Construx®

Software Development Best Practices

The 10 Most Important Ideas in Software Development

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Most Key Ideas Are Not New

Q: What are the most exciting/promising software engineering ideas or techniques on the horizon?

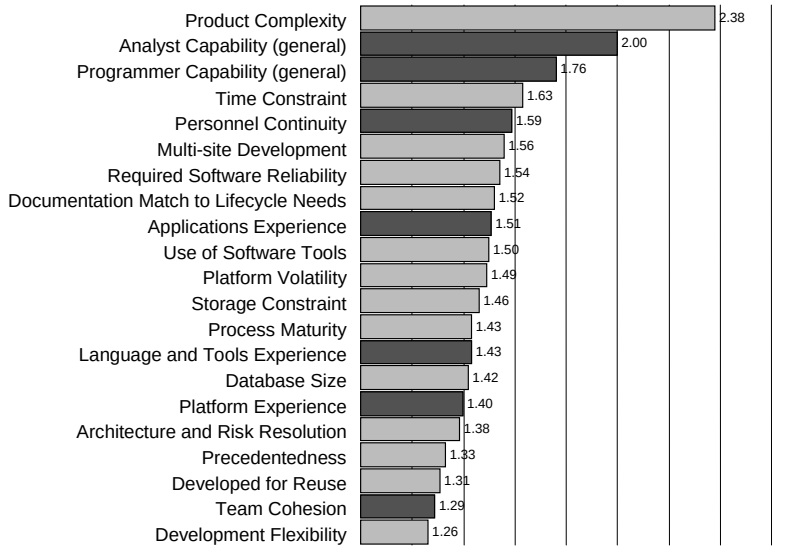
A: I don't think that the most promising ideas are on the horizon. They are already here and have been here for years but are not being used properly.

— David L. Parnas

#1

Software Development Work is Performed by Human Beings

Cocomo II's View of Software Project Influences



Importance of Human Influences

- Human Influences make a 14x difference in total project effort & cost, according to Cocomo II
- Capability factors alone make a 3.5x difference
- Experience factors alone make a 3.0x difference

Why Do These Variations Exist?

- Experience?
- Technology knowledge?
- Business knowledge?
- Personal processes?

This Just In …

Conclusions You Can Take to the Bank

With 20x differences in individuals and 10x differences in teams commonly reported…

- **Technical successes of Google, Amazon, Microsoft and similar companies are not accidents**
- **Recruiting top staff is easily cost justified**
- **Even elaborate staff retention programs are also easily cost justified**

#2

Incrementalism is Essential

Incrementalism

- Definition: “The use of a series of regular additions or contributions”
- An “incremental” approach is one that is done a little bit at a time.
- The final result may be completely mapped out in advance

Conclusions You Can Take to the Bank

What do you get from incrementalism?

- **Feedback! (on the software itself)**
- **Feedback! (on the dev process)**
- **Feedback! (on the people/dev capability)**
- **Ability to adapt**

Or, Another Perspective on Feedback …

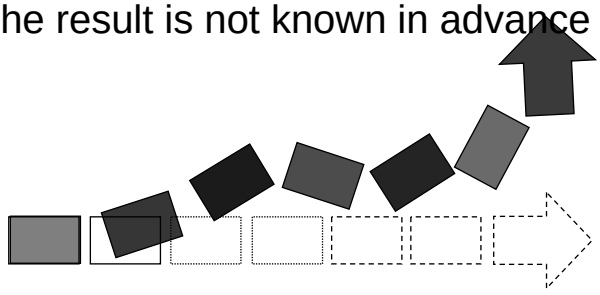
If the map and the terrain disagree, trust the terrain!

