

Finding flow

Generative AI's impact on developer productivity

By Richard Seroter
Chief Evangelist, Google Cloud



Table of contents

01

Inside this guide

02

Introduction

03

Is developer productivity “stuck”?

04

How to measure developer productivity

05

Gen AI is making a big difference to productivity

06

Google Cloud’s gen AI tools for developers

07

The time is now for gen AI



01

Inside this guide

How do you measure developer productivity? Should you measure it? And how can generative AI enhance it? This guide dives into developer productivity, and explores how gen AI can help teams to keep getting better at what they do — while working more productively and collaboratively than ever before.



02

Introduction

It's time to get back on offense. Over the past few years, companies honed their defensive game — with turbulent market conditions forcing them to focus on retaining customers and protecting the bottom line. Today's customers want more. Their expectations have evolved, so much so that 86% would leave a brand they were once loyal to after two or three bad customer service experiences.¹

To get out in front and deliver compelling, helpful, and rich digital experiences, smart companies are investing heavily in technology. They are engaging with customers in new ways, expanding into new markets, and growing their product portfolio. For builders, it's an exciting time.

1. Emplifi, 2022, 86 Percent of Consumers Will Leave a Brand They Trusted After Only Two Poor Customer Experiences.



Yet it's also a challenging time. Think about it. Do you have less on your to-do list today than you did a year ago? Does your manager say "no rush" when handing out assignments? Are you working with an unlimited technology budget? If you answer "yes" then, congratulations, you have an amazing job. For most of us, though, there's more work, tighter deadlines, and fewer resources. It's hard to balance all this, while still experiencing the satisfaction of a job well done.



No wonder the topic of "productivity" has resurfaced in recent months. Specifically, developer productivity. Some experts are asking, "Can we measure developer productivity?" Others are asking, "Should we?" In this guide, we reframe the question to look at what really matters when it comes to a developer team's performance, and explore the role that gen AI can play in unlocking new potential. After all, one of the biggest questions we're hearing today is, "Could gen AI be the difference-maker, or is it simply one tool of many at your disposal?"



03

Is developer productivity...



“stuck”?

Like any aspect of work or life, a key goal in software development should be to keep on getting better at what you do. Instead of getting bogged down in defining unrealistic goals or targets, teams should focus on iterative improvement. This will deliver the most value in the long term.

Yet some data suggests that teams are currently stalled. The 2023 State of Continuous Delivery Report shows that the number of developers with lead times of less than a day — an indicator of a “top performer” — sits stubbornly at 15%, with little change over the last two years. Use of productivity-enhancing CI/CD tools only increased two percentage points year over year, to just 49% today