Information System - Risk Management
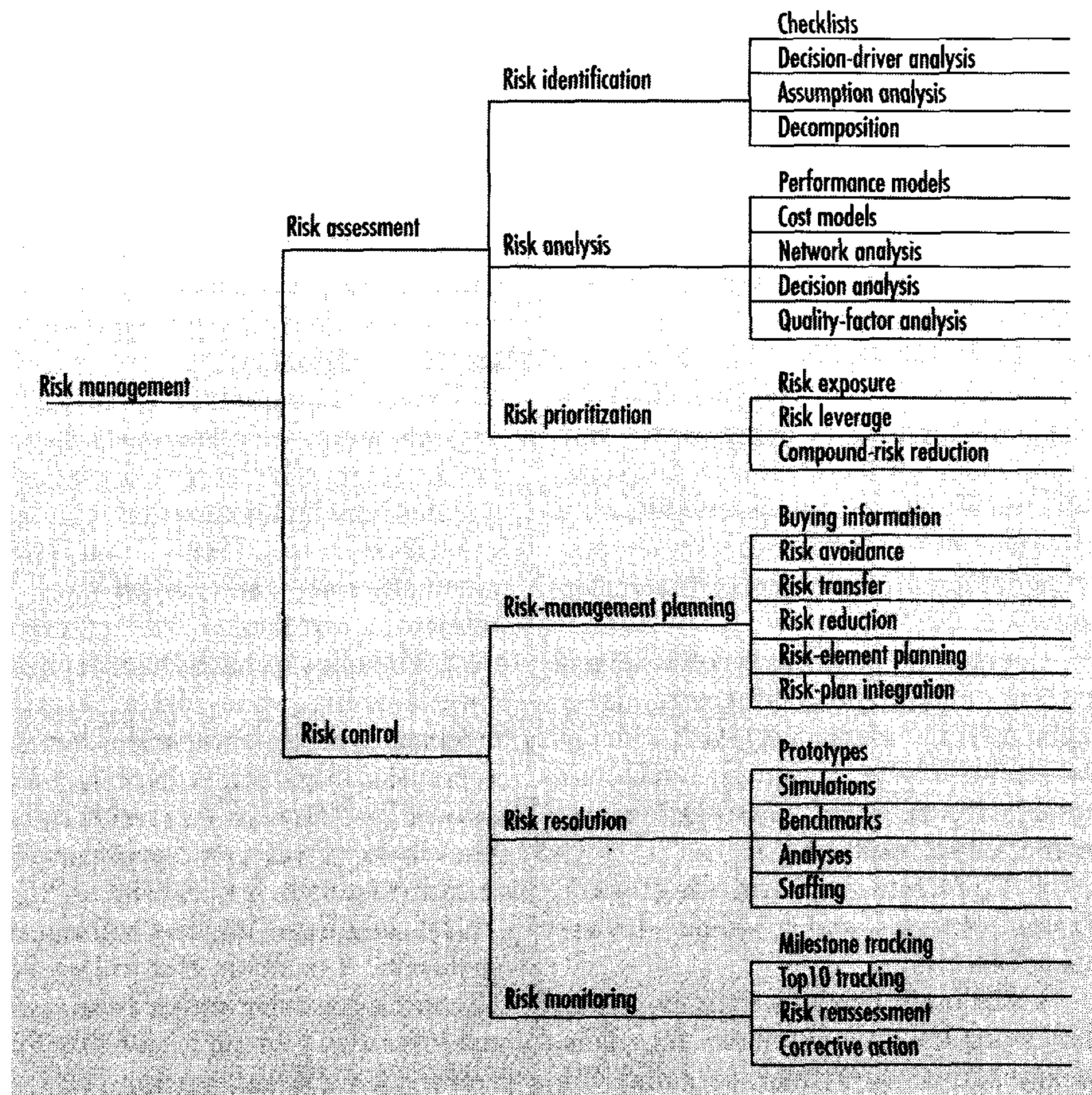
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http://jpaulgibson.synology.me/~jpaulgibson/TSP/Teaching/CSC4104/CSC4104-InformationSystem-RiskManagement.pdf

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- Richard Fairley. 1994. Risk Management for Software Projects. *IEEE Softw.* 11, 3 (May 1994), 57-67. DOI=10.1109/52.281716 http://dx.doi.org/10.1109/52.281716

- Higuera, Ronald P. and Haimes, Yacov Y. *Software Risk Management* (CMU/SEI-96-TR-012). Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, June 1996.

