# The Art & Science of Software Process

**Steven Teleki**
Vice President, Software Engineering, Yash & Lujan Consulting, Inc.
Chairman, IEEE Computer Society, Austin Chapter



## Why *Art & Science*?

When asked why he gave the title, *The Art of Computer Programming,* to his famous series of books, Donald Knuth said:

*"Science is what we understand well enough to explain to a computer and art is everything else."*

Knuth, Donald. *Computer Programming is an Art.* Communications of the ACM. December 1974.

## What is the Goal of the Process?

- Make commitments that you can keep.
- *Produce quality software on-time and on-budget.*
  - To paraphrase Peter Drucker: *The process serves to organize the participants of software work to create value.*

Drucker, Peter F. *The Essential Drucker.* Harper Business. New York, NY. 2001.





## Challenges

# Learning Is Difficult

- Crawl, walk, run!
  - An accomplished walker doesn't think about the mechanics of the steps anymore.
- Learning dilemma:

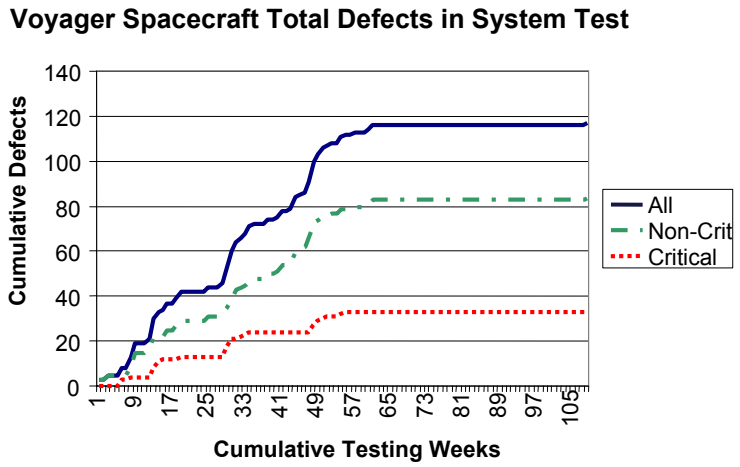
  *We learn best from experience but we never directly experience the consequences of many of our most important decisions.*

Senge, Peter. *The Fifth Discipline.* Pg. 23. Currency Doubleday. New York, NY. 1990.





# Defect Removal Pattern



# Simple ROI Calculation

| Current | Averages | | Example | |
|---|---|---|---|---|
| | | | 20,000 | LOC |
| | 5 | defects/KLOC | 100 | defects |
| | 10 | hours/defect | 1,000 | hours |
| | 125 | $/hour | 125,000 | $ |
| | 10 | LOC/hr | 2,000 | hours |
| | 20 | hours/week | 100 | weeks/dev |
| | 4 | developers | 25 | weeks/team |
| | | | | |
| | | | | |
| | | | | |
| **Future** | **Averages** | | **Example** | |
| | | | 20,000 | LOC |
| | 1 | defects/KLOC | 20 | defects |
| | 10 | hours/defect | 200 | hours |
| | 125 | $/hour | 25,000 | $ |
| | 10 | LOC/hr | 2,000 | hours |
| | 20 | hours/week | 100 | weeks/dev |
| | 4 | developers | 25 | weeks/team |
| | | | | |
| **Savings** | | | 800 | hours |
| | | | 100,000 | $ |





# Organizational Expectations

"Wanted: Young, skinny, wiry fellows not over 18. Must be expert riders willing to risk death daily. Orphans preferred. Wages $25 per week."

– Pony Express advertisement, 1860.

McConnell, Steve. *After the Gold Rush*. Microsoft Press. 1999.

## What Changed In 140+ Years?

"We realize the skills, intellect and personality we seek are rare, and our compensation plan reflects that. In return we expect TOTAL AND ABSOLUTE COMMITMENT to project success—overcoming all obstacles to create applications on time and within budget."

– Software Developer Advertisement, Seattle Times, 1995.

McConnell, Steve. *After the Gold Rush.* Microsoft Press. 1999.





## A Disaster off the Scilly Isles

What do you know to be *important* but are *unable* to measure?

- Longitude: How far east or west you are?
- Guessing average speed, or dropping a log over the side of the boat and measuring time of travel from bow to stern.
- October of 1707, Admiral Clowdisley Shovell
- 4 warships and 2,000 lives were lost

Buckingham, Marcus, Curt Coffman. *First, Break All The Rules.* Simon & Schuster. NY, NY. 1999.

