

Software Technology Support Center



U.S. AIR FORCE

Why Software Projects Fail

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Software Technology Support Center

Hill AFB, UT



Project success rate

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CHAOS 2004 Software Project Survey





CHAOS Success rate definitions



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- **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



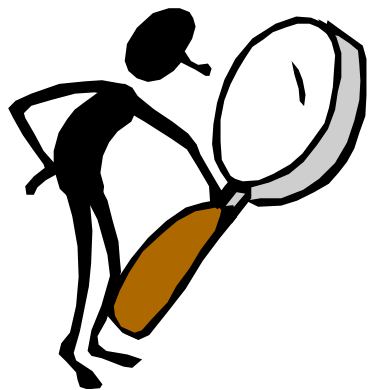


Software problems are not new



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



1968 CS Conference, Munich, Germany



Reasons for project failure



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- **ADVERTISED**

- Immature technology
- Inadequate requirements
- Insufficient developer experience

- **COVERT**

- **Poor estimating and planning**
- **Hope (Pandora's paradox)**



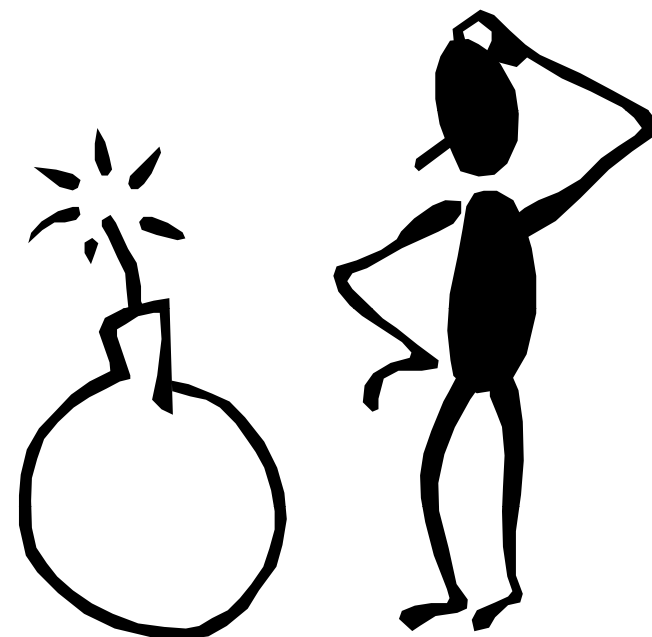


Repeatable things



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



Let's look at some proof



BIG productivity drivers

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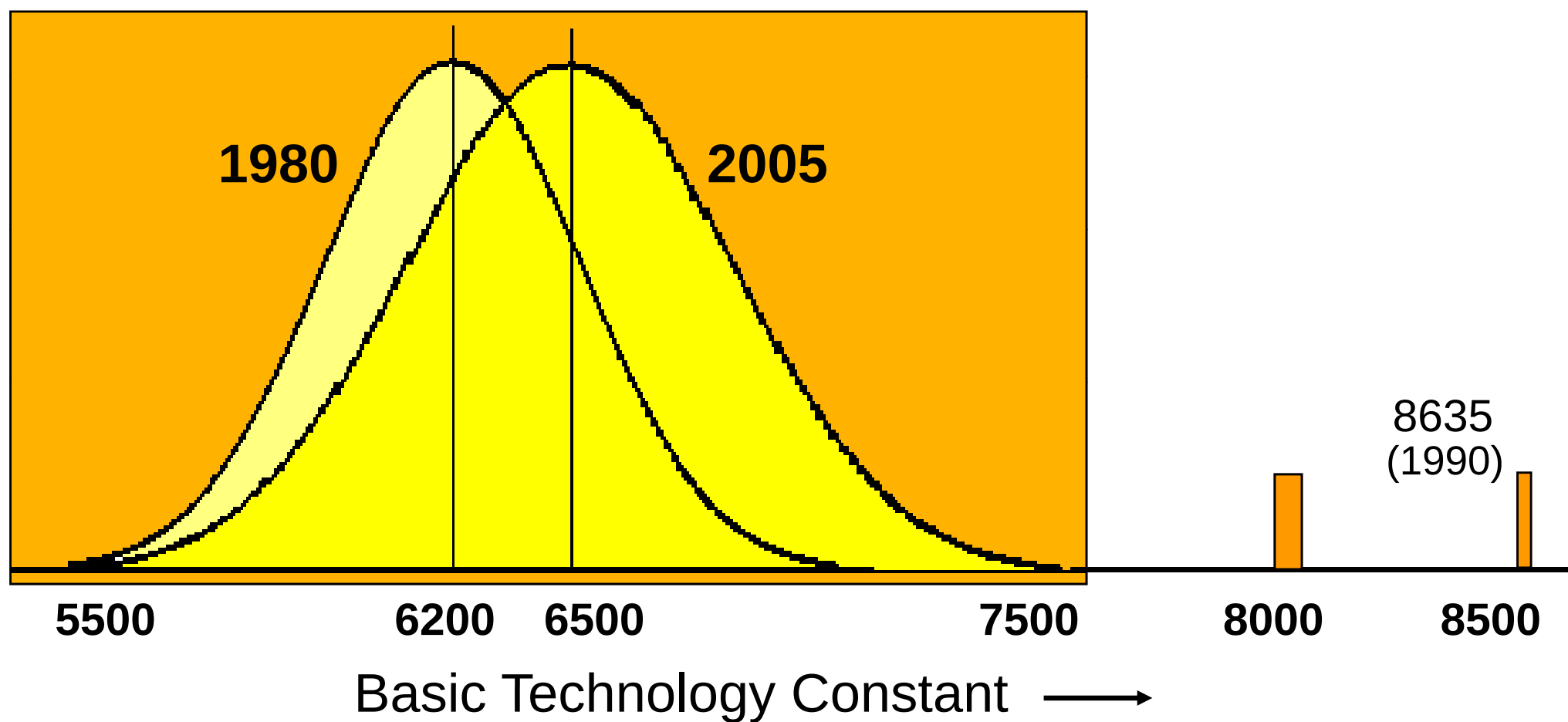
- Analyst capability
 - Management style
 - Motivation
 - Problem solving skills
 - Use of team methods
 - Working environment
- Application domain experience
- Automated tool support
- Programmer capability
- Use of modern practices