#3

Iteration is Essential

Iteration

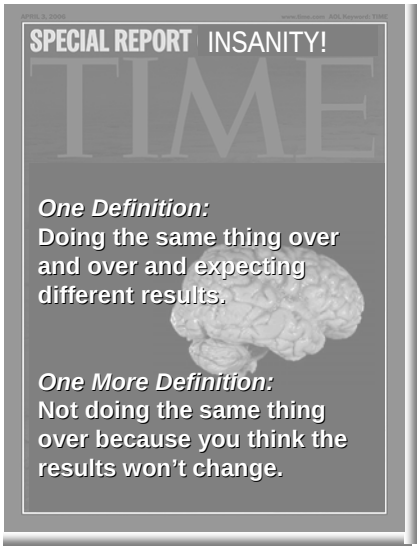
- Definition: “Recital or performance a second time; repetition”
- An “iterative” approach is one that converges to a solution a little bit at a time
- The result is not known in advance



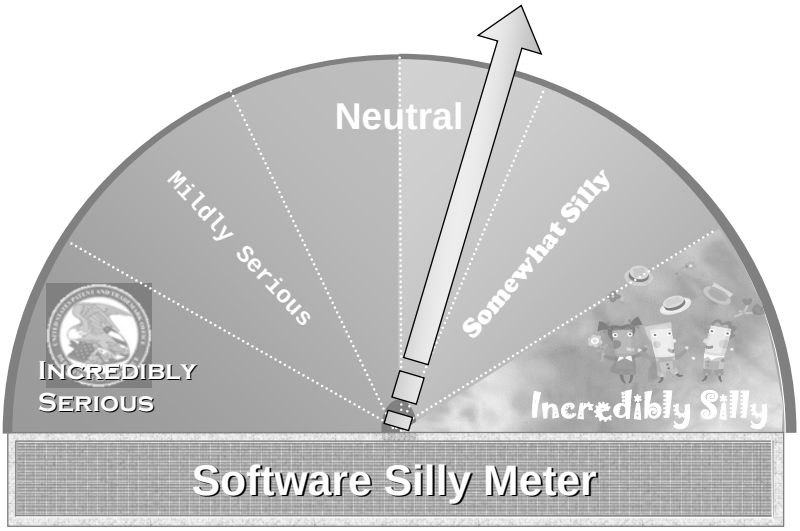
News Flash!

News Flash!

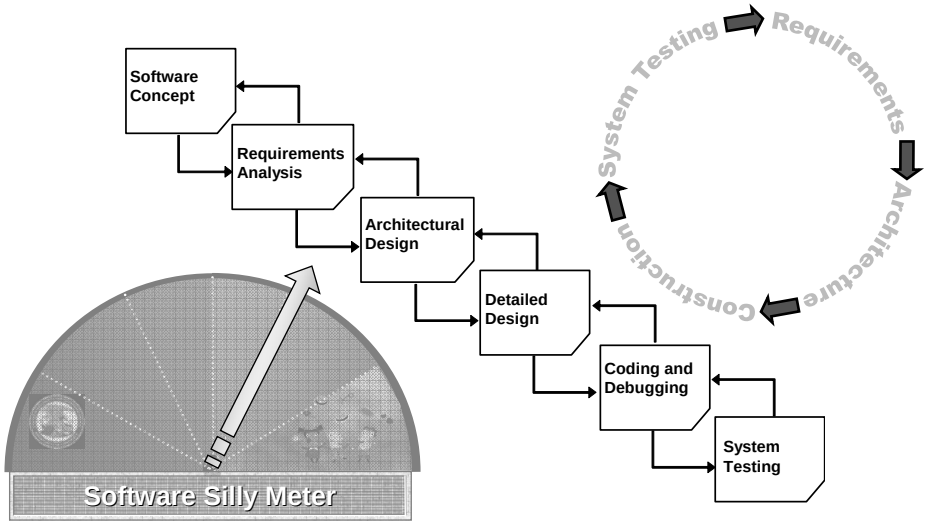
This Just In …



In the Midst of These Important Ideas, Some Are Just Plain Silly



Silly Idea: **The only two development options in existence are "Iterate Nothing" and "Iterate Everything"**



Conclusions You Can Take to the Bank

- **Some practices derive their power from incrementalism (doing a little bit at a time)**
- **Some practices derive their power from iteration (repeating the same task)**
- **You can iterate *within* an activity or phase (e.g., *within* requirements)**
- **You can iterate *across* any pair of activities or phases (e.g., requirements & architecture)**
- **You can iterate *across* entire development cycles**
- **The degree of iteration can vary from practically 0-100% either *within* or *across* activities**

