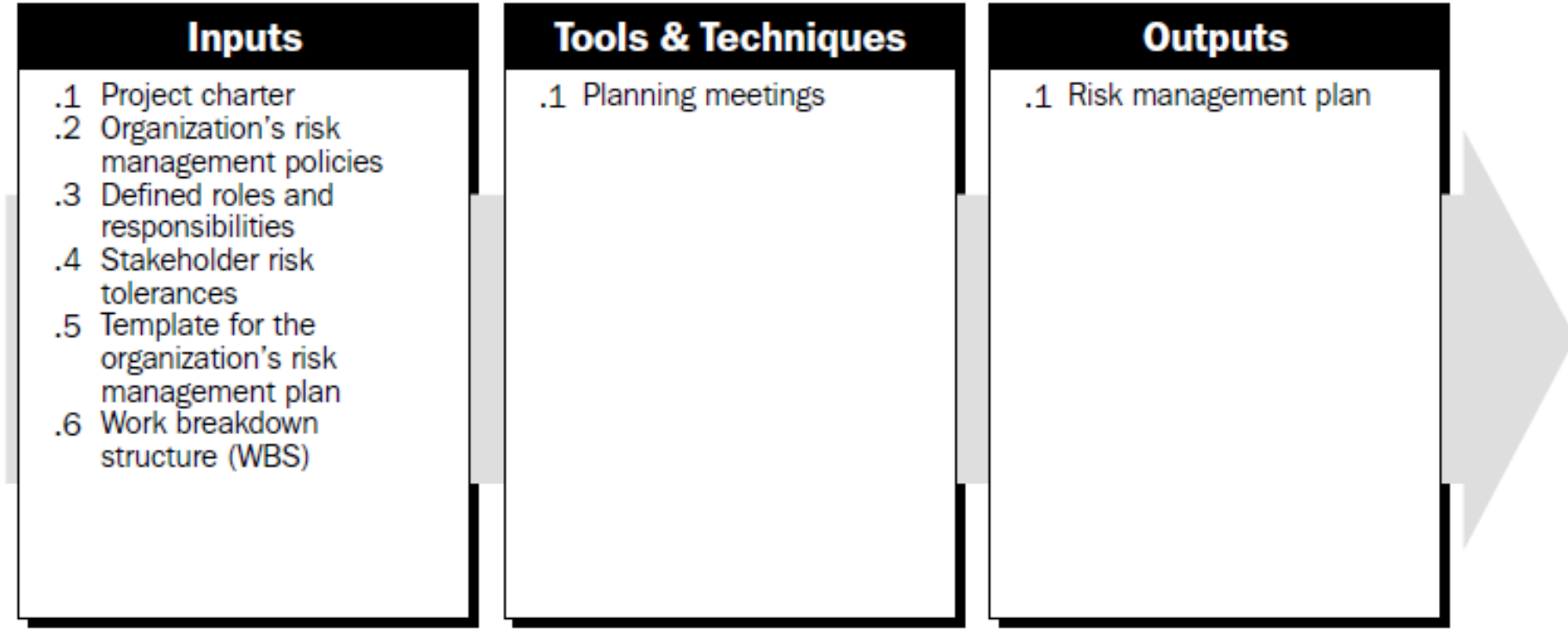
Bad quality delivered from subcontractors

Excessive inflation

Construction site congestion


PROJECT RISK MANAGEMENT
11.1 Risk Management Planning
.1 Inputs
.1 Project charter
.2 Organization's risk management policies
.3 Defined roles and responsibilities
.4 Stakeholder risk tolerances
.5 Template for the organization's risk management plan
.6 Work breakdown structure (WBS)
.2 Tools and Techniques
.1 Planning meetings
.3 Outputs
.1 Risk management plan
11.2 Risk Identification
.1 Inputs
.1 Risk management plan
.2 Project planning outputs
.3 Risk categories
.4 Historical information
.2 Tools and Techniques
.1 Documentation reviews
.2 Information-gathering techniques
.3 Checklists
.4 Assumptions analysis
.5 Diagramming techniques
.3 Outputs
.1 Risks
.2 Triggers
.3 Inputs to other processes
11.3 Qualitative Risk Analysis
.1 Inputs
.1 Risk management plan
.2 Identified risks
.3 Project status
.4 Project type
.5 Data precision
.6 Scales of probability and impact
.7 Assumptions
.2 Tools and Techniques
.1 Risk probability and impact
.2 Probability/impact risk rating matrix
.3 Project assumptions testing
.4 Data precision ranking
.3 Outputs
.1 Overall risk ranking for the project
.2 List of prioritized risks
.3 List of risks for additional analysis and management
.4 Trends in qualitative risk analysis results
11.4 Quantitative Risk Analysis
.1 Inputs
.1 Risk management plan
.2 Identified risks
.3 List of prioritized risks
.4 List of risks for additional analysis and management
.5 Historical information
.6 Expert judgment
.7 Other planning outputs
.2 Tools and Techniques
.1 Interviewing
.2 Sensitivity analysis
.3 Decision tree analysis
.4 Simulation
.3 Outputs
.1 Prioritized list of quantified risks
.2 Probabilistic analysis of the project
.3 Probability of achieving the cost and time objectives
.4 Trends in quantitative risk analysis results
11.5 Risk Response Planning
.1 Inputs
.1 Risk management plan
.2 List of prioritized risks
.3 Risk ranking of the project
.4 Prioritized list of quantified risks
.5 Probabilistic analysis of the project
.6 Probability of achieving the cost and time objectives
.7 List of potential responses
.8 Risk thresholds
.9 Risk owners
.10 Common risk causes
.11 Trends in qualitative and quantitative risk analysis results
.2 Tools and Techniques
.1 Avoidance
.2 Transference
.3 Mitigation
.4 Acceptance
.3 Outputs
.1 Risk response plan
.2 Residual risks
.3 Secondary risks
.4 Contractual agreements
.5 Contingency reserve amounts needed
.6 Inputs to other processes
.7 Inputs to a revised project plan
11.6 Risk Monitoring and Control
.1 Inputs
.1 Risk management plan
.2 Risk response plan
.3 Project communication
.4 Additional risk identification and analysis
.5 Scope changes
.2 Tools and Techniques
.1 Project risk response audits
.2 Periodic project risk reviews
.3 Earned value analysis
.4 Technical performance measurement
.5 Additional risk response planning
.3 Outputs
.1 Workaround plans
.2 Corrective action
.3 Project change requests
.4 Updates to the risk response plan
.5 Risk database
.6 Updates to risk identification checklists