Capability shift (environment)



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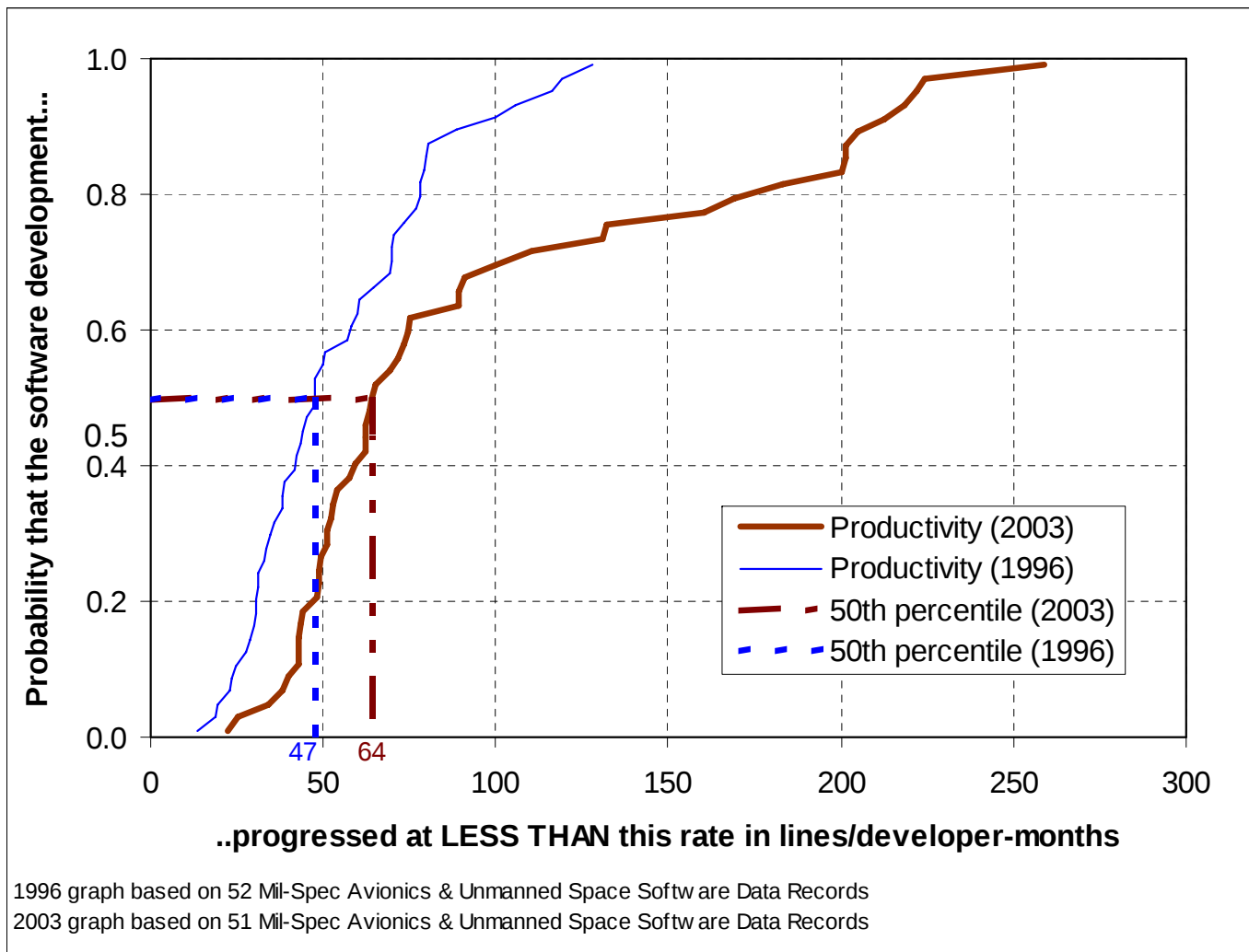
BE AMERICA'S BEST



1996/2003 Productivity for Avionics and Unmanned Space



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Aerospace Corp – Long et al 2004