## What is Your Software Development Performance?

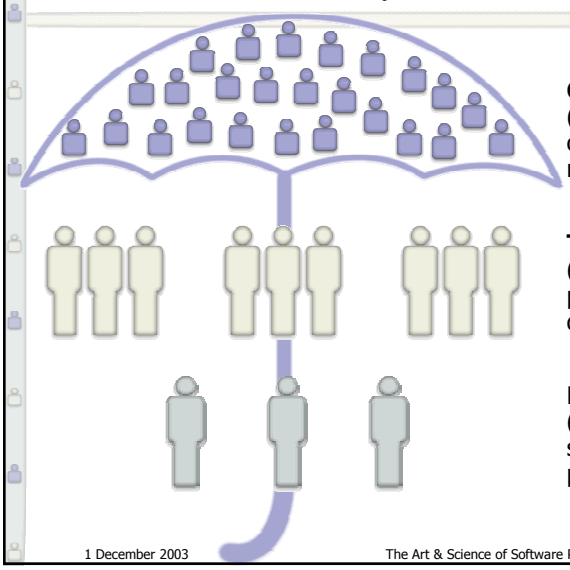
- Have you been thinking about it before?
  - Do you know your *"batting average?"*
- *Software Development Performance is the complexity of all activities that an individual or team does in order to create software.*
- An **understanding** of your performance is the basis of making good estimates.





## Approaches

# A Comprehensive Approach to Process Improvement



**Capability Maturity Model (CMM):** Focuses on the organization's capability; management actions.

**Team Software Process (TSP):** Focuses on team performance; product development.

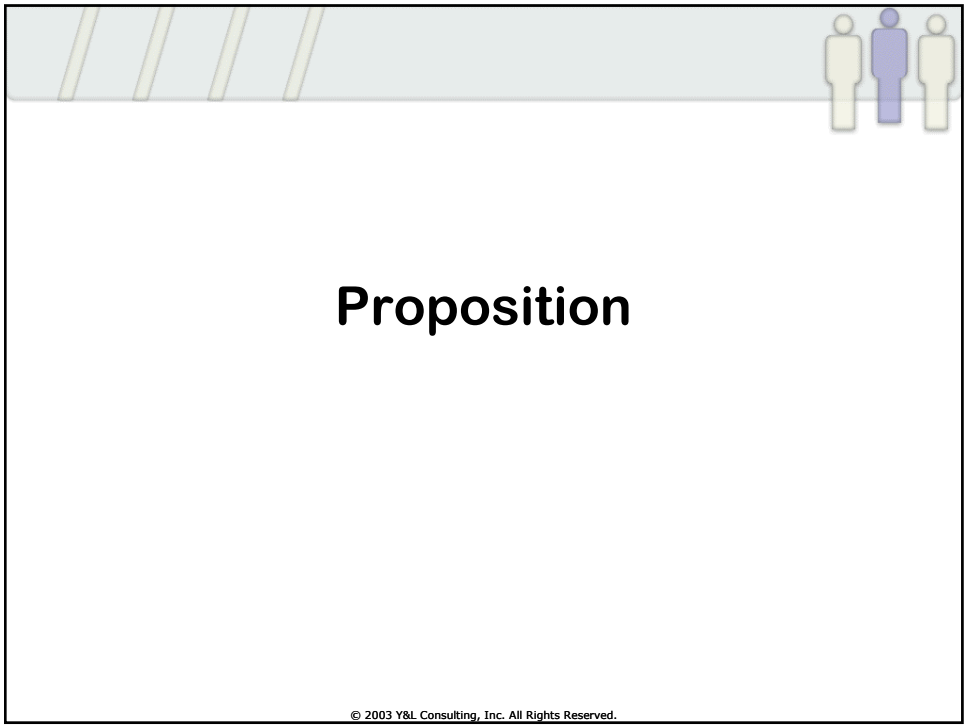
**Personal Software Process (PSP):** Focuses on individual skills and discipline; entirely personal.