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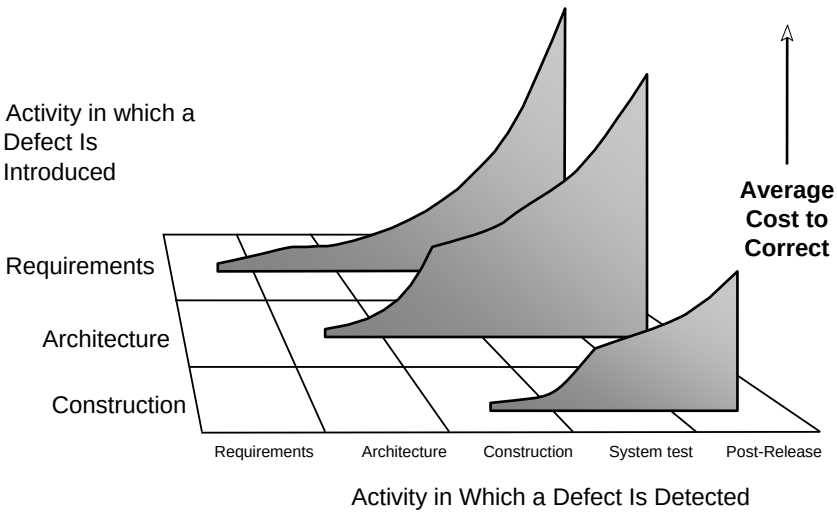
#4

The Cost To Fix A Defect Increases Over Time

Defect Cost Increase (DCI)



Notable Historical Mistakes

Greatest Mistakes in History

U.S.News & WORLD REPORT

480 BC:

"*This* is a *nice* gift!"

Notable Historical Mistakes

Greatest Mistakes in History

U.S.News & WORLD REPORT

1999:

"In the New Economy, companies won't need to make a profit to be successful."

Notable Historical Mistakes

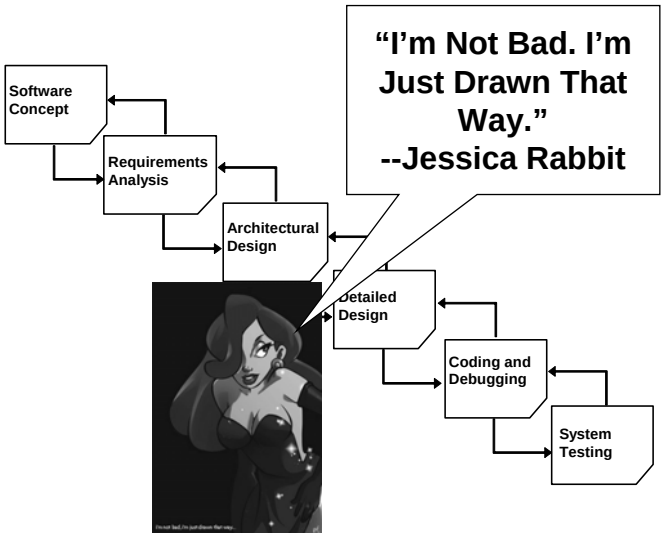
Conclusions You Can Take to the Bank

- Defect creation is a function of effort
- Defect detection and removal is a function of QA activities
- Fix more defects earlier!
- Use practices that reduce the magnitude of DCI

