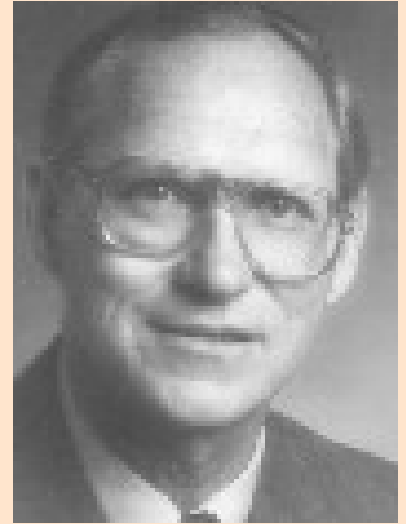


The Spiral Model and Risks

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Basic Seminar on Software Engineering
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2009

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- Worked at General Dynamics, Rand, TRW
- Director of DARPA Information Science and Technology Office 1989-1992
- Fellow of ACM, IEEE
- COCOMO cost model, Spiral model, ...

The Basic Force

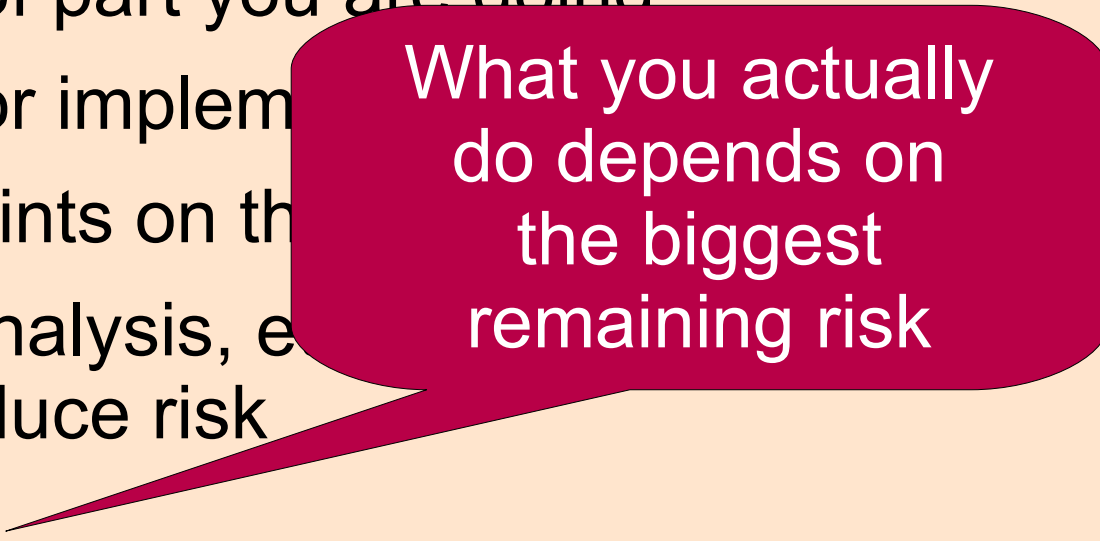
- Code-driven development
 - “Code-and-fix” approach
 - No design leads to poor code and frustrated clients
- Document-driven development
 - Waterfall model
 - Requirement for fully developed documents unrealistic
- Risk-driven development
 - Support iterative development
 - Decide how to proceed by reducing risk of failure

The Spiral Model

- Several rounds development: System concept, Requirements, design
- In each round, mitigate risks
 - Define objectives of part you are doing
 - Map alternatives for implementation
 - Recognize constraints on these alternatives
 - Use prototyping, analysis, etc. to gain necessary knowledge and reduce risk
 - Plan the next step
- At the end, perform sequence of coding, testing, and integration

The Spiral Model

- Several rounds development: System concept, Requirements, design
- In each round, mitigate risks
 - Define objectives of part you are doing
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What you actually do depends on the biggest remaining risk

Using the Spiral

- Start with hypothesis that something can be done
- Round 1: concept and lifecycle plan
- Round 2: top level requirements
- Additional rounds: preliminary design, detailed design
- May go back and redo previous round if needed
- If the evaluation at some stage shows that it won't work then stop

