



Software Engineering Economics (CS656)

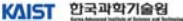
Risk Management - I

Jongmoon Baik




Questions to Consider

- Why am I talking to you about risk management?
- How many of you manage risks continuously or have you managed them throughout a project before?



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If you don't actively attack the risks?



The risks will actively attack you !
-Tom Gilb -

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What is A Risk?

- “The chance or possibility of suffering loss, injury, damage, or harm” – Webster’s dictionary, 1981
- “The measure of the probability and severity of adverse effects” – William Lawrance, “Of Acceptable Risk”, 1976
- “problems that could cause some loss or threaten the success of projects, but which has not happened yet”
 - http://www.processimpact.com/articles/risk_mgmt.html
- No universally accepted definition
- All definitions share the following characteristics:
 - *Uncertainty* – an event may or may not happen
 - *Loss* – an event has unwanted consequences or losses

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Risk and Project Management

Risk Management is aimed addressing the risks
within the project management environment ..
Not just the technical risks

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Is Risk Necessarily Bad?

“Risk in itself is not bad; risk is essential to progress, and failure is often a key part of learning.

But we must learn to balance the possible negative consequences of risk against the potential benefits of its associated opportunity.”

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The Need to Manage Risk

- Project risk increases as the systems become more complex

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Risk Management

- Get recognized as best practice to reduce the surprise factor
 - Structured risk mgmt: to peek over the horizon at the traps that might be looming,
 - Provides visibility in threats to project success
 - Control risks across multiple projects
 - Take actions to minimize the likelihood or impact of these potential problems
- Inefficient risk management cause:
 - A continual state of project instability
 - Constant fire-fighting
 - Multiple schedule slippage

“Deal with a concern before it becomes a crisis”

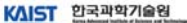
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Is This A Risk?

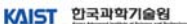
- We just started integrating the software
 - and we found out that COTS* products A and B just can't talk to each other
- We've got too much tied into A and B to change
- Our best solution is to build wrappers around A and B to get them to talk via CORBA**
- This will take 3 months and \$300K
- It will also delay integration and delivery by at least 3 months

*COTS: Commercial off-the-shelf
 **CORBA: Common Object Request Broker Architecture

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Is This A Risk?

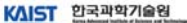
- No, it is a problem
 - Being dealt with reactively
- Risks involve *uncertainties*
 - And can be dealt with pro-actively
 - Earlier, this problem was a risk

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Earlier, This Problem Was A

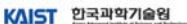
- A and B are our strongest COTS choices
 - But there is some chance that they can't talk to each other
 - **Probability of loss P(L) [or P(UO)]**
 - If we commit to using A and B
 - And we find out in integration that they can't talk to each other
 - We'll add more cost and delay delivery by at least 3 months
 - **Size of loss S(L) [or L(UO)]**
- **Risk Exposure (RE)**