- Mark Keil, Paul E. Cule, Kalle Lyytinen, and Roy C. Schmidt. 1998. A framework for identifying software project risks. *Commun. ACM* 41, 11 (November 1998), 76-83. DOI=10.1145/287831.287843 http://doi.acm.org/10.1145/287831.287843

- Ropponen, J.; Lyytinen, K.; , "Components of software development risk: how to address them? A project manager survey," *Software Engineering, IEEE Transactions on* , vol.26, no.2, pp.98-112, Feb 2000, doi: 10.1109/32.841112

Risk management
- Risk assessment
  - Risk identification
    - Checklists
    - Decision-driver analysis
    - Assumption analysis
    - Decomposition
  - Risk analysis
    - Performance models
    - Cost models
    - Network analysis
    - Decision analysis
    - Quality-factor analysis
  - Risk prioritization
    - Risk exposure
    - Risk leverage
    - Compound-risk reduction
- Risk control
  - Risk-management planning
    - Buying information
    - Risk avoidance
    - Risk transfer
    - Risk reduction
    - Risk-element planning
    - Risk-plan integration
  - Risk resolution
    - Prototypes
    - Simulations
    - Benchmarks
    - Analyses
    - Staffing
  - Risk monitoring
    - Milestone tracking
    - Top10 tracking
    - Risk reassessment
    - Corrective action

