Project Management

Risk Management

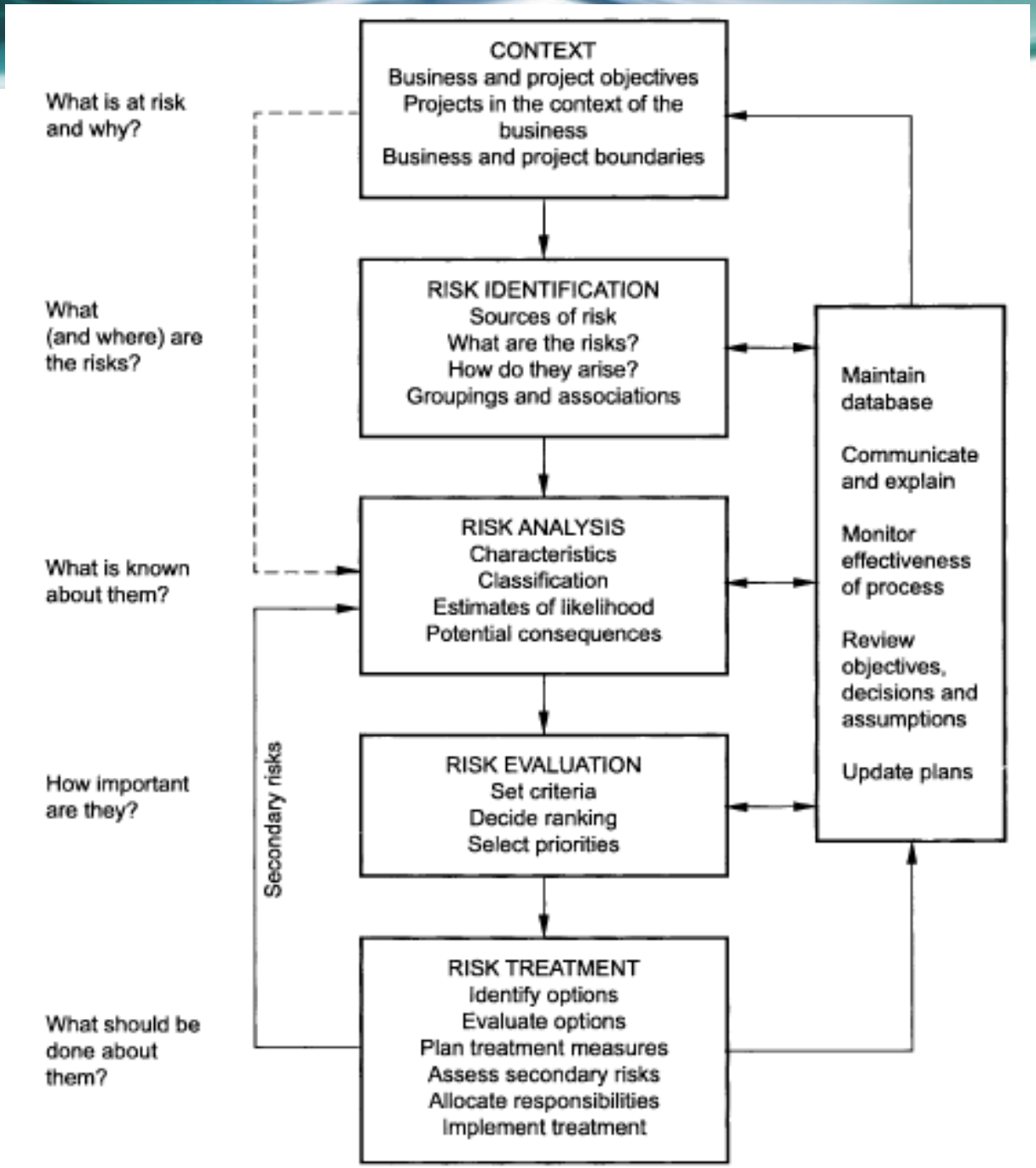
Panos Fitsilis

Risk management

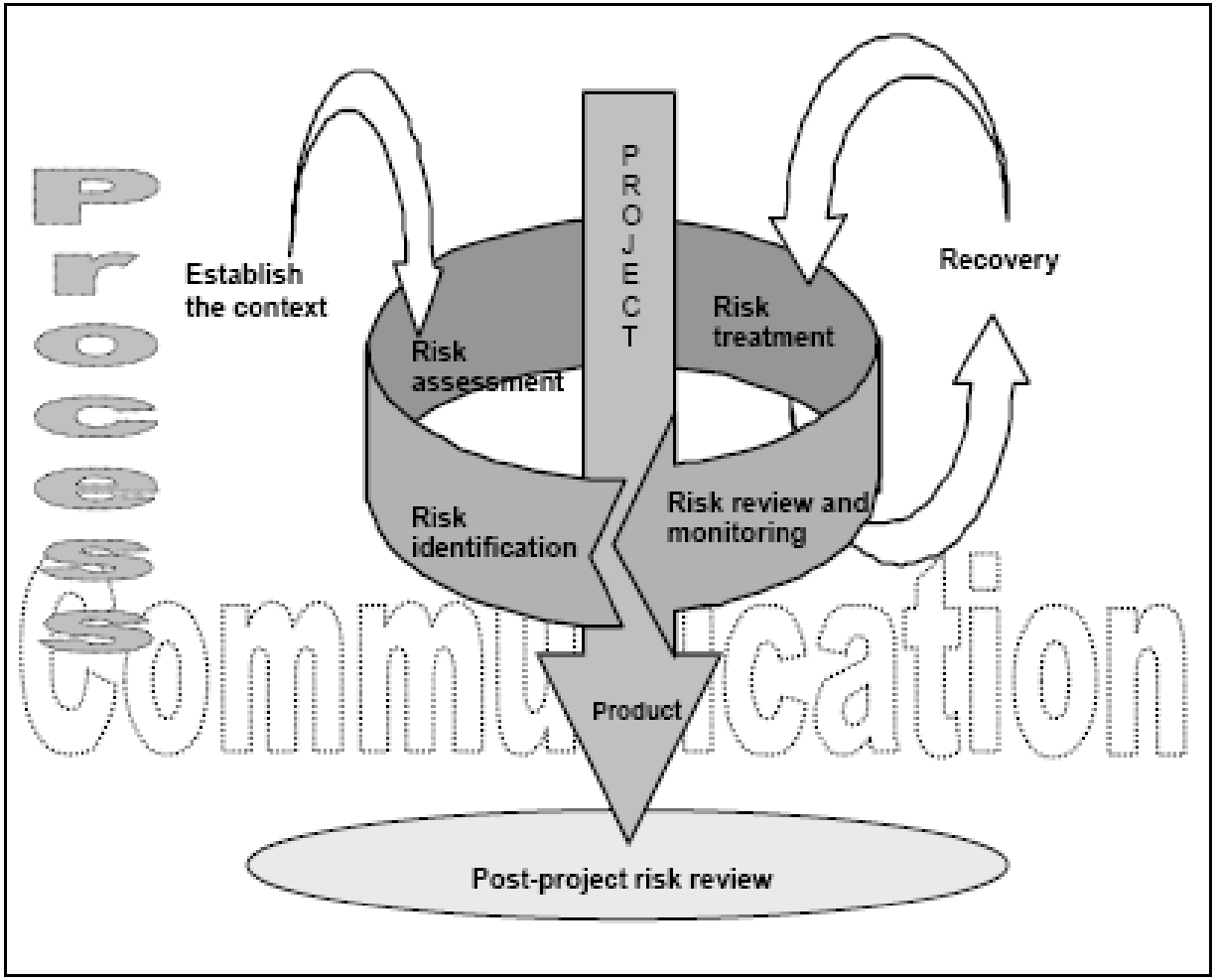
- Risk management is the **systematic process of identifying, analyzing, and responding to project risk**.
- It includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to project objectives.

Benefits of systematic risk management

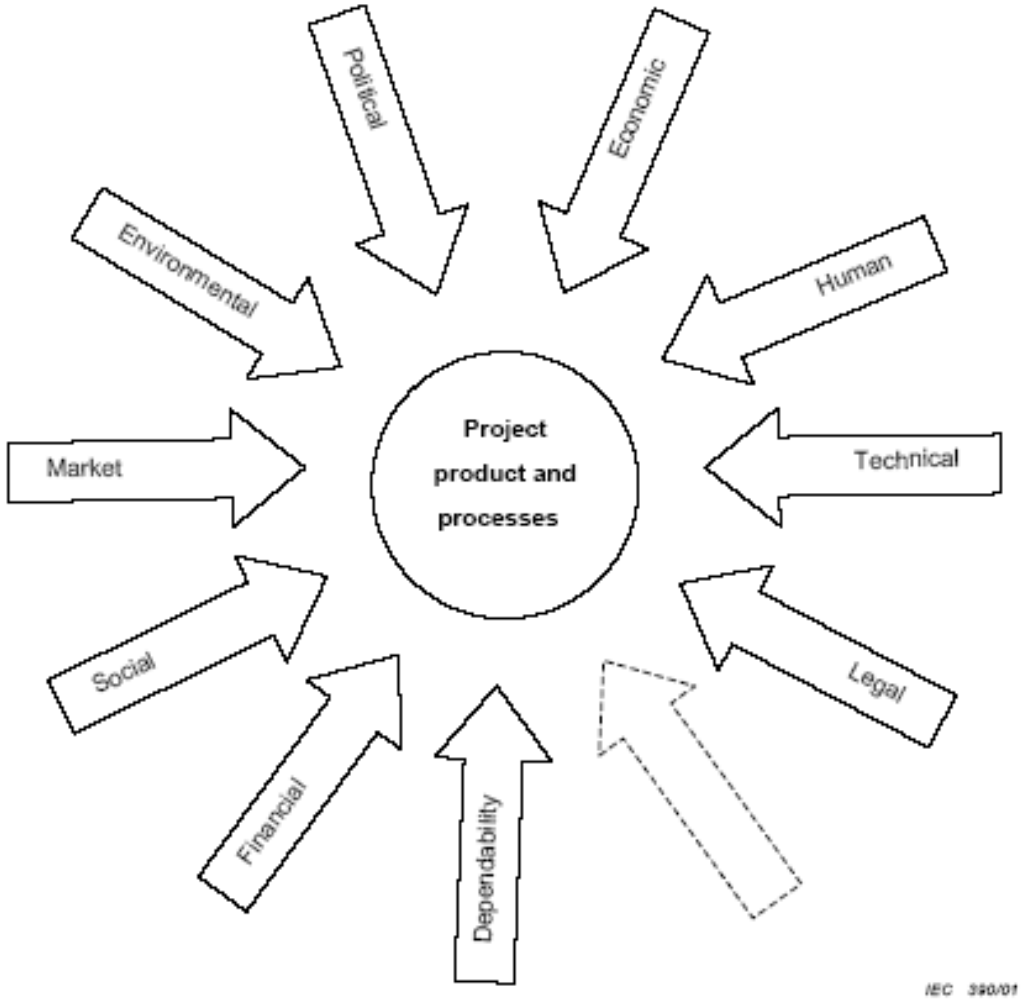
- more realistic business and project planning;
- actions being implemented in time to be effective;
- greater certainty of achieving business goals and project objectives;
- appreciation of, and readiness to, exploit all beneficial opportunities;
- improved loss control;
- improved control of project and business costs;
- increased flexibility as a result of understanding all options and their associated risks;
- greater control over innovation and business development;
- fewer costly surprises through effective and transparent contingency planning.


