Why Software Projects Fail

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CHAOS 2004 Software Project Survey

- Success: 29%
- Failed: 18%
- Challenged: 53%

Project success rate
CHAOS Success rate definitions

- **Success**
  - Produced acceptable results delivered close to on-time and on-budget

- **Challenged**
  - Delivered software product significantly over budget and/or schedule

- **Failed**
  - Failed to deliver any usable result within budget or schedule constraints
Software problems are not new

- Unreliable
- Late delivery
- Modification costs prohibitive
- Impossible to maintain
- Inadequate performance
- Product exceeds budget costs

1968 CS Conference, Munich, Germany
Reasons for project failure

- **ADVERTISED**
  - Immature technology
  - Inadequate requirements
  - Insufficient developer experience

- **COVERT**
  - Poor estimating and planning
  - Hope (Pandora’s paradox)
Repeatable things

- Development environment
- Productivity
- Minimum development time
  - Effective product size
  - Complexity
  - Paul Masson rule

Let’s look at some proof
BIG productivity drivers

- Analyst capability
  - Management style
  - Motivation
  - Problem solving skills
  - Use of team methods
  - Working environment
- Application domain experience
- Automated tool support
- Programmer capability
- Use of modern practices
Capability shift (environment)
1996/2003 Productivity for Avionics and Unmanned Space

1996 graph based on 52 Mil-Spec Avionics & Unmanned Space Software Data Records
2003 graph based on 51 Mil-Spec Avionics & Unmanned Space Software Data Records

Aerospace Corp – Long etal 2004
1996/2003 Productivity Distributions for Ground and Mobile

...progressed at LESS THAN this rate in lines/developer-months

1996 graph based on 112 Military Ground & Military Mobile Software Data Records
2003 graph based on 135 Military Ground & Military Mobile Software Data Records

Aerospace, Long et al, 2004
Common technology claim

If you use *(new technology)*,

Productivity will improve by an *order of magnitude*

And

Defects will reduce to *zero*
There is always HOPE


- Structured Analysis
- Structured Design
- Ada
- OOD
- Process Maturity
- PWB
- Structured Programming
- 3rd Generation Languages

BE AMERICA’S BEST
Where would you focus effort?

Source: G. Weinberg, Quality Software Management, Vol. 3
Relative payoff

Source: G. Weinberg, Quality Software Management, Vol. 3
Repeatable things

- Development environment
- Productivity
- Minimum development time
  - Effective product size
  - Complexity
  - Paul Masson rule

Let’s look at more proof
Historic project data

Source: Long, L. G. et al, 2004
Historic space project limits

Successful Completions

Source: Long, L. G. et al, 2004
Three development variables

- Cost
- Schedule
- Scope

Developer can control any two
“More software projects have gone awry for lack of calendar time than for all other causes combined…”

F. P. Brooks, Jr., Mythical Man Month
Common estimate dilemma

THE ORIGINAL SCHEDULE LOOKED LIKE THIS...

ONE MONTH FOR A MANAGEMENT DECISION AND ONE YEAR TO DO THE PROJECT.

DECIDE

DO

THE REVISED SCHEDULE IS THIS...

ONE YEAR OF INDECISION FOLLOWED BY INTENSE PRESSURE TO DO THE IMPOSSIBLE BEFORE THE DEADLINE.

NOW IF YOU'LL EACH TAKE A PAIR OF 3-D GLASSES...

YOU CAN SEE THE LAYERS OF MANAGEMENT INCOMPETENCE PRACTICALLY JUMP OUT AT YOU.

NOW SCRATCH ONE OF THESE SCENTED CARDS TO SNIFF THE UNMISTAKABLE ODOR OF DOOM.

I DON'T SMELL ANYTHING. IS MINE BROKEN?

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Constraint analysis

- Success and failure
  determined by
- Expected cost and schedule
  determined by
- Project plan
  determined by
- Cost and schedule ESTIMATES
  determined by
- Managers and/or Estimators
Key estimate factors

Management

Personnel

Process

Environment

Technology

Size

Productivity

Cost

Schedule

Start Here
Elements for successful estimates

- Basic understanding of the requirements
- Ability to accurately size the deliverable product
- Assessment of the deliverable complexity
- Profile of the organization’s delivery capability
Estimates are important

Without well thought out estimates, there is no firm basis for:

- Defining costs and schedules
- Making tradeoffs
- Associating development costs with the benefits
- Conforming to a budget or schedule

THE PROJECT IS ALREADY OUT OF CONTROL!
Project success rate

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Success definitions: 2nd look

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Conclusions

- Software project failures are primarily due to failed expectations
- Technology, requirements and experience are largely accounted for in resource estimates
- Failure ranking:
  1. Poor estimating and planning
  2. Hope (Not a management strategy)
  3. Immature technology
  4. Inadequate requirements
  5. Insufficient developer capability (Ebonians)
New estimating models?

- Lack of confidence in existing tools
  - Optimistic estimates
  - Unacceptable estimates
    - Skill
    - Experience
    - Integrity
- Aging tools
  - Quality data
  - Culture is constant
  - New models require validation
- Silver bullet
- New estimators?
We learn from experience that we don’t learn from experience.

D. H. Lawrence
The End, or is it The Beginning?

(History does repeat itself)