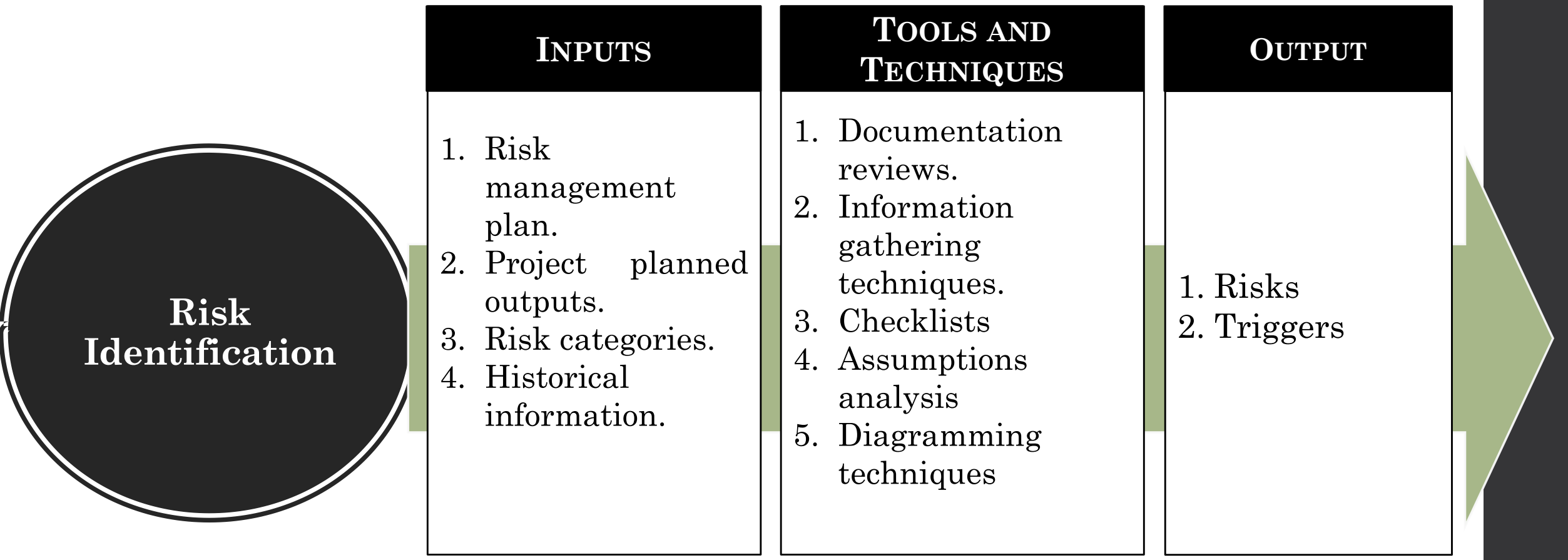
Risk Management Planning



Perceiving risks

- Risk that are threats to project might be accepted if they are in balance with the rewards that is gained from taking the risk

- Example ?
  - Adopting a fast track project


Risk Identification
Inputs
1. Risk management plan.
2. Project planned outputs.
3. Risk categories.
4. Historical information.
Tools and Techniques
1. Documentation reviews.
2. Information gathering techniques.
3. Checklists
4. Assumptions analysis
5. Diagramming techniques
Output
1. Risks
2. Triggers

How to measure project risks ?

