Advances in Measuring Software Size and Productivity

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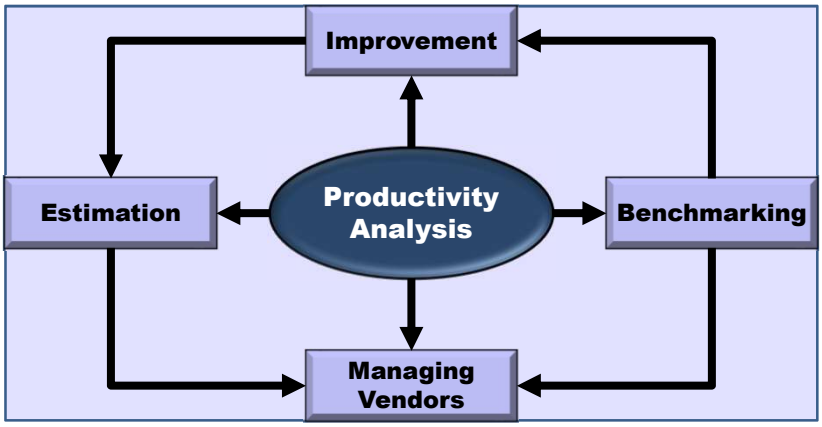
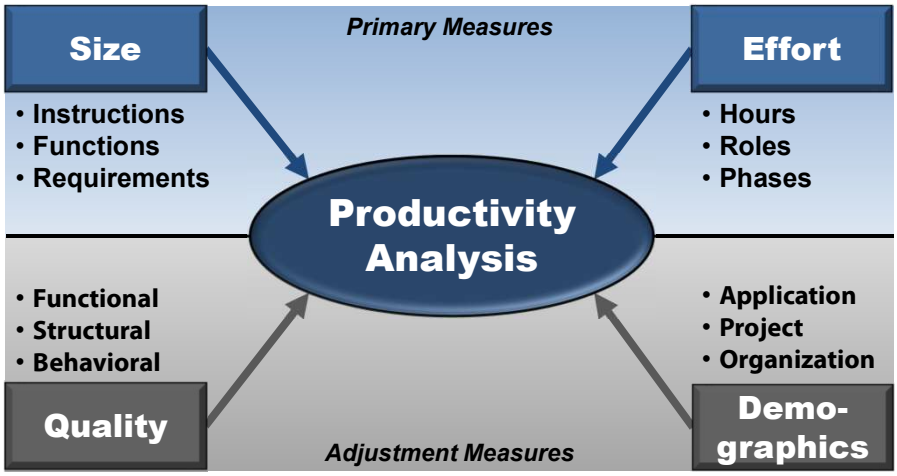
CISQ
Consortium for IT Software Quality

International Standards for Automating Software Size and Structural Quality Measurement

Productivity Analysis Objectives



Productivity Analysis Measures



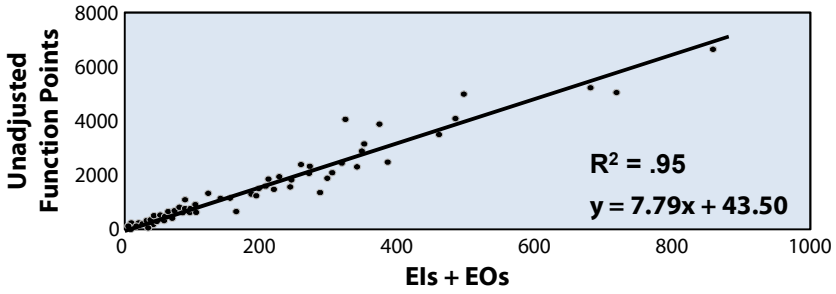
Software Size Measures

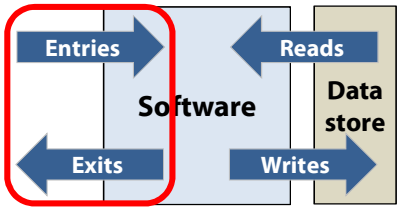
Instructions	Lines of Code
Most frequently used. Different definitions of a line can cause counts to vary by 10x. Smaller programs often accomplish the same functionality with higher quality coding.	