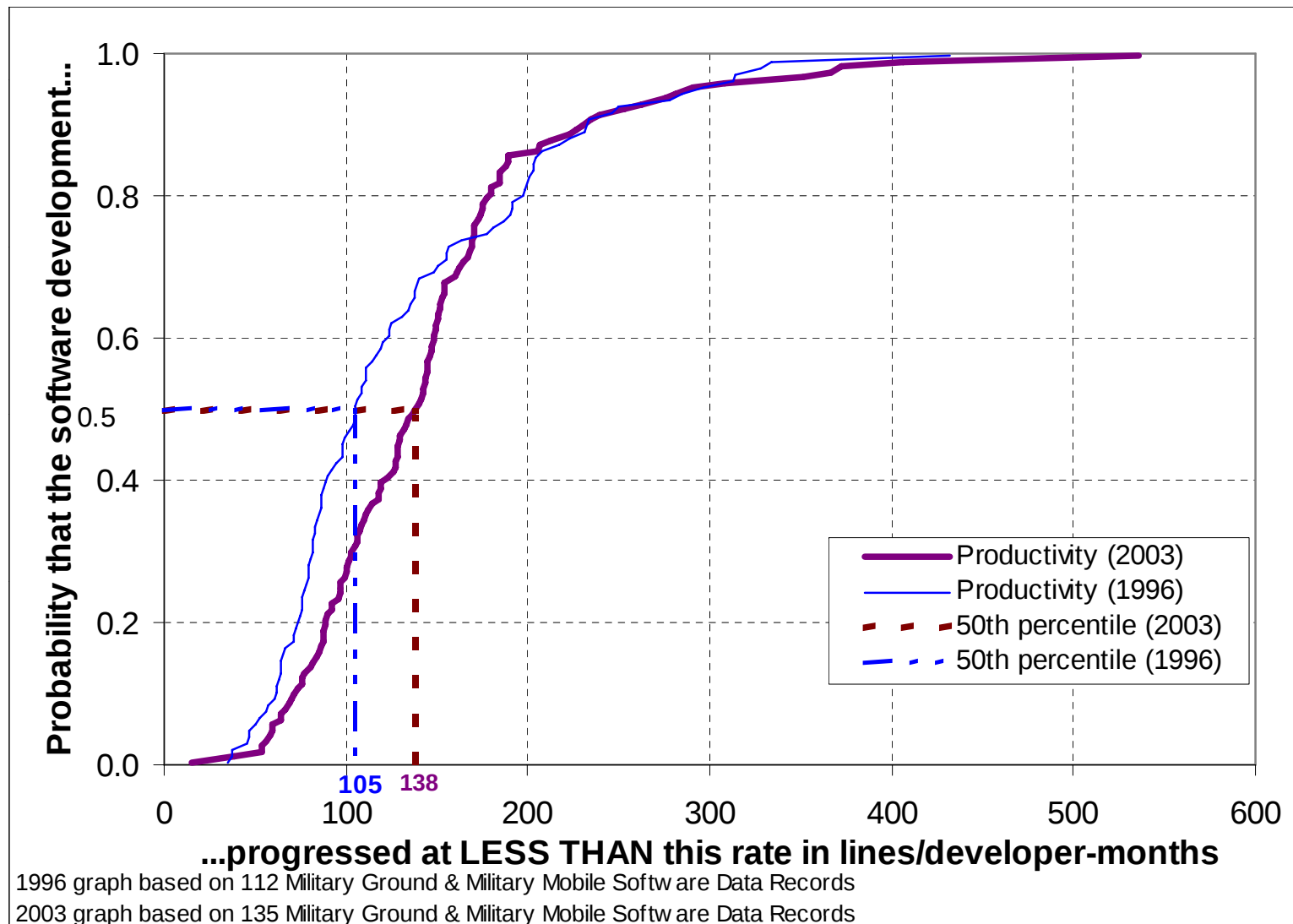
BE AMERICA'S BEST



1996/2003 Productivity Distributions for Ground and Mobile



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Aerospace, Long et al, 2004

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Common technology claim



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If you use (*new technology*),