Risk = probability x Consequence

1. identify risk trigger

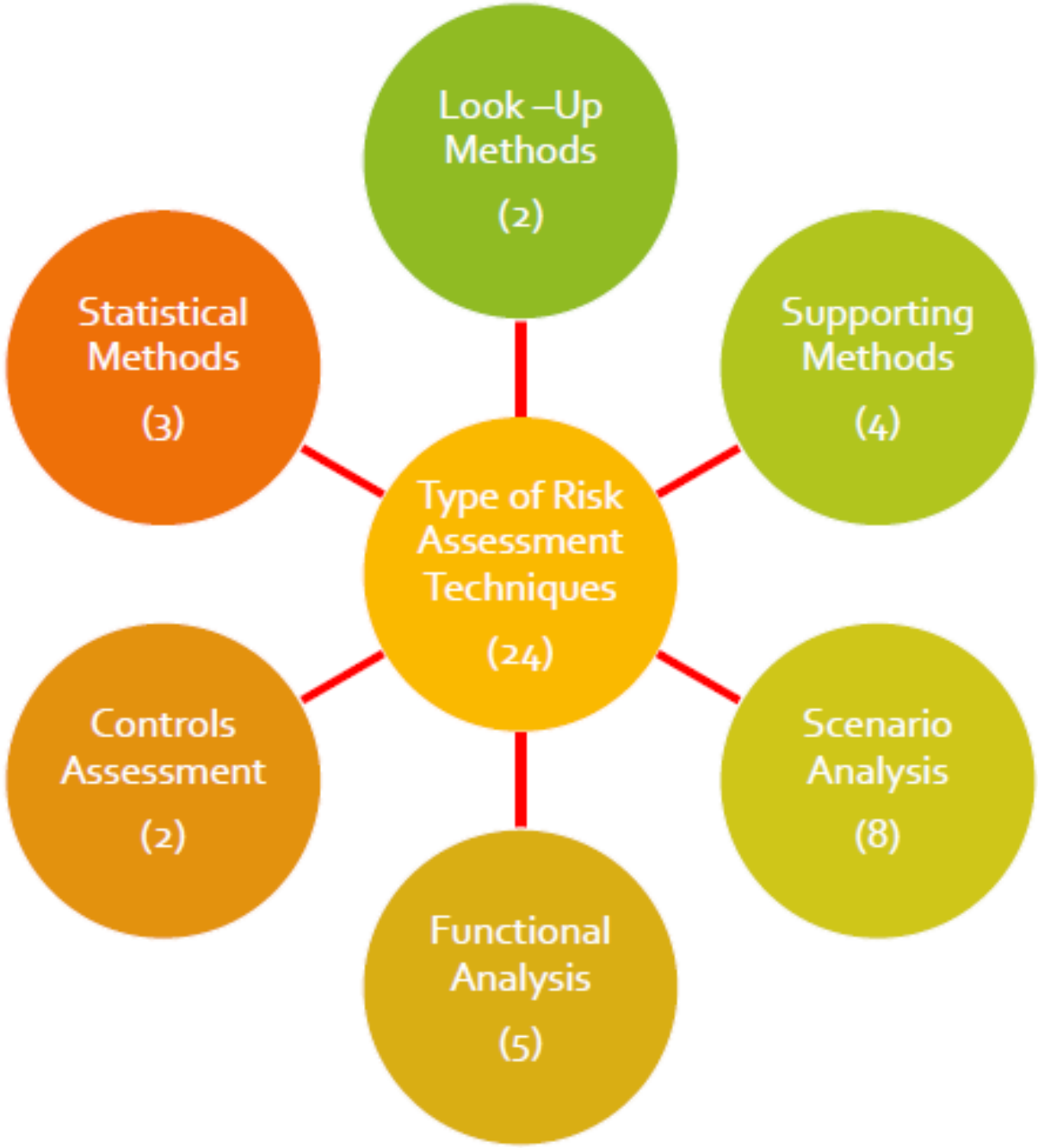
2. identify associated probability

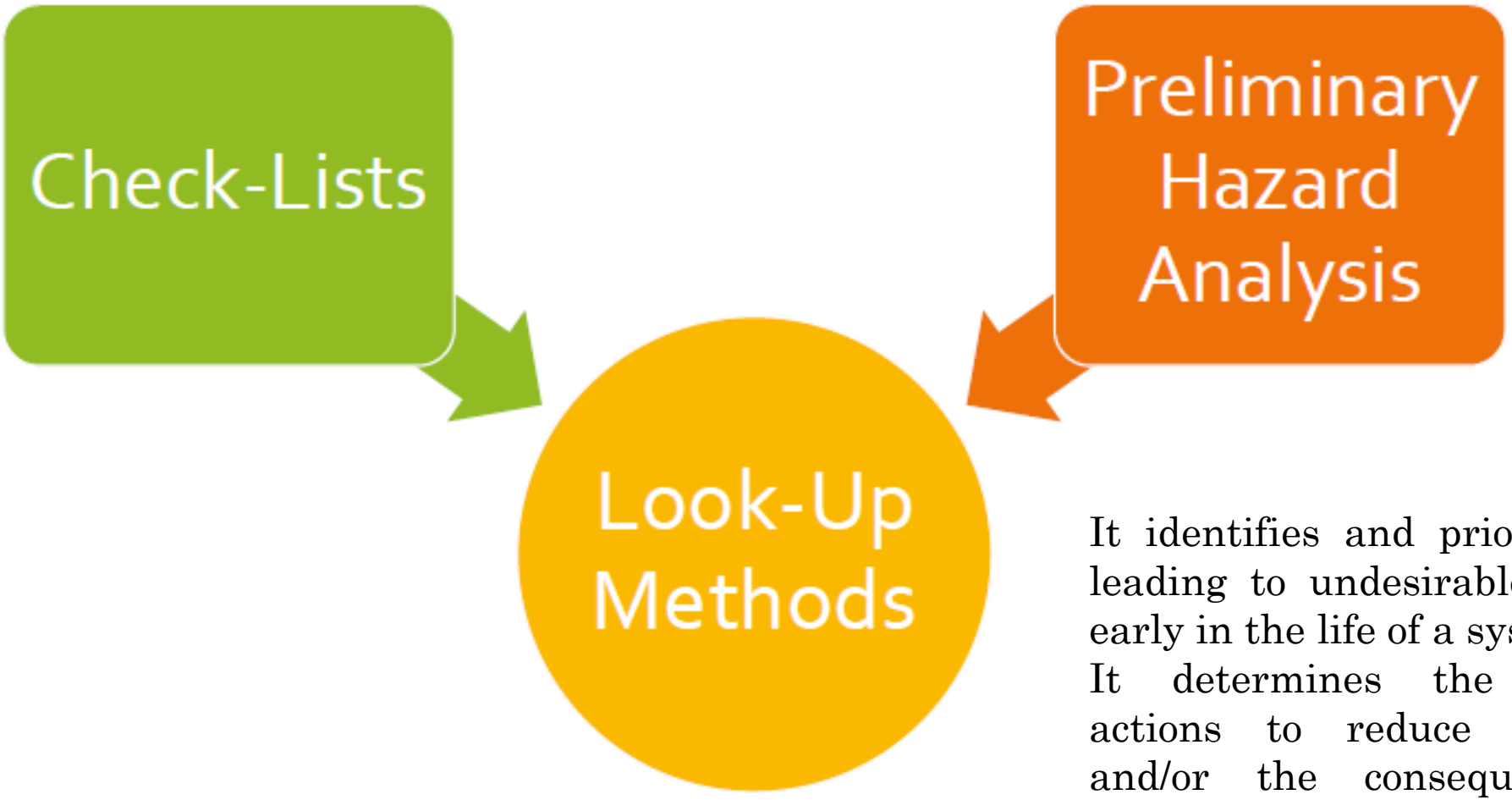
3. identify associated consequence based upon the decision maker risk response plan

Example :

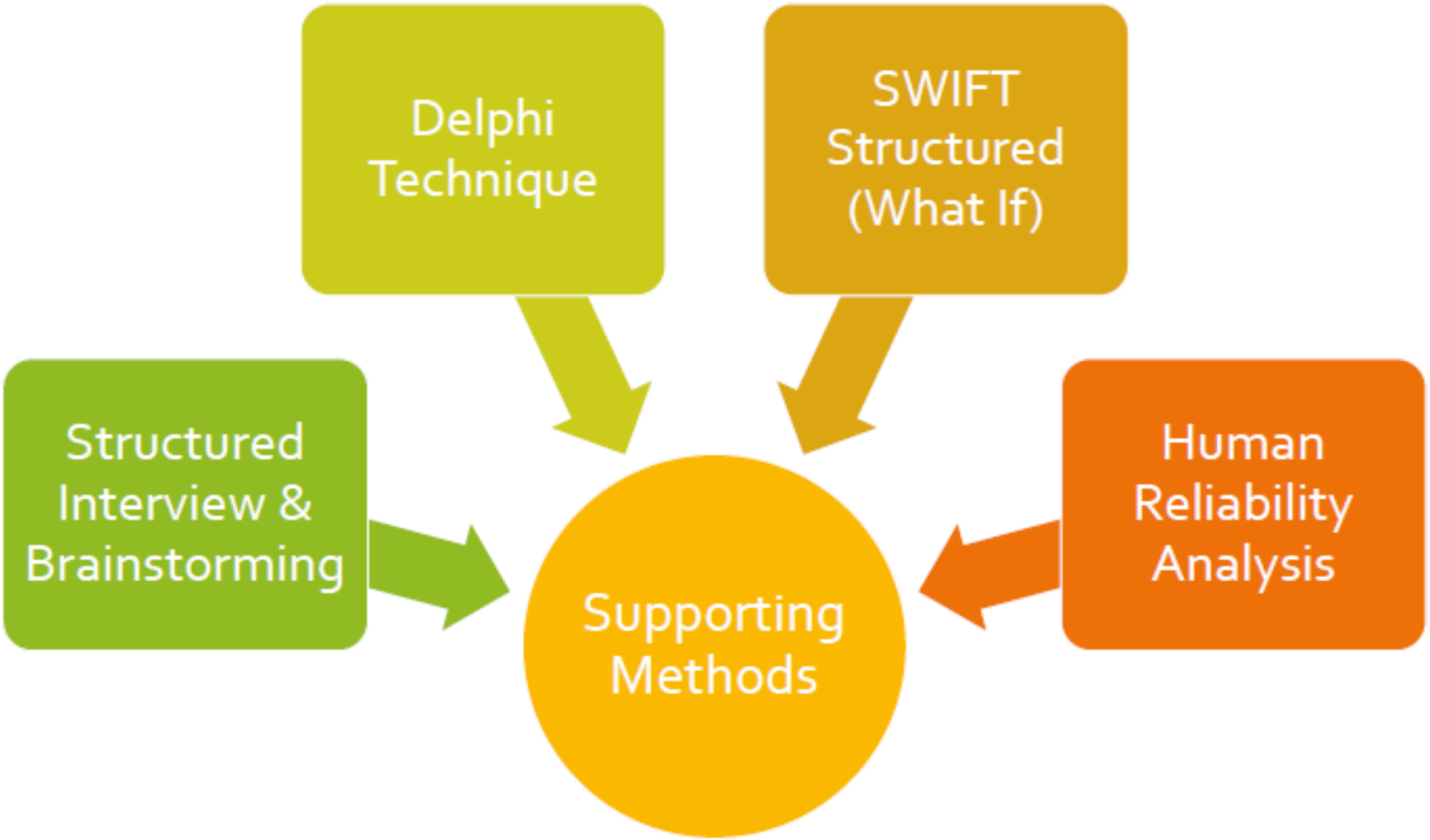
Trigger : an event, the passage of a date, or simply be the identification of the risk and an agreement to address it immediately