- Barry W. Boehm, "Software Risk Management: Principles and Practices," IEEE Software, pp. 32-41, January/February, 1991
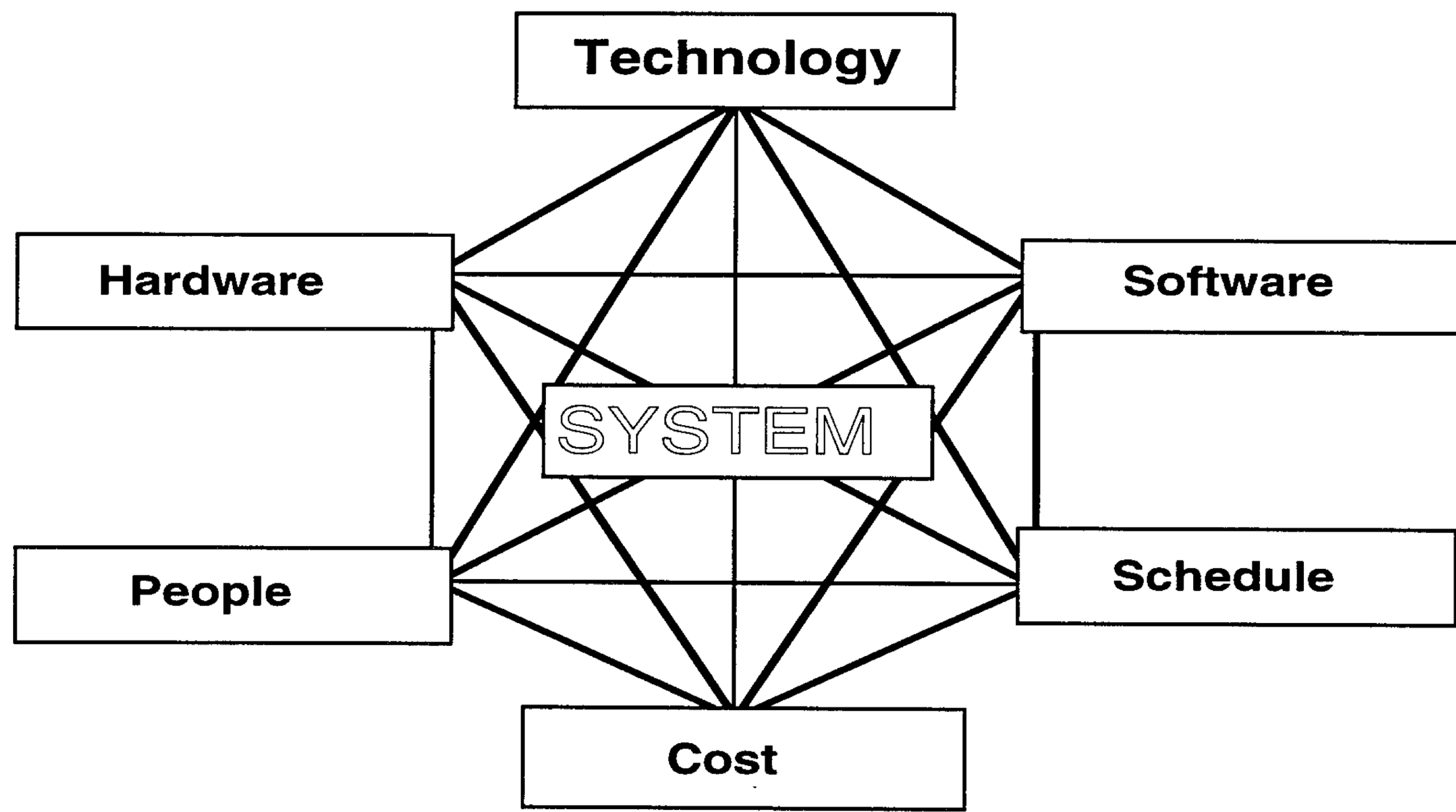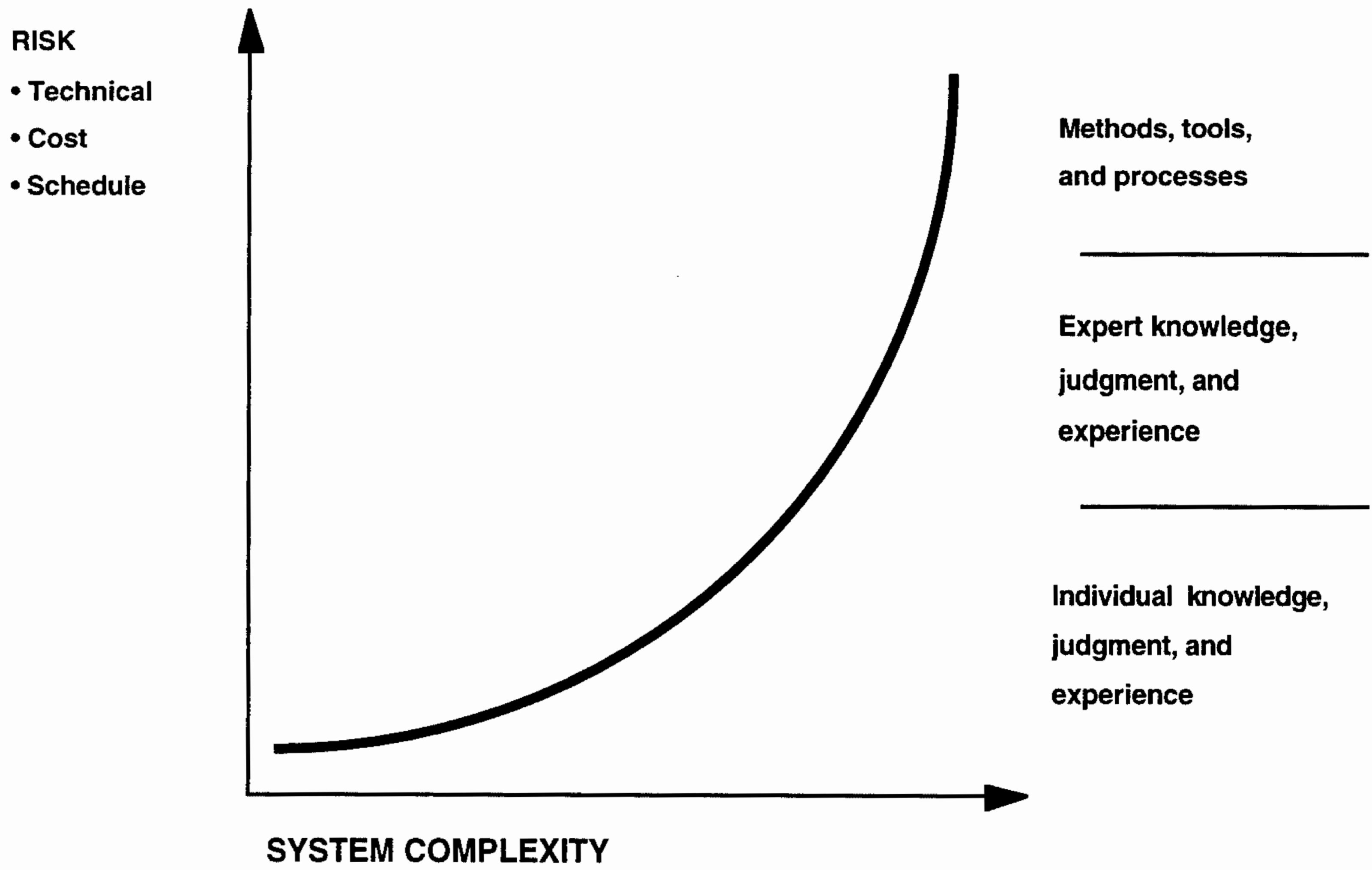
Figure 1: Risks Within a System Context

