Models [5]

Prototypes [2.3.1]

Process repetition [2.3.2, 2.4]

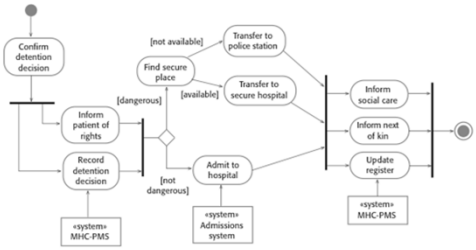
Agile processes [3]

## Models

- Abstraction
  - remove detail
  - focus on viewpoint
- Dynamic
  - interaction with environment
  - control flow
  - data flow
- Static
  - physical
  - database schema
  - object structure



Figure 5.2 Process model of involuntary detention




UML activity diagram

Figure 5.6 Sequence diagram for View patient information

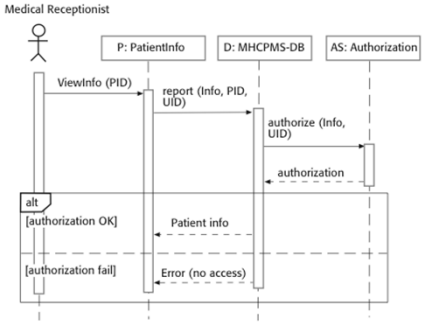
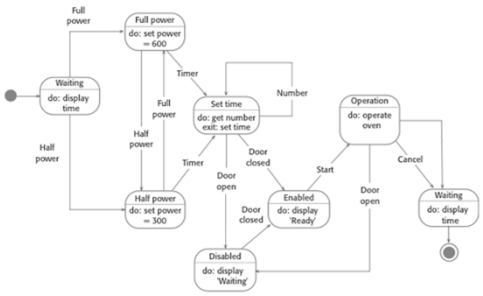


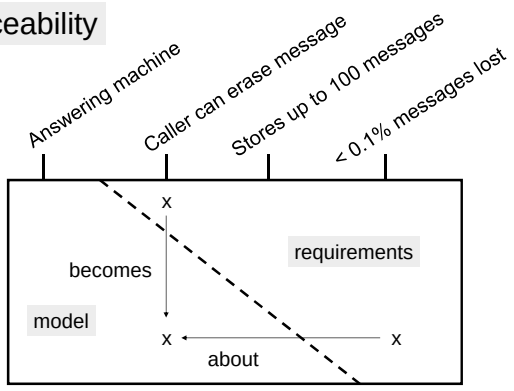

Figure 5.16 State diagram of a microwave oven




## Models

- Why?
  - Improve understanding
  - all viewpoints
  - ”coathanger” - requirements refer to it
  - validation
- Warnings
  - try to avoid design
  - avoid massive documentation

## Traceability






## Prototypes

- Used for
  - requirements elicitation
  - requirements validation
  - proof of concept

  } Risk reduction

  - user training
  - back to back testing



## Warning

- A prototype is not the product! It may differ in
  - functionality
  - performance
  - reliability
  - scalability
  - maintainability
  - user-interface, ”finish”



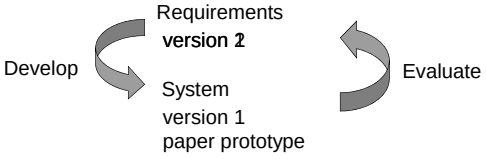
| | Throw away prototype | Exploratory development |
|---|---|---|
| Goal | specification validation, risk | working system |
| Start | uncertain parts | known parts |
| Role | evaluate and throw away | grow into the system |
| Quality | as low as useful | product |
| Risks | - not thrown away<br>- too low quality prevents evaluation | - bad structure<br>- low process visibility<br>- contractual problems |



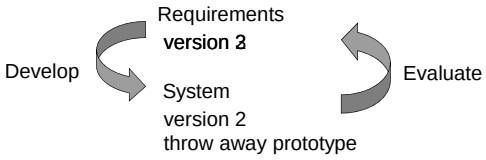
## Repetition in processes

Iterative
Incremental
Evolutionary

## Iterative process



## Iterative process






## Iterative process

- Each iteration
  - functionality can be added
  - requirements can be changed
- Problem: when does it end?
  - budget
  - contract



## Incremental (divide and conquer)

1. Requirements Design, code, unit test Test Test Test
2. Requirements Design, code, unit test
3. Requirements Design, code, unit test
4. Requirements Design, code, unit test

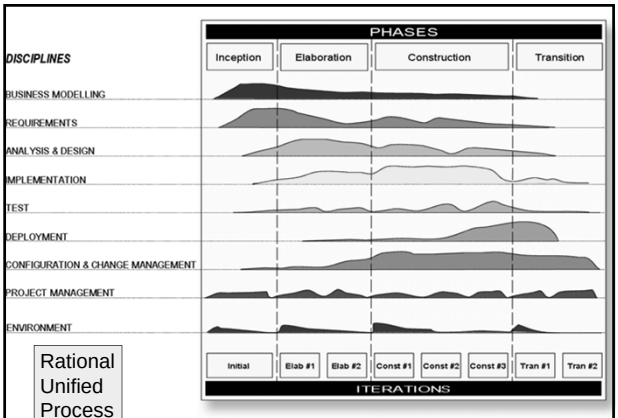
Note: choose process inside increment, e.g. V-model



1. Requirements Design, code, unit test Test Test Test
2. Requirements Design, code, unit test
3. Requirements Design, code, unit test
4. Requirements Design, code, unit test

Advantages of incremental development:
- The most important parts are most tested
- Later increments benefit from more domain knowledge
- Can even out work load for specialists (in UCSD)
- After each increment there is a working (incomplete) system
  - could be delivered if money or time runs out
  - could be used for user training






Rational Unified Process (RUP)



## Top-down vs. Bottom-up

- Traditional ”from scratch” development
- Hierarchical system
- ”The Cathedral”
- Reuse based development
- ”network” system component-based
- ”The Bazaar”

## Agile manifesto

We have come to value.

- Individuals and interactions
- Working Software

over

- Processes and tools
- Comprehensive documentation
- Customer collaboration
- Responding to change
- Contract negotiation
- Following a plan



## Traditional vs. Agile .

- Follow a plan
- Change costs
- Frozen requirements contract
- Documentation
- Deliverables at a deadline

incremental

- People
- Embrace change
- User stories, tests, customer involvement
- Working software
- Time-boxed
- smaller increments



| Agile principle | Scrum | Extreme Programming |
|---|---|---|
| Incremental planning and development | Sprints<br>Sprint backlog<br>Planning poker | Implement user stories<br>Story cards<br>Planning poker |
| Customer involvement | Product owner<br>Demo at end of sprint | Customer representative in development team |
| People, not process | Scrum meetings<br>Sustainable pace (time-boxed) | Pair programming<br>Collective ownership of code<br>Sustainable pace |
| Embrace change | Change occurs from one sprint to the next | Continuous integration and release<br>Test-first development |
| Maintain simplicity | Refactoring<br>No anticipation of future requirements | Refactoring<br>No anticipation of future requirements |