Requirements-based	Use Case Points, Story Points
Use Case Points have not become widely used and need more development. Story points are subjective to each team and are susceptible to several forms of bias.	

Functions	Function Points
Popular in IT. Several counting schemes (IFPUG, NESMA, Mark II, COSMIC, etc.). Manual counting is expensive and subjective—certified counters can differ by 10%. Automated FPs taking root.	

Function Point Estimation





Functional view of software

- **Functional size can be estimated from external inputs and outputs**
- **Upfront functional analysis provides basis for good estimates**
- **Repository of FP data provides basis for calibrating estimates**

Ebert & Dumke (2007). *Software Measurement*, p.188.

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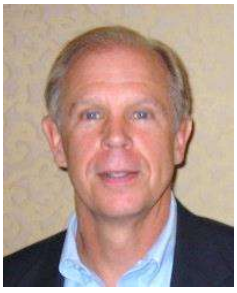
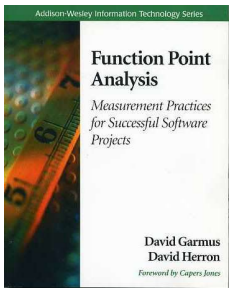
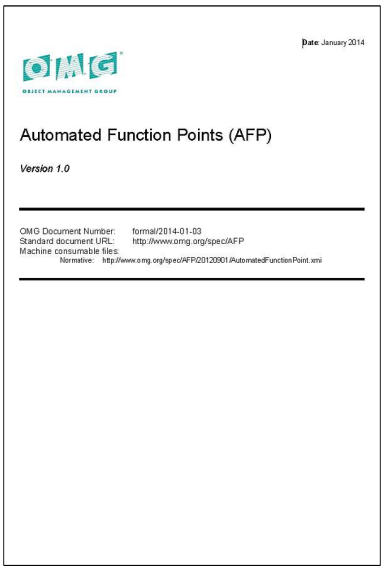
Automated Function Points

- **Mirrors IFPUG counting guidelines, but automatable**
- **Specification developed by international team led by David Herron of David Consulting Group**
- **Submitted thru OMG's fasttrack as ISO 19515, currently under review**







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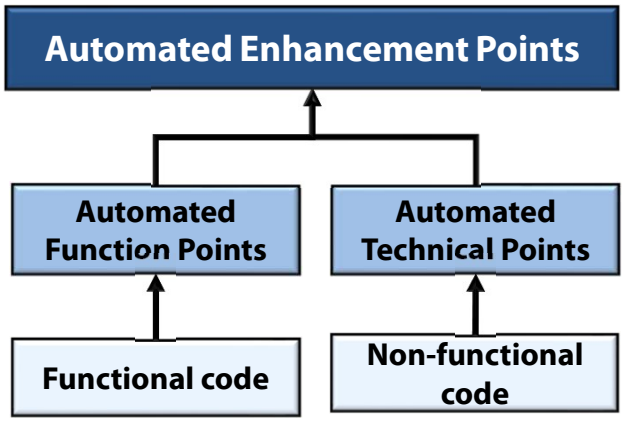
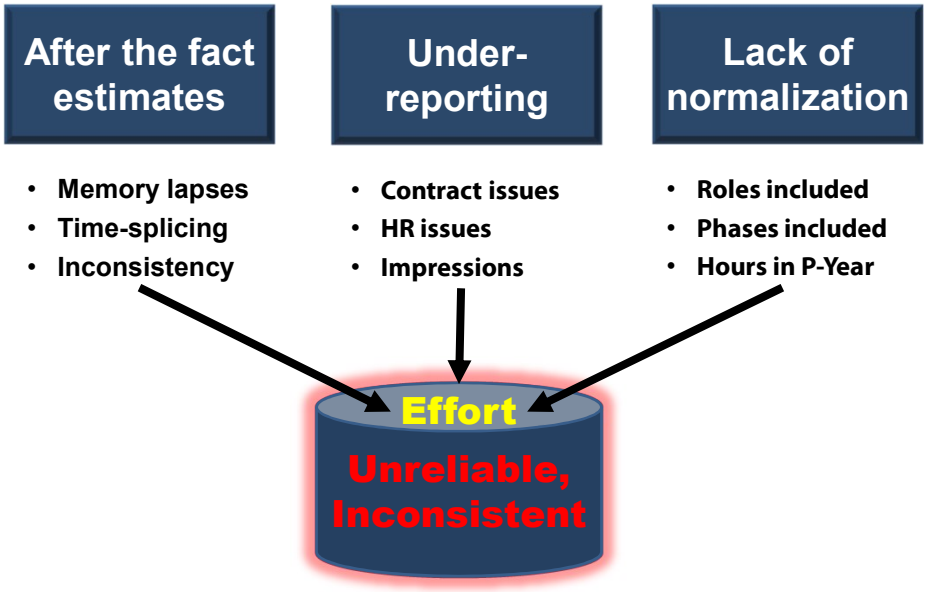
Automated Enhancement Points