•Higuera, Ronald P. and Haimes, Yacov Y. *Software Risk Management* (CMU/SEI-96-TR-012). Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, June 1996.

RISK

• Technical

• Cost

• Schedule

Methods, tools,
and processes

_____

Expert knowledge,
judgment, and
experience

_____

Individual knowledge,
judgment, and
experience

SYSTEM COMPLEXITY

• Higuera, Ronald P. and Haimes, Yacov Y. *Software Risk Management* (CMU/SEI-96-TR-012). Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, June 1996.

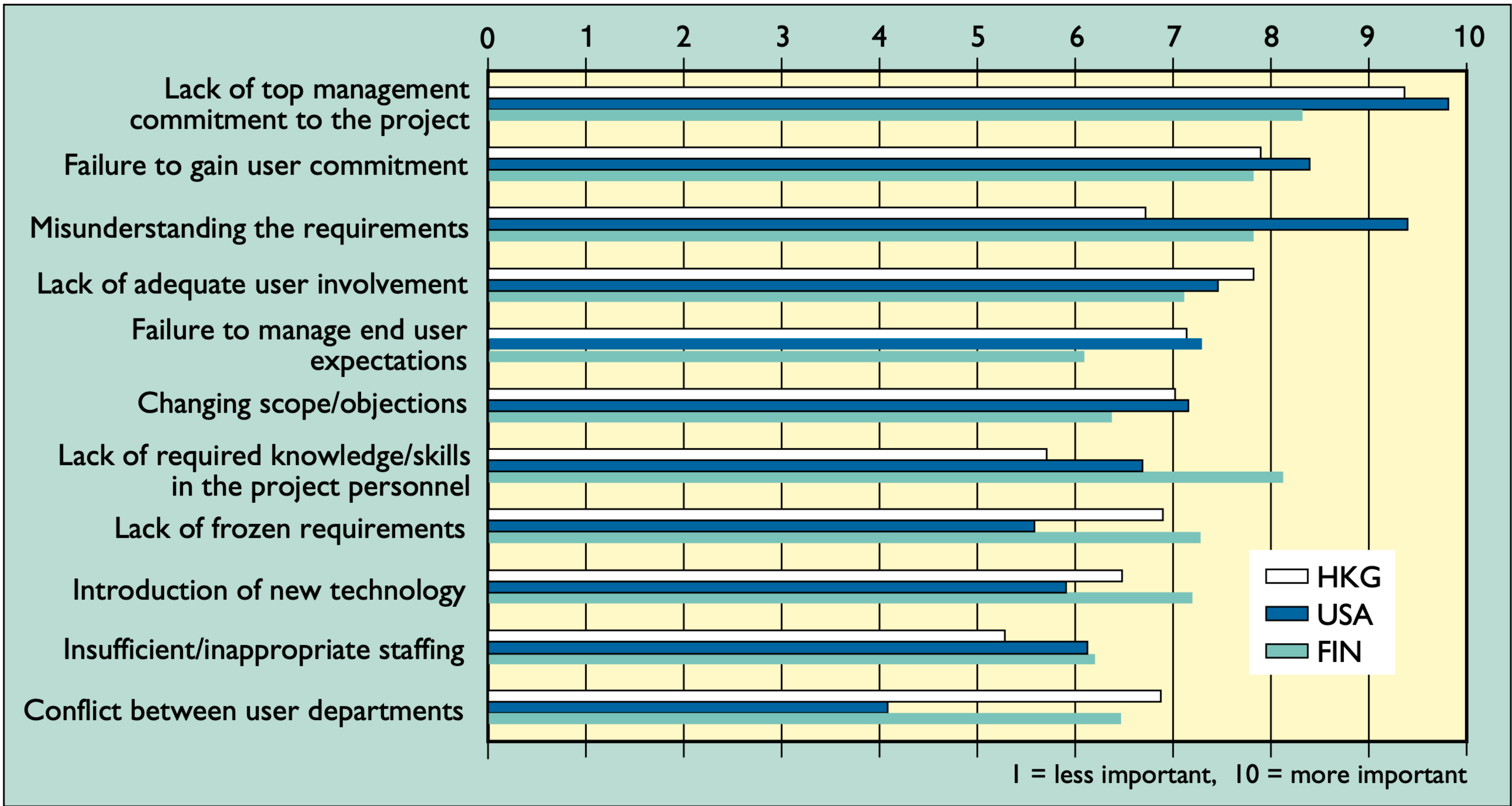**Figure 2: The Need to Manage Risk Increases With System Complexity**

