

Managing the Development of Large Software Systems

Winston W. Royce, *Proc. IEEE WESCON*, Aug 1970

Presented by Dina Zeliger
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

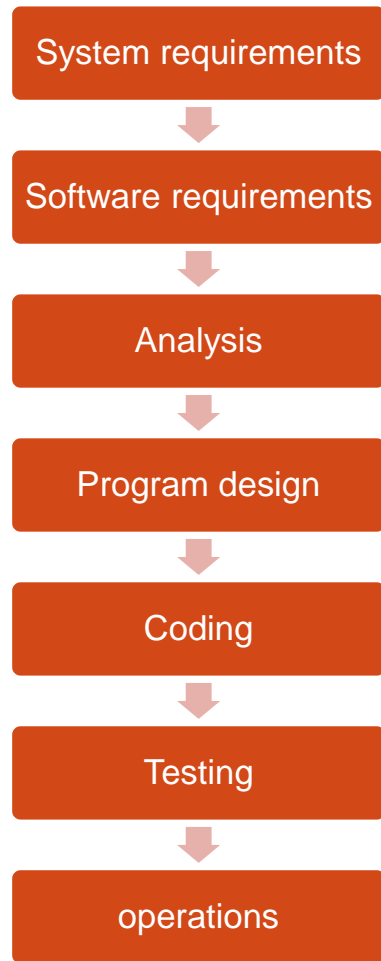


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graph TD; A[Analysis] --> B[Coding];
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Analysis

Coding

Developing Large Computer Programs

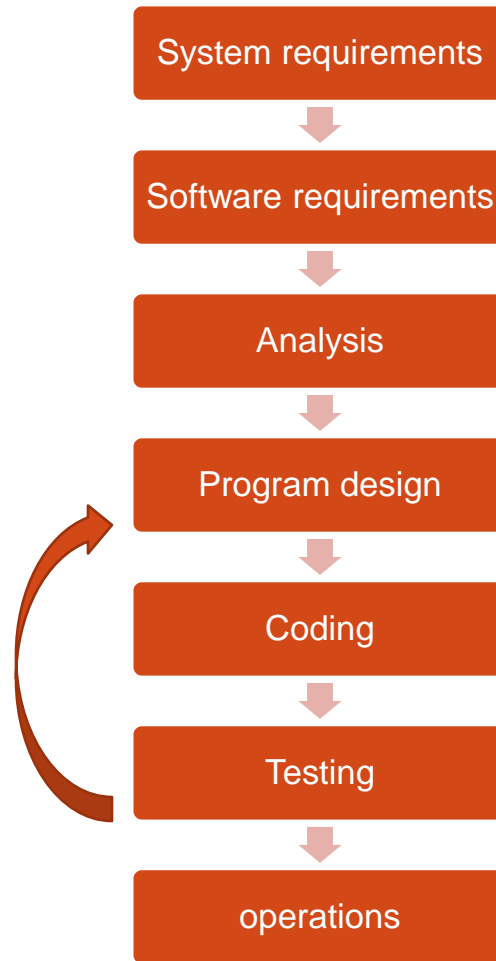


- The additions are distinctly different in the way they are executed
- Must be planned and staffed differently for best utilization of program resources