What is at risk and why?
CONTEXT
Business and project objectives
Projects in the context of the business
Business and project boundaries
What (and where) are the risks?
RISK IDENTIFICATION
Sources of risk
What are the risks?
How do they arise?
Groupings and associations
What is known about them?
RISK ANALYSIS
Characteristics
Classification
Estimates of likelihood
Potential consequences
How important are they?
RISK EVALUATION
Set criteria
Decide ranking
Select priorities
What should be done about them?
RISK TREATMENT
Identify options
Evaluate options
Plan treatment measures
Assess secondary risks
Allocate responsibilities
Implement treatment
Secondary risks
Maintain database
Communicate and explain
Monitor effectiveness of process
Review objectives, decisions and assumptions
Update plans

Risk management concept



Risks affecting a project



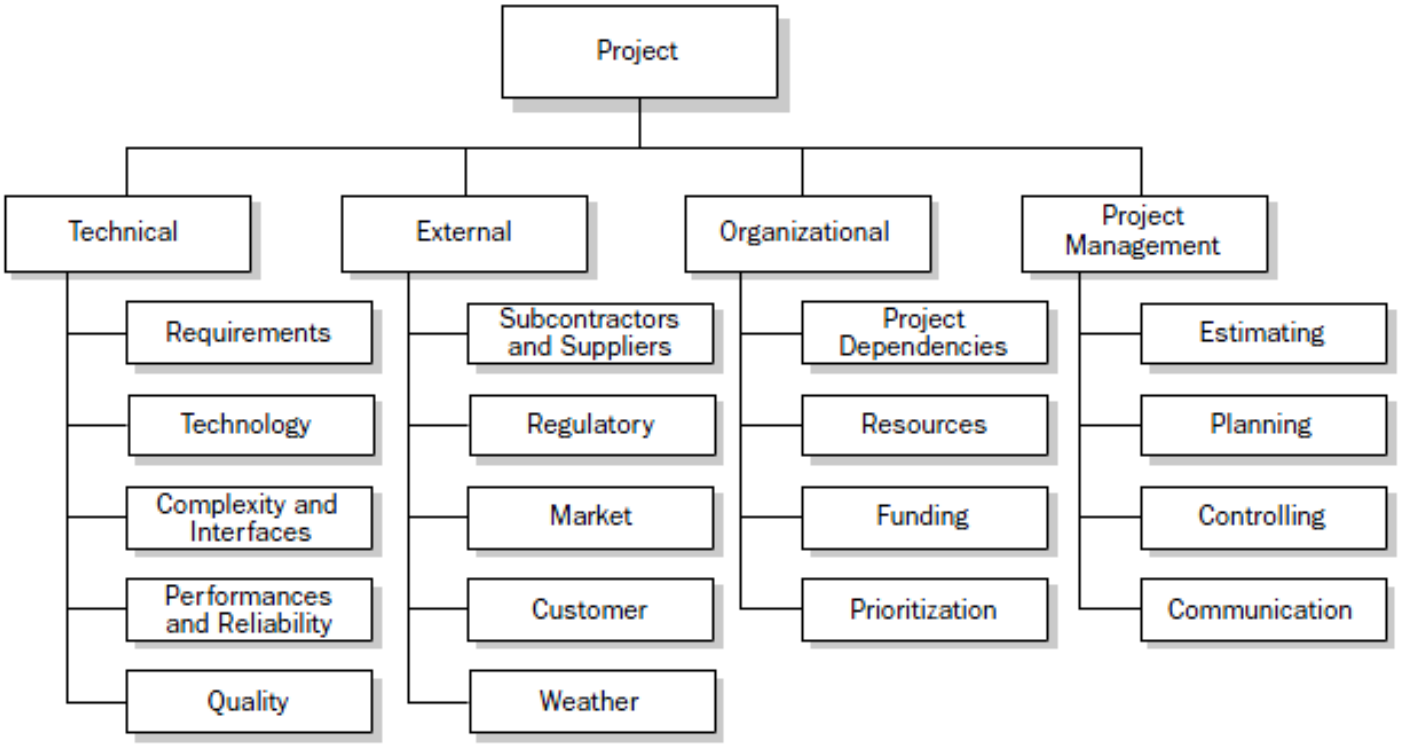
Risk management processes

- **11.1 Risk Management Planning** —deciding how to approach and plan the risk management activities for a project.
- **11.2 Risk Identification**—determining which risks might affect the project and documenting their characteristics.
- **11.3 Qualitative Risk Analysis**—performing a qualitative analysis of risks and conditions to prioritize their effects on project objectives.
- **11.4 Quantitative Risk Analysis**—measuring the probability and consequences of risks and estimating their implications for project objectives.
- **11.5 Risk Response Planning**—developing procedures and techniques to enhance opportunities and reduce threats to the project's objectives.
- **11.6 Risk Monitoring and Control**—monitoring residual risks, identifying new risks, executing risk reduction plans, and evaluating their effectiveness throughout the project life cycle.

Risk Management Plan

- Methodology. Defines the approaches, tools, and data sources that may be used to perform risk management on this project.
- Roles and responsibilities.
- Budgeting.
- Timing.
- Scoring and interpretation.
- Thresholds.
- Reporting formats.
- Tracking.

Risk Breakdown Structure



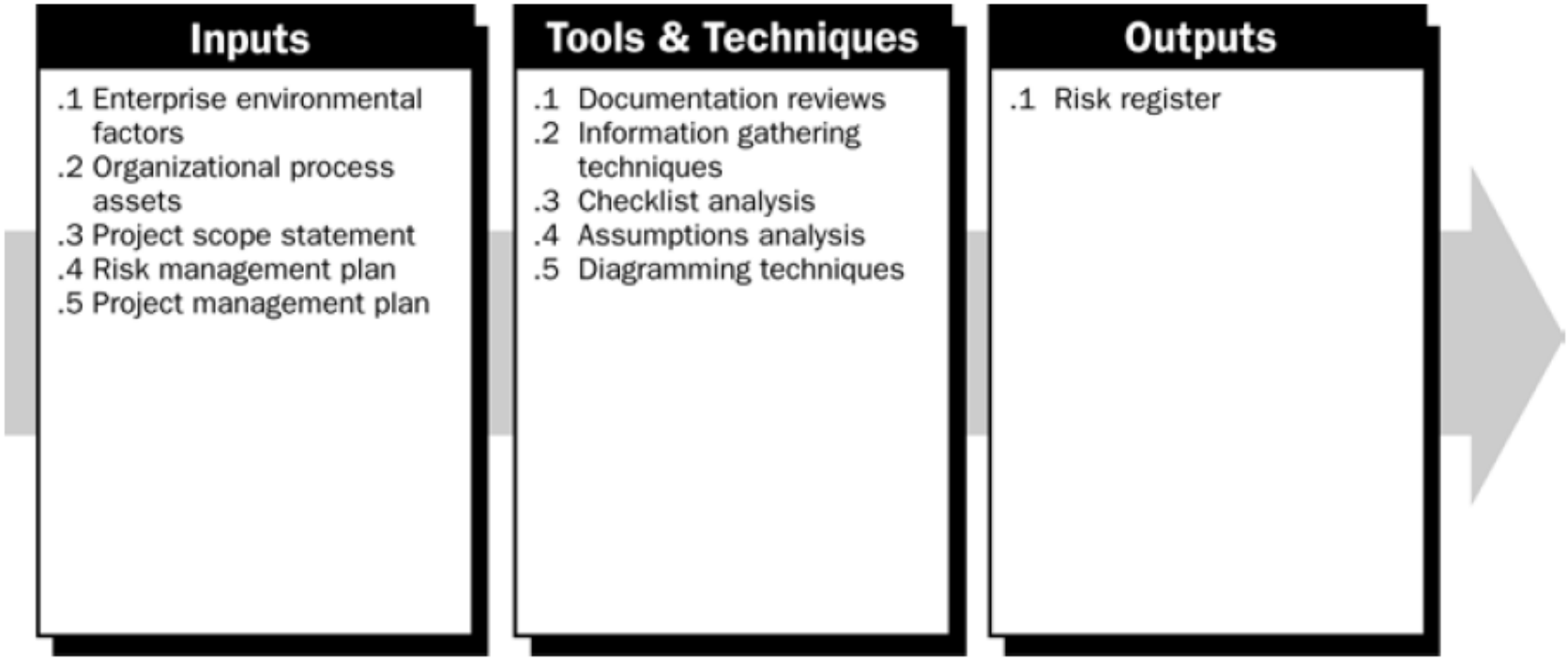
The Risk Breakdown Structure (RBS) lists the categories and sub-categories within which risks may arise for a typical project. Different RBSs will be appropriate for different types of projects and different types of organizations. One benefit of this approach is to remind participants in a risk identification exercise of the many sources from which project risk may arise.

Risk Impact Scales

Defined Conditions for Impact Scales of a Risk on Major Project Objectives (Examples are shown for negative impacts only)					
Project Objective	Relative or numerical scales are shown				
	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.