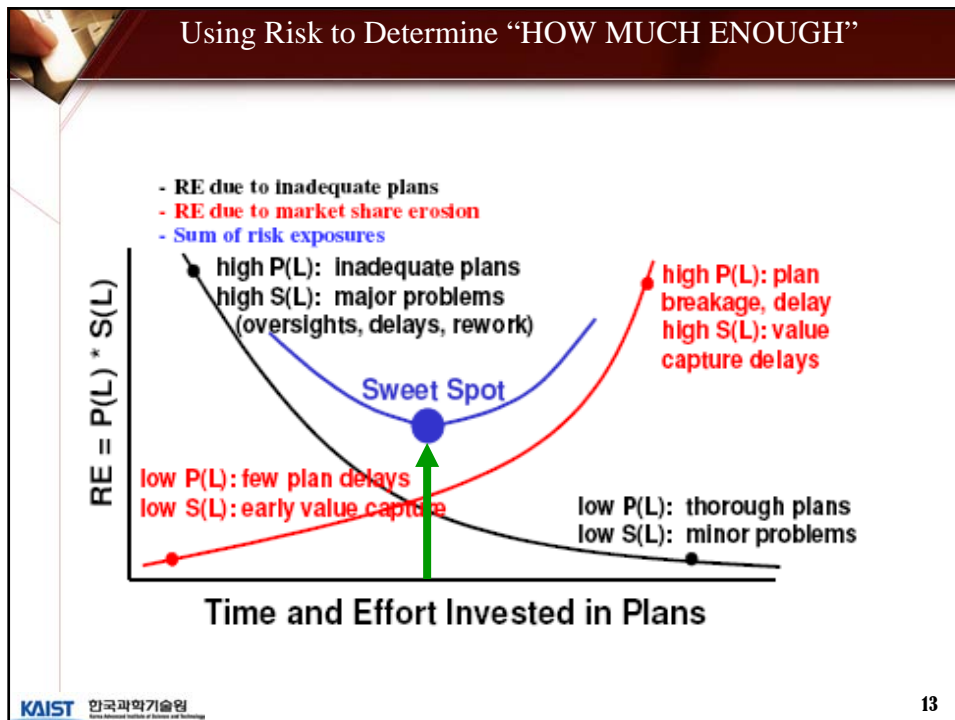
$$RE = P(L) * S(L)$$


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Risk-Analysis: Decision Tree

	Risk Exposure		Combined Risk Exposure
Do IV&V <ul style="list-style-type: none"> Find CE Don't find CE No CE 	\$0.18M	\$0.5M	} \$1.3M More attractive option
	\$0.82M	\$20.5M	
	\$0.30M	\$0.5M	
No IV&V <ul style="list-style-type: none"> Find CE Don't find CE No CE 	\$0	\$0	} \$2M
	\$2M	\$20M	
	\$0	\$0	


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RISK vs. PROBLEM

- Example:
 - A risk: threat of your top technical people being hired away by the competition
 - A problem: unable to hire right skilled staff
- Current, real problems
 - Requires prompt corrective actions
- Looming risk
 - Dealt with several different ways

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How to Deal with Risks?

- Buying Information
- Risk Avoidance
- Risk Transfer
- Risk Reduction
- Risk Acceptance

Risk Management Strategies - I

Buying Information

- Let's spend \$30K and 2 weeks prototyping the integration of A and B
- This will buy information on the magnitude of $P(L)$ and $S(L)$
- If $RE = P(L) * S(L)$ is small, we'll accept and monitor the risk
- If RE is large, we'll use one/some of the other strategies

Risk Management Strategies - II

- Risk Avoidance
 - COTS product C is almost as good as B, and it can talk to A
 - Delivering on time is worth more to the customer than the small performance loss
- Risk Transfers
 - If the customer insists on using A and B, have them establish a risk reserve.
 - To be used to the extent that A and B can't talk to each other
- Risk Reduction
 - If we build the wrappers and the CORBA corrections right now, we add cost but minimize the schedule delay
- Risk Acceptance
 - If we can solve the A and B interoperability problem, we'll have a big competitive edge on the future procurements
 - Let's do this on our own money, and patent the solution