The Development is Iterative

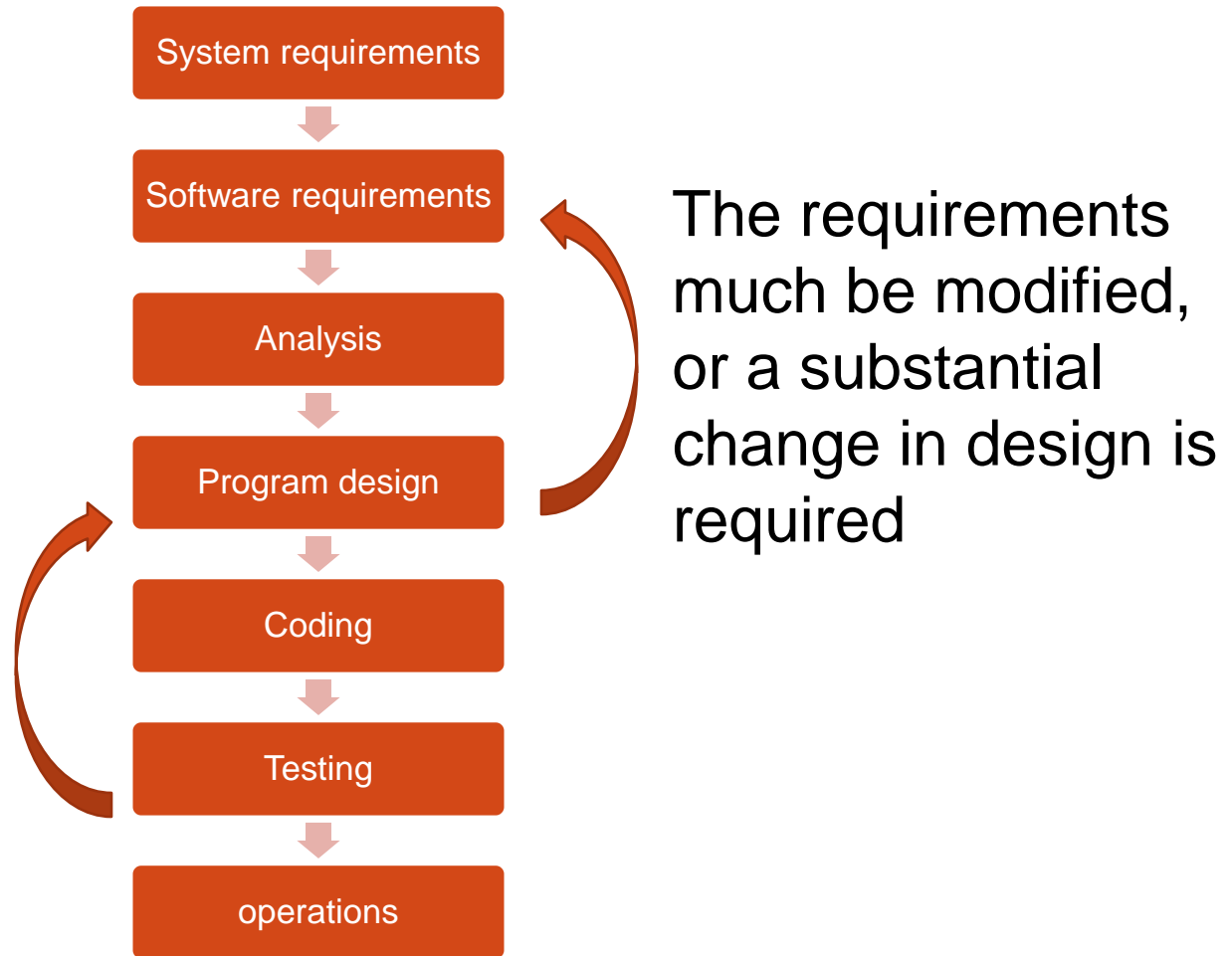


Design Steps are Never Just Successive



Timing, storage, input/output transfers, etc., are experienced

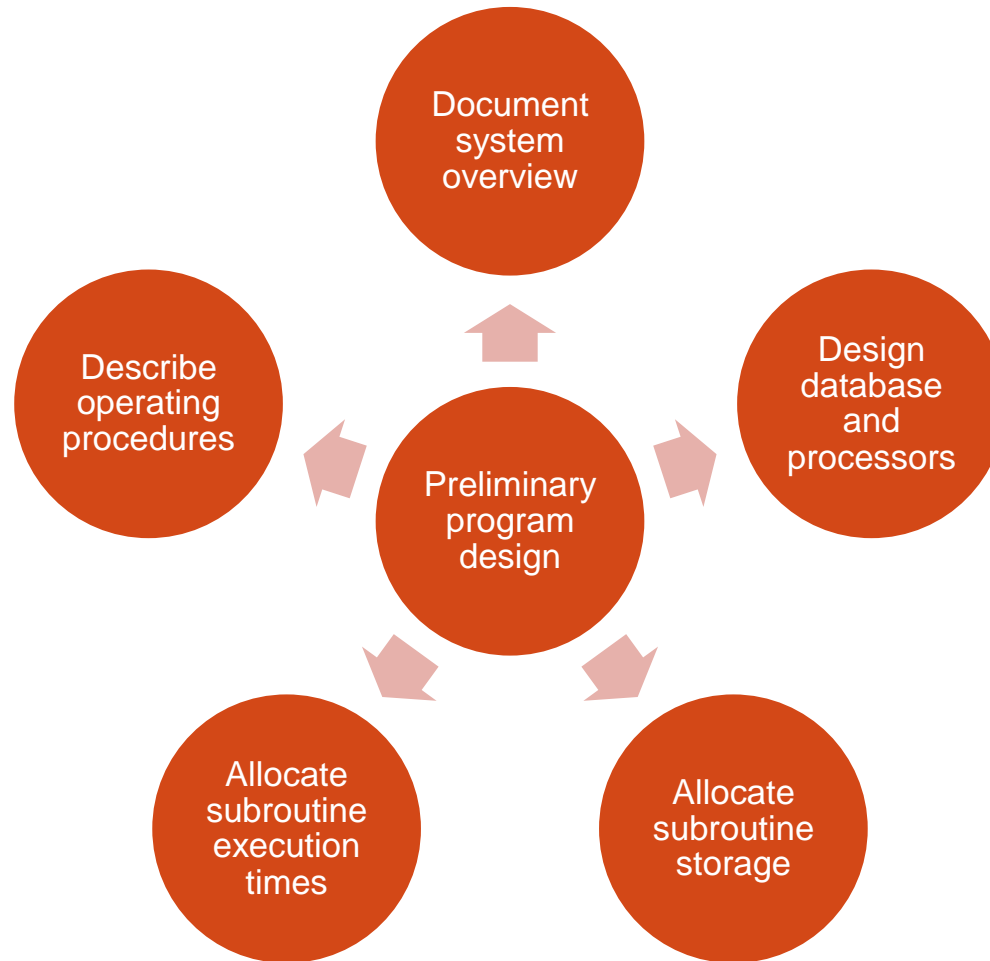
Design Steps are Never Just Successive



Timing, storage, input/output transfers, etc., are experienced