Risk identification



Examples of phase-related risk areas

Concept and definition	Design and development	Manufacturing	Installation and commissioning	Operation and maintenance	Decom-missioning and disposal
Bid/no bid	Trade-offs	Subcontractors	Drawings	Dependability	Safety
Budgets	Make/buy	Materials	Integration	Safety	Replacement
Safety	Performance	Resources	Performance	Interoperability	Salvage
Warranties	Producibility	Integration	Dependability	Modifications	Scrap
Technology	Technology	Configuration changes	Safety	Penalties	Penalties
Contracts	Dependability	Dependability	Testing	Legislation	Inherited risks
Regulatory requirements	Information sources	Penalties	Procedures	Guarantees	
Project management	Contracts	Safety	Penalties	Inherited risks	
	Penalties	Inherited risks	Guarantees		
	Safety		Inherited risks		
	Inherited risks				

Type of risks

- This list is subdivided into three categories:
- **Known Risks -** those risk elements that are apparent from a detailed analysis of the Call for Tender, contract and/or bid assumptions.
- **Potential/Predictable Risks** - those risk elements that experience tells us have a high probability of occurring.
- **Unknown/Unpredictable Risks -** those risk elements that could happen, but the likelihood or timing of these risks occurring cannot be accurately predicted.

Known Risks

- Has the project's Project Definition been formalised and approved?
- Contract type.....
- Are there rigid contract terms, conditions, or constraints?
- Are there penalty clauses in the contract?
- Are there unverified bid assumptions?
- Are the Acceptance Criteria defined and agreed to?
- Will it be difficult to receive additional project funding, if needed?
- Is the schedule realistic?
- Is each milestone in the project schedule reasonable?
- Can delivery dates be adjusted if needed?
- Are the bid rates adequate for the required team member skills?
- Are the project manager and team members experienced in this type of project?
- Is there a recognised project sponsor?
- Are the preliminary assumptions valid?
- Were estimates based on actual effort for similar processes and deliverables?
- Are the subcontractors and vendors known and reliable?

PREDICTABLE RISKS - 1

- Will promised information sources be available and of adequate quality?
- Will user reviews and acceptance be timely?
- Will client management decisions be timely?
- Are there client dependencies and responsibilities?
- Is client management committed to this project?
- Is the client known to be co-operative and reasonable?
- Are client expectations known and acceptable?
- Does the client resolve issues quickly?
- Has the client agreed to required scope changes in the past?
- Is the development environment adequate?
- Is the test environment adequate?
- Will new or unfamiliar development tools be used?
- Are the workspace and work environment adequate?

PREDICTABLE RISKS - 2

- Can the workspace accommodate a larger staff if needed?
- Has a similar project attempt failed before?
- Are requirements completely and adequately specified?
- Is the design complete?
- Is the work completely defined?
- Will the acceptance process be difficult?
- Is the technical infrastructure adequate?
- Is a new or unfamiliar technology required?
- Are the requirements technically complex or innovative?
- Are the functions complex or difficult?
- Are the technical performance requirements demanding?
- Will key stakeholders be accessible and committed to the project results?
- Will technical support be committed to the project?
- Will there be critical dependencies on subcontractors?
- Does project success depend on a few key individuals?
- Does the project plan accommodate a learning curve?
- Is the staffing plan practical?
- Has the project plan and schedule accounted for vacation, sickness and administrative time?

UNPREDICTABLE RISKS

- Will the client's priorities change?
- Is there instability in the client organisation?
- Will the business case remain persuasive?
- Will funding availability change?
- Will project objectives be redefined?
- Will key project personnel change?

Another risk classification

- The following six risk categories are suggested for this analysis:
  - Timescale - How does the time allowed for the activity affect the risk?
  - Organisation and Personnel - How do the personnel involved in the activity and the relationships between them affect the risk?
  - Degree of change - How does the degree of change involved in the activity affect the risk?
  - Degree of Complexity - How does the complexity or difficulty of the activity affect the risk?
  - Constraints - How do any constraints (apart from timescale) placed on the activity affect the risk?
  - Time-ahead - How is the risk to the activity affected by how far in the future it is planned for?

Risk inventory

- For each risk, it has the following information:
  - Risk ID Number. Unique identification of risk.
  - Risk. Name or short description of risk.
  - Identification Date
  - Area of Impact. Assessment of where the risk will affect the project, that is, cost (C), schedule (S), or quality of deliverable (Q), technology (T), business (B).
  - Risk Warning Flag. Circumstances which establish that a risk either has become a reality or is no longer a threat.
  - Risk Probability. The estimated likelihood that a risk will occur.
  - Potential Cost Impact. The estimated cost to a project if the risk does occur.
  - Probable Risk Cost. The expected cost of the risk to the project, calculated as the potential cost impact multiplied by the risk probability.
  - Risk priority. That is high (H), medium (M), low (L).

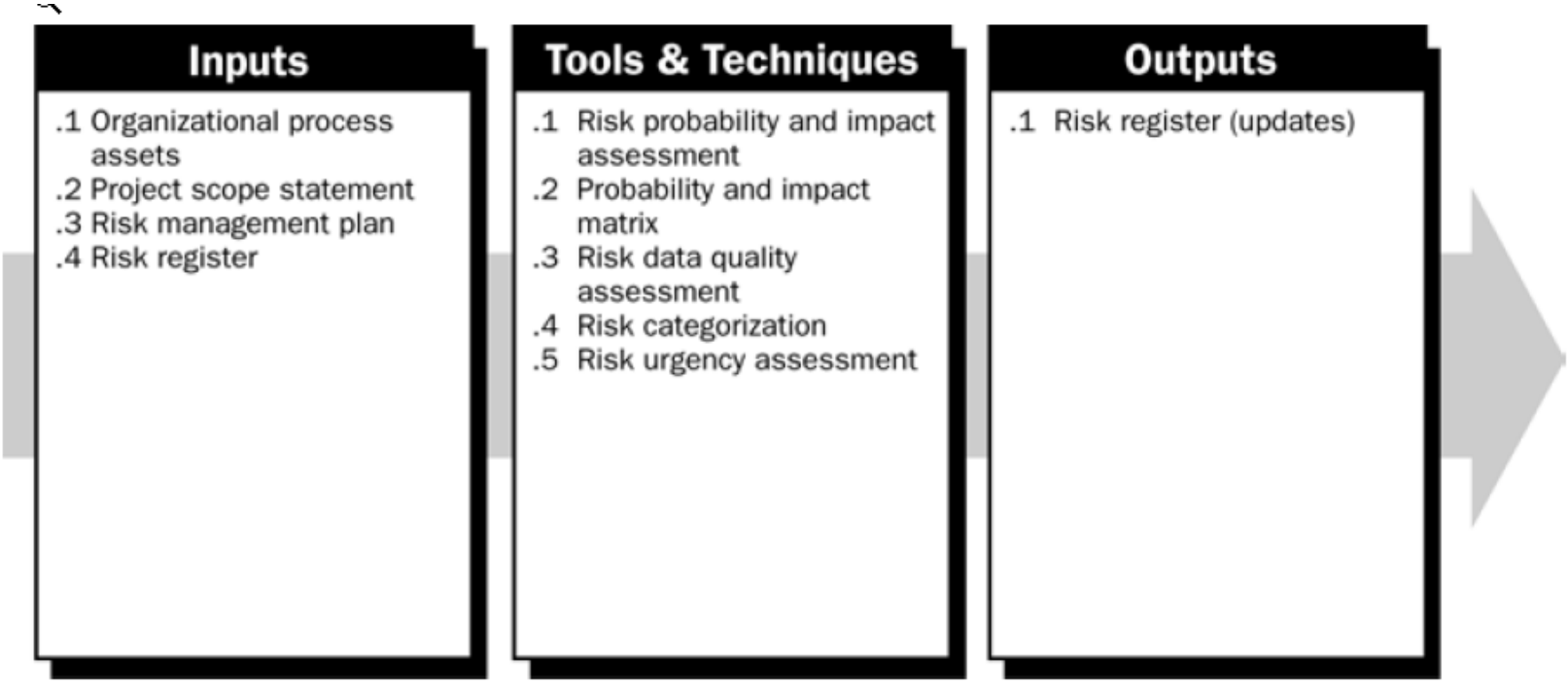
An example

Risk Inventory and Assessment Worksheet									
Risk ID num.	**Risk title**	**ID date**	**Area of impact**	**Probable impact date**	**Risk warning flag**	**Risk probability (%)**	**Potential risk cost ($K)**	**Probable risk cost ($K)**	**Risk priority**
1.	Scope increases by 10%	7/2004	C, S	11/2004	Schedule delays or cost increases	75	80	60	High
2.	Standards change	7/2004	C, S	12/2004	Rework increases	50	50	25	Medium
3.	Team is inexperienced in technology	7/2004	C, S, Q	10/2004	Schedule delays, cost increases, or quality issues	20	80	16	Low