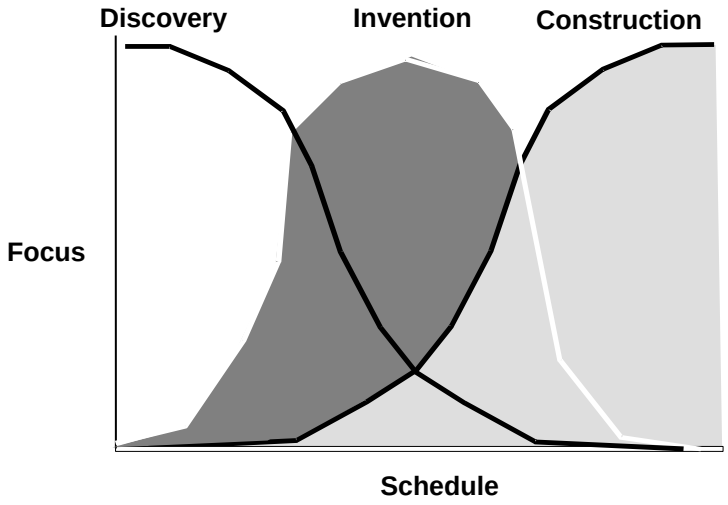
#5

There's an Important Kernel of Truth in the Waterfall Model

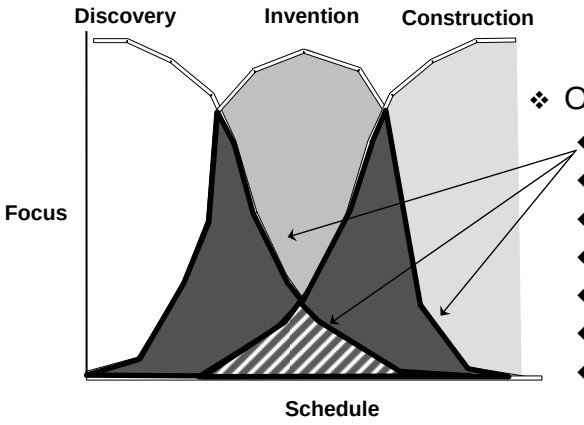
Remember This?



Intellectual Phases



Cost of Overlapping Intellectual Phases



- Overlap =
  - Dependencies
  - Uncertainty
  - Risk
  - Rework
  - Higher costs
  - Longer schedules
  - Lower quality

Conclusions You Can Take to the Bank

- Some degree of wickedness is inevitable. Plan for it.
- Much wickedness is avoidable. Plan for that, too.
- Attack wickedness actively, especially via incremental and iterative approaches.

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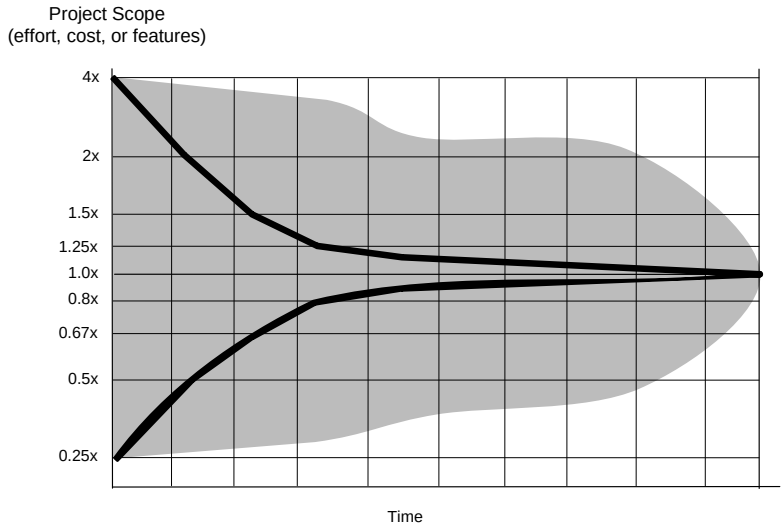
#6

Ability to Create Useful Software Estimates Can be Improved Over Time (The Cone Of Uncertainty)

Cone of Uncertainty



Conclusions You Can Take to the Bank

- Estimation must be iterative
- Project planning must be incremental
- An estimate isn't meaningful unless it contains a description of its inaccuracy

