

GitHub Copilot - Technology Report

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This report provides an introductory evaluation of GitHub Copilot to assess its potential application at CodeFlow Solutions. By analyzing multiple sources, it examines the technology's capabilities, benefits, drawbacks, and overall suitability for our development processes. The goal is to offer a well-rounded assessment that informs whether further investigation, such as a feasibility study, is warranted.

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Summary

This report analyzes GitHub Copilot's capabilities, examines its applications in the industry, and compares it to competing technologies. Our findings suggest that GitHub Copilot best aligns with the needs of our small development team and integrates into our workflow more easily. Field experiments show that companies such as Microsoft and Accenture have successfully integrated GitHub Copilot into their developers' workflows and have seen significant improvements. While there are concerns about overreliance and occasional AI-generated errors, GitHub Copilot provides a cost-effective solution to scaling development without increasing headcount. Based on these findings, we should further investigate GitHub Copilot adoption, incorporating A/B testing and developer feedback to evaluate its effectiveness.

Description

[GitHub Copilot](#) is an AI-driven coding assistant designed to help developers with coding tasks, improve productivity, and refine code quality. It is a multifunction tool that can act as a code reviewer, documentation assistant, and [rubber duck](#), as well as perform a multitude of other functions. This makes it a potential replacement for tools like debuggers or practices such as pair programming.

Key Features

- **AI Model Selection:** Users can switch between different AI models, including Anthropic's Claude 3.5 Sonnet, OpenAI o3, and GPT-4o
- **Agent Mode:** In agent mode, GitHub Copilot can gather information across multiple files, suggest and test edits, and then validate its changes for developer approval.
- **Edit Suggestions:** Predicts and adapts to a developer's workflow by offering context-based suggestions.
- **Code Review Assistance:** Developers can ask GitHub Copilot to review their code, uncover bugs, fix mistakes, and refine code quality.
- **Third-Party Integrations:** GitHub Copilot Chat integrates with various third-party tools and services through extensions.
- **Terminal Assistance:** Developers can receive help with specific commands and actions directly in the terminal.
- **Mobile App Support:** Copilot is available on mobile devices.

How It Works

GitHub Copilot is powered by generative AI models developed by GitHub, OpenAI, and Microsoft. It has been trained on natural language text and code from publicly available sources, including public GitHub repositories.

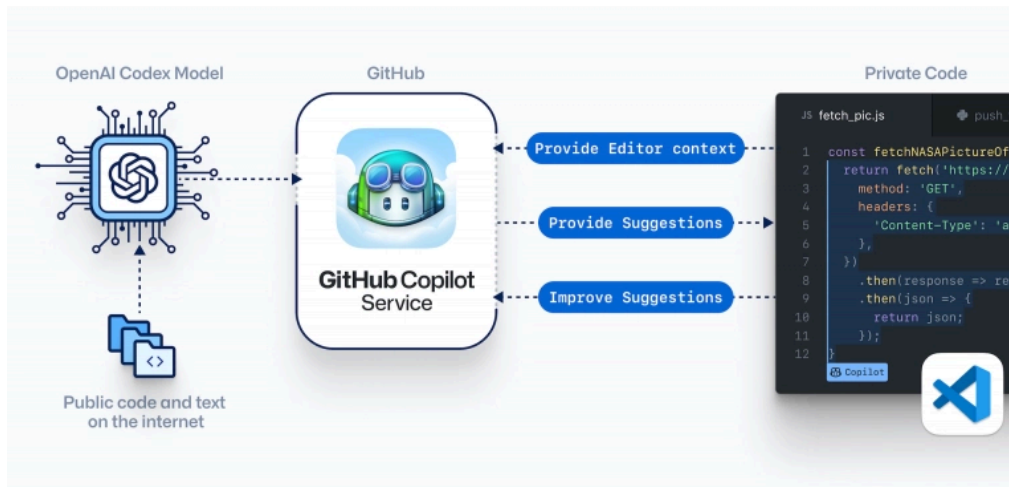


Figure 1: GitHub Copilot Operational Flow ([source](#))

Copilot integrates smoothly with various Integrated Development Environments (IDEs), such as Visual Studio Code, Xcode, and JetBrains, and supports all programming languages that appear in public repositories.