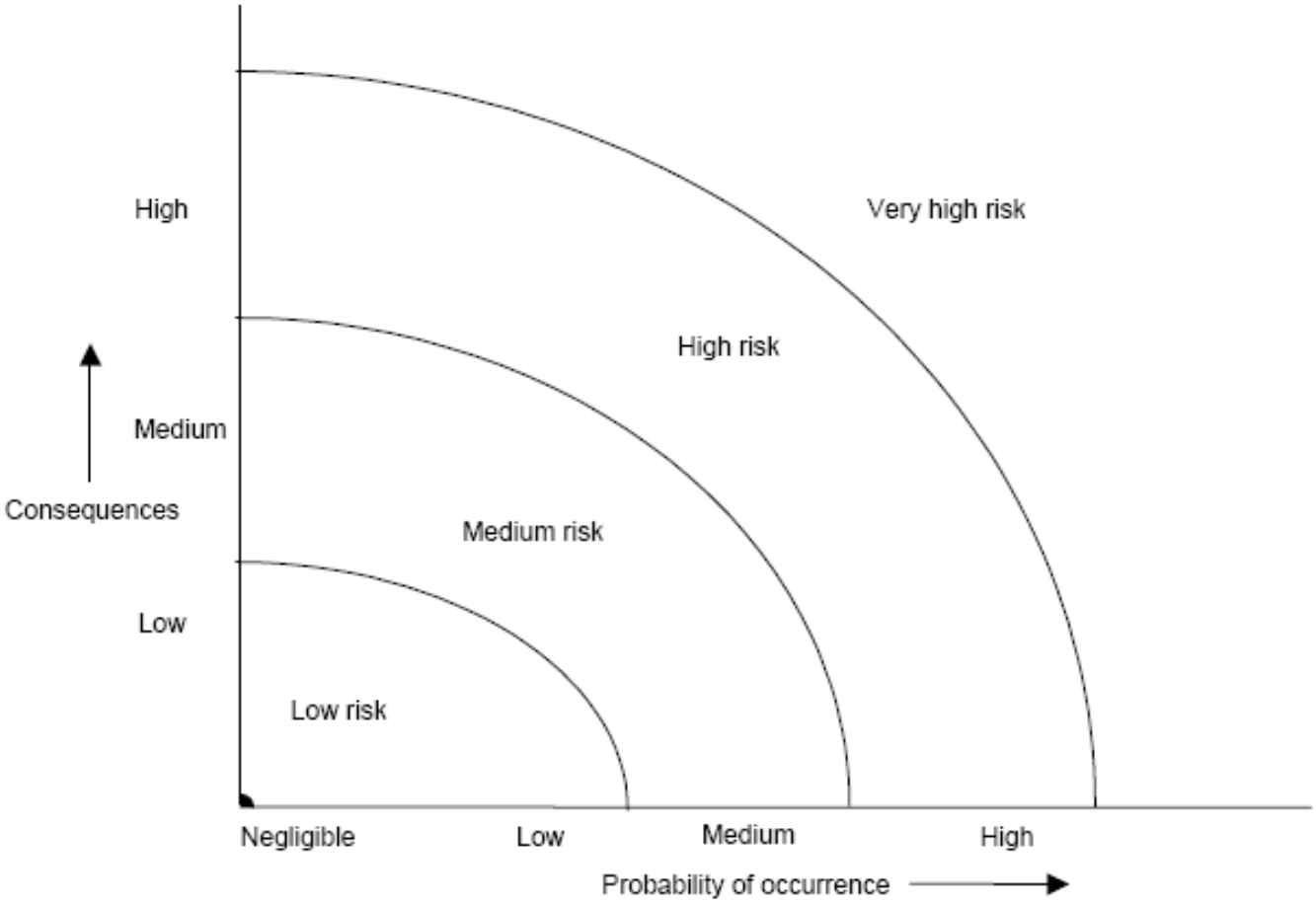
Risk analysis

- Purpose
  - Identify areas of impact (scope, schedule, cost, quality)
  - Identify risk warning flags
  - Estimate risk probability
  - Estimate potential and probable risk cost
  - Prioritise risks.
- Types
  - Quantitative
  - Qualitative

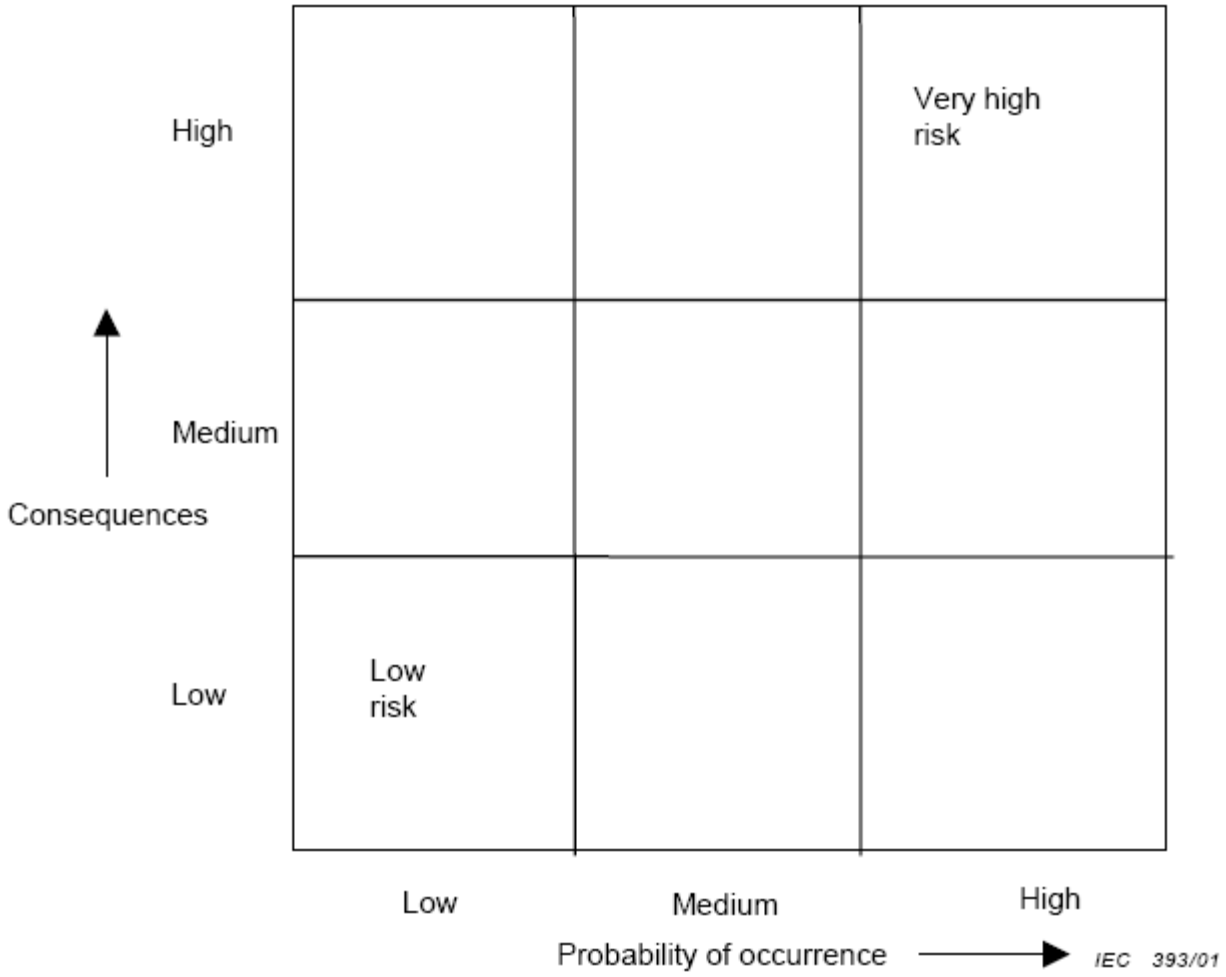
Qualitative Risk Analysis



Risk Diagram



Risk Matrix


High
Medium
Low
Consequences
Very high risk
Low risk
Low
Medium
High
Probability of occurrence
IEC 393/01

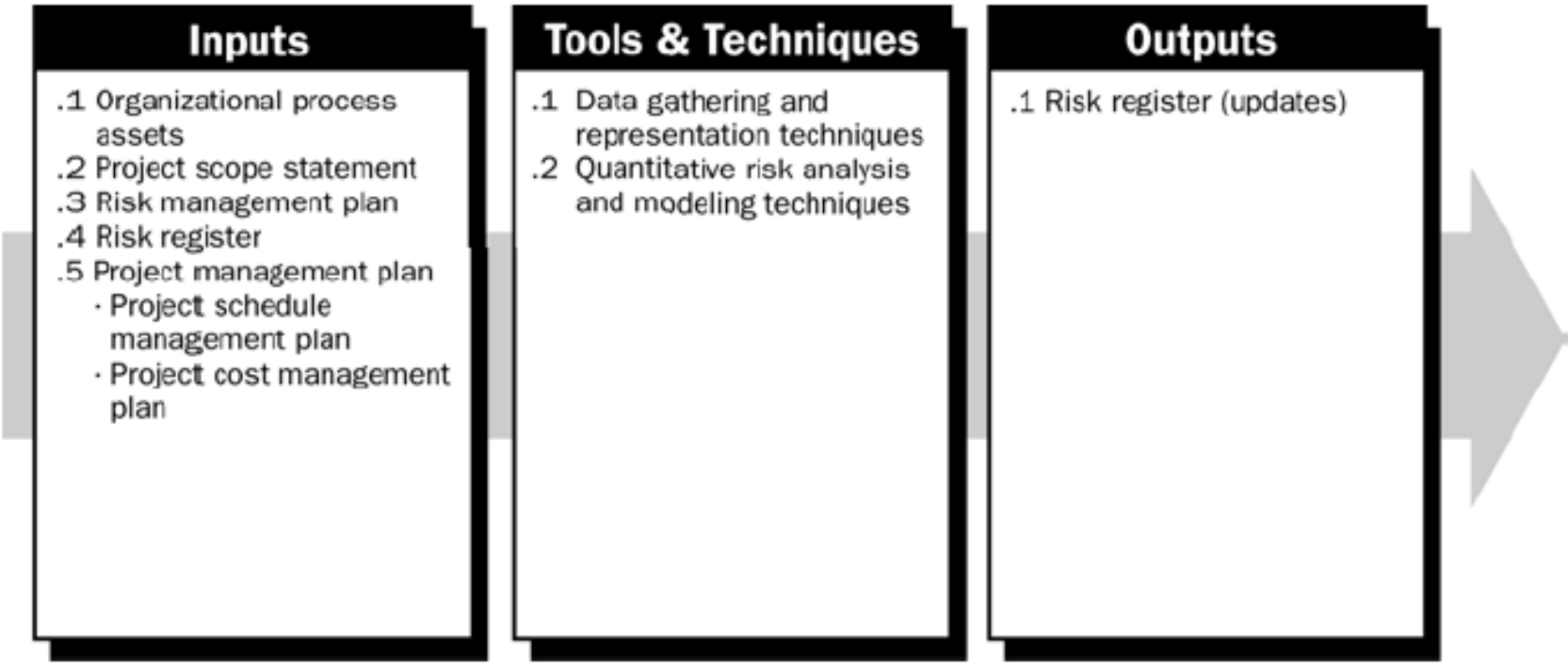
Impact list

No	Description	Probability (P)	Impact(I)	Risk indicator (PxI)
R1	Project delay	5	7	35
R2	Delivery of a defective product	4	8	32
R3	Delayed delivery of raw materials	2	10	20
R4	Specialized personnel non available	9	2	18

Quantitative Risk Analysis

- Determine the probability of achieving a specific project objective.
- Quantify the risk exposure for the project, and determine the size of cost and schedule contingency reserves that may be needed.
- Identify risks requiring the most attention by quantifying their relative contribution to project risk.
- Identify realistic and achievable cost, schedule, or scope targets.

