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Software Life cycles and Process models II
Project Planning
The *assembla* workspace

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1

Rationale

- Developed as a tool for gaining and maintaining control over complex software development processes
- Application of “divide-and-conquer” to software processes and products
 - Identify distinct phases of development and distinct products
 - Requirements phase – understand the problem to be solved
 - Product – Software Requirements Specification
 - Assumption: Simpler to address each phase separately
 - E.g., Elicit, specify, and validate requirements before doing design
 - True to the extent dependencies between phases and products are limited

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2

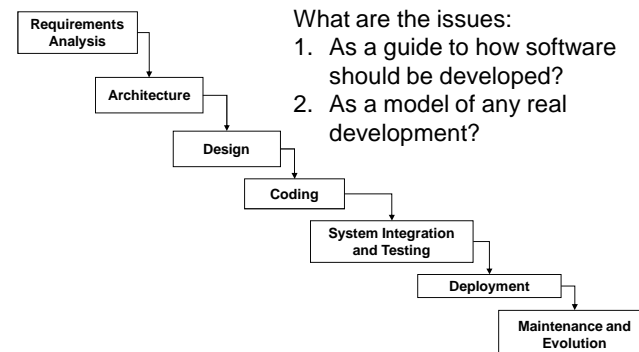
Common Process Models

Waterfall
Prototyping
Iterative
Spiral
Agile

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3

A “Waterfall” Model



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4

A "Waterfall" Model

1. As a guide: does not address some common development risks

- What happens if requirements are wrong?
- Is scheduling or budget is wrong?

2. As a model: unrealistic as a model of any real development

- How do real developments differ?

Problems of temporal distance

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Waterfall Model Variations

There have been many variations attempting to address these issues

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Characteristic Model: Prototyping

- Waterfall variation
- First system versions are prototypes, either:
 - Interface
 - Functional
- Which waterfall risks does this try to address?

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Characteristic Processes: The Iterative Model

- Process viewed as a sequence of iterations, each iteration produces an increment of the working software (sequence of waterfalls)
 - Build minimal useful subset, test, validate
 - Build next version by extending last iteration
 - After first iteration, always have working software

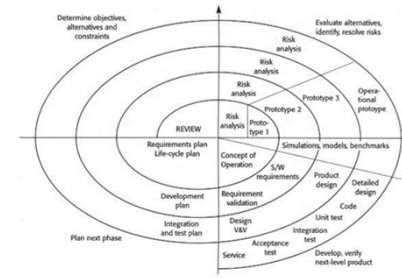
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Iterative Model

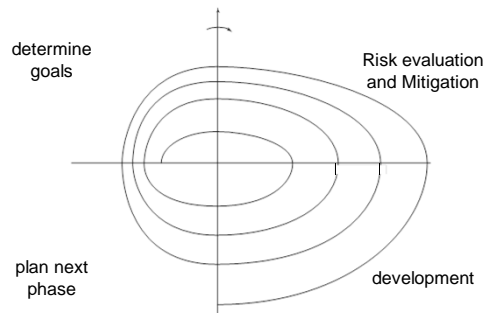
- Also called “incremental development”
- Addresses some common waterfall risks
 - Risk that software cannot be completed – build incremental subsets
 - Risk of building the wrong system – stakeholder have opportunities to see the software
 - Also, feasibility, schedule, budget and others to some extent

Characteristic Processes: The Spiral Model

- Process viewed as repeating cycles of increasing scale
- Identify risks and determine (next set of) requirements, build next version by extension, increasing scale each time
- Early iterations may be prototypes



Spiral Model



Spiral Model Goals

- Response lack of risk analysis and risk mitigation in “waterfall” process
 - Make risk analysis standard part of process
 - Address risk issues early and often
- Explicit risk analysis at each phase
- Framework for explicit risk-mitigation strategies
 - E.g., prototyping
- Explicit Go/No-Go decision points in process

Characteristic Processes: Agile (scrum, RAD, XP)

- Process viewed as nested sequence of builds (sprints)
 - Each build adds small feature set
 - Customer in loop, code centered (little or no documentation)
 - Problem detection and correction through daily team meetings (scrum)

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How do we Choose a Development Process?

E.g., for your projects

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Objectives

- Goal: proceed as rationally and systematically as possible (i.e., in a controlled manner) from a statement of goals to a design that demonstrably meets those goals with design and management constraints
 - Understand that any process description is an abstraction
 - Always must compensate for deviation from the ideal (e.g., by iteration)

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A Software Engineering Perspective

- SE view provides perspective on life-cycle activities (e.g., Design)
- Choose processes, methods, notations, etc. to provide *an appropriate level of control* for the given *product and context*
 - Sufficient control to achieve results
 - No more than necessary to contain cost and effort
- Provides a basis for choosing or evaluating processes, methods, etc.
 - Does it achieve our objectives at reasonable cost?
 - E.g., does this notation provide a handle on the properties of interest?

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Project Relevance

- Need to agree on kind of control you need and how you will accomplish it
- Process model (description) will then help keep everyone on track
 - Basis for planning and scheduling
 - Each person knows what to do next
 - Basis for tracking progress against schedule
- Should be one of the first products you produce but expect it to evolve

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17

Contents of a Process Specification

- Details depend on the purpose of the specification
- In general terms [Parnas & Clements]
 - What product we should work on next
 - Equivalently – what decision(s) must we make next
 - What kind of person should do the work
 - What information is needed to do the work
 - When is the work finished?
 - What criteria the work product must satisfy
- In personal terms, answers the questions
 - Is this my job?
 - What do I do next?
 - What do I need to do the work?
 - Am I done yet?
 - Did I do a good job?