Figure 1. Risk factors identified by all three panels ordered by relative importance

TABLE 1
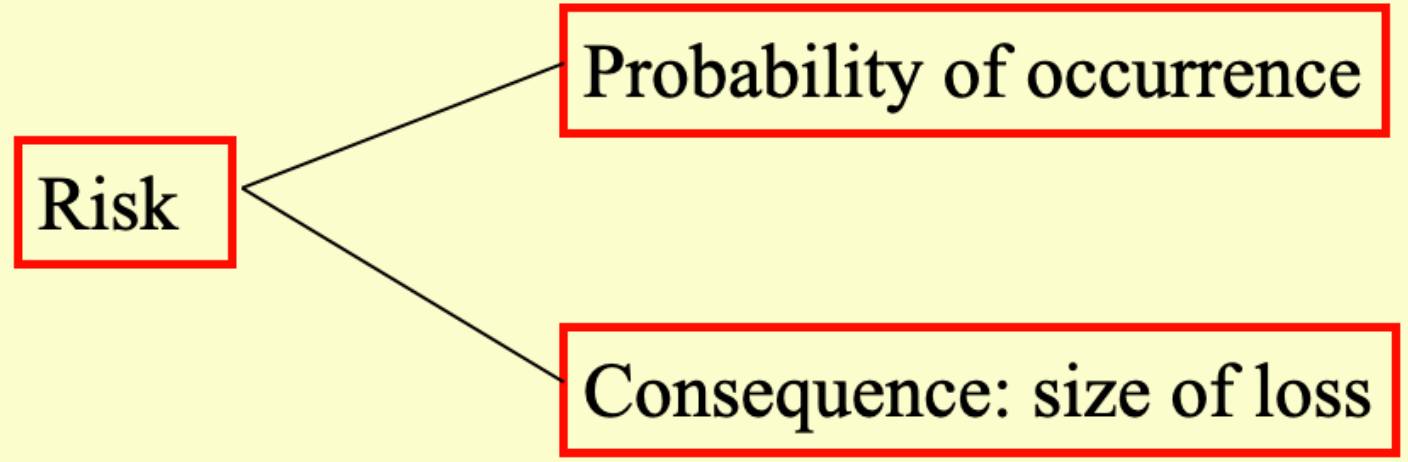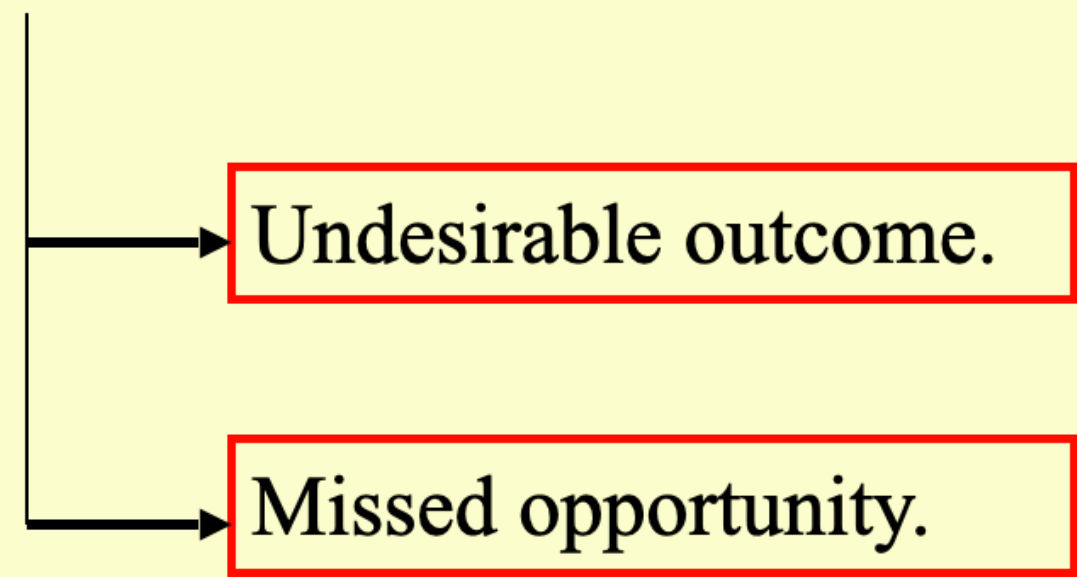Factor Matrix on Software Risks