Quantitative Risk Analysis

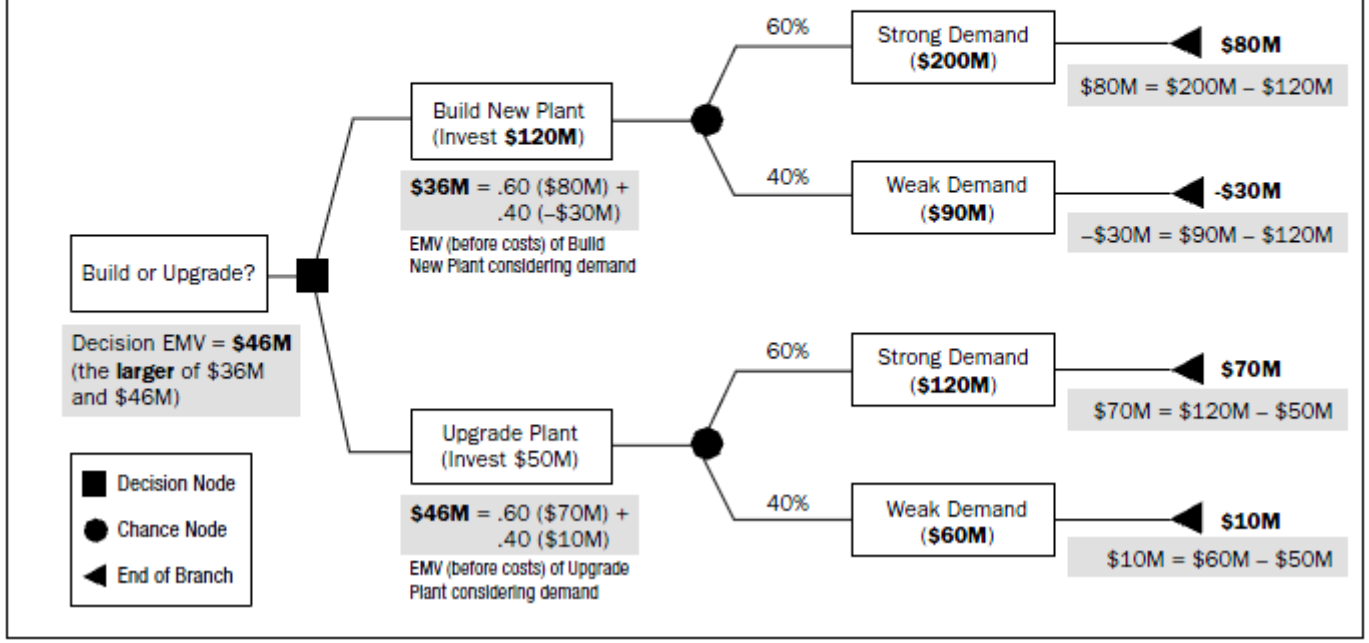


Tools and techniques

- Sensitivity analysis
- Expected Monetary Value Analysis
- Decision Tree
- Simulation

Decision Tree

Decision Definition	Decision Node	Chance Node	Net Path Value
Decision to be Made	**Input:** Cost of Each Decision **Output:** Decision Made	**Input:** Scenario Probability, Reward if it Occurs **Output:** Expected Monetary Value (EMV)	**Computed:** Payoffs minus Costs along Path

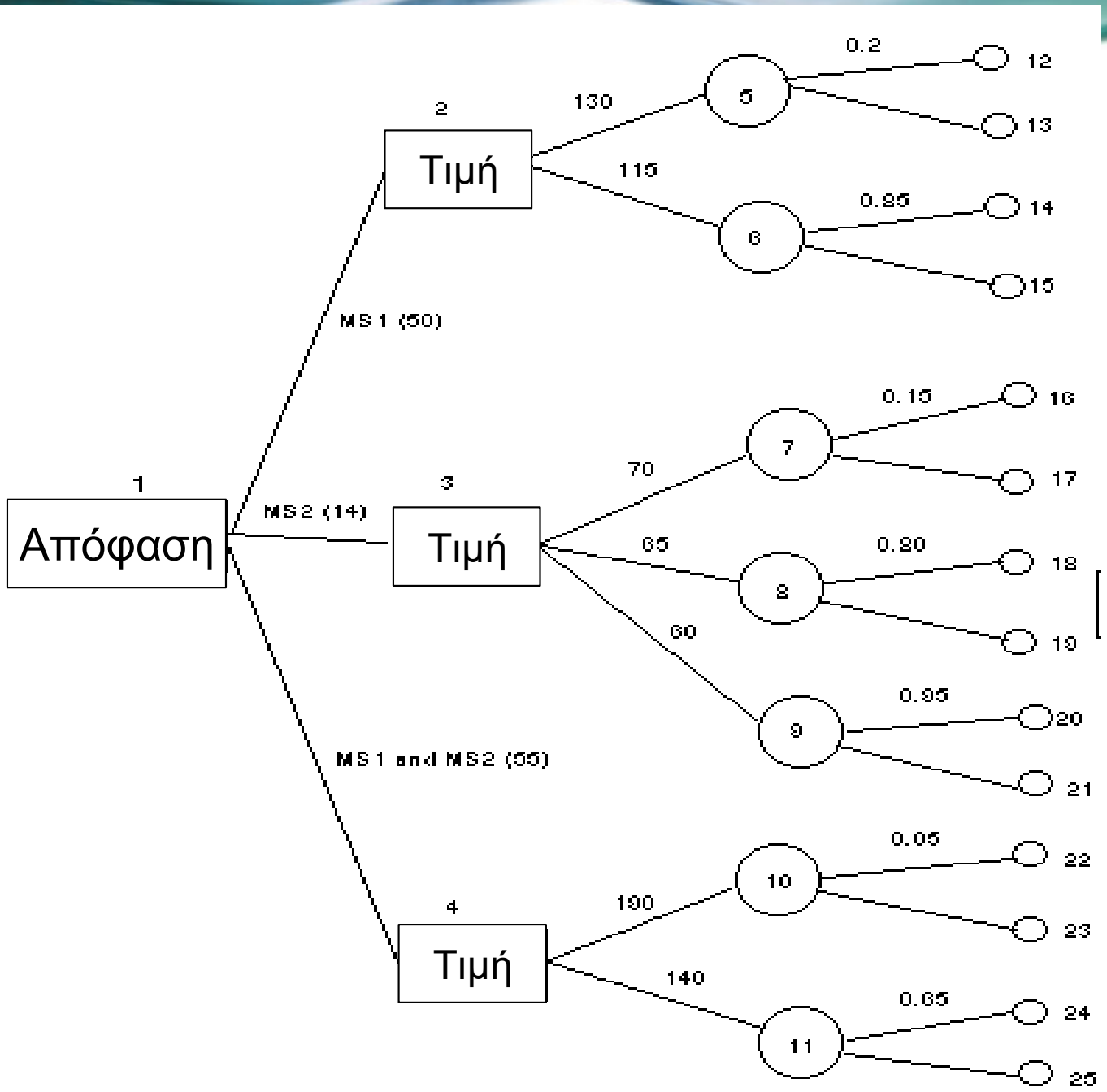


Άσκηση / 1

- Η επιχείρησή σας εξετάζει εάν πρέπει να υποβάλει προσφορά για δύο συμβάσεις (MS1 και MS2) για την προμήθεια του δήμου με διάφορα υλικά.
- Η επιχείρηση έχει τρεις δυνατότητες:
  - προσφορά για MS1 μόνο ή
  - προσφορά για MS2 μόνο ή
  - προσφορά και για MS1 και για MS2.
- Κάθε προσφορά έχει κόστος. Αυτό το κόστος θα πρέπει να συμπεριληφθεί εξ ολοκλήρου στην τιμή συμβάσεων. Ο κίνδυνος, φυσικά, είναι ότι εάν μια προσφορά είναι ανεπιτυχής η επιχείρηση θα έχει χάσει χρήματα.
- Το κόστος της προσφοράς για τη σύμβαση MS1 είναι £50,000. Εάν η προσφορά είναι επιτυχής το κόστος των υλικών θα είναι 18,000.
- Το κόστος της προσφοράς για τη σύμβαση MS2 είναι 14,000. Εάν η προσφορά είναι επιτυχής το κόστος των υλικών θα είναι 12,000.
- Το κόστος της προσφοράς για τη σύμβαση MS1 και για τη σύμβαση MS2 είναι 55,000. Εάν η προσφορά είναι επιτυχής το κόστος των υλικών θα είναι 24,000.

