Managing the Development of Large Software Systems


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Reading Course on Software Development
Who is Winston Royce?

- American computer scientist
- Director of Lockheed Software Technology Center in Austin, Texas
- Leader in software development in the second half of the 20th century
- Was first to describe the waterfall model, though did not coin the term.
- Felt a strong need to share his experience with others…
Computer Program Development

- Implementation steps do deliver a small computer program for internal operations
- common to all computer program developments, regardless of size or complexity
Developing Large Computer Programs

- System requirements
- Software requirements
- Analysis
- Program design
- Coding
- Testing
- Operations

- The additions are distinctly different in the way they are executed
- Must be planned and staffed differently for best utilization of program resources
The Development is Iterative

Software Development

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- Software requirements
- Program design
- Analysis
- Coding
- Testing
- operations
Design Steps are Never Just Successive

System requirements

Software requirements

Analysis

Program design

Coding

Testing

operations

Timing, storage, input/output transfers, etc., are experienced
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The requirements must be modified, or a substantial change in design is required
Step 1: Program Design Comes First

- Document system overview
- Design database and processors
- Allocate subroutine storage
- Allocate subroutine execution times
- Describe operating procedures
Step 2: Document the Design

- How much documentation?
Step 2: Document the Design

- Quite a lot!
Step 2: Document the Design

- **Hardware:** 30 page spec
- **Software:** 1500 page spec

$5,000,000
Step 2: Document the Design
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Why so much?

- Communication: a verbal record is too intangible
- Until coding begins documentation, specification and design are the same thing
- Monetary value – allocate resources at the correct place and at the correct time
Step 3: Do It Twice

Attempt to do the job twice: the first result provides an early simulation of the final product.
Step 4: Plan, Control and Monitor Testing

- Test phase is the greatest risk in terms of money and schedule
- The previous steps are aimed to solve problems before the test phase
- Additional aspects of testing:
  - Test specialists might do a better job than the programmers (remember to provide good documentation)
  - Code review: Every bit of code should be inspected by a second party in order to detect silly bugs
  - Code Coverage: Test every logic path in the execution at least once
  - After silly bugs are removed, to a final checkout
Step 5: Involve the Customer

- Software design is subject to wide interpretation even after previous agreement.
- The customer should commit himself before final delivery.
- Giving the contractor free rein between requirements definition and operation is trouble.
Summary
Want to Know More?

- [http://portal.acm.org/citation.cfm?id=41801](http://portal.acm.org/citation.cfm?id=41801)