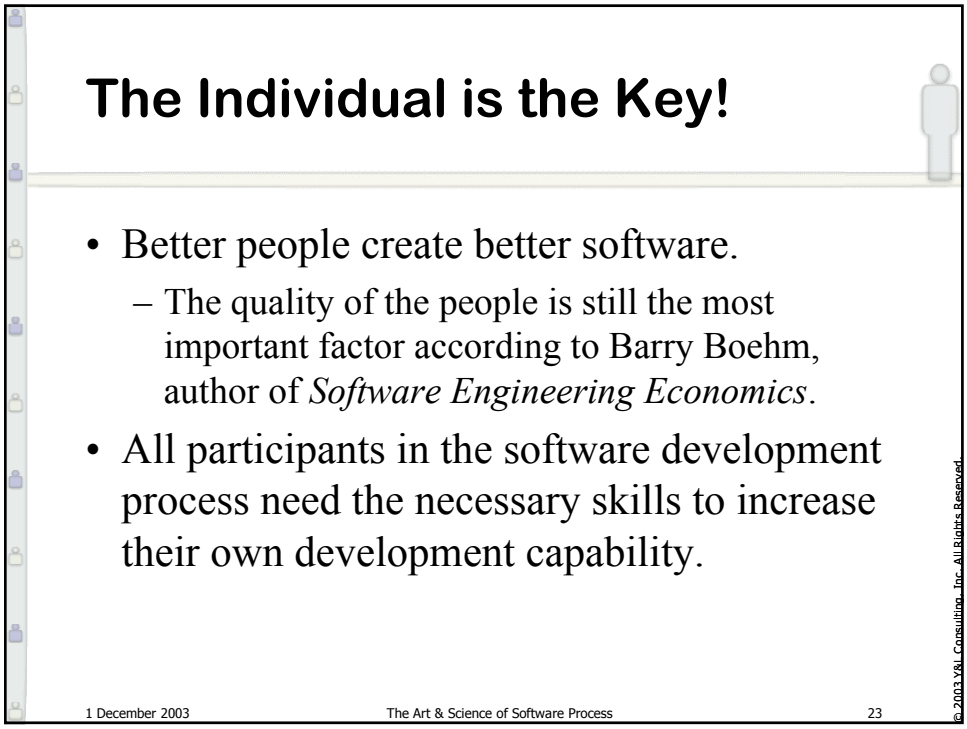




# Other Approaches

- ISO 9001/9000-3
- FDD (Feature Driven Development) www.featuredrivendevelopment.com
- Rational Unified Process www.rational.com
- SCRUM www.controlchaos.com
- Extreme Programming www.extremeprogramming.org
- OPEN (Object-oriented Process, Environment, and Notation) www.open.org.au
- **Code 'n Fix ☺**


Proposition
© 2003 Y&L Consulting, Inc. All Rights Reserved.


The Individual is the Key!
• Better people create better software.
– The quality of the people is still the most important factor according to Barry Boehm, author of *Software Engineering Economics*.
• All participants in the software development process need the necessary skills to increase their own development capability.
1 December 2003
The Art & Science of Software Process
23
© 2003 Y&L Consulting, Inc. All Rights Reserved.

# Personal Mastery (Personal Process)

Senge, Peter. *The Fifth Discipline.* Currency Doubleday. New York, NY. 1990.



## Personal Software Process

- Personal
  - It is *your* process. If there is something that you don't like, then *you* need to change it!
- Software
  - A personal process applied to software development.
- Process
  - *"A series of actions, changes, or functions bringing about a result."*

Anybody who creates a deliverable that could have defects can benefit from a personal process.

Humphrey, Watts S. *A Discipline for Software Engineering.* Addison-Wesley. Reading, MA. 1994.
Excerpted from *The American Heritage® Dictionary of the English Language*

## DISTINCT … OR EXTINCT!

***"If there is nothing very special about your work, no matter how hard you apply yourself, you won't get noticed and that increasingly means you won't get paid much, either."***

**Michael Goldhaber, *Wired***

## LOW PRODUCTIVITY KILLS!

***"However low its wages, a business […] is unlikely to survive, let alone prosper, unless it measures up to the standards set by the leaders in its field, anyplace in the world."***

**Peter F. Drucker**

## Why Focus on Yourself?

- You are special!
- You are the same person at home & at work.
- Think of yourself as:

**Me, Inc.**

– Even if you happen to be on somebody's payroll at the moment!

Peters, Thomas, J. *Brand You 50:Fifty Ways to Transform Yourself from an "Employee" into a Brand that Shouts Distinction, Commitment, and Passion*. Knopf/Random House, 1999.





## Work To Your Talents

- What is a **talent**?

  *"A talent is a recurring pattern of thought, feeling, or behavior that can be productively applied."*

- Every role performed at excellence requires talent.

  *"Michelangelos of housekeeping."*

Buckingham, Marcus, Curt Coffman. *First, Break All The Rules.* Simon & Schuster. NY, NY. 1999.
Peters, Thomas J. *The Circle of Innovation.* Random House. New York, NY. 1997.