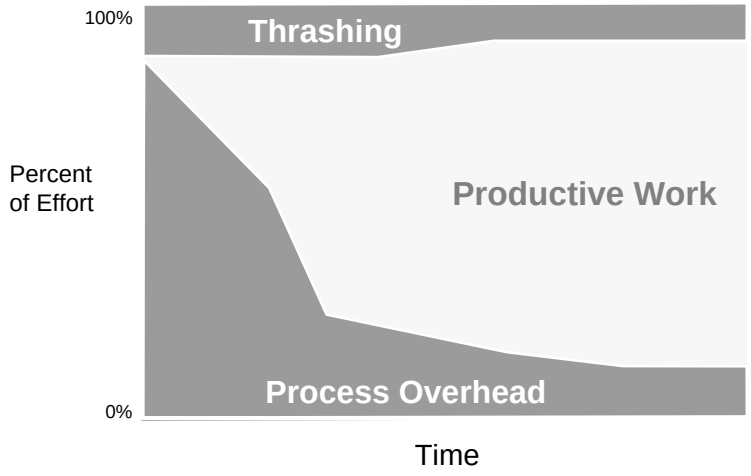
#7

The Most Powerful Form of Reuse is *Full* Reuse

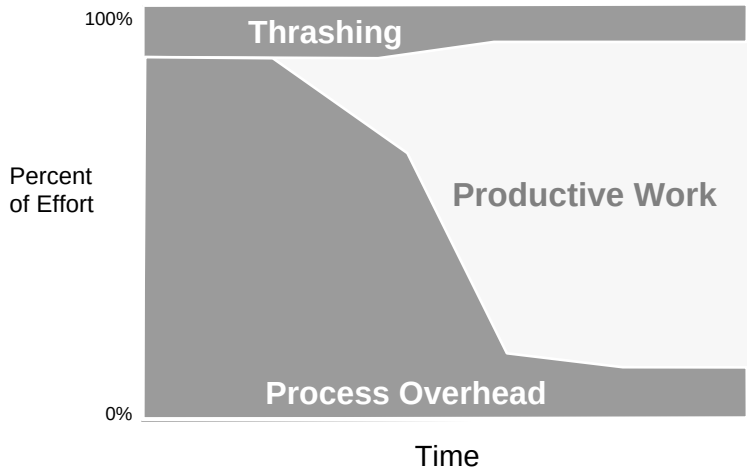
History of Reuse

- First idea was to reuse code
- Later idea was to reuse code + design
- Current idea is to reuse as much as possible, including processes and plans

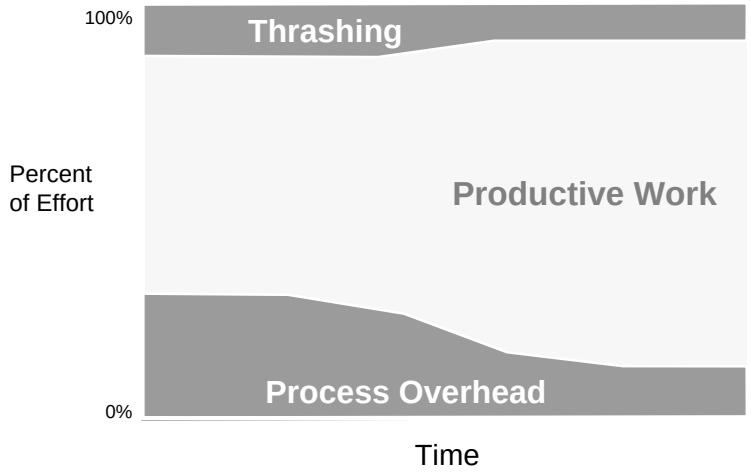
Effect of Adding Process the First Time (What I Wrote in *SPSG* in 1997)



Effect of Adding Process the First Time (What I Think Now)



Effect of Adding Reused Processes



Conclusions You Can Take to the Bank

Consider reusing any or all of these:

- **Coding standards**
- **Change control policies**
- **Estimation procedures**
- **Formats & outlines of project plans, requirements doc, design docs, QA plan, test plan, etc.**
- **Checklists for plans, estimates, change control, inspections, QA, etc.**
- **Roles & responsibilities**
- **Training**

#8

Risk Management Provides Critical Insights into Many Core Software Development Issues

Risk Management Type 1: Extrinsic

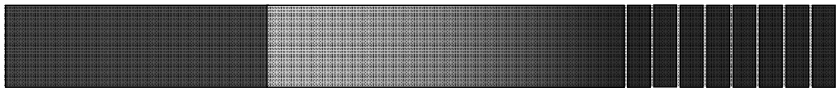
- Added on to the project primarily for purposes of risk management
- Examples of Extrinsic Risk Management
  - Top 10 Risks list
  - Risk management plans
  - Risk officer
  - Etc.

Risk Management Type 2: Intrinsic

- Built into the project for other reasons; risk reduction is an additional benefit
- Examples of intrinsic risk management
  - Active project tracking
  - UI Prototyping
  - End-user involvement
  - Incremental delivery
  - Upstream technical reviews
  - Etc.