The requirements much be modified, or a substantial change in design is required

Step 1: Program Design Comes First



Step 2: Document the Design



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- How much documentation?

Step 2: Document the Design



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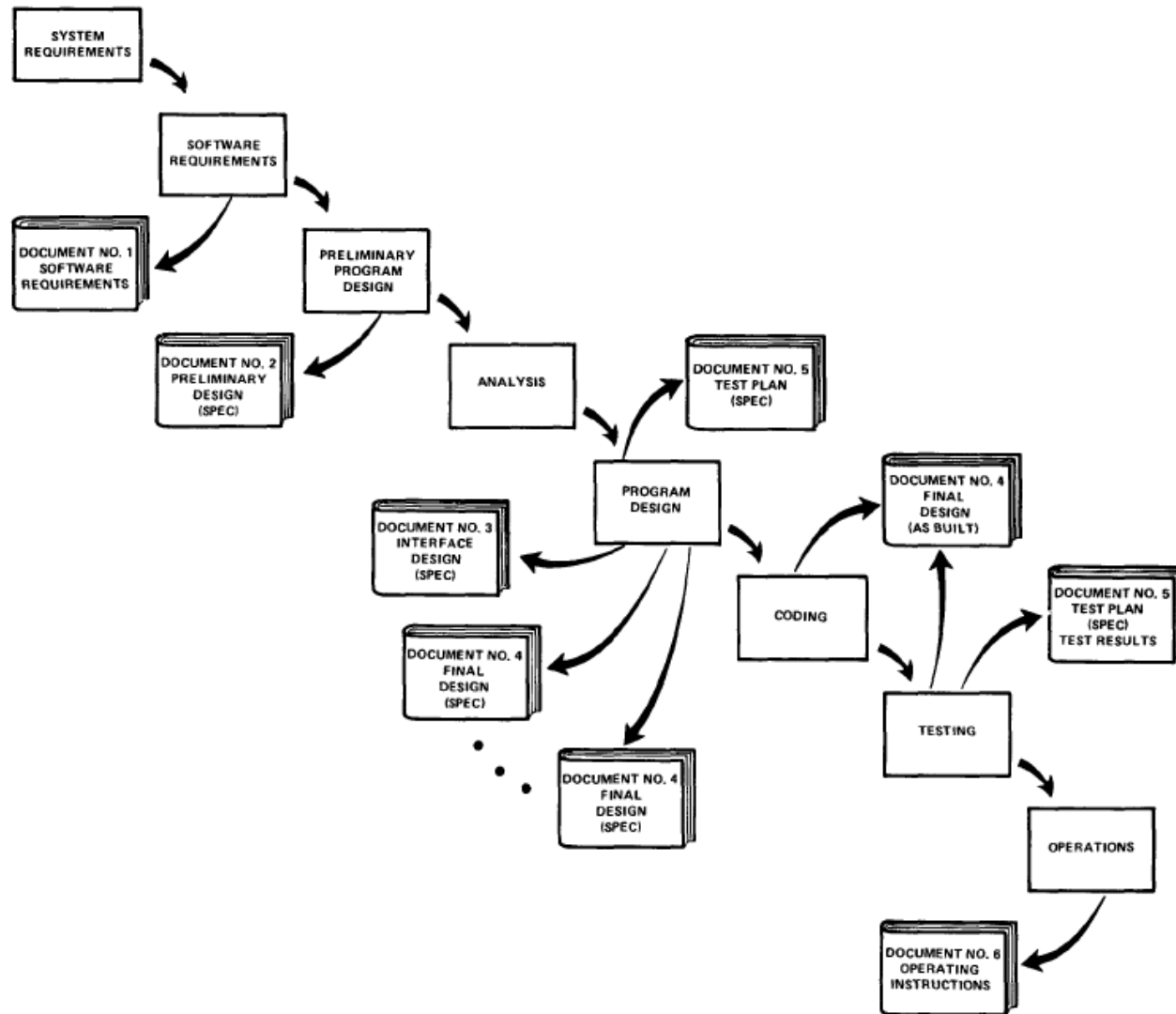
- **Quite a lot!**