Factors Variables	Factor 1 Scheduling Timing	Factor 2 System function.	Factor 3 Sub-contract.	Factor 4 Requir. Manag.	Factor 5 Res. use perform.	Factor 6 Personnel manag.
Personnel shortfalls	-.00280	-.07714	-.02218	.01591	.02593	.75975
Problems in timetable	.83713	.04218	-.05162	.18396	-.15252	.08019
Resource usage and deadline	-.10617	-.11342	-.06551	.05988	.84819	.11891
Actual costs vs. estimated costs	.73074	-.27027	.16433	-.02437	.00298	.08001
Wrong size estimates	.61561	.22824	.22494	-.11404	.35527	-.01836
Estimates for personnel need	.55120	.43683	.42497	-.02526	-.00559	-.09131
Steady consumption of time	.01702	.19711	.03388	.48534	.06886	.40460
Insufficient expertise	.33951	.34520	.21398	-.31981	.07002	.39192
Managing project complexity	.52462	.08301	.23004	.24002	.48669	-.00887
Functions and properties correct	-.14384	.68828	.08495	.17152	.05864	.09647
Gold plating	-.03734	.34691	.25577	.60022	.10082	-.23089
Requirement changes	.28515	.04586	.07563	.75526	.07941	.12582
Changes in timetable	.65640	.02312	-.09419	.47302	.01124	-.08475
Satisfaction with the user interface	.07839	.79661	-.12782	.12238	-.13369	.13935
Shortfalls in externally furnished components	.12644	.09566	.79357	.04726	.06017	.03823
Unrealistic expectation of the personnel's abilities	.01215	.21776	.27694	.04472	.15203	.57234
Evaluation of performance requirements	.10498	.33530	.02009	.10129	.49317	.38082
Success in externally performed tasks	.07044	-.06682	.83802	.12630	-.02520	.16717
Estimation of hardware and software capabilities	.16448	.62809	.19168	.04457	.47688	-.06653

Legend of the table: Grayed entries denote the entries that loaded, i.e., have a high correlation with the factors defined in the column.