Άσκηση 2

	Τιμή	Πιθανότητα
Μόνο MS1	130,000 115,000	0.20 0.85
Μόνο MS2	70,000 65,000 60,000	0.15 0.80 0.95
Και τις δύο	190,000 140,000	0.05 0.65


1
Απόφαση
MS1 (50)
MS2 (14)
MS1 and MS2 (55)
2
Τιμή
3
Τιμή
4
Τιμή
130
115
70
65
60
190
140
5
6
7
8
9
10
11
0.2
0.85
0.15
0.80
0.95
0.05
0.65
12
13
14
15
16
17
18
19
20
21
22
23
24
25

- Το μονοπάτι για τον τελικό κόμβο 12, υποβάλλουμε πρόταση για το MS1 μόνο (κόστος 50), τιμή 130, και κερδίζουμε το συμβόλαιο, κόστος υλικών 18, συνολικό κέρδος 130-50-18 = 62
- Το μονοπάτι για τον τελικό κόμβο 13, υποβάλλουμε πρόταση για το MS1 μόνο (κόστος 50), τιμή 130, και χάνουμε το συμβόλαιο, συνολικό κέρδος -50
- Το μονοπάτι για τον τελικό κόμβο 14, υποβάλλουμε πρόταση για το MS1 μόνο (κόστος 50), τιμή 115, και κερδίζουμε το συμβόλαιο, κόστος υλικών 18, συνολικό κέρδος 115-50-18 = 47
- Το μονοπάτι για τον τελικό κόμβο 15, υποβάλλουμε πρόταση για το MS1 μόνο (κόστος 50), τιμή 115, και χάνουμε το συμβόλαιο, συνολικό κέρδος -50
- Το μονοπάτι για τον τελικό κόμβο 16, υποβάλλουμε πρόταση για το MS2 μόνο (κόστος 14), τιμή 70, και κερδίζουμε το συμβόλαιο, κόστος υλικών 12, συνολικό κέρδος 70-14-12 = 44
- Το μονοπάτι για τον τελικό κόμβο 17, υποβάλλουμε πρόταση για το MS2 μόνο (κόστος 14), τιμή 70, και χάνουμε το συμβόλαιο, συνολικό κέρδος -14
- Το μονοπάτι για τον τελικό κόμβο 18, υποβάλλουμε πρόταση για το MS2 μόνο (κόστος 14), τιμή 65, και κερδίζουμε το συμβόλαιο, κόστος υλικών 12, συνολικό κέρδος 65-14-12 = 39
- Το μονοπάτι για τον τελικό κόμβο 19, υποβάλλουμε πρόταση για το MS2 μόνο (κόστος 14), και χάνουμε το συμβόλαιο, συνολικό κέρδος -14

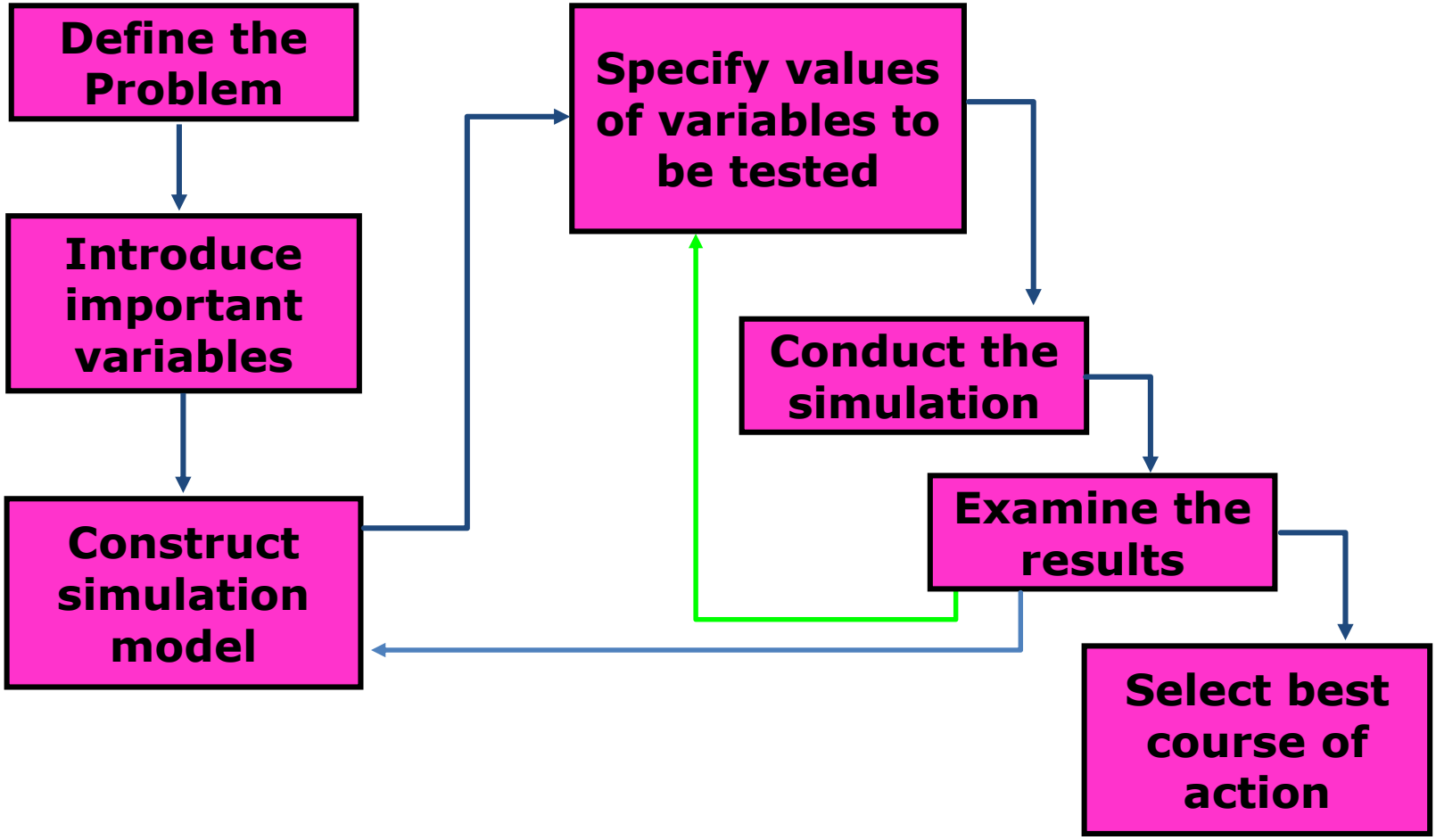
Τερματικός κόμβος	Συνολικό κέρδος (Κ €)
12	62
13	-50
14	47
15	-50
16	44
17	-14
18	39
19	-14
20	34
21	-14
22	111
23	-55
24	61
25	-55

- Για τον κόμβο πιθανότητας 5 το EMV είναι 0,2x62 + 0,8 x(-50) = -27,6
- Για τον κόμβο πιθανότητας 6 το EMV είναι 0,85 x 47 + 0,15 x (-50) = 32,45
- ως εκ τούτου η καλύτερη απόφαση στον κόμβο απόφασης 2 είναι να υποβάλει προσφορά στην τιμή των 115 (EMV=32,45).
- Για τον κόμβο πιθανότητας 7 το EMV είναι 0,15 x 44 + 0,85 x (-14) = -5,3
- Για τον κόμβο πιθανότητας 8 το EMV είναι 0,80 x 39 + 0,20 x (-14) = 28,4
- Για τον κόμβο πιθανότητας 9 το EMV είναι 0,95 x 34 + 0,05 x (-14) = 31,6
- ως εκ τούτου η καλύτερη απόφαση στον κόμβο απόφασης 3 είναι να υποβάλει προσφορά στην τιμή των 60 (EMV=31.6).
- Για τον κόμβο πιθανότητας 10 το EMV είναι 0,05 x 111 + 0,95 x (-55) = -46,7
- Για τον κόμβο πιθανότητας 11 το EMV είναι 0,65 x 61 + 0,35 x (-55) = 20,4
- ως εκ τούτου η καλύτερη απόφαση στον κόμβο 4 απόφασης είναι να υποβάλει προσφορά στην τιμή των 140 (EMV=20.4).
- Για τον κόμβο 1 έχουμε τρεις εναλλακτικές λύσεις::
- προσφορά για MS1 μόνο, EMV=32.45
- προσφορά για MS2 μόνο, EMV=31.6 και
- προσφορά για MS1 και για MS2, EMV = 20,4
- ως εκ τούτου που η καλύτερη απόφαση είναι να υποβάλει προσφορά για MS1 μόνο (στην τιμή των 115) δεδομένου ότι έχει την υψηλότερη αναμενόμενη νομισματική αξία 32,4.

Simulation

- The idea behind simulation is to:
- Imitate a real-world situation mathematically
- Study its properties and operating characteristics
- Draw conclusions and make action recommendations based on the results of the simulation

The Process of Simulation

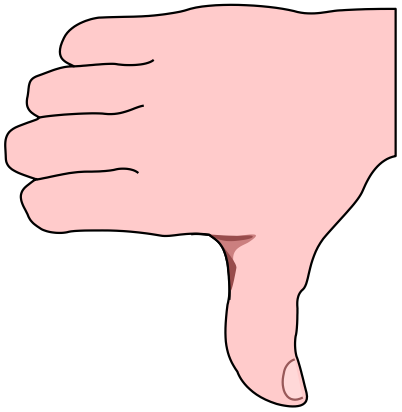


Advantages of Simulation

- Simulation
  - flexible, straightforward
  - can analyze large, complex real-world problems for which no closed-form analytical solutions exists
  - can include real-world complications which most other techniques cannot
  - enables “time compression”
  - allows “what if” type questions
  - does not interfere with the real-world system
  - allows study of relationships

Disadvantages of Simulation

© 1984-1994 T/Maker Co.