Rain falling on a scheduled outdoor finishes day.


Look –Up Methods (2)
Statistical Methods (3)
Supporting Methods (4)
Type of Risk Assessment Techniques (24)
Controls Assessment (2)
Scenario Analysis (8)
Functional Analysis (5)



It identifies and prioritizes hazards leading to undesirable consequences early in the life of a system.
It determines the recommended actions to reduce the frequency and/or the consequences of the prioritized hazards. This is an **inductive** modeling approach

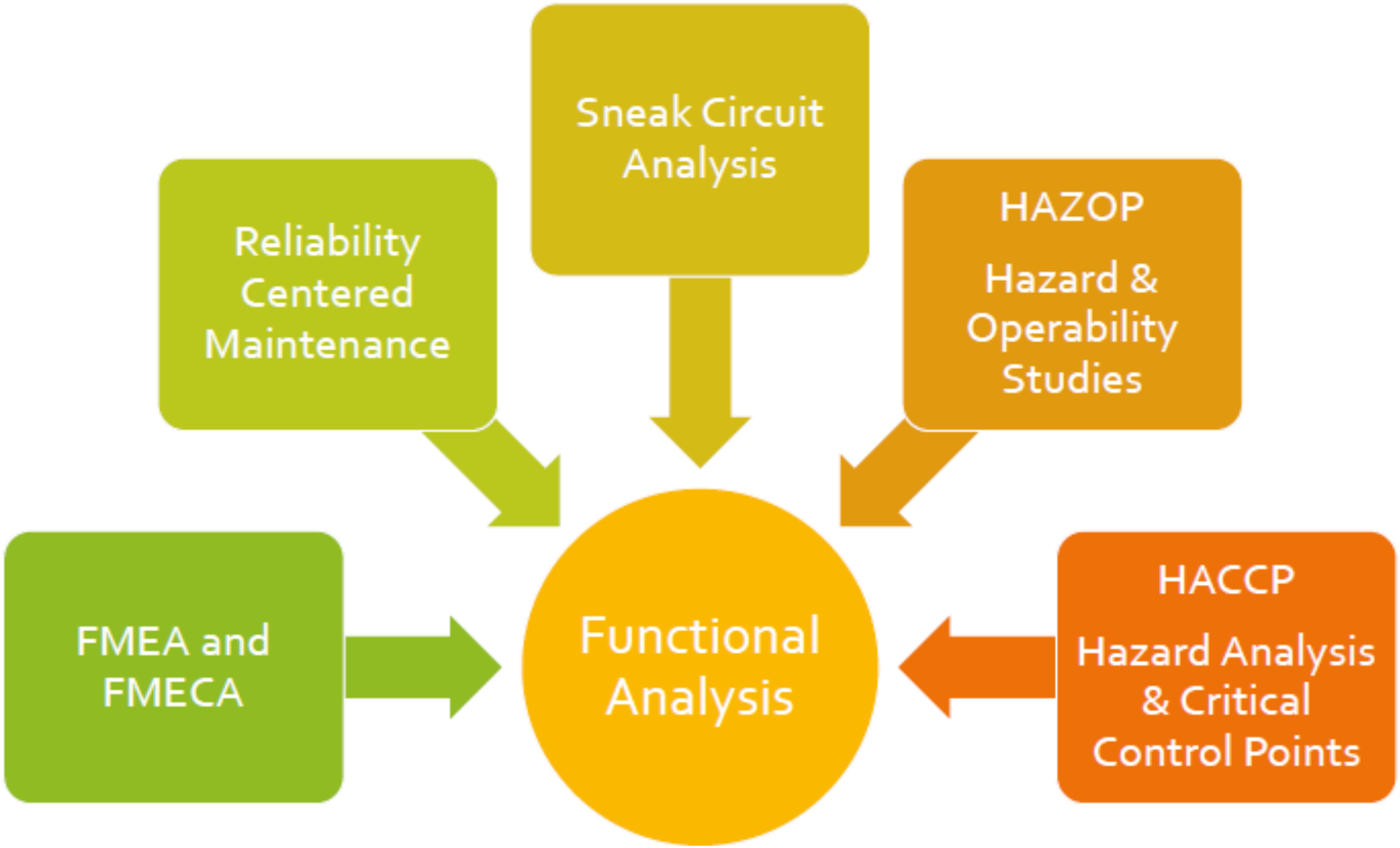

Delphi Technique
SWIFT Structured (What If)
Structured Interview & Brainstorming
Human Reliability Analysis
Supporting Methods

Look up methods for cases of conventional projects where the list of risk can be easily identified or predicted from similar or previous projects.