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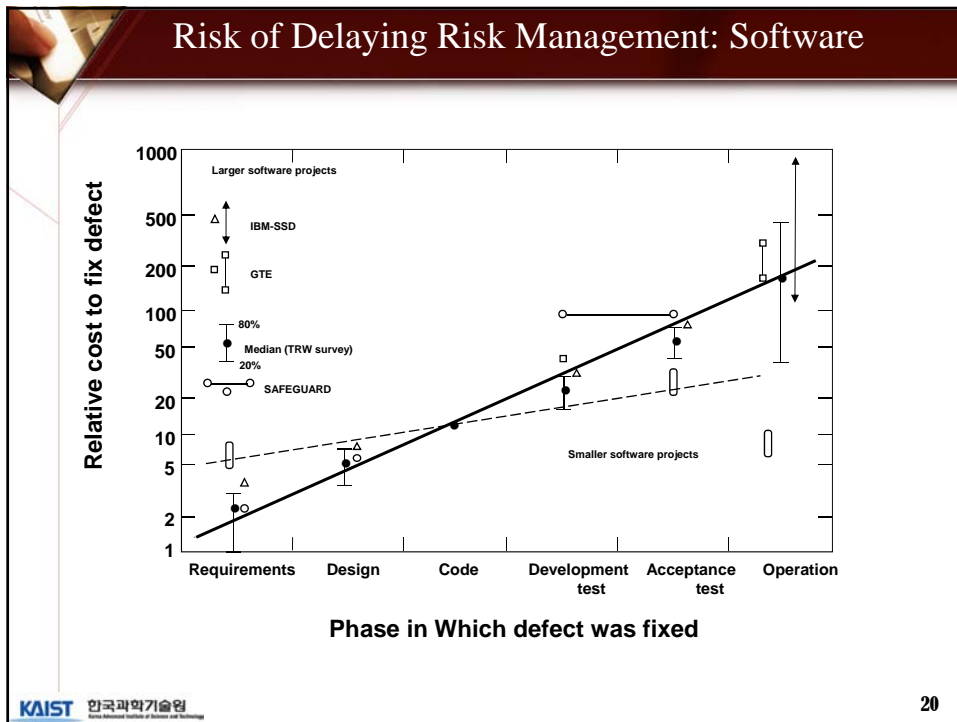
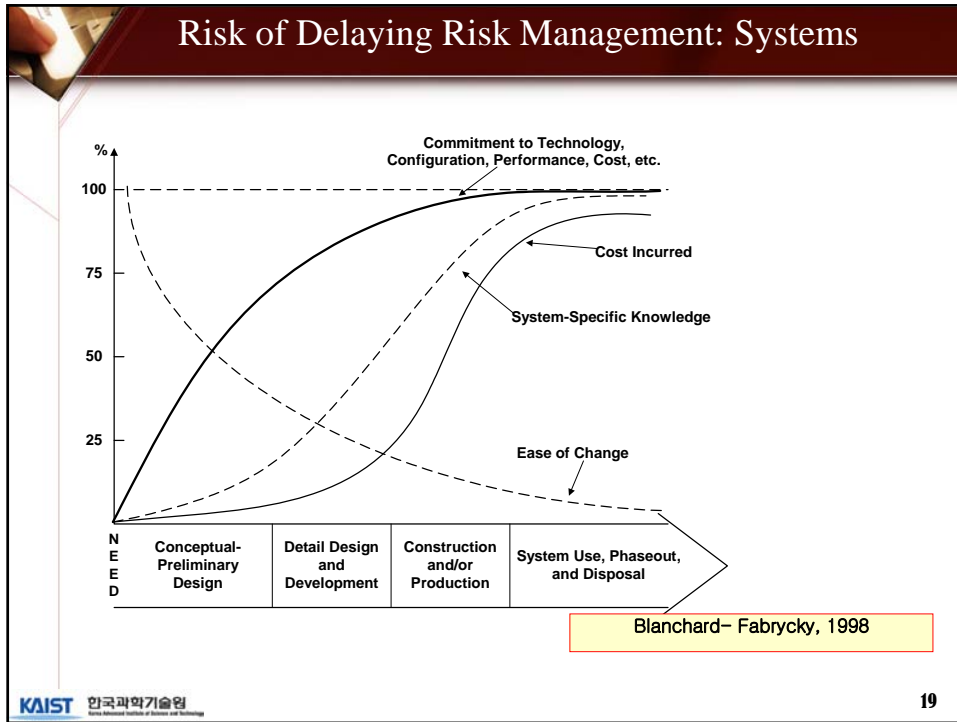