- IT shops found that both automated and manual Function Points had severe limitations in productivity analysis → they did not include the size of non-functional code
- The Automated Enhancement Points specification measures both functional and non-functional code and integrates them into one size measure



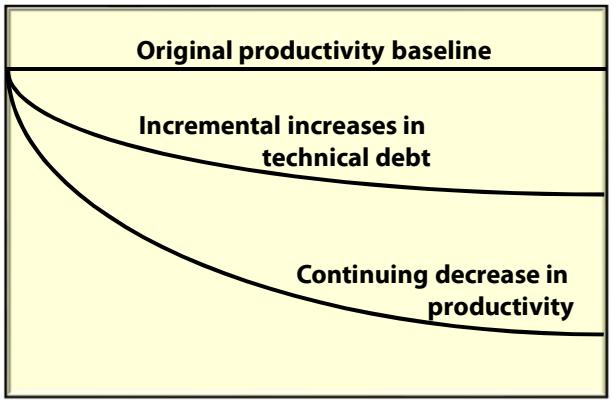
Effort — Weakest Measure



How Quality Affects Productivity

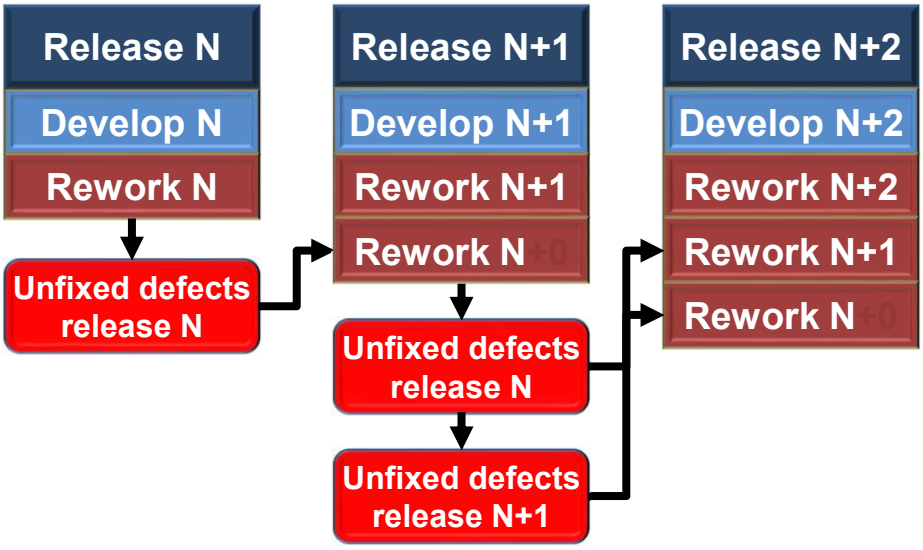
Assumption: Productivity is a stable number

Reality: Productivity is unstable, tending to decline



Unless you take action !!!