FOR DISCUSSION: What is risk?

A risk is a possibility of loss.

Undesirable outcome.

Missed opportunity.

Risk
- Probability of occurrence
- Consequence: size of loss
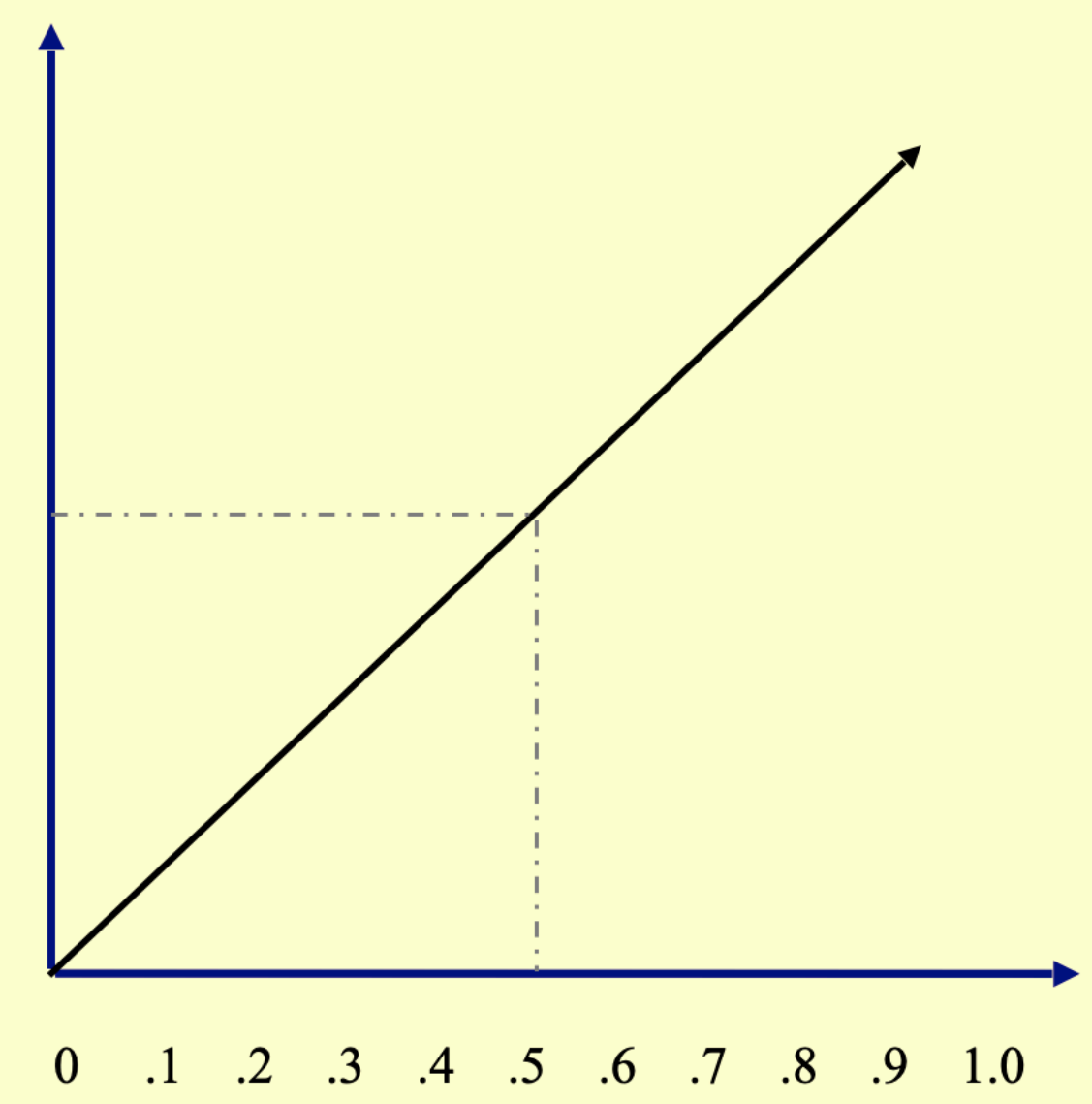
Question: what is a reasonable unit of measurement for exposure

