

Productivity and Quality

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"Trade-Offs between Productivity and Quality in Selecting Software Development Practices."

IEEE Software, 20(5):78-85, September-October, 2003.

Study the role that development practices have on productivity and quality

Empirical Setting

- HP, Agilent software development projects
 - 2000-2001
- Web-based survey instrument; 29 respondents
- Productivity: Lines of new code per person-day
- Quality: customer-reported defects per month per millions of lines of code averaged over first twelve months after launch

Software Development Practices

- Extent of functional specifications and requirements completed before coding
- Extent of detailed design specifications completed before coding
- Formal design reviews (binary)
- Formal code reviews (binary)
- Subcycles (increments of functionality) (binary)
- Early prototype (%-age of final functionality complete when first prototype was released)
- Daily builds (binary)
- Integration/regression tests done on code check-in (binary)

Descriptive Statistics

- Median project
 - 70KLOC new of 170KLOC total
 - Nine people
 - 14 months
- Type
 - 59% of projects involved application software
 - 38% systems software
 - 28% embedded software
- Mean rates
 - Defects: 18.8 defects/month-MLOC
 - Productivity: 26LOC/person-day

Results

- Systems software $\uparrow \Rightarrow$ defects \uparrow
- Size $\uparrow \Rightarrow$ productivity \downarrow
- Size $\uparrow \Rightarrow$ defects \downarrow
- Functional specifications $\uparrow \Rightarrow$ productivity \uparrow
- Design specifications $\uparrow \Rightarrow$ defects \downarrow
- Design reviews $\uparrow \Rightarrow$ defects \downarrow
- Prototype $\uparrow \Rightarrow$ defects \downarrow ; productivity \uparrow
- Sub-cycles $\uparrow \Rightarrow$ defects \downarrow
- Testing $\uparrow \Rightarrow$ defects \downarrow

Suggestions

- Best fit for quality
 - Systems software, prototype, regression testing
- Best fit for productivity
 - Prototype, daily builds
- Establish primary objective at start
 - Then pick coherent set of methods
- Short-term tradeoff