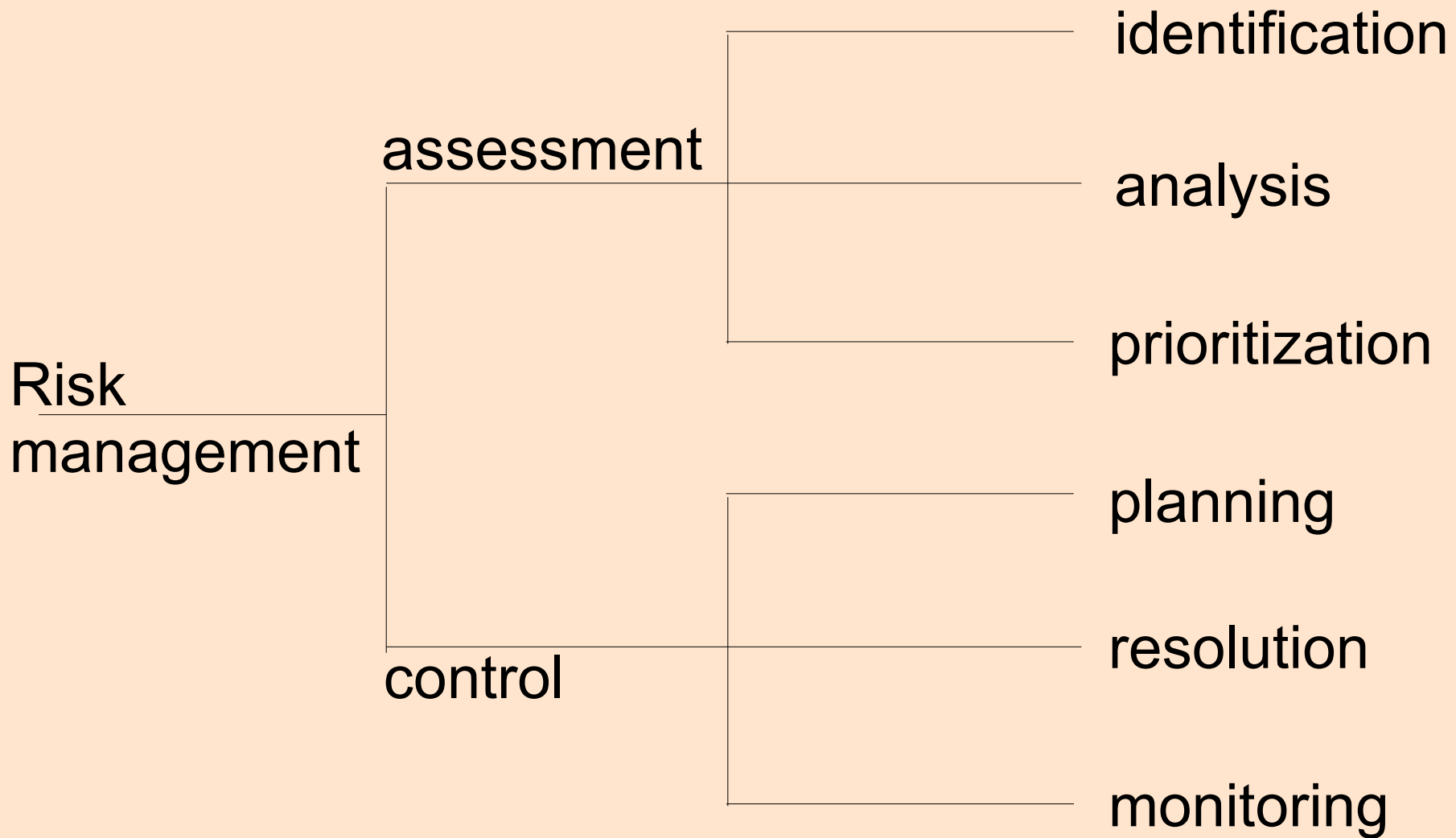
Risks

- Developing software is fraught with uncertainty
- Uncertainty implies risk
- This needs to be **quantified**:

$$\text{RiskExposure} = \text{Probability} \times \text{Loss}$$

- Can be used to choose between alternatives:
select the one where the expected loss is smaller

Risk Management

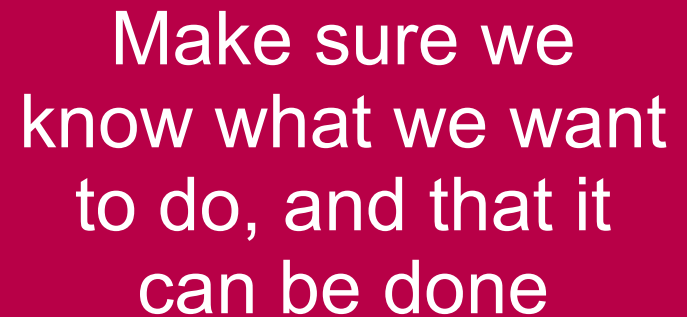


Milestones

- In waterfall model there are many milestones
 - This is too rigid and sequential
 - But there are three **really important** ones:
 - Life-cycle objectives
 - Life-cycle architecture
 - Initial operational capability
- (these foreshadow the unified process)

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Make sure we know what we want to do, and that it can be done

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- But there are three **really** important milestones
 - Life-cycle objectives
 - Life-cycle architecture
 - Initial operational capability

Make sure we

Elaborate on
how things will
be built

(these foreshadow the unified process)

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- This is too rigid and sequential

- But there are three **really** important milestones

- Life-cycle objectives

- Life-cycle architecture

- Initial operational capability

(these foreshadow the unified process)

Make sure we

Elaborate on

Prepare for the transition to the client in terms of site and training

Milestones

- Milestones are not (necessarily) documents!
 - Not a fully specified spec or architecture, but a framework that will evolve
 - For example, important interfaces must be specified precisely, but user interfaces can be a prototype
 - Articulation of feasibility and rationale are important
 - Agreement of stakeholders is crucial

Conceptual Development with Time

- Spiral model (1988): in an example round 0 is about deciding that the project is worth doing
- Risk management (1991): one of the risks is that the project is plain wrong
- Anchoring (1996): the first anchor point is agreement among stakeholders that the project can and should be done