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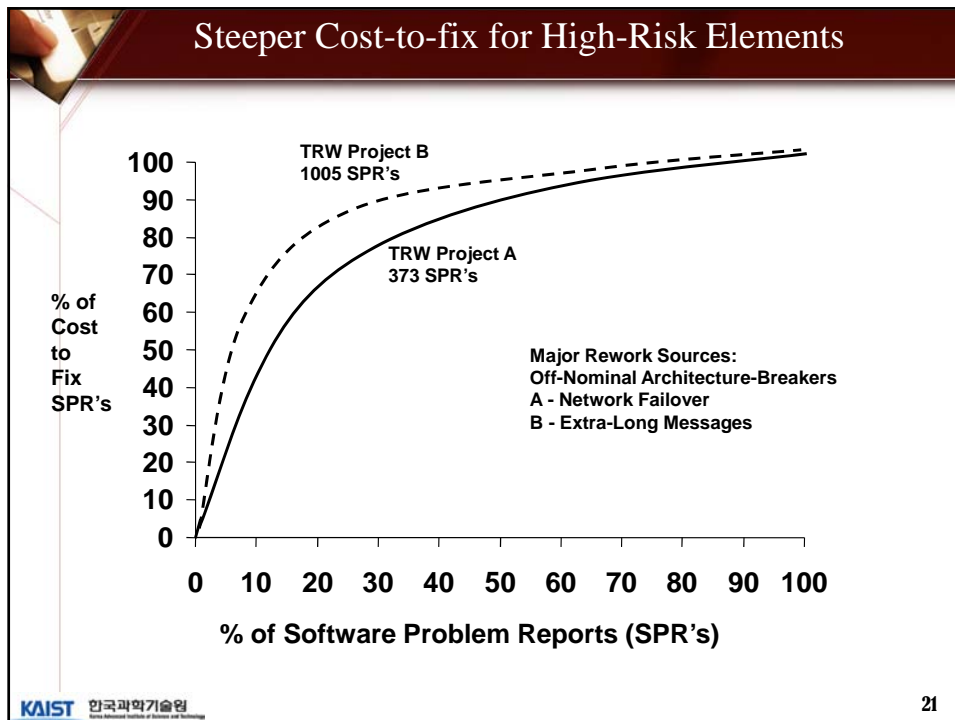
When You have to Start RM?