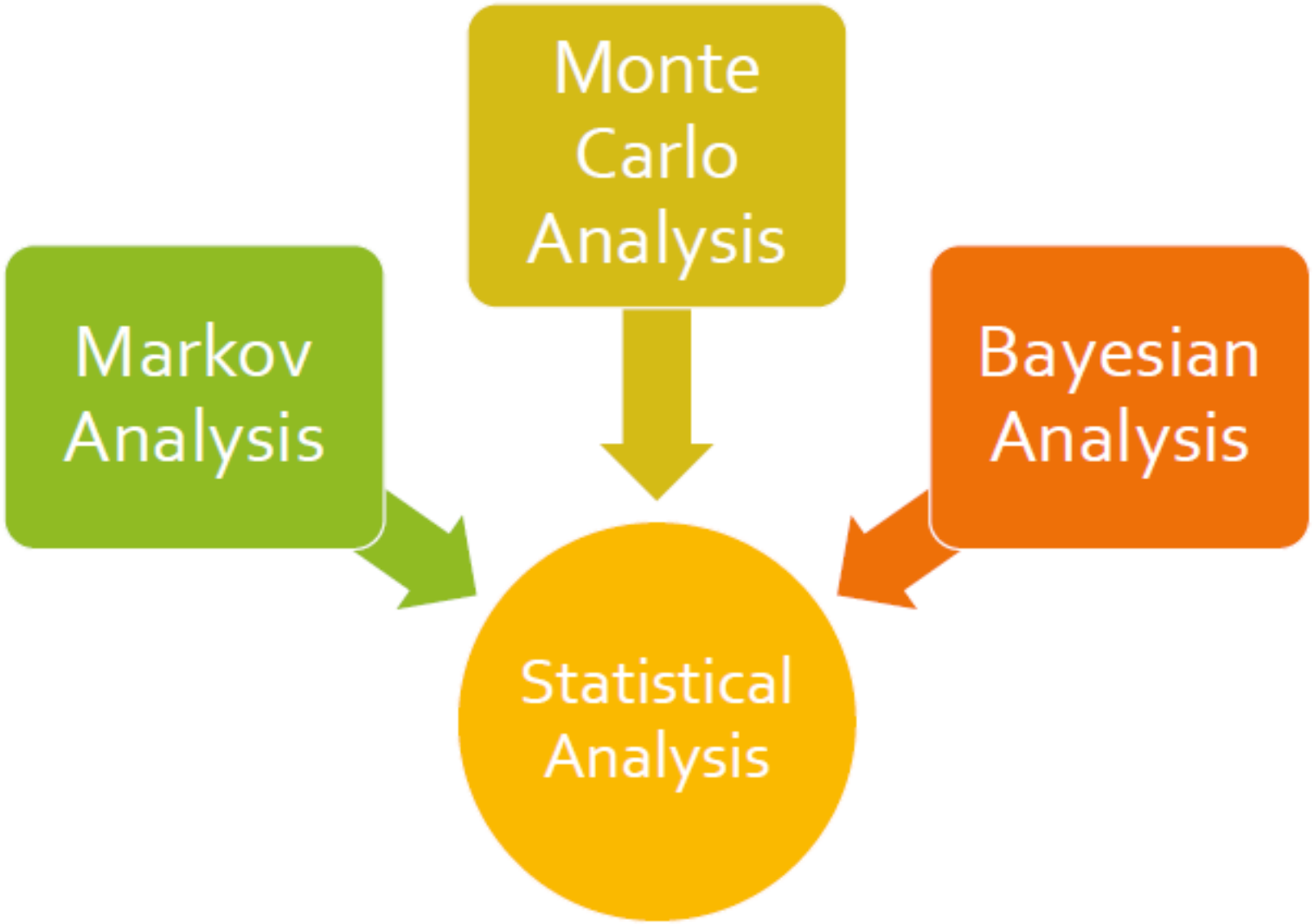
Supporting methods work best when the project is totally or partially unconventional or when new circumstances allow for the generation of a new type of risk like the Egyptian market now wrt the risk of inflation. This is also applicable on application of new methods of construction, new technology, or even new material.

Method	Scope
Checklist	It ensures that organizations are complying with standard practices.
Risk register (or risk log)	It manages risk by acting as a central repository for risks identified by the project staff and, for each risk, tracks information such as risk factor, event, probability, impact, countermeasures, and risk owner
Interviewing	It identifies risk events by interviews of experienced project managers or subject matter experts. The interviewees identify risk events based on experience and project information.
Experience-based identification	It identifies risk events based on experience, including implicit assumptions.
Brainstorming	It identifies risk events using facilitated sessions with stakeholders, project team members, and infrastructure support staff.
Delphi technique	It assists in reaching the consensus of experts on a subject such as project risk while maintaining anonymity by soliciting ideas about the important project risks that are collected and circulated to the experts for further comment. Consensus on the main project risks may be reached in a few rounds of this process.

