

A Comprehensive Approach to Supporting Blockchain Developers



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Introduction

Motivation: Blockchain technology has the potential to revolutionize industries by providing decentralized, secure, and transparent systems. However, Blockchain developers face unique challenges in securing decentralized environments and ensuring interoperability across diverse blockchain networks.

Research Goal: My research seeks to enhance the productivity of blockchain developers by investigating the software engineering (SE) methodologies they use, integrating AI tools to streamline development processes, and analyzing how social media impacts blockchain projects.

Research Questions

- **RQ1:** How can we adapt software engineering practices to better support blockchain development?
- **RQ2:** What is the role of AI in enhancing blockchain development processes and developer productivity?
- **RQ3:** How can we manage the impact of external factors, such as social media, on blockchain projects?
- **RQ4:** What frameworks and tools are needed to ensure the security, scalability, and effectiveness of blockchain applications?

Methodologies

- **Surveys:** Gathered insights from 56 blockchain developers on SE practices.
- **GitHub Data Analysis:** Analyzed popular crypto-related GitHub repositories to measure development activity post-social media signals.
- **Social Media Impact Study:** Examined 100 influential crypto-related tweets to assess their effect on GitHub development trends.
- **Generative AI Evaluation:** Conducted experiments using ChatGPT, Google Gemini, and ChainGPT to generate and validate smart contracts.

Current Result Analysis

Table 1: SE Methodologies Adopted by Blockchain developers

SE Practice	% of Participants	Number of Participants	Key Benefits
Agile	57%	31 out of 54	Iterative development, flexibility, adaptability
Secure Coding	14%	8 out of 54	Enhanced security, better handling of sensitive data
Quality Assurance	7%	4 out of 54	High-quality solutions, adherence to industry standards
Requirements Gathering	9%	5 out of 54	Thorough understanding of project requirements and constraints
Waterfall/Plan-Driven Approaches	7%	3 out of 54	Systematic handling of complex requirements, advance planning
CI/CD and TDD	15%	6 out of 54	Continuous integration and testing, consistent delivery

Table 2: GitHub Development Activity Metrics for Top Influencers

Characteristic	Dataset	Mean	Median	p-value
num_commits	before signal	8.66	2	-
	after signal	9.83	3	$p = 0.3295$
code_churn*	before signal	605.2	46	-
	after signal	722.7	64	$p = 0.0382$
files_changed	before signal	31.1	3	-
	after signal	29.4	5	$p = 0.2560$
num_issues	before signal	0.40	0	-
	after signal	0.71	0	$p = 0.4232$
dev_activity	before signal	33.34	7	-
	after signal	35.80	15	$p = 0.3336$
github_activity*	before signal	110.80	71	-
	after signal	151.37	116	$p = 0.0036$

* denotes statistically significant results (p-value < 0.05)

Table 3: Smart Contracts Effectiveness Testing Results

Type	Passed	Failed	Test %	p-value
Manual				
ChatGPT	63	27	70%	$p = 0.043^*$
ChainGPT	53	19	74%	$p = 0.1661$
Gemini	7	5	58%	$p = 0.0252^*$
Original	88	19	82%	—
Automated				
ChatGPT	240	60	80%	$p = 1$
ChainGPT	124	31	80%	$p = 1$
Original	232	58	80%	—

* denotes statistically significant results (p-value < 0.05)

- 59% of blockchain developers prefer using SE methodologies, emphasizing the importance of systematic design, code reuse, and maintainability. These practices are seen as crucial for building reliable, scalable, and secure blockchain applications.
- Crypto-related tweets from influencers notably increase GitHub activity (e.g., 965 lines of code modified after Musk's tweet), impacting cryptocurrency development.
- Generative AI tools, led by ChatGPT (70% of passed testcases), enhance smart contract development, but human oversight remains crucial for accuracy and security (15% of passed testcases).

Future Work

- Improving AI-generated code accuracy, security and integrating robust testing frameworks.
- Emphasize security-first approaches in SE methodologies to enhance the reliability of blockchain applications
- **Ultimate Goal:** Empower blockchain developers to overcome challenges and contribute to Blockchain Oriented Software Engineering.

Implications

- Tailored SE methodologies boost productivity and security in blockchain projects.
- Understanding social media's impact aids in better Risk Management.
- AI integration accelerates smart contract development.
- Addressing security and privacy challenges supports broader blockchain adoption.