Productivity will improve by an *order of magnitude*

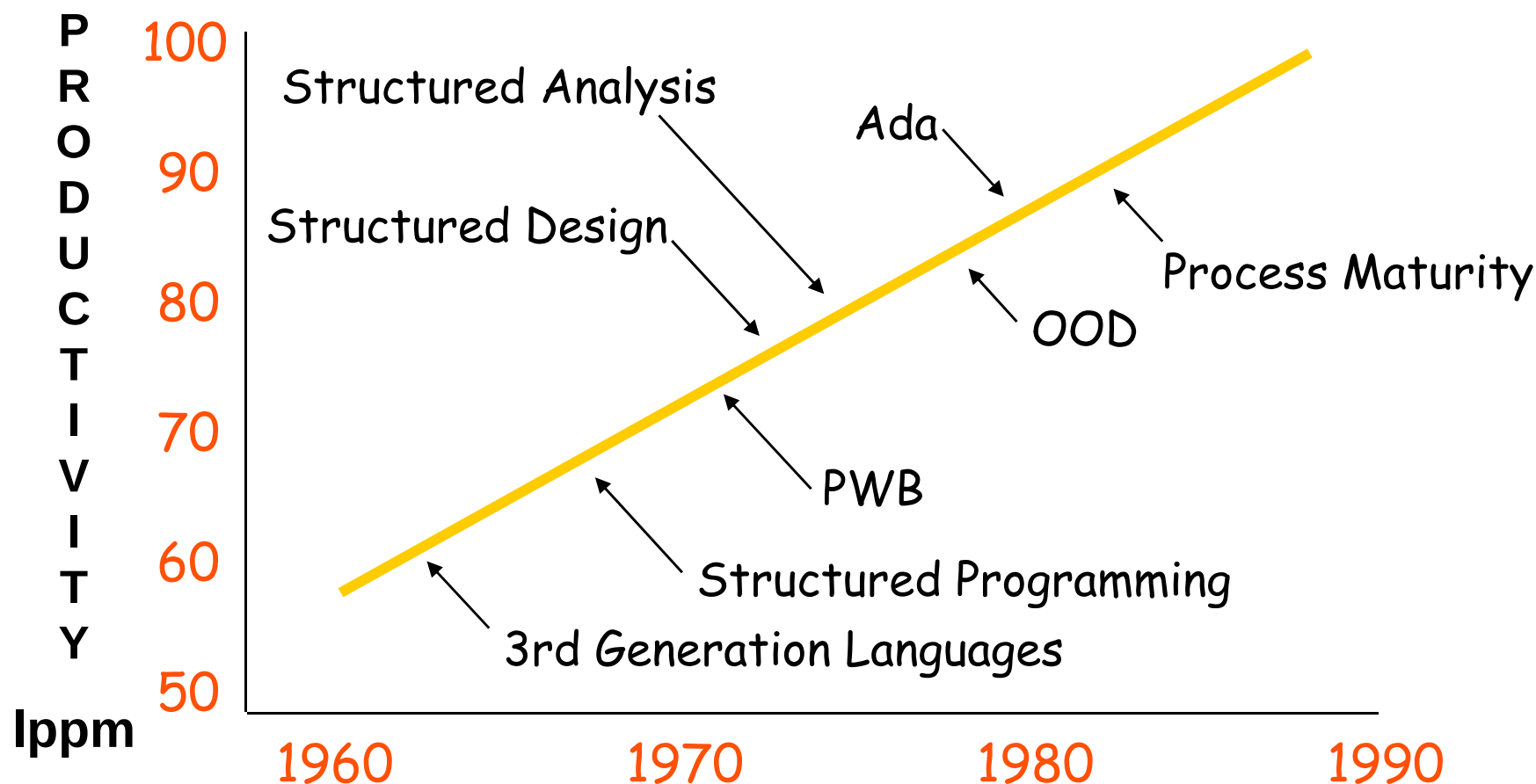
And

Defects will reduce to *zero*



There is always HOPE

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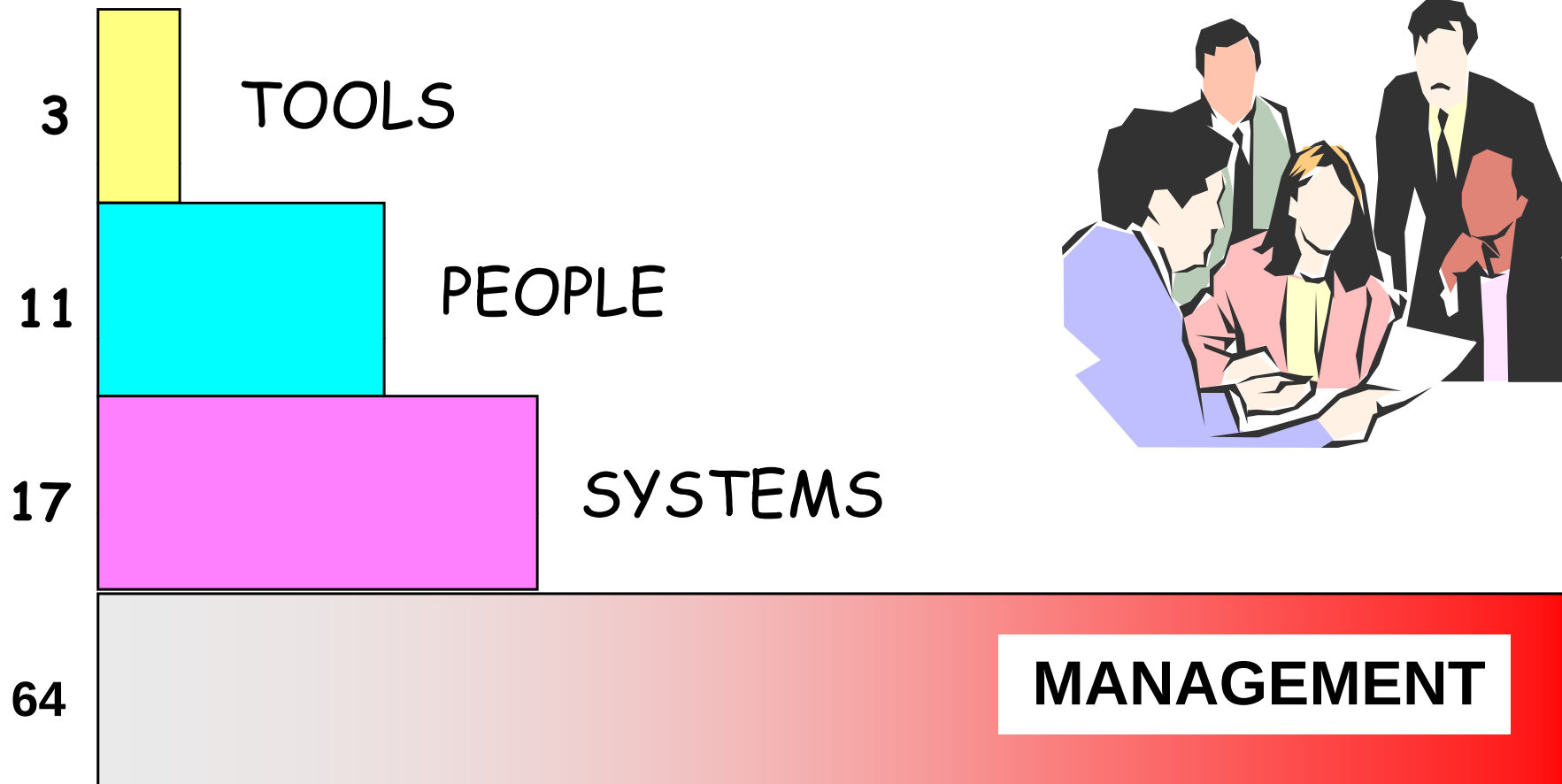
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Where would you focus effort?



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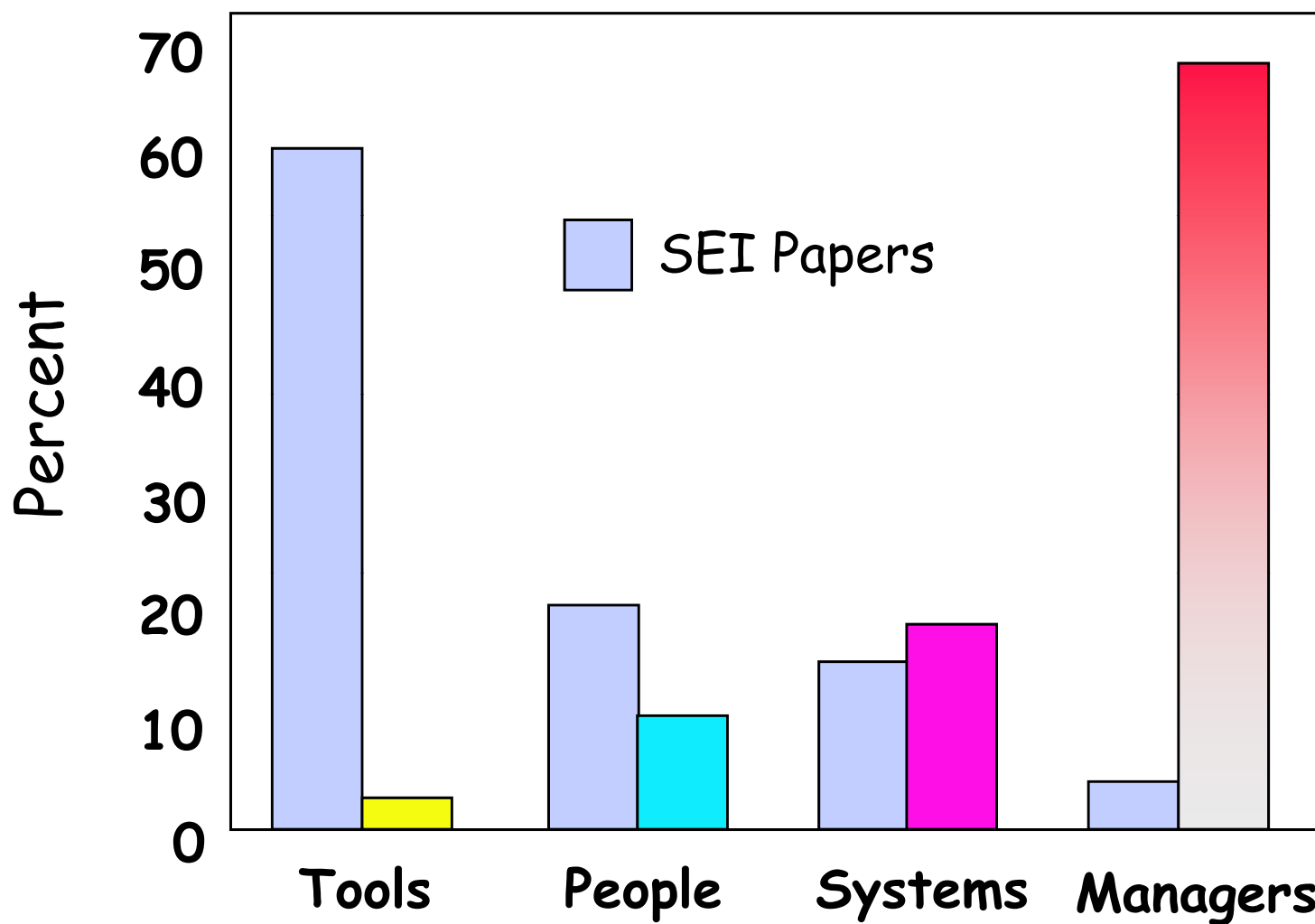