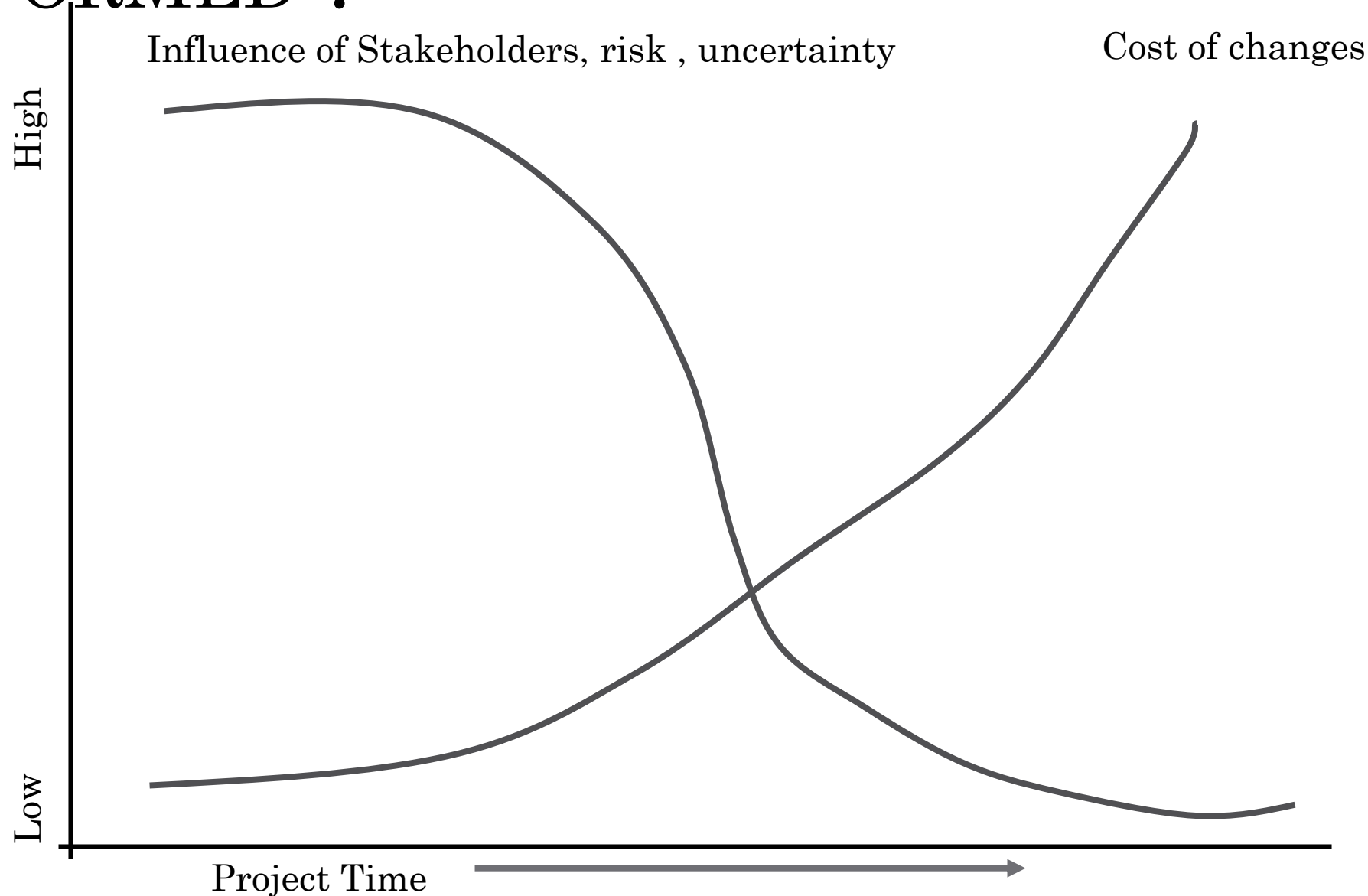

Business Impact Analysis
Fault Tree Analysis
Toxicological Risk Assessment
Event Tree Analysis
Scenario Analysis
Cause/Consequence Analysis
Root Cause Analysis
Scenario Analysis
Cause and Effect Analysis


Sneak Circuit Analysis
Reliability Centered Maintenance
HAZOP
Hazard & Operability Studies
FMEA and FMECA
Functional Analysis
HACCP
Hazard Analysis & Critical Control Points


LOPA
Layers of Protection Analysis
Bow Tie Analysis
Control Assessments


Monte Carlo Analysis
Markov Analysis
Bayesian Analysis
Statistical Analysis

WHEN IS RISK MANAGEMENT BEST PERFORMED ?



Risk Identification

- It forms the basis for all the future activities
- The appropriate timing for an initial risk identification session can be somewhat tricky to determine but it should be held early, soon after the basic program requirements, milestone dates, etc. have been outlined, but before the budget and business case are baselined.
- Risk Register
  - List of identified risks
  - List of potential responses

Risk Assessment

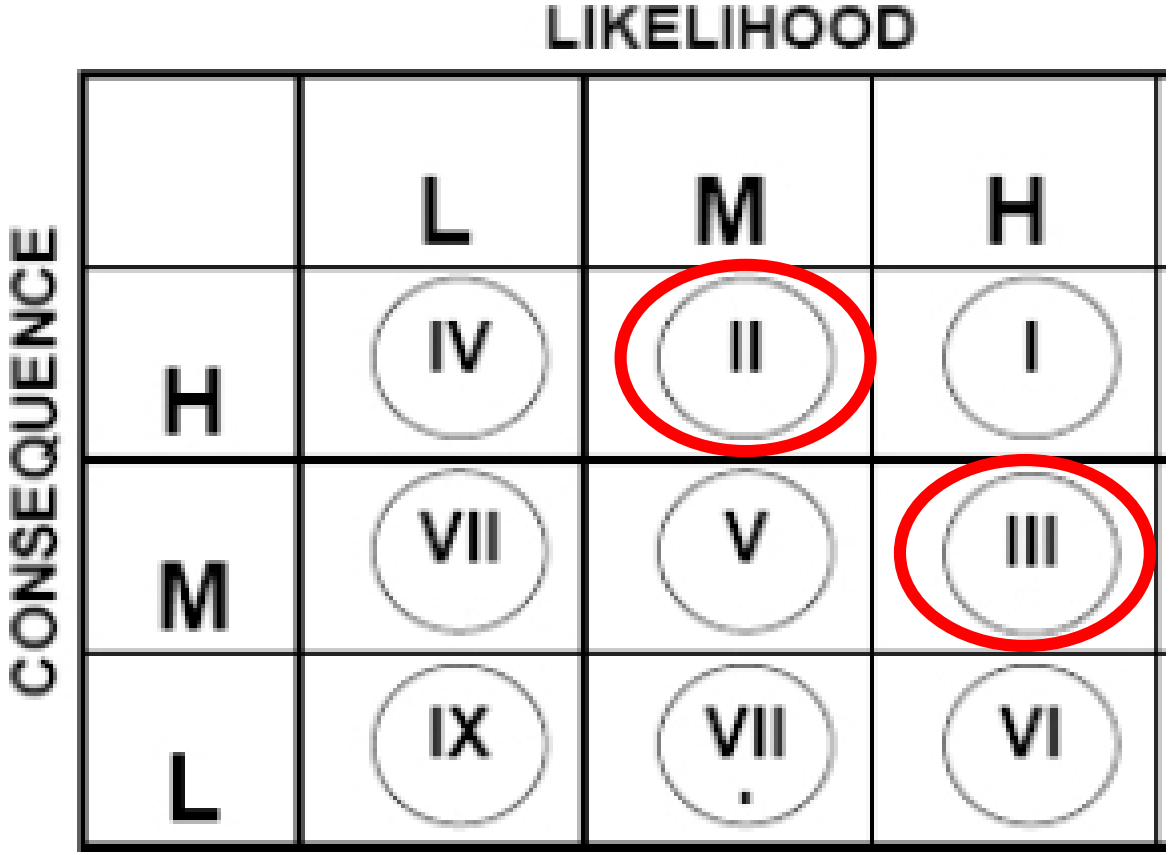
- Focus on high priority risks

How can high priority risks be identified?

Qualitative assessment

- Often the first stage in any assessment has to be a qualitative approach because there is insufficient information available to proceed with any quantitative methods.
- Applying weighting factors to the qualitative assessment provides a *quasi-quantitative* form of analysis.
- Methodologies that can screen out unfeasible alternatives, study the entire range of solutions, and explore the effect of likely constraints, will develop contrasting possibilities as to what is required.