- The Answer is **DAY ONE**
 - Early & Risk Resolution
 - Data
 - Temptations to Avoid
- Early Risk Resolution with the WinWin Spiral Model
 - Identifying Stakeholders and Win Conditions
 - Model Clash and Win-Lose Risk Avoidance
 - Avoiding Cost/Schedule Risks with the SAIV Model

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Day One Temptations to Avoid - I

- It's too early to think about risks. We need to:
 - Finalize the requirements
 - Maximize our piece of the pie
 - Converge on the risk management organization, forms, tools, and procedures. Don't put the cart before the horse.
- The real horse is the risks, and it's leaving the barn
 - Don't sit around laying out the seats on the cart while this happens. **Work this concurrently.**

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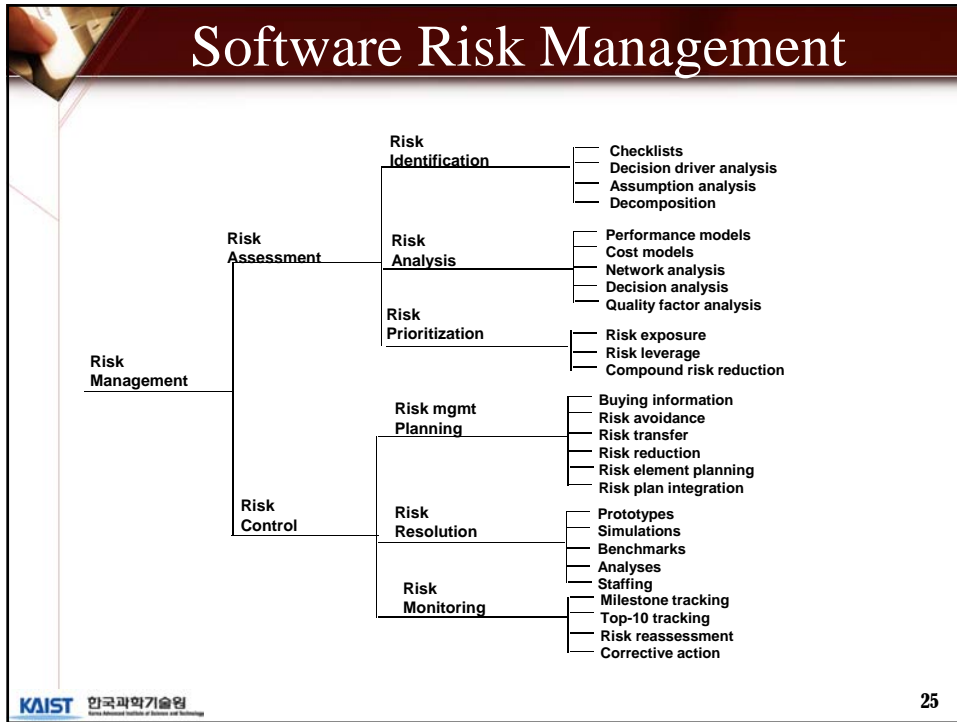
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Day One Temptations to Avoid - II

- We don't have time to think about the risks. We need to:
 - Get some code running right away
 - Put on a socko demo for the customers
 - Be decisive. Lead. Make commitments.
- The Contrarian's Guide to Leadership (Sample, 2002)
 - Never make a decision today that can be put off till tomorrow.
 - Don't form opinions if you don't have to. Think gray.


Day One Temptations to Avoid - III

- Unwillingness to admit risks exist
 - Leaves impression that you don't know exactly what you're doing
 - Leaves impression that your bosses, customers don't know exactly what they're doing
 - "Success-orientation"
 - "Shoot the messenger" syndrome
- Tendency to postpone the hard parts
 - Maybe they'll go away
 - Maybe they'll get easier, once we do the easy parts
- Unwillingness to invest money and time up front



Risk Identification


- Produce lists of the project specific risk items likely to compromise a project's success
- Typical risk Identification Techniques
 - Risk-item checklists
 - Decision driver analysis
 - Comparison with experience (Assumption Analysis)
 - Win-lose, lose-lose situations
 - Decomposition
 - Pareto 80 – 20 phenomena
 - Task dependencies
 - Murphy's law
 - Uncertainty areas
 - Analysis of Model Clashes


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Example: Risk Item Checklist

- Will you project really get all the best people?
- Are there critical skills for which nobody is identified?
- Are there pressures to staff with available warm bodies?
- Are there pressures to overstaff in the early phases?
- Are the key project people compatible?
- Do they have realistic expectations about their project job?
- Do their strengths match their assignment?
- Are they committed full-time?
- Are their task prerequisites (training, clearances, etc.) Satisfied?


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Example: Examination of Decision Drivers

- Political versus Technical
 - Choice of equipment
 - Choice of subcontractor
 - Schedule, Budget
 - Allocation of responsibilities
- Marketing versus Technical
 - Gold plating
 - Choice of equipment
 - Schedule, budget
- Solution-driven versus Problem-driven
 - In-house components, tools
 - Artificial intelligence
 - Schedule, Budget
- Short-term versus Long-term
 - Staffing availability versus qualification
 - Reused software productions engineering
 - Premature SRR, PDR
- Outdated Experience