Source: G. Weinberg, *Quality Software Management*, Vol. 3



Relative payoff

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Source: G. Weinberg, *Quality Software Management*, Vol. 3

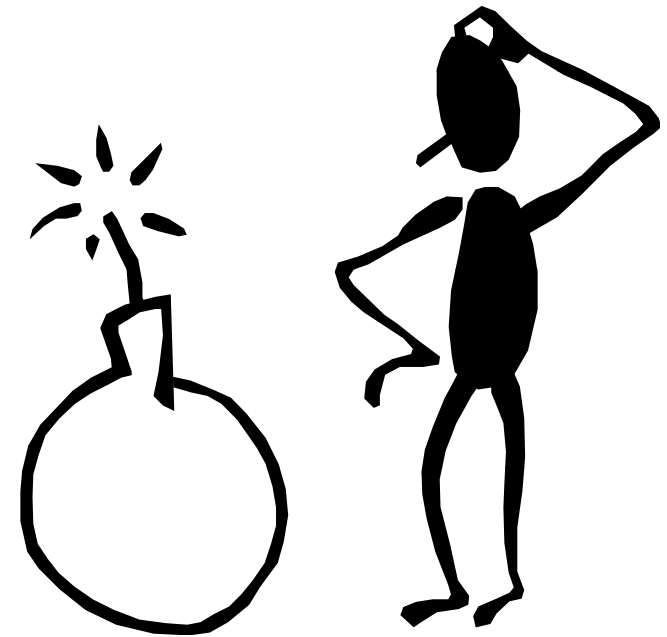


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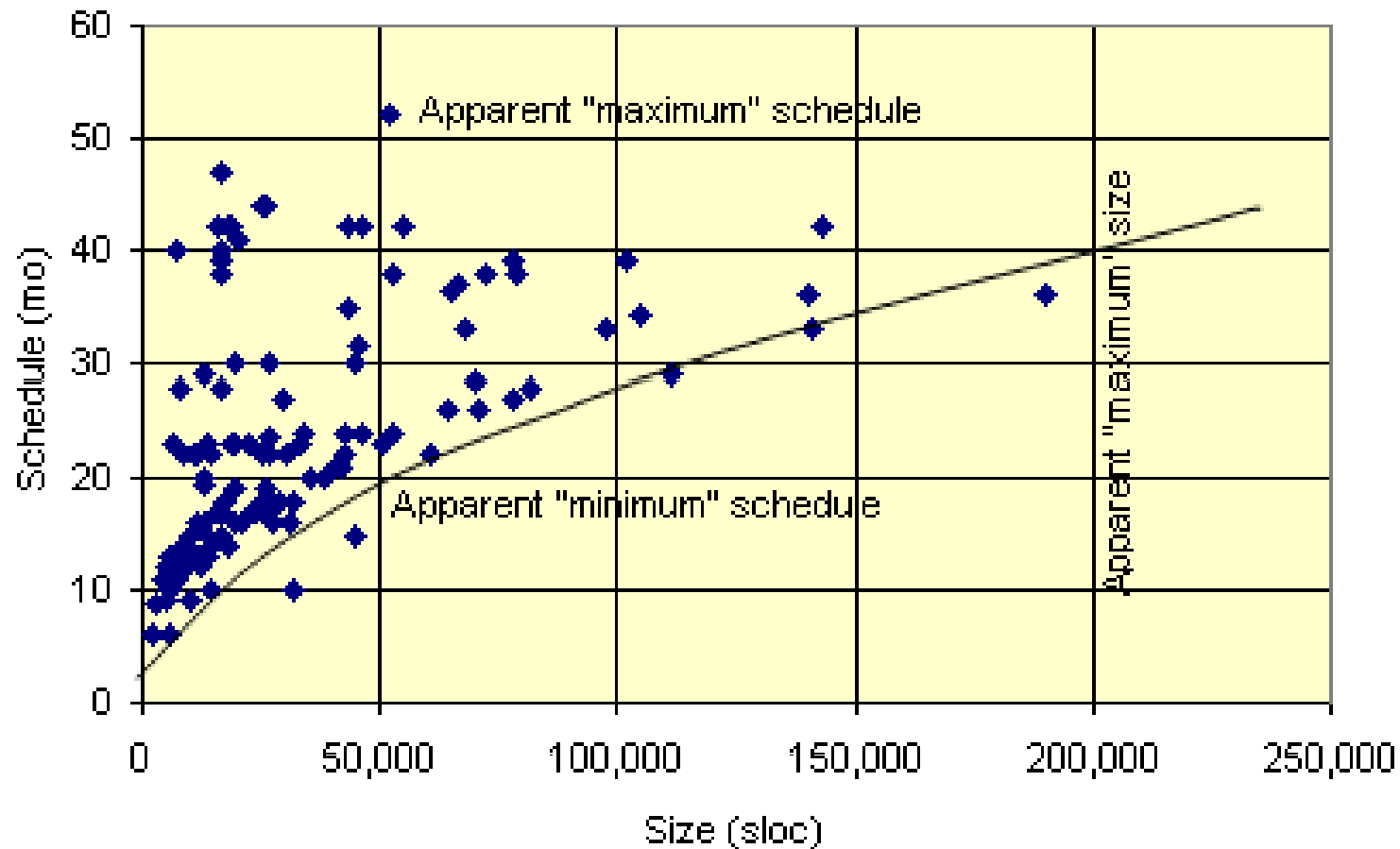