Risk Priority Matrix



Risk Appetite

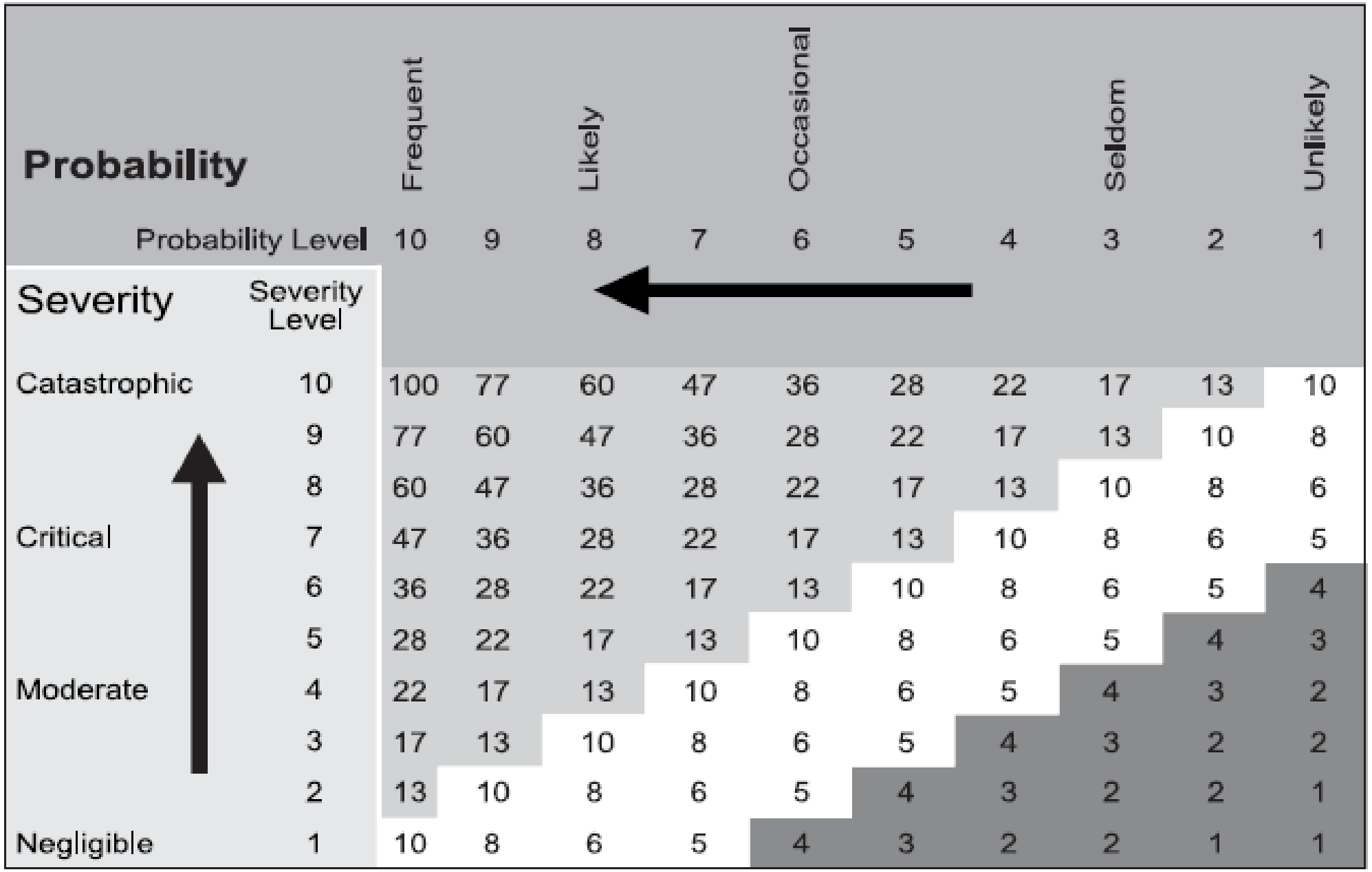
Risks are group or ranked based on their significance to project objectives

Defined Conditions for Impact Scales of a Risk on Major Project Objectives

(Examples are shown for negative impacts only)

	Relative or numerical scales are shown				
Project Objective	Very low /.05	Low /.10	Moderate /.20	High /.40	Very high /.80
Cost	Insignificant cost increase	<10% cost increase	10-20% cost increase	20-40% cost increase	>40% cost increase
Time	Insignificant time increase	<5% time increase	5-10% time increase	10-20% time increase	>20% time increase
Scope	Scope decrease barely noticeable	Minor areas of scope affected	Major areas of scope affected	Scope reduction unacceptable to sponsor	Project end item is effectively useless
Quality	Quality degradation barely noticeable	Only very demanding applications are affected	Quality reduction requires sponsor approval	Quality reduction unacceptable to sponsor	Project end item is effectively useless

This table presents examples of risk impact definitions for four different project objectives. They should be tailored in the Risk Management Planning process to the individual project and to the organization's risk thresholds. Impact definitions can be developed for opportunities in a similar way.


Probability
Frequent
Likely
Occasional
Seldom
Unlikely
Probability Level
10 9 8 7 6 5 4 3 2 1
Severity
Severity Level
Catastrophic
Critical
Moderate
Negligible
10 100 77 60 47 36 28 22 17 13 10
9 77 60 47 36 28 22 17 13 10 8
8 60 47 36 28 22 17 13 10 8 6
7 47 36 28 22 17 13 10 8 6 5
6 36 28 22 17 13 10 8 6 5 4
5 28 22 17 13 10 8 6 5 4 3
4 22 17 13 10 8 6 5 4 3 2
3 17 13 10 8 6 5 4 3 2 2
2 13 10 8 6 5 4 3 2 2 1
1 10 8 6 5 4 3 2 2 1 1

Risk Score for a Specific Risk					
Probability	Risk Score = P × I				
0.9	0.05	0.09	0.18	0.36	0.72
0.7	0.04	0.07	0.14	0.28	0.56
0.5	0.03	0.05	0.10	0.20	0.40
0.3	0.02	0.03	0.06	0.12	0.24
0.1	0.01	0.01	0.02	0.04	0.08
	0.05	0.10	0.20	0.40	0.80
	Impact on an Objective (e.g., cost, time, or scope) (Ratio Scale)				

Each risk is rated on its probability of occurring and impact if it does occur. The organization's thresholds for low (dark gray), moderate (light gray) or high (black) risk as shown in the matrix determines the risk's score.