- Simulation:
  - Can be expensive and time consuming
  - Does not yield optimal solution
  - Requires good managerial input
  - Results not generalizable to other situations

The Monte Carlo Simulation Technique

- Setup probability distribution for important variables
- Build cumulative distribution for each variable
- Establish interval of random numbers for each variable
- Generate random numbers
- Simulate a series of trials

Partial Table of Random Numbers
(upper left corner)

52	06	50	88	53	30	10	47	99	37	66	91	35
37	63	28	02	74	35	24	03	29	60	74	85	90
82	57	68	28	05	94	03	11	27	79	90	87	92
69	02	36	49	71	99	32	10	75	21	95	90	94
98	94	90	36	06	78	23	67	89	85	29	21	25
96	52	62	87	49	56	49	23	78	71	72	90	57
33	69	27	21	11	60	95	89	68	48	17	89	34
50	33	50	95	13	44	34	62	63	39	55	29	30
88	32	18	50	62	57	34	56	62	31	15	40	90
90	30	36	24	60	82	51	74	30	35	36	85	01
50	48	61	18	85	23	08	54	17	12	80	69	24
27	88	21	62	69	64	48	31	12	73	02	68	00
45	14	46	32	13	49	66	62	74	41	86	98	92

Real World Variables Which Are Probabilistic in Nature

- Inventory demand
- Lead time for orders to arrive
- Time between machine breakdowns
- Times between arrivals at a service facility
- Service times
- Times to complete project activities
- Number of employees absent from work each day

Example: Dist. 1 – Failure Times

Time Between Failures (Hours)	Probability	Cumulative Probability	Random - Number Interval
36	0.13	0.13	01 – 13
24	0.17	0.30	14 – 30
12	0.15	0.45	31 – 45
8	0.25	0.70	45 – 70
6	0.20	0.90	71 - 90
4	0.10	1.00	91 - 00

Example: Dist. 2 – Recovery Times

Recovery Times (Hours)	Probability	Cumulative Probability	Random-Number Interval
24	0.05	0.05	01 – 05
12	0.15	0.20	06 – 20
8	0.50	0.70	21 – 70
6	0.20	0.90	71 – 90
4	0.10	1.00	91 - 00

Example: Simulating

Rn	Int Fail Time	Failure Time	Recovery Starts	Rn	Recovery Time	Recovery Ends	Waiting Time
52	8	8	8	37	8	16	0
06	36	44	44	63	8	52	0
50	24	68	68	28	8	76	0
88	6	74	76	02	24	98	2
53	8	82	98	74	6	104	16
30	24	106	106	35	8	114	0
10	36	142	142	24	8	150	0
47	8	150	150	03	24	174	0
99	4	154	174	29	8	182	20

From Dist. 1

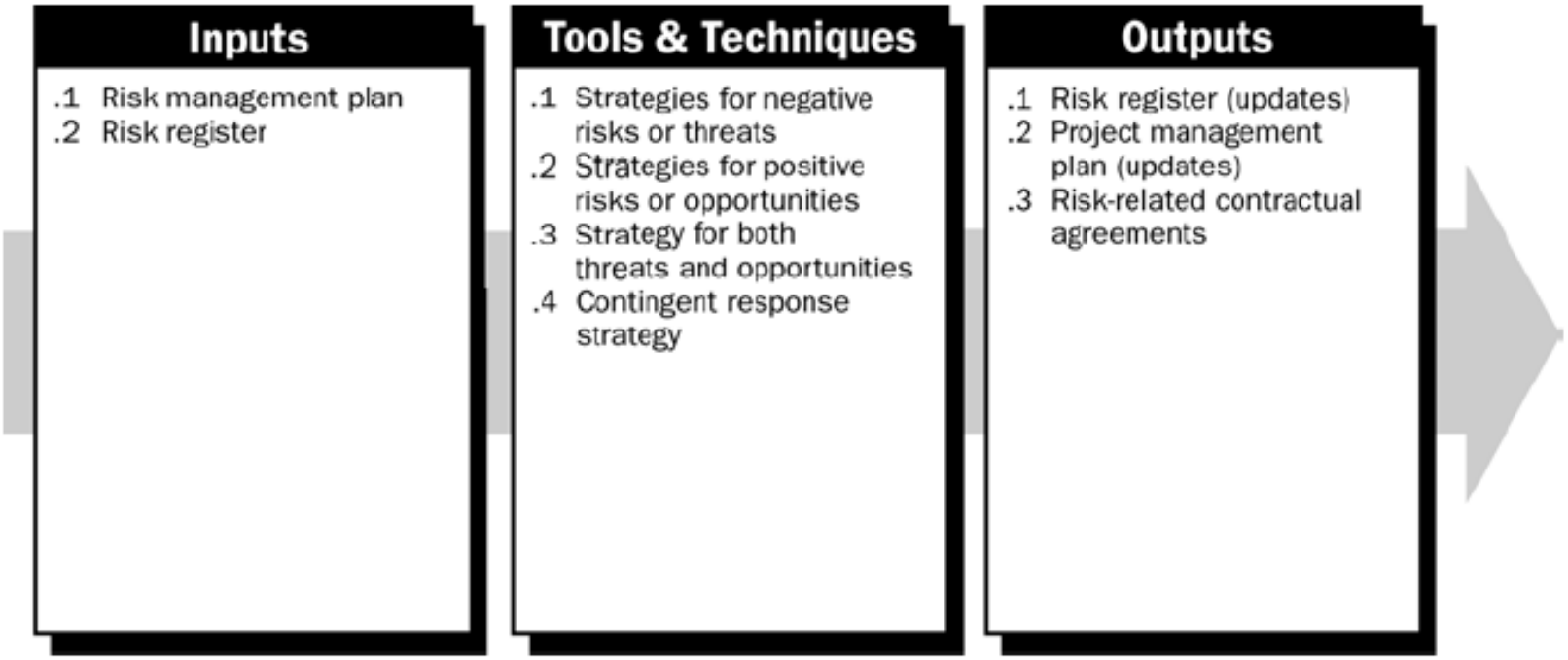
From Random Number Table

From Dist. 2

Example: Some Simple Statistics

Average Time Between Failure (Hours)	Average Time to Recover (Hours)	Total Wait Time (Hours)	Average Wait Time (Hours)	Average Time not Operating
154/9 hrs	102/9 hrs	38 hrs	38/9 hrs	11.3 + 4.2 hrs
17.1 hrs	11.3 hrs		4.2 hrs	15.5 hrs

Risk Response Planning



Risk response techniques

- Avoidance
- Transference
- Mitigation
- Acceptance

Avoidance/1

- Directly:
  - Clarify requirements
  - Clarify project objectives
  - Collect relevant information
  - Improve communication
  - Develop prototypes
  - Training
  - Invite specialists

Avoidance/2

- Indirectly
  - Change project scope to avoid complex and difficult points
  - Use well documented techniques – methodologies
  - Use bullet proof technology
  - Use redundancy in project planning

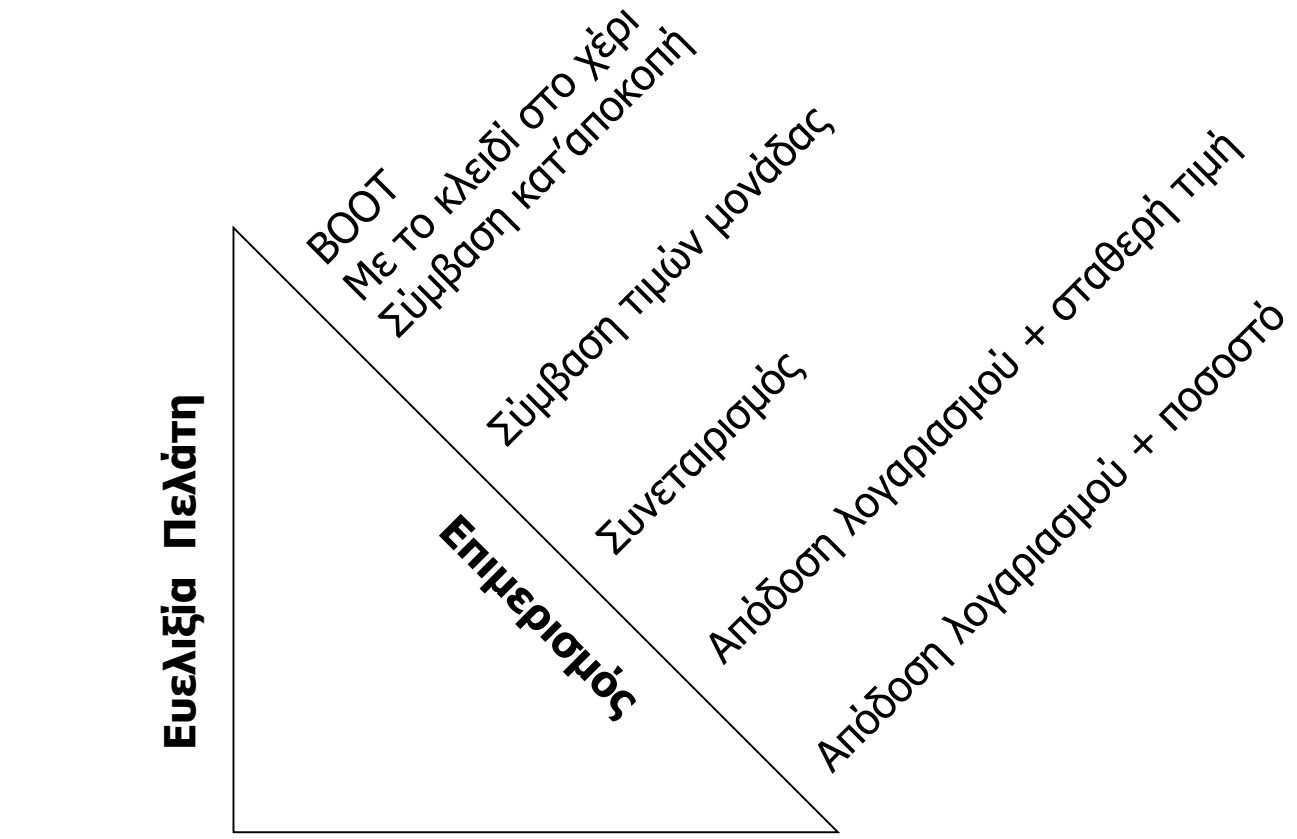
Risk Transfer

- Use subcontractors
- Insure risks
- Buy out risks

Contracts

- Fixed cost contract (Σύμβαση ορισμένου ποσού ή κατ'αποκοπή)
- Contract with fixed profit percentage (Σύμβαση με ποσοστό επί του απολογιστικού κόστους)
- Unit price contract (Σύμβαση με τιμή μονάδος)
- Turn key solution contract (Σύμβαση με το κλειδί στο χέρι)
- Consortium (Συνεταιρισμός)
- BOOT Build, Own, Operate, Transfer (Σύμβαση κατασκευής, εκχώρησης, εκμετάλλευσης και μεταβίβασης)

Σχέση είδος σύμβασης με κίνδυνο



Warranties, Insurances

- Warranties
  - Final payment withhold
  - Warrantee letter
- Insurance
  - Damages
  - Losses
  - Liability

Risk mitigation

- Two types of risk mitigation:
  - Pre-emptive measures
  - Direct measures
  - Indirect measures

Pre-emptive measures

- Create benchmarks for performance; make a separate prototype
- Start early
- Provide training
- Document decisions and agreements
- Plan to receive formal sign-off
- Implement a formal change management procedure
- Set expectations
- Involve the client in early planning
- Orient project staff
- Provide proper tools and training
- Anticipate and provide the right physical and technical environment
- Develop a personnel succession plan.