## Make Non-Talents Irrelevant

*"People don't change that much. Don't waste time trying to put in what was left out. Try to draw out what was left in. That is hard enough."* – wisdom from great managers

- Team up people with complimentary talents.

Buckingham, Marcus, Curt Coffman. *First, Break All The Rules.* Simon & Schuster. NY, NY. 1999.





## Elements of High-Performance Software Development Practice

## Defined Process

- A process is defined if it is:
  - Written down;
  - Has enough detail that it can be enacted repeatedly producing the same or very similar outcome.
- A process must be defined for any measurement to be meaningful.




## Planning

- Why?
  - The plan is the basis of commitments.
  - To be successful you must be able to make commitments that you can meet—**at a profit**.
- What is a plan?
  - It is the amount of work that needs to be done to achieve the desired outcome.
- How?
  - Plan in detail. Task length: 45-90 minutes.

## Research vs. Development

- Research:
  - Inventing something new, that has never existed.
  - It can only be time limited.
- Development:
  - Use existing technology, or implement an invention.
    - Can be planned & scheduled; it has been done before.
- *Library research* and *learning* can be planned.




## Context

- What is context?
  - Everything that is said, done, drawn, or written during the software development process.
- How much context do you need?
  - Just enough to always know where you are with the work and to know what to do next.

## Effective On-Task Time (EOT)

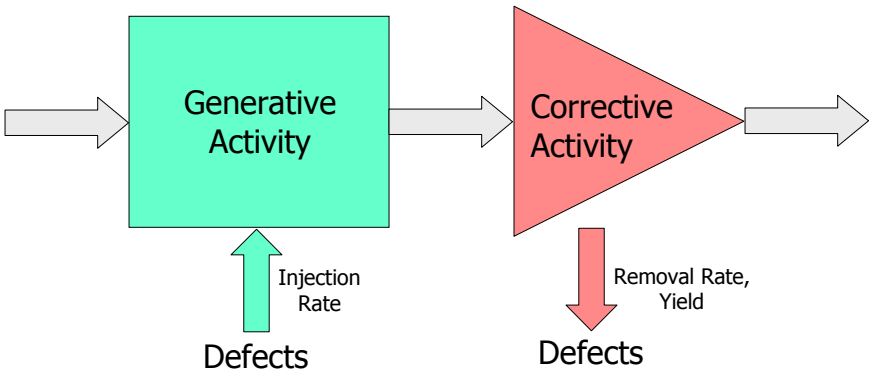
- The time effectively spent on project work.
- Doesn't include:
  - Reading email (usually even if it is project related)
  - Meetings (except well-defined project meetings)
  - Lunch time, breaks, phone conversations, etc.
- Measure your EOT per week.
  - Best organizations in the world get 20+ hrs/week.
  - You may only get about 3-5 hrs/wk the first week. You should get up to 15 hrs/wk in a few weeks.




## Quality Planning

- You must change your process to change your results!
  - *What is insanity? Doing the same thing over and over and expecting a different result!*
- You know that you will put the defects in, might as well plan to remove them.
- Calculate the ROI of all activities!