Risk Exposure = Probability x Consequence

Perceived Probability

Almost certainly
Highly likely
Very good chance
Probable
Likely
Probably
We believe
Better than even
We doubt
Improbable
Unlikely
Probably not
Little chance
Almost no chance
Highly unlikely
Chances are slight

0   .1   .2   .3   .4   .5   .6   .7   .8   .9   1.0

Risk Analysis Table

Probability \ Impact		Trivial	Minor	Moderate	Major	Extreme
	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	Medium
	Moderate	Low	Medium	Medium	Medium	High
	Likely	Medium	Medium	Medium	High	High
	Very likely	Medium	Medium	High	High	High

https://www.justgetpmp.com/2012/02/probability-and-impact-matrix.html

Classification of software risks

There are many different classification frameworks, eg:

- **Software Project Risks**
  - Resource constraints, external interfaces, supplier relationships, nonperforming vendors, internal politics, interteam/intergroup coordination problems, inadequate funding.

- **Software Process Risks**
  - Undocumented software process, lack of effective peer reviews, no defect prevention, poor design process, poor requirements management, ineffective planning.

- **Software Product Risks**
  - Lack of domain expertise, complex design, poorly defined interfaces, poorly understood legacy system(s), vague or incomplete requirements.

SOFTWARE REQUIREMENT RISKS

Lack of analysis for change of requirements	Change extension of requirements
Lack of report for requirements	Poor definition of requirements
Ambiguity of requirements	Change of requirements
Inadequate of requirements	Impossible requirements
Invalid requirements	

TODO: For the "Presence en cours" case study, complete a Risk Analysis Table

SOFTWARE COST RISKS

Lack of good estimation in projects	Unrealistic schedule
The hardware does not work well	Human errors
Lack of testing	Lack of monitoring
Complexity of architecture	Large size of architecture
Extension of requirements change	The tools does not work well
Personnel change	Management change
Technology change	Environment change
Lack of reassessment of management cycle	

TODO: For the "Presence en cours" case study, complete a Risk Analysis Table

SOFTWARE SCHEDULING RISKS

Inadequate budget	Change of requirements
Extension of requirements change	Human errors
Inadequate knowledge about tools	Inadequate knowledge about techniques
Long-term training for personnel	Lack of employment of manager experience
Lack of enough skill	Lack of good estimation in projects
Lack of accurate system domain definition	Lack of goals specification
Difficulty of implementation	Disagreement between members
Lack of tools	Shortage of personnel
Tools failure	Technology change
Lack of agreement between customer and developer	Slow management cycle
Supply budget in inappropriate time	Environment change
Lack of a good guideline	

TODO: For the "Presence en cours" case study, complete a Risk Analysis Table

SOFTWARE QUALITY RISKS

Inadequate documentation	Lack of project standard
Lack of design documentation	Inadequate budget
Human errors	Unrealistic schedule
Extension of requirements change	Poor definition of requirements
Lack of enough skill	Lack of testing
Lack of good estimation in projects	Inadequate knowledge about techniques
Lack of employment of manager experience	Lack of accurate system domain definition
The simulator is to be destroyed	Lack of reassessment
Inadequate knowledge about programming language	Inadequate knowledge about tools
The hardware does not work well	Lack of analysis for change of requirements
The tools do not work well	Loss technical equipment
Lack of stability between personnel	Personnel change
Weakness of management	Lack of commitment
Disagreement between members	Ambiguity of requirements
Complexity of architecture	Incomplete requirements
Lack of roles and responsibilities definition	Inadequate training of personnel
Management change	Technology change
Lack of collaboration between developer	Environment change
Lack of a good guideline	

TODO: For the "Presence en cours" case study, complete a Risk Analysis Table

SOFTWARE BUSINESS RISKS

The products that no one want them
The products that are not suitable with total strategy
The products that sellers do not know how to sell them
Failure in total budget
Failure in commitment
Failure in management because of change in different people

TODO: For the "Presence en cours" case study, complete a Risk Analysis Table

The Risk Management Process