Carry-forward Rework



Example of Quality Impact

Project A (Plodders)

- 20 developers, 3 months
- $120k per FTE
- 3 FPs per staff month
- 180 FPs delivered
- $3,333/FP cost

Project B (Better, Faster, Cheaper)

- 20 developers, 3 months
- $120k per FTE
- 4 FPs per staff month
- 240 FPs delivered
- $2,500/FP cost

Project B is 25% more productive

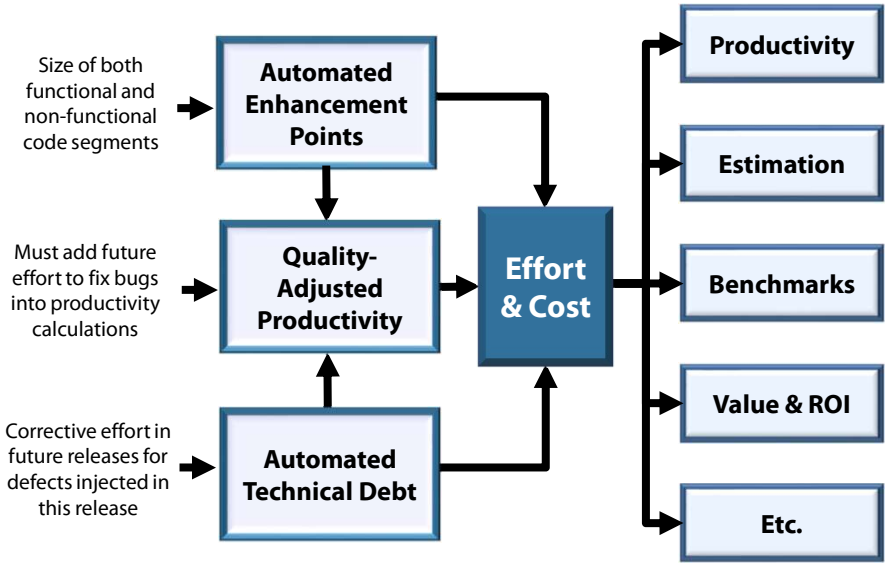
However !!!

- 2 critical violations per FP
- $500 per fix
- Cost for 360 fixes = $180k
- Total Cost to Own = $780k
- $4,333/FP of TCO