Step 2: Document the Design

\$5,000,000

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

Step 2: Document the Design



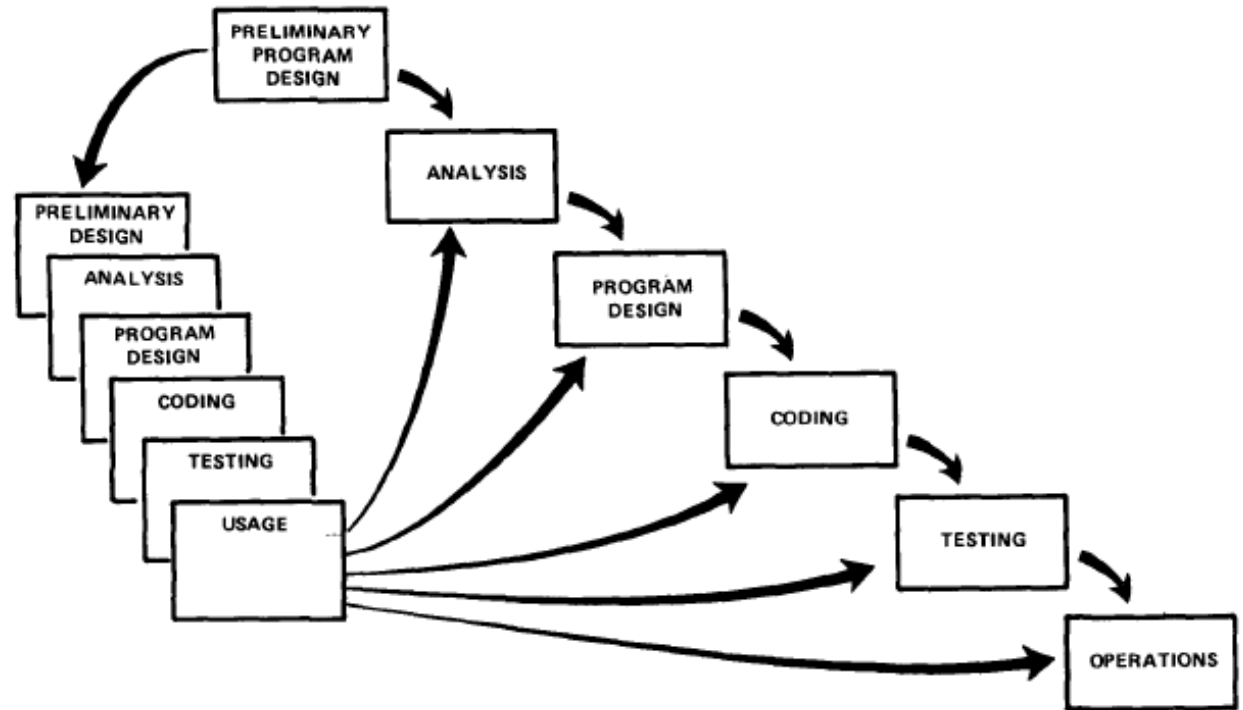
Step 2: Document the Design

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