Let's look at more proof



Historic project data

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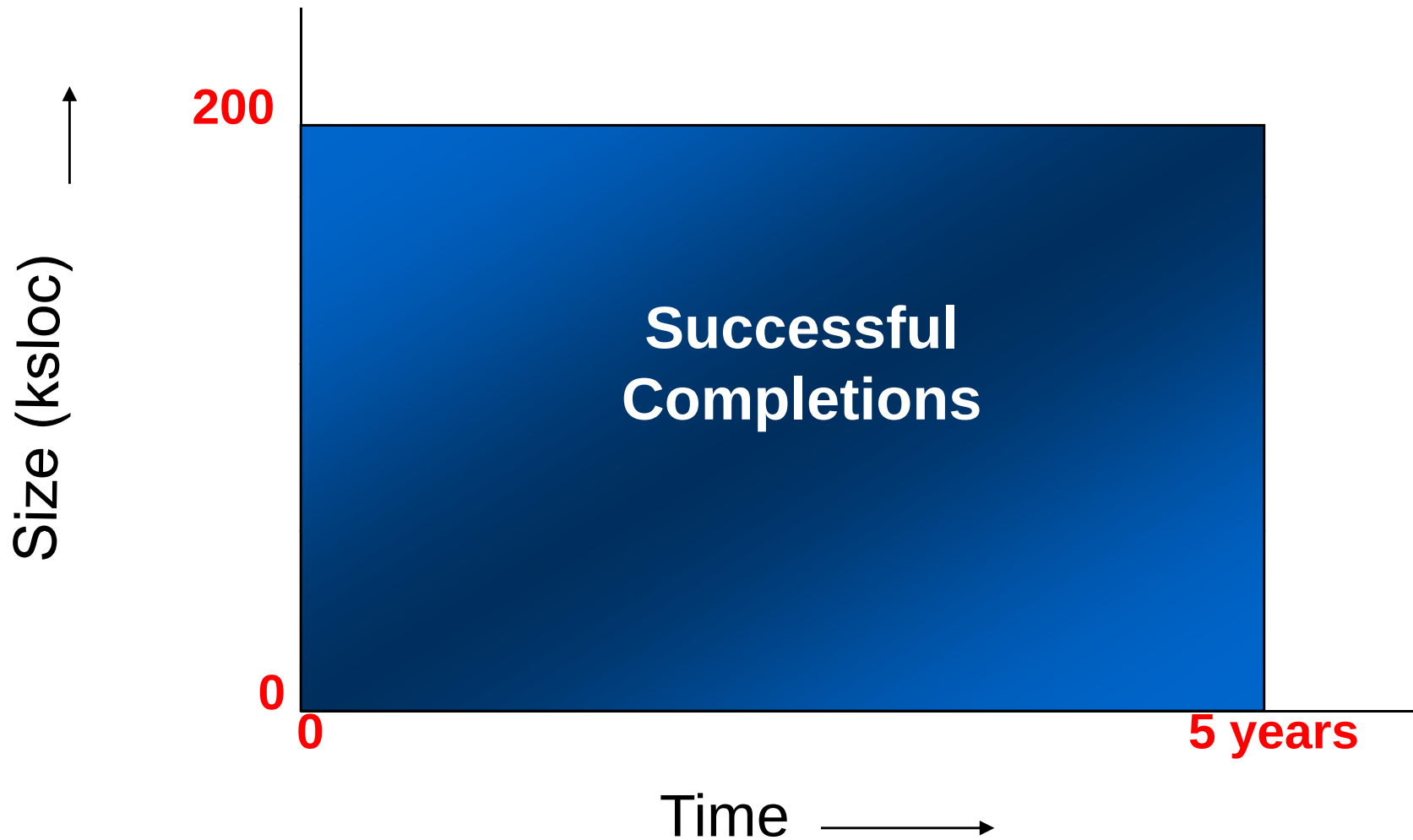


Source: Long, L. G. et al, 2004



Historic space project limits

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Source: Long, L. G. et al, 2004