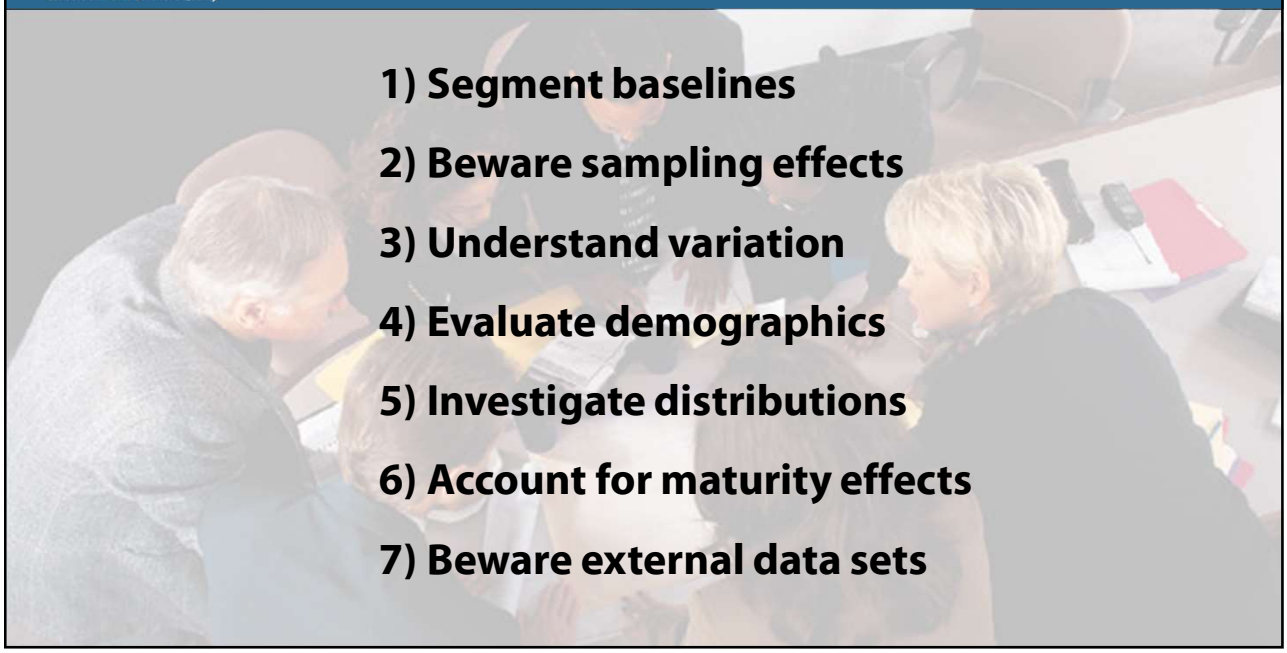
- 5 critical violations per FP
- $500 per fix
- Cost for 1200 fixes = $600k
- Total Cost to Own = $1,200k
- $5,000/FP of TCO

Project A is 13.4% more productive

Quality-Adjusted Productivity



Best Practices in Productivity Analysis



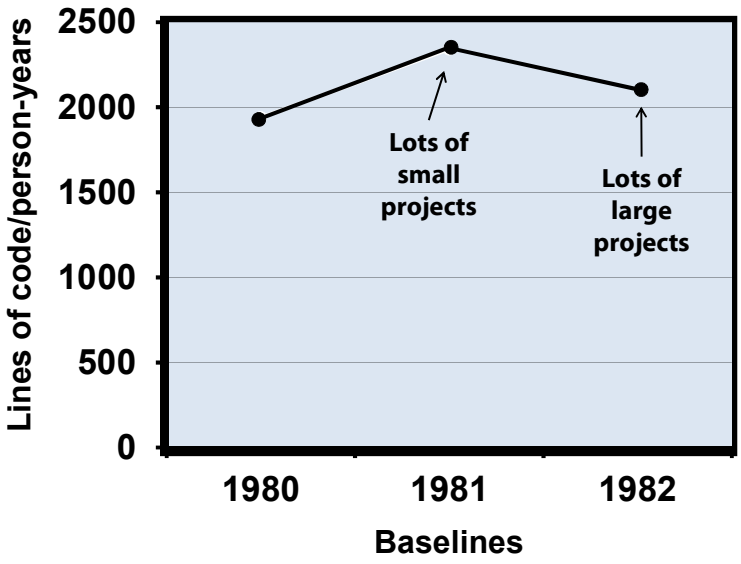
1) Segment baselines
2) Beware sampling effects
3) Understand variation
4) Evaluate demographics
5) Investigate distributions
6) Account for maturity effects
7) Beware external data sets

2 — Segment Baselines

Multiple baselines are usually the most valid

Year	Projects	Productivity
Total Corporate		
1981	28	2342
1980	21	1939
Telecommunications		
1981	14	1811
1980	12	1458
Engineering & Defense		
1981	8	2965
1980	6	2739
Business Applications		
1981	6	3054
1980	3	1813

3 — Beware Sampling Effects



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