For detailed videos and images, visit the [GitHub Copilot Features Page](#).

Applications

Many of our customers' web applications follow similar architectural patterns and may contain the same elements; by utilizing GitHub Copilot, our engineers could reduce the amount of time spent on redundant code generation. GitHub Copilot can also be used to improve code quality and consistency by enforcing best practices, which often leads to less technical debt. It significantly reduces debugging time by identifying errors and suggesting fixes, which minimizes the need to search documentation or online resources. GitHub Copilot can also automatically generate function descriptions, README files, and other documentation, which saves time and reduces stress for developers.

Company Integrations

Many companies have integrated GitHub Copilot into their workflows to enhance developer efficiency. For example, [Mercedes-Benz](#) utilized it to improve collaboration and efficiency for their developers in the automotive industry, while [Duolingo](#) used it to enforce code consistency and improve developer speed in the mobile app industry. GitHub has highlighted its impact across different companies in their [case studies and blog posts](#).

Field Experiments

GitHub Copilot has been tested in both laboratory and field experiments. Although laboratory experiments are useful, we can gauge how the tool performs in the real world by focusing on field experiments.

- [A study was conducted by GitHub](#) to measure the impact on Accenture's development workflow after the use of GitHub Copilot. They found that developers delivered projects faster by spending less time debugging, which ultimately accelerated time to market. This is particularly relevant for our developers since reducing debugging time would allow our small team to focus on delivering high-quality features.
 - In a [recent field experiment from February 2025](#), it was found that developers from Microsoft, Accenture, and an anonymous Fortune 100 company saw a 26.08% increase in completed tasks after the use of GitHub Copilot. This suggests that adopting GitHub Copilot could lead to a significant boost in developer efficiency which helps our team complete more projects without increasing headcount.
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Competing Technologies

GitHub Copilot is one of several different tools created for software development environments, with Amazon Q Developer and ChatGPT being popular alternatives. While all three of these tools were released relatively close to each other, there are a multitude of differences.

[ChatGPT](#) is a general-purpose AI chatbot with coding capabilities but lacks direct IDE integration and customization. ChatGPT primarily functions as a language model, unlike GitHub Copilot and Amazon Q Developer, which are built specifically for software development. While it can assist with code generation and debugging, it does not support platform-specific integrations like GitHub or AWS.

[Amazon Q Developer](#) is an AI-powered assistant designed for software engineering, similar to GitHub Copilot, but with a stronger focus on AWS integration. It offers AWS-specific features

like cloud service automation and troubleshooting, making it more tailored to AWS environments than general-purpose coding assistants.

AI coding assistants do not replace any single tool but may reduce the need for [pair programming](#), extensive manual debugging, and hiring additional developers. They can also lessen reliance on code search tools, autocomplete extensions, and some aspects of traditional integrated debugging features.

Relative Advantages & Disadvantages

To evaluate between traditional pair programming and the code generation tools, the following criteria should be considered:

- **Code Quality & Accuracy:** Does the code correctly solve the problem? Is the code up to quality standards?
- **Security:** Does the code expose any security vulnerabilities?
- **Productivity:** Are developers more efficient?
- **Workflow Integration:** Does it work well within our development environment?
- **Cost:** Is it affordable?

GitHub Copilot	
Advantages	Disadvantages
<p>Code Quality & Accuracy: From this study, it was found that the quality of code written by GitHub Copilot was objectively better than code written without it. Code was more functional, easier to read, and more likely to be approved.</p> <p>Security: Has many policies and settings to ensure best practices are being followed.</p> <p>Productivity: From a 2022 study, it was found that developers experienced improved satisfaction and completed a software related task 55% faster. In general, developers perceive their productivity to be increased after the integration of GitHub Copilot.</p> <p>Workflow Integration:</p> <ul style="list-style-type: none"> • Since we use GitHub to house all of our projects, Copilot fits into our workflow smoothly. • Integrates into VS Code, our primary IDE. • Many customization options. <p>Cost: \$39/mo per user for their Enterprise plan. More details here.</p>	<p>Security: Note on Security</p> <p>Productivity: Note on Productivity</p>