Top 10 S/W Risk Items

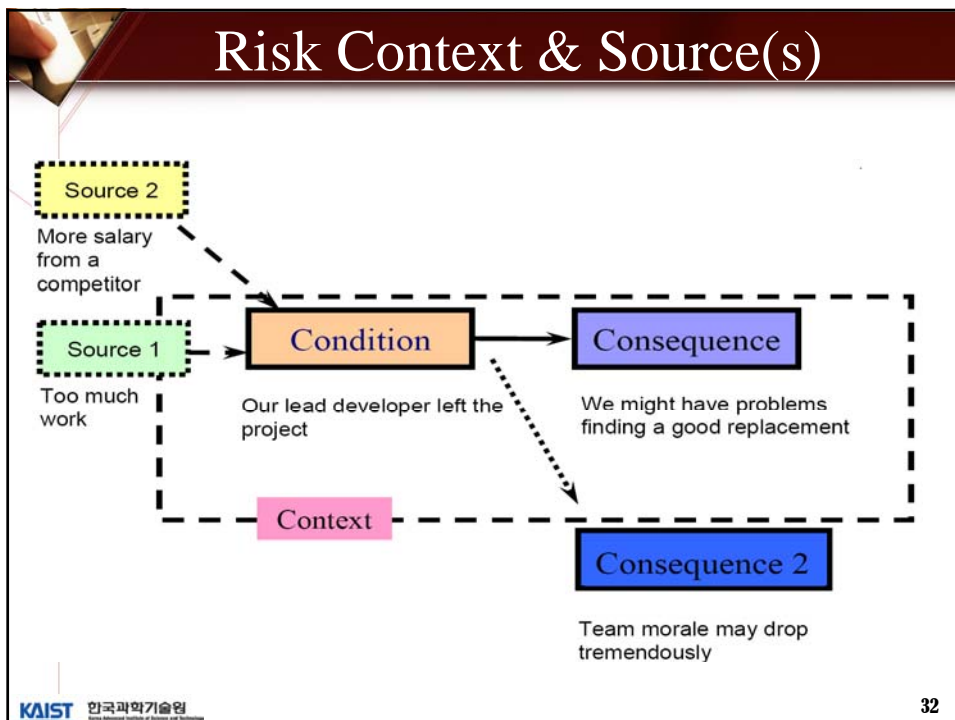
Risk item	Risk-management technique
Personnel shortfalls	Staffing with top talent, job matching, team building, key personnel agreements, cross training.
Unrealistic schedules and budgets	Detailed multisource cost and schedule estimation, design to cost, incremental development, software reuse, requirements scrubbing.
Developing the wrong functions and properties	Organization analysis, mission analysis, operations-concept formulation, user surveys and user participation, prototyping, early users' manuals, off-nominal performance analysis, quality-factor analysis.
Developing the wrong user interface	Prototyping, scenarios, task analysis, user participation.
Gold-plating	Requirements scrubbing, prototyping, cost-benefit analysis, designing to cost.
Continuing stream of requirements changes	High change threshold, information hiding, incremental development (deferring changes to later increments).
Shortfalls in externally furnished components	Benchmarking, inspections, reference checking, compatibility analysis.
Shortfalls in externally performed tasks	Reference checking, preaward audits, award-fee contracts, competitive design or prototyping, team-building.
Real-time performance shortfalls	Simulation, benchmarking, modeling, prototyping, instrumentation, tuning.
Straining computer-science capabilities	Technical analysis, cost-benefit analysis, prototyping, reference checking.

Barry Boehm, IEEE Software January, 1991

Top 10 Risk Items: 1989 vs. 1995

1989	1995
1. Personnel shortfalls	1. Personnel shortfalls
2. Schedules and budgets	2. Schedules, budgets, process
3. Wrong software functions	3. COTS, external components
4. Wrong user interface	4. Requirements mismatch
5. Gold plating	5. User interface mismatch
6. Requirements changes	6. Architecture, performance, quality
7. Externally-furnished components	7. Requirements changes
8. Externally-performed tasks	8. Legacy software
9. Real-time performance	9. Externally-performed tasks
10. Straining computer science	10. Straining computer science

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Q & A



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