Direct measures

- The direct risk mitigation strategy could apply the following actions:
  - Negotiate a change
  - Build in a management budget reserve
  - Procure required resources and personnel
  - Conduct reviews or walk-throughs
  - Take corrective action to fix a specific problem
  - Use productivity tools.

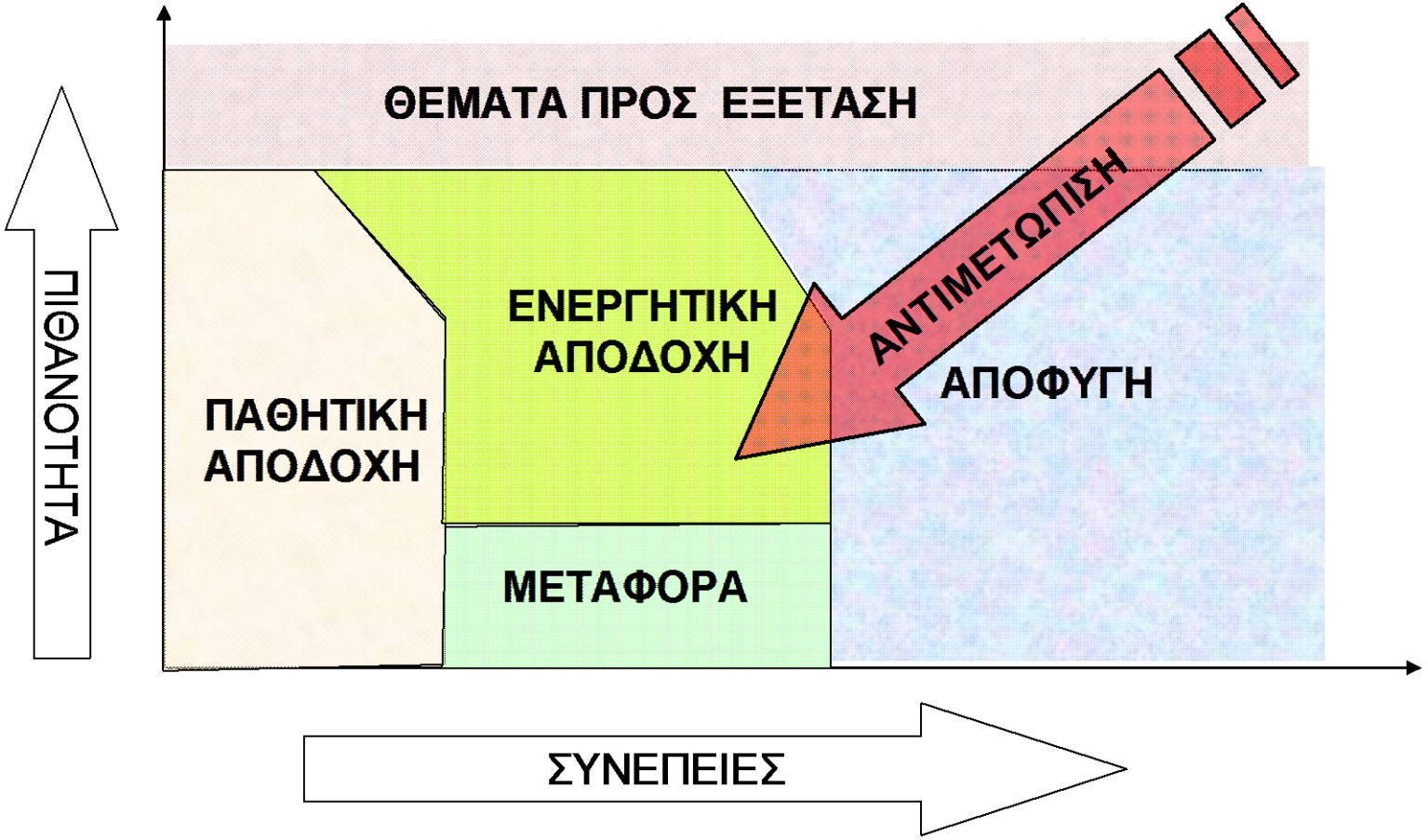
Indirect risk mitigation

- The indirect risk mitigation strategy could apply the following actions:
  - Extend work hours
  - Increase staff
  - Modify scope
  - Delay schedules.

Risk Acceptance

- This technique indicates that the project team has decided not to change the project plan to deal with a risk or is unable to identify any other suitable response strategy.
  - Active acceptance may include developing a contingency plan to execute, should a risk occur.
  - Passive acceptance requires no action, leaving the project team to deal with the risks as they occur

Risk strategy



Risk Assesment

- For each risk it contains the following information:
  - Risk Identification.
  - Consequences.
  - Possible Causes.
  - Risk Probability.
  - Potential Cost Impact.
  - Probable Risk Costs.
  - Alarm Signals
  - Evaluation Metrics.
  - Approach.

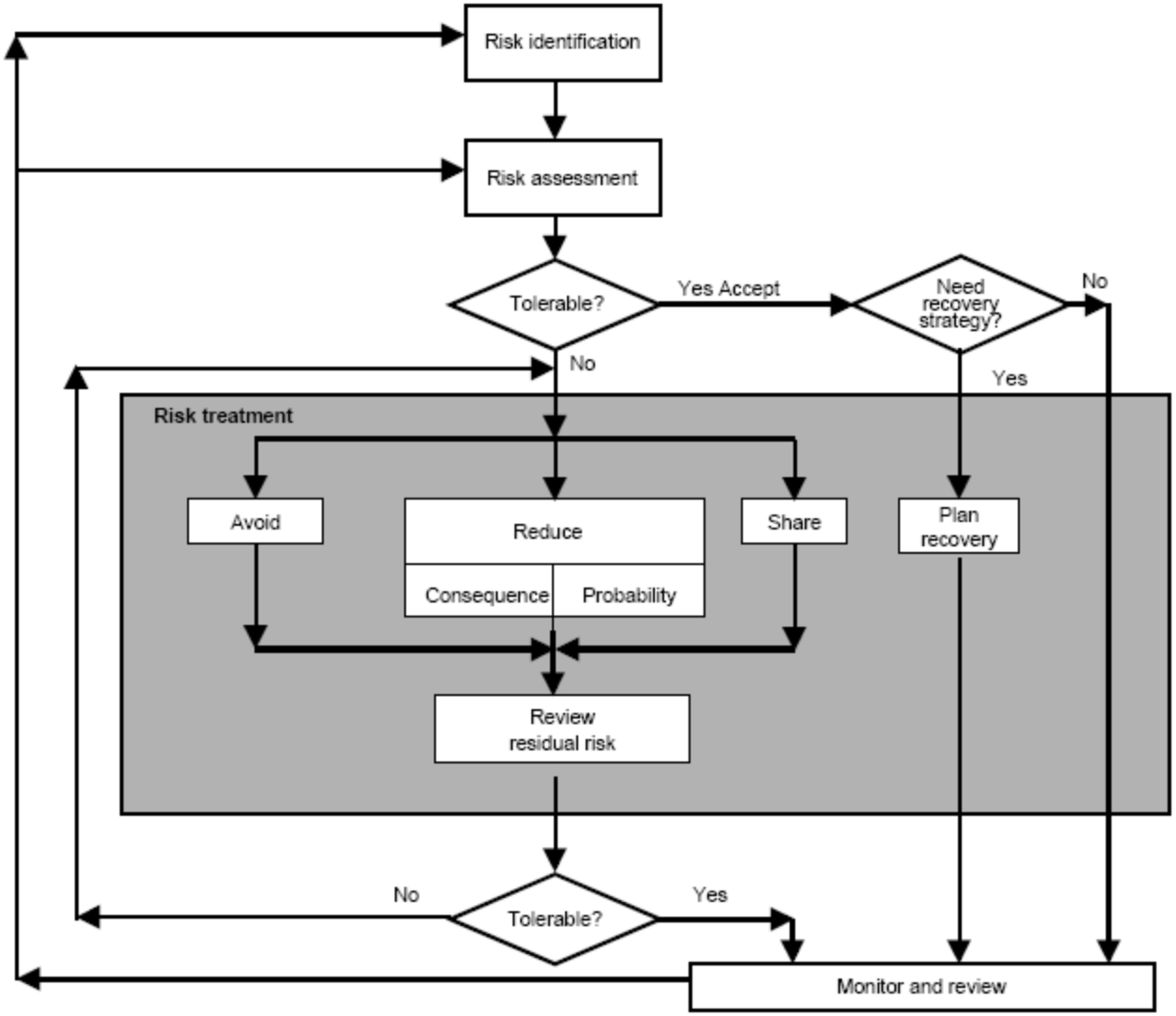
Risk response plan.

- It should include some or all of the following:
  - Identified risks, their descriptions, the area(s) of the project (e.g., WBS element) affected, their causes, and how they may affect project objectives.
  - Risk owners and assigned responsibilities.
  - Results from the qualitative and quantitative risk analysis processes.
  - Agreed responses including avoidance, transference, mitigation, or acceptance for each risk in the risk response plan.
  - The level of residual risk expected to be remaining after the strategy is implemented.
  - Specific actions to implement the chosen response strategy.
  - Budget and times for responses.
  - Contingency plans and fallback plans.

Risk response criteria

- Should be proper
- Should be cost effective
- Should lead to a specific actions.
- Should be realistic.
- Can be evaluated
- Agreed between stakeholders

Risk response process



Examples

Risk	Avoidance	Acceptance	Mitigation	Transfer
Car accident	Go walking	Pray first	Speed limit Wear Seat belts	Insurance Built hospital
Hard disk crash	Do not use it	Disk back-up in near future	Take immediately back-up	Use specialised software for data recovery

Exercise

- Analyse the following risks.
  - Delayed delivery of a deliverable
  - Risk of getting injured

Risk monitoring and control

- The purpose of risk monitoring is to determine if:
  - Risk responses have been implemented as planned.
  - Risk response actions are as effective as expected, or if new responses should be developed.
  - Project assumptions are still valid.
  - Risk exposure has changed from its prior state, with analysis of trends.
  - A risk trigger has occurred.
  - Proper policies and procedures are followed.
  - Risks have occurred or arisen that were not previously identified.

Risk monitoring and control