Amazon Q Developer	
Advantages	Disadvantages
<p>Code Quality & Accuracy: An acceptance rate of up to 37% of suggestions from a BT Group report in 2024.</p> <p>Security: Includes a feature which will scan for vulnerabilities & autcreate tests, but cannot guarantee complete coverage.</p> <p>Productivity: Developers were quoted experiencing up to a 40% increase in productivity. However, this was seen when companies already utilized AWS.</p> <p>Workflow Integration:</p> <ul style="list-style-type: none"> • Integrates into VS Code, our primary IDE. • Many customization options. <p>Cost: \$19/mo per user, more details here.</p>	<p>Security: Note on Security</p> <p>Productivity: Note on Productivity</p> <p>Workflow Integration: Optimized for AWS environments, meaning our company, which uses many cloud providers, may face integration challenges.</p>

ChatGPT	
Advantages	Disadvantages
<p>Code Quality & Accuracy: Excellent at generating correct responses to simple coding tasks. (Zhan Shu et al., Ranim Khojah et al.)</p> <p>Security Enterprise plans exclude customer data from training, provide enterprise-grade controls, and enhance security with API-level protections.</p> <p>Productivity Several studies indicate an overall increase in developer productivity:</p> <ul style="list-style-type: none"> • Development time was reduced by up to 73% in some cases compared to manual coding in this study. • Countries with ChatGPT access saw about 645 more GitHub pushes per 100,000 people in this analysis. • 50% of participants said ChatGPT reduced repetitive tasks in this study 	<p>Code Quality & Accuracy: Unable to generate correct responses for more complex coding tasks. (Zhan Shu et al., Ranim Khojah et al.)</p> <p>Security</p> <ul style="list-style-type: none"> • Note on Security • This study found that ChatGPT-generated code was not always optimized for security, with vulnerabilities related to user input handling and data queries. <p>Productivity Note on Productivity</p> <p>Cost: No specific price is given for the enterprise plan. Only has custom pricing based on the company.</p> <p>Workflow Integration:</p> <ul style="list-style-type: none"> • ChatGPT does not natively integrate with IDEs or provide specialized support for tools like GitHub or AWS. • Does not offer many customization options

Note on Security

Since suggestions are only as good as the data that they are trained on, there will always be security risks because data models cannot keep up with the [latest attack techniques](#).

Note on Productivity

An overreliance on AI can occur in developers, as spoken of in this article subsection, “Mitigating the potential risks of AI in software development” from [IBM](#). Overreliance could

lead to deteriorating critical thinking and problem solving skills. Furthermore, there is a balance between the speed at which a developer can write code and the speed at which a developer can review code generated by an AI, where the latter seems to be more efficient.

Summary

GitHub Copilot has strong evidence of increased code quality and productivity while still being secure. Amazon Q Developer offers similar advantages to GitHub Copilot and has lower pricing, but it is primarily useful for developers in AWS environments. ChatGPT has similar benefits and drawbacks to its competitors but lacks IDE integration and specialized workflow support. Although each tool has inherent drawbacks, GitHub Copilot integrates with our existing GitHub-based workflow, unlike Q Developer and ChatGPT.

Conclusion

Based on our research, GitHub Copilot stands out as the most secure and effective AI assistant for our development environment, integrating with our existing GitHub workflow. In contrast, Amazon Q Developer is tailored for AWS, while ChatGPT lacks direct integration capabilities and is already part of Copilot's underlying technology. Given our reliance on GitHub and the need for cloud flexibility, Copilot's broader compatibility makes it the best fit for our needs.

The cost of GitHub Copilot Enterprise is **\$57,564 annually** for our 123 employees. This cost is significantly lower than hiring additional employees to improve company-wide productivity. Additionally, the Enterprise plan provides crucial security and administrative controls. These controls ensure that Copilot is used securely across our teams, reducing risks associated with AI-generated code and maintaining a high standard of development integrity.

To determine whether the benefits are readily recognizable, A/B testing could be conducted to measure productivity gains and development speed improvements. Additionally, collecting qualitative feedback from our developers on workflow integration could provide tailored insights into their experience.

Despite concerns about overreliance and potential inaccuracies, research shows that GitHub Copilot delivers significant productivity gains at a manageable cost. With its integration capabilities and security features, it stands out as the best choice for our company. Based on these findings, exploring its adoption within our development teams is worthwhile.

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