## Process Building Block



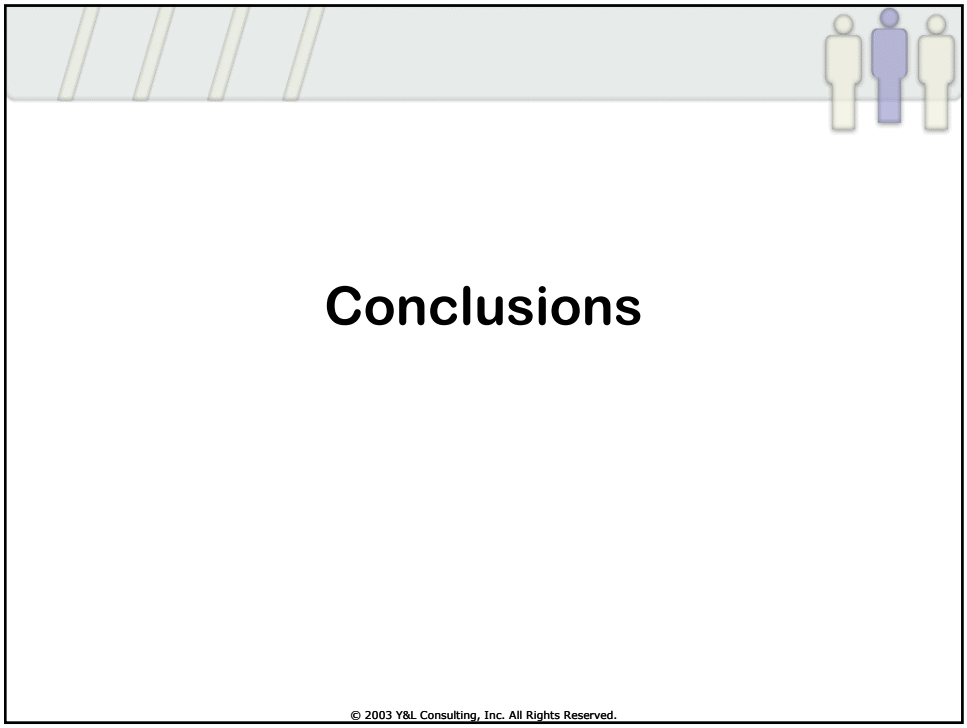


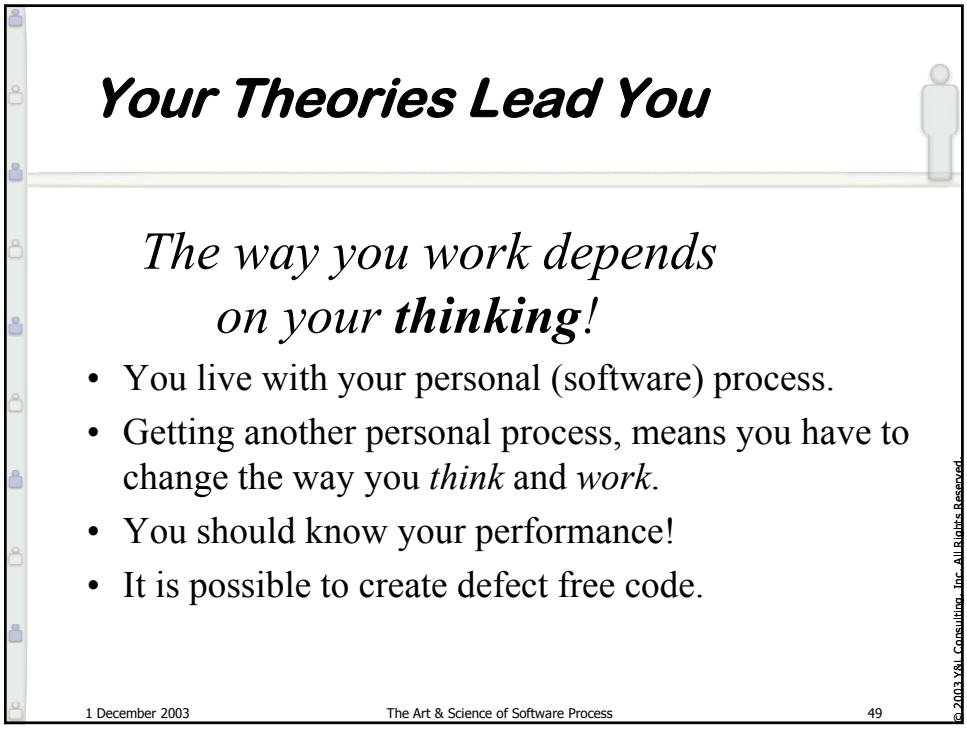


## Broken Windows & Software?

- The brainchild of criminologist James Q. Wilson and George Kelling.
  - Crime is the inevitable result of disorder.
  - If one window broken, soon more will be broken.
- Applies to software equally well…
  - One defect is followed by other defects.
  - NOT Microsoft Windows.

Gladwell, Malcolm. *The Tipping Point: How Little Things Can Make A Big Difference*. Pg. 141. Little, Brown, and Company. New York, NY 2000.


Conclusions
© 2003 Y&L Consulting, Inc. All Rights Reserved.


Your Theories Lead You
The way you work depends on your thinking!
• You live with your personal (software) process.
• Getting another personal process, means you have to change the way you think and work.
• You should know your performance!
• It is possible to create defect free code.
1 December 2003
The Art & Science of Software Process
49
© 2003 Y&L Consulting, Inc. All Rights Reserved.

## Closing Quote

*"If things seem under control,*
*you are just not going fast enough."*

—Mario Andretti, race-car driver





## Thank You!

Contact Information

**Steven Teleki**
**Y&L Consulting, Inc.**
1605 Amelia Drive
Cedar Park TX 78613

**teleki@acm.org or teleki@ylconsulting.com**

For a software development reading list please visit:
**http://pseng.net/reading/**