Impact of AI on Software Development Productivity

A Comprehensive Study of 500 Development Teams

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Abstract

This study examines the impact of AI-assisted coding tools on software development productivity across 500 development teams over 18 months. Results show a 37% average increase in code output, with significant variations based on team size, programming language, and project type. Quality metrics improved by 22%, while time-to-deployment decreased by 31%.

Key Findings

1. Productivity Metrics:

- **Lines of code per developer per day: +37% (from 145 to 199)**
- **Pull requests merged per week: +28% (from 12.3 to 15.7)**
- **Bug fix resolution time: -24% (from 4.2 to 3.2 hours)**

2. Code Quality Indicators:

- **Code review pass rate: +22% (from 78% to 95%)**
- **Post-deployment bugs: -41% (from 8.3 to 4.9 per 1000 lines)**
- **Test coverage: +18% (from 72% to 85%)**

3. Team Dynamics:

- **Developer satisfaction score: 8.2/10 (up from 7.1/10)**
- **Onboarding time for new developers: -35%**
- **Cross-team collaboration increased by 45%**

4. Economic Impact:

- **Estimated cost savings: $45,000 per developer per year**
- **ROI on AI tools: 312% over 12-month period**
- **Time saved per developer: 8.5 hours per week**

Methodology: Mixed-methods approach combining quantitative analysis of development metrics with qualitative interviews. Data collected from January 2023 to June 2024 across 47 companies in 12 countries.