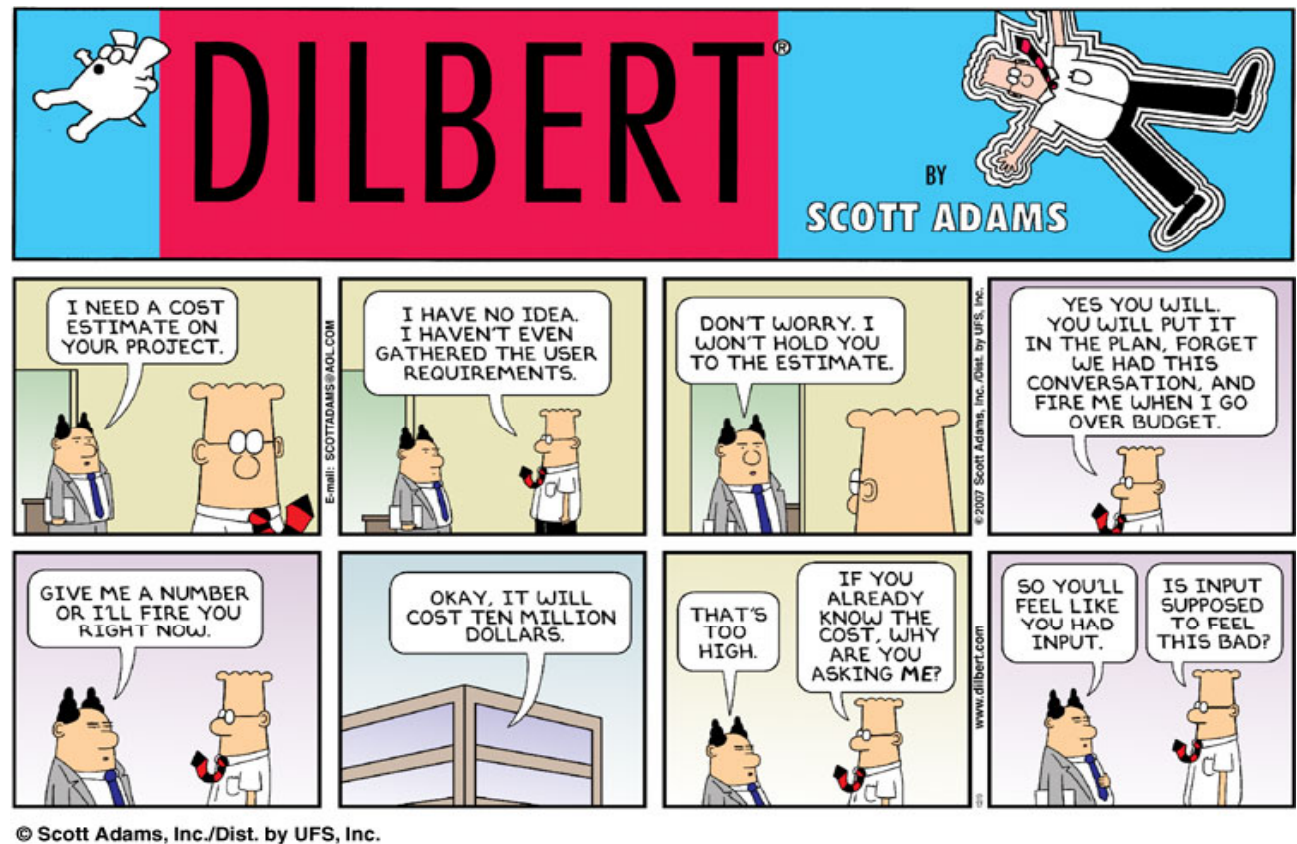


Three development variables



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- Cost
- Schedule
- Scope



- Developer can control any two



Historic note:



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"More software projects have gone awry for lack of calendar time than for all other causes combined..."