A View of Software Risk Reduction

Typical Relationship between Planned Work and Variable Work:

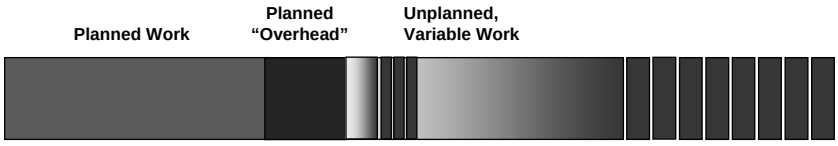


Planned Work | **Unplanned, Variable Work (typically >50% of total)**

Better Relationship:

Planned Work | **Planned "Overhead"** | **Unplanned, Variable Work**

A View of Software Risk Reduction

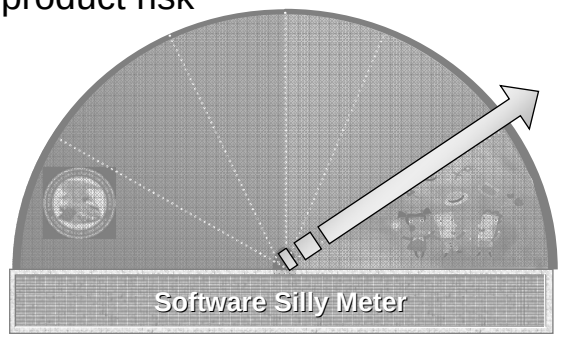


Conclusions You Can Take to the Bank

- **Risk is the key to many tough decisions in project management:**
  - **What is the best lifecycle model?**
  - **How much requirements work is enough?**
  - **How much design work is enough?**
  - **Can you use junior staff instead of senior staff?**
  - **Should you do design reviews? Code reviews?**
  - **How much schedule buffer do you need?**

A Silly View of Risk …

- "We're an entrepreneurial company. We can't be afraid of risk"
- Not separating business risk from project risk from product risk



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#9

Different Kinds of *Software* Call For Different Kinds of *Software Development* (The "Toolbox")

Examples of Overreaching Claims

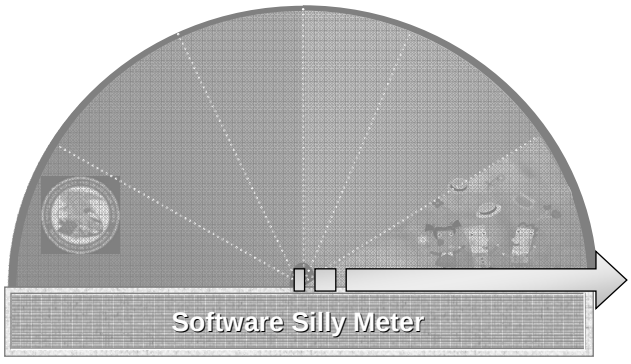
"The pace of information technology (IT) change is accelerating *and* agile methods adapt to change better than disciplined methods *therefore* agile methods will take over the IT world."

"Software development is uncertain *and* the SW-CMM improves predictability *therefore* all software developers should use the SW-CMM."

Examples from *Balancing Agility and Discipline: A Guide for the Perplexed,* Barry Boehm, Richard Turner, 2004

Time for More Silliness

- There is one single development approach that works best for all projects.