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18

Project Processes

- Discuss: what process elements are appropriate for your project?
- What are the products?
- What aspects of traditional models are irrelevant?
- What are the constraints?
 - Which aspects can't be changed?
 - Which can be?
- What are the major risks?
- What are appropriate strategies to address the risks?

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19

Project Planning

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20

From Process to Plan

- Process definition manifests itself in the project plan
 - Process definition is an abstraction
 - Many possible ways of implementing the same process
- Project plan makes process concrete, it assigns
 - People to roles
 - Artifacts to deliverables and milestones
 - Activities to tasks over time
- Project plan should be one of the first products but expect it to evolve

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21

Project Plan

- Minimal plan contents
 - Risks and mitigation strategies
 - Evolves with progress and understanding
 - Tasks to be performed
 - Person(s) assigned to roles and tasks
 - Deadline for each task
 - Sequencing among tasks
 - Task dependencies
 - Development plan
- Usually owned by team manager
- Updated as project proceeds

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22

Project Plan Template

- Use the template provided in your Assembla team workspace (under the Wiki tab)
- This should be a *living document*
 - Changed as the project progresses
 - For the reader, reflects both the planned activities and provides a snapshot of the current project state

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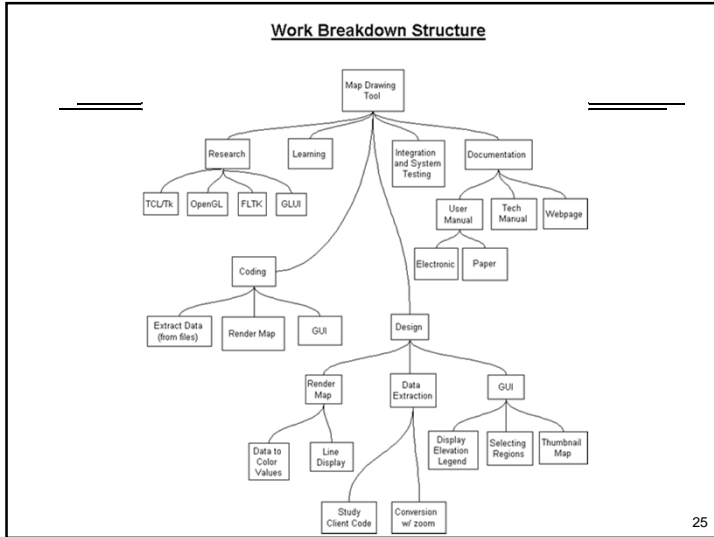
23

Work Breakdown Structure

- This is a technique to analyze the content of work and cost by decomposing it into its component parts. It is produced by:
 - Identifying the key elements
 - Decomposing each element into component parts
 - Continuing to decompose until manageable work packages have been identified. These can then be allocated to the appropriate role/person
- The WBS is used to allocate responsibilities
- For the software, the WBS depends on the software architecture (discuss next)

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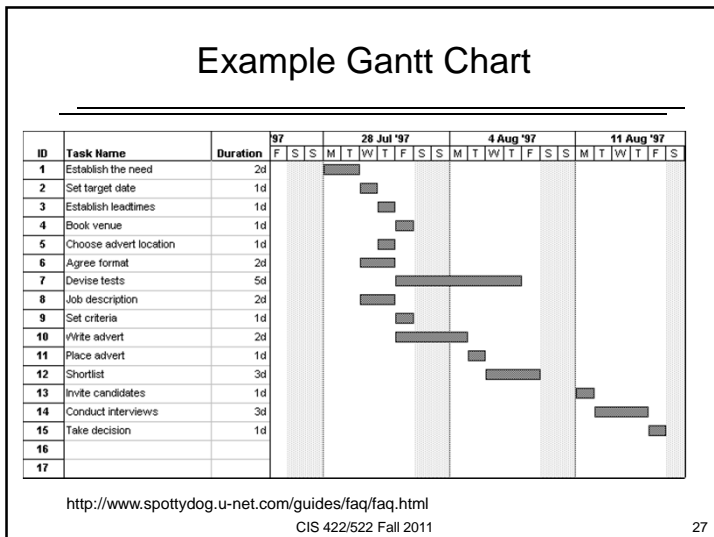
24



Milestone Planning

- Milestone planning is used to show the major steps that are needed to reach the goal on time
- Milestones typically mark completion of key deliverables or establishment of baselines
 - Baseline: when a work product is put under configuration management and all changes are controlled
- Often associated with management review points
 - E.g., Requirements baseline, project plan complete, code ready to test
- Can use Gantt charts

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Assignment

- Reading:
 - Chap. 8
- Project
 - Familiarize with *assembla*
 - Begin filling out project plan

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The Joys of Faking It

From: Parnas & Clements "A Rational Design Process"

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29

Design Processes are Idealizations

- Assertion: Design is an inherently "irrational" process
- Completely rational processes proceed by a sequence of optimal steps (the right choice each time)
- Real processes rarely proceed rationally from goals to products
- This is an essential characteristic of the design process
 - It's a human process
 - We're neither omniscient nor omnipotent

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30

It Pays to "Fake it"

- Thesis: It is nonetheless useful to "fake" a rational design process
 - Follow the ideal process as closely as possible
 - Write the documentation and other work products as is we had followed the ideal
- Rationale
 - Idealized process can provide guidance
 - Helps come closer to the ideal (emulation)
 - Helps standardize the process (provide a common view of how to proceed and what to produce)
 - Provides a yardstick for assessing progress
 - Provides better products (e.g. final draft not first)

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31