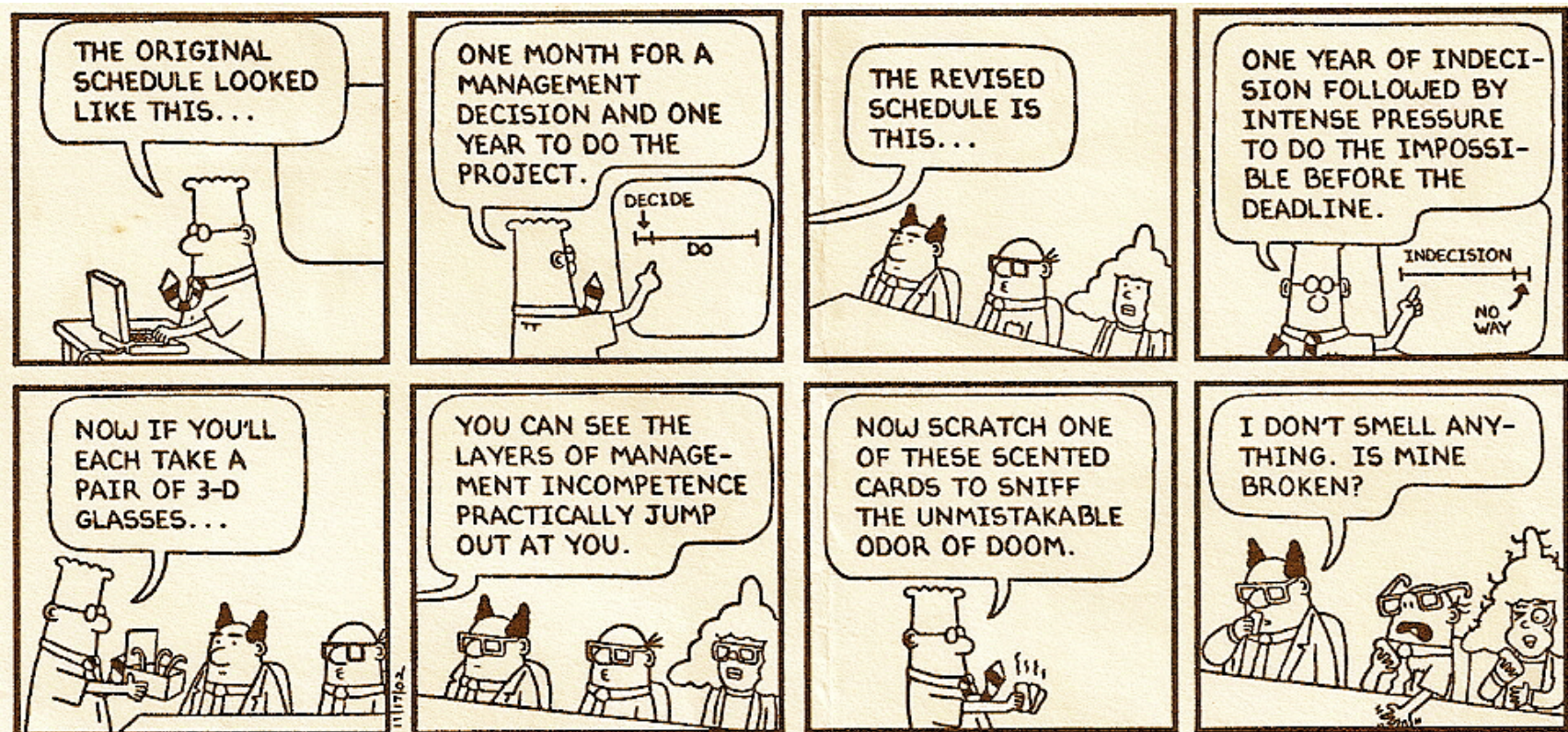
F. P. Brooks, Jr., Mythical Man Month



Common estimate dilemma



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Constraint analysis

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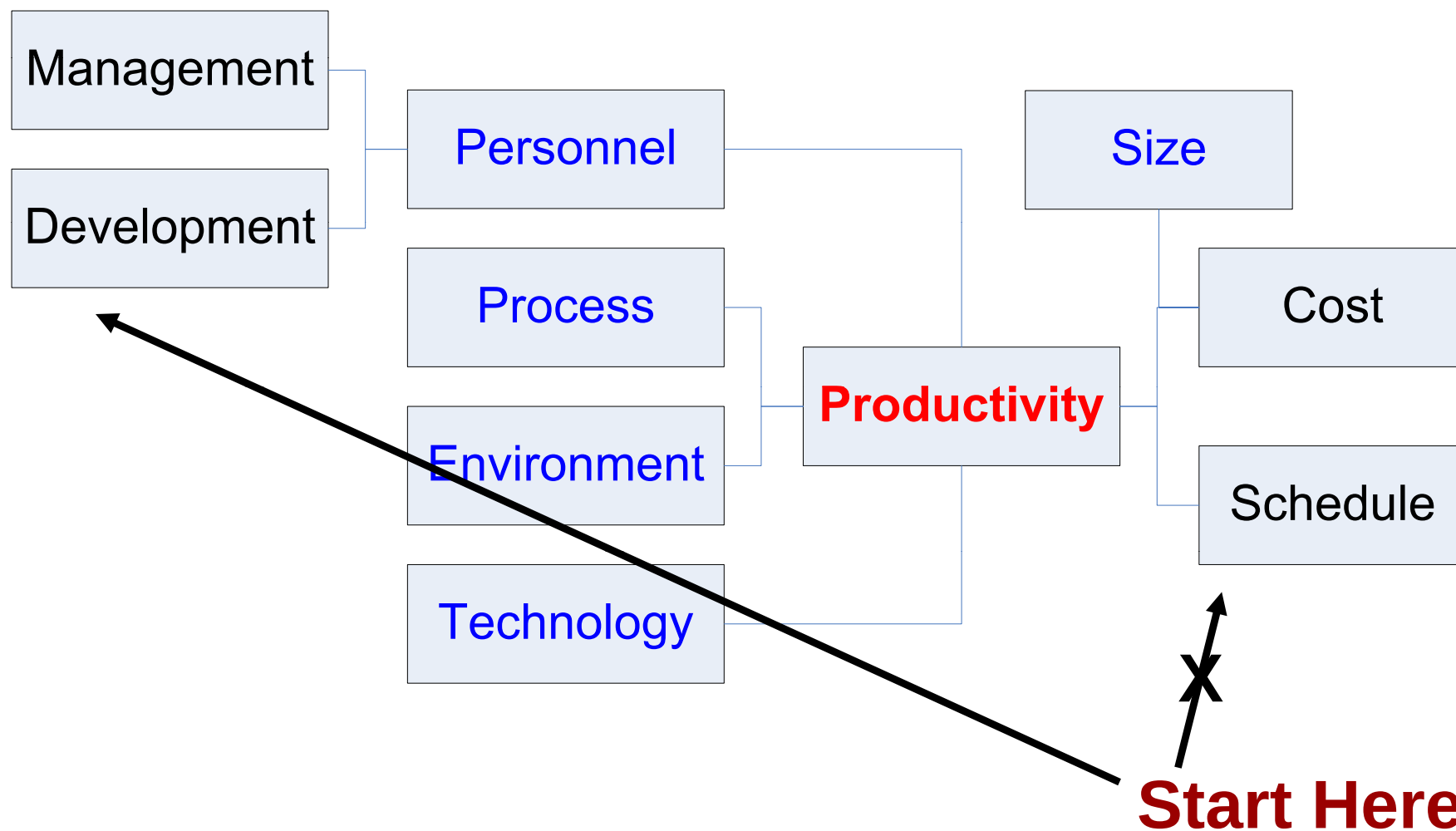
- Success and failure
determined by
- Expected cost and schedule
determined by
- Project plan
determined by
- Cost and schedule ESTIMATES
determined by
- **Managers and/or Estimators**





Key estimate factors

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Elements for successful estimates



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- 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



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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

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- 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?



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- 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?

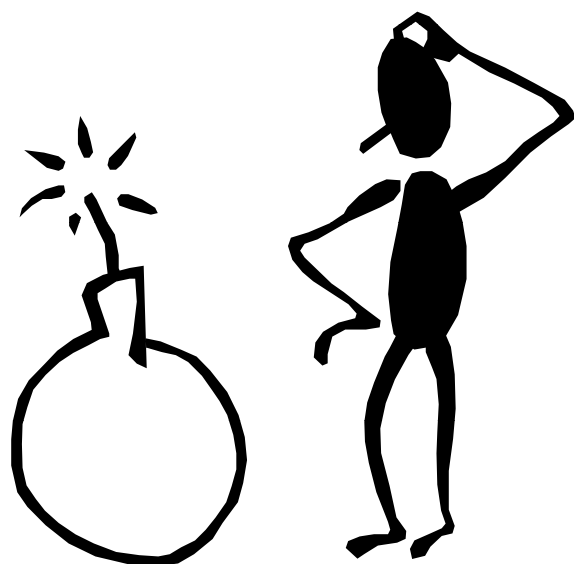




Historic note:



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We learn from
experience that
we don't learn
from experience.

D. H. Lawrence



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**The End,
or
is it
The Beginning?**

(History does repeat itself)