This is a saw …

… this is also a saw …

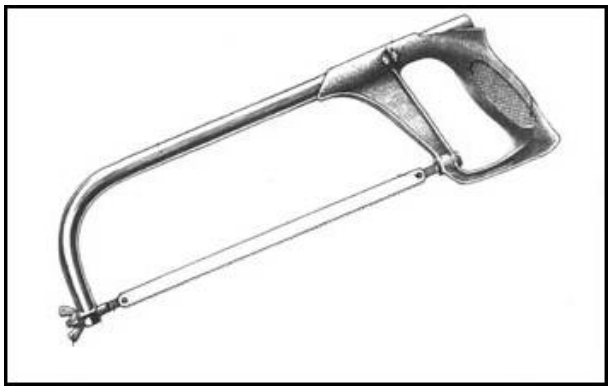
… and so is this …

… and so is this …

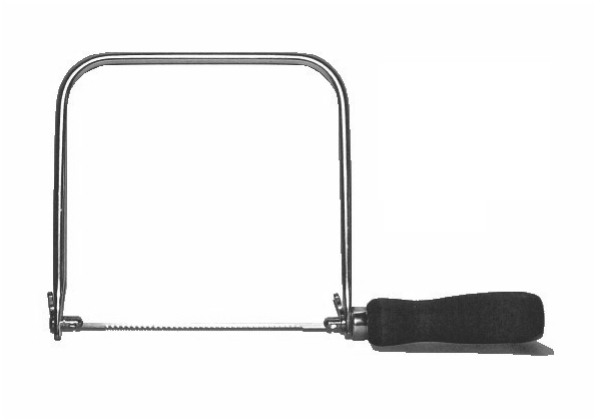
… and so is this …

… and so is this …

… and so is this …



… and so is this …



… and so is this …

… and so is this …

News Flash!

Conclusions You Can Take to the Bank

- **Which software development approach works best depends on the kind of project**

#10

Software Engineering Body of Knowledge (SWEBOK)

The SWEBOK
(Software Engineering Body of Knowledge)

- Software Configuration Management
- Software Construction
- Software Design
- Software Engineering Management
- Software Engineering Process
- Software Maintenance
- Software Quality
- Software Requirements
- Software Testing
- Software Tools and Methods

Effect of the SWEBOK

To organize something is to understand it.
– Aristotle

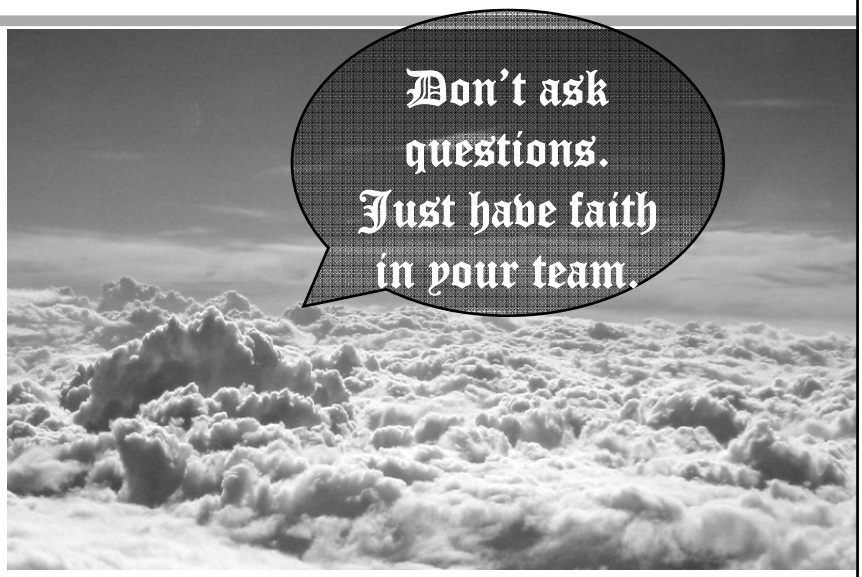
- The main contribution of the SWEBOK is to bring clarity to software development research, discussions, and application

Alternatives to the SWEBOK

- Maybe software is so complicated only gurus can understand it?
- Perhaps software can't be reduced to words, and you just have to trust the developers to do the right thing?
- Maybe good development practices should be kept secret so they don't fall into the wrong hands

Alternative #1 to the SWEBOK

Alternative #2 to the SWEBOK



Alternative #3 to the SWEBOK

I could explain software to you,
but I'd have to kill you.

Conclusions You Can Take to the Bank

SWEBOK provides a wide spectrum of support for software development practices:

- **Defined, reusable software development processes**
- **Academic curriculums**
- **Career development**
- **Professional certification**
- **Employment interviewing**
- **Technical skills inventory**

And we're just getting started!

Is the SWEBOK the Ultimate Answer?

"Truth will sooner come out of error than from confusion."
– Francis Bacon

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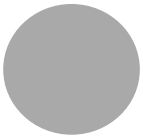

Conclusions


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