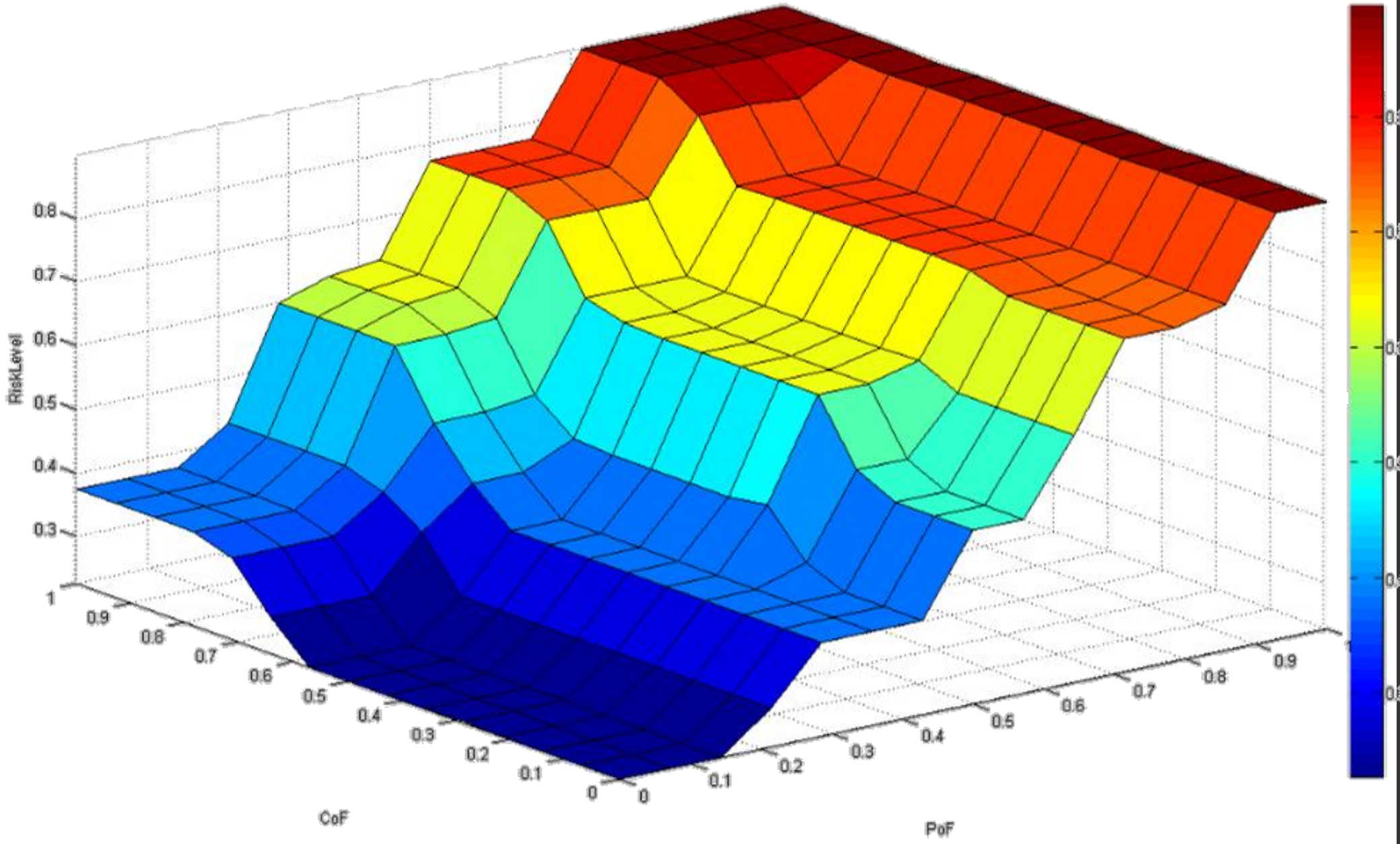
Probability and Impact Matrix

Probability	Threats				
0.90	0.05	0.09	0.18	0.36	0.72
0.70	0.04	0.07	0.14	0.28	0.56
0.50	0.03	0.05	0.10	0.20	0.40
0.30	0.02	0.03	0.06	0.12	0.24
0.10	0.01	0.01	0.02	0.04	0.08
	0.05	0.10	0.20	0.40	0.80

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization's thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.

Figure 11-10. Probability and Impact Matrix


RiskLevel
0.8
0.7
0.6
0.5
0.4
0.3
CoF
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
PoF
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

Outputs of qualitative assessment

- Relative ranking of project risks
- Risks grouped by category (RBS)
- Causes of risks (project areas requiring attention)
- List of risks requiring near-term response

Risk Category	Risk Factor or Event	Identification Number	Probability (1–3)	Impact (1–3)	Risk Score	Mitigation or Countermeasure	Contingency	Risk Owner	Action Timing
Natural hazard	Strong wind	1.1	2 (medium)	2 (medium)	4	Avail hardware to secure equipment, supplies, and structure	Secure equipment, supplies, and structure	Jim	Within 2 hours
Natural hazard	High temperature	1.2	1 (low)	2 (high)	2	Access and ice to water suppliers	Offer frequent breaks, provide water, etc.	John	Within 2 hours
Materials	Delay in arrival	2.1	2 (medium)	2 (medium)	4	Identify points of contacts of suppliers	Check with suppliers	Janet	Within 2 hours
Labor	Strike	3.1	1 (low)	3 (high)	3	Monitor labor concerns and address early	Alternate labor providers	Everyone	According to plan
Labor	Low productivity	3.2	1 (low)	2 (medium)	2	Track and provide incentives	Increase or replace labor force	Susan Michael	Within a day
Start-up check	Low-power output	4.1	1 (low)	3 (high)	3	Perform component checks	Engage technical support	Mathew	Within 6 hours

Risk response plan

- Risk response plan should include a definition of:
- what is to be done,
- by whom,
- what the schedule is,
- how the work will be funded, etc.

Exercise (Class work)

- IN groups of 4
- Prepare a list of identified risks (10 minimum) for a New Egyptian Museum Given the following project information.
  - The project is partially funded by foreign donations .
  - The location of the museum was selected to be close to the pyramids, mobilization works started immediately .
  - All escalators and equipment will be exported from country of donation.
  - The building requires LEED certifications (Only one building in Egypt is LEED certified)
  - Work packages include building the museum and expansion of the adjacent roads to account for the expected high traffic
- Use the matrix method to assess the listed risks.
- Prepare a preliminary response plan for the highest priority risks.

References

- MS IEC/ISO 31010 –Risk Management -Risk Assessment Techniques
- Chapter 11, *A Guide To The Project Management Body Of Knowledge (PMBOK Guide)*. Newtown Square, Pa. : Project Management Institute, Inc., 2004. Print.
- Lecture Notes
- Readings on website
- http://www.elearn.eng.cu.edu.eg/course/view.php?id=122