2 Software life span models

• Stages through which software goes, from conception to death

• Stages may be very different

• Software = product
  – stages are similar to the stages in the life span of other products
Product lifespan

The Product Life Cycle (PLC) - www.marketingteacher.com

SALES

TIME

Introduction  Growth  Maturity  Decline  Withdrawal
Software lifespan

• Software is a product
  – sales go through the same lifespan

• Unique proprietary software
  – value follows the same curve

• Different names of stages
Simple staged model

Initial development

first version

Evolution

evolution stops

evolution changes

Servicing or Maintenance

servicing patches

servicing discontinued

Phase-out

switch-off

Close-down
Initial development

• Develop the first functioning version
  – requirements
  – design
  – implementation
    • similar to waterfall, but of limited duration

• Fundamental decisions
  – technology
    • programming language, coding conventions, libraries,…
  – architecture
    • style, components, interactions

• Acquire initial domain knowledge
Evolution

- Adapts the application to the ever-changing user and operating environment
- Adds new features
- Corrects mistakes and misunderstandings
- Responds to both developer and user learning
- Responds to changes in technology
- Program usually grows during evolution
- Both software architecture and software team knowledge make evolution possible
Evolution stops

• Managerial decision
  – business reasons to stop evolution

• Software stabilization
  – problem is solved
  – no reason to continue evolution

• Code decay
Code decay

• Loss of software coherence
• Loss of the software knowledge
  – less coherent software requires more extensive knowledge
  – if the knowledge is lost, the changes will lead to a faster deterioration
• Loss of key personnel = loss of knowledge
• Challenge: eliminate or slow code decay
Servicing = Maintenance

- No additions of new functionality
- Changes are limited to patches and wrappers
  - less costly, but they cause further deterioration
- Process is different from evolution
  - no need for senior engineers
  - the process is predictable
    - well suited to process measurement and management
Reversal from servicing to evolution

• Expensive, rare

• Not simply a technical problem
  – the knowledge of the software team must also be recovered
Reengineering

- **Initial development**
- **Evolution**
  - first running version
  - software changes
  - reengineering
  - code decay
  - servicing patches
- **Servicing**
  - servicing discontinued
- **Phase-out**
  - switch-off
- **Close-down**
Phase-out

• No more servicing is being undertaken
  – but the system still may be in production

• Users must work around known deficiencies
Close-down

• Software use is disconnected
  – current life of successful software:
  – about 10 to 20 years

• Users are directed towards a replacement

• An ‘exit strategy’ is needed.
  – changing to another system requires retraining
  – what to do with long-lived data?
Versioned staged model

• Used by software with many users

• Evolution is the backbone of the process
  – evolution produces versions
  – versions are serviced, phased-out, closed down
### Mozilla Firefox releases

- **2008 – 2009**
- **Versions 2.0 and 3.0**  
  - serviced in parallel
- **Version 3.5 introduced 4/2009**  
  - while version 3.0 still serviced
  - while version 2.0 in phase-out

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Incomplete lifespans

• Discontinued projects
  – stopped during initial development

• Stable domain
  – no need for evolution

• Development starts with evolution
  – a related old software is evolved into new one
Lifecycle vs. lifespan model

• Lifecycle
  – common terminology
  – incorrect: There is no cycle
    • some software discontinued without a replacement

• Lifespan model
  – better terminology
  – less commonly used
V-Model

- requirements
- system design
- unit design
- implementation
- unit testing
- system testing
- functional testing
- maintenance

Maintenance
Prototyping model

- requirements
- prototype
- corrected requirements
- design
- implementation
- maintenance