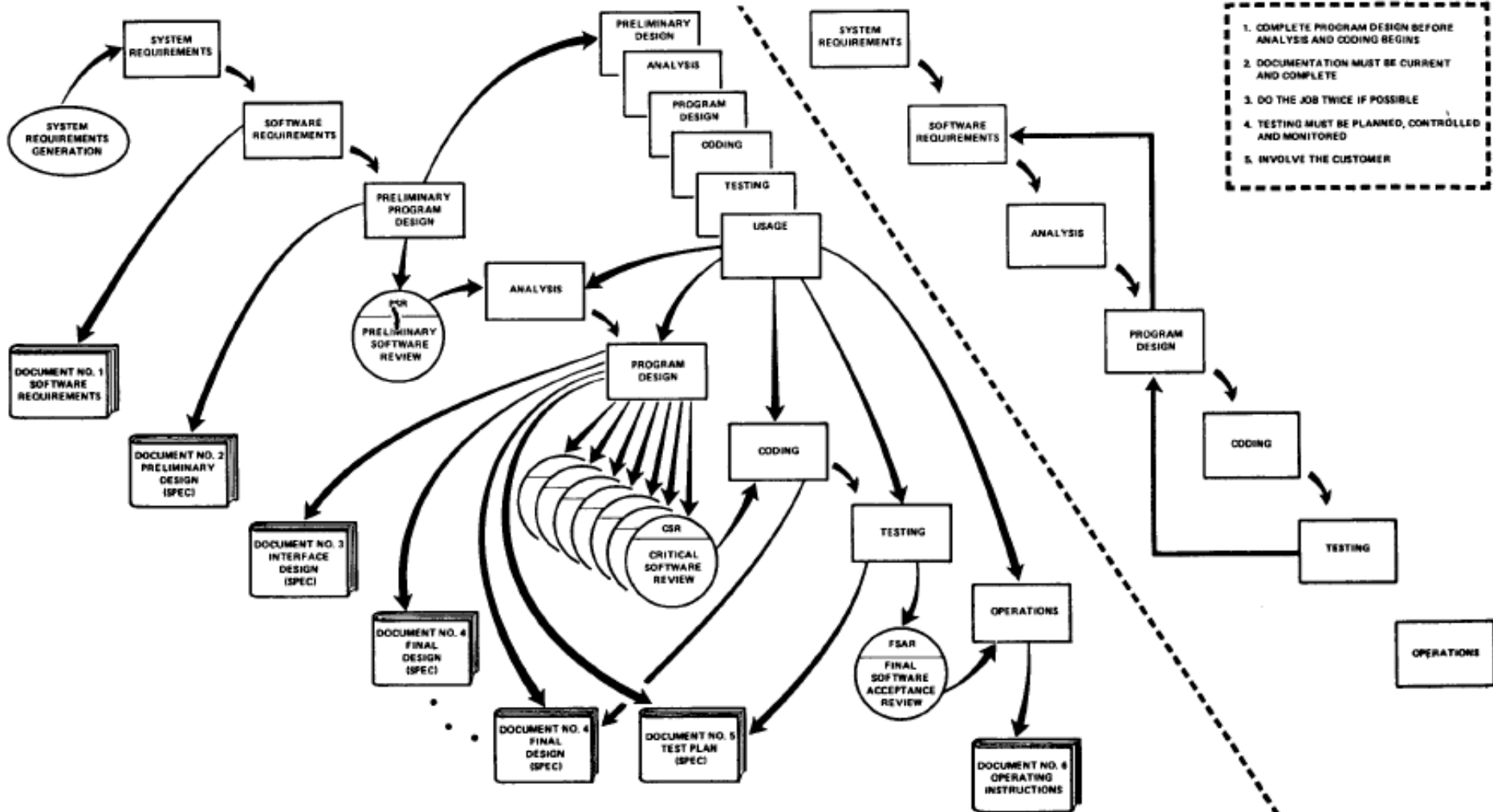
Step 4: Plan, Control and Monitor Testing

- 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://en.wikipedia.org/wiki/Waterfall_model
- http://en.wikipedia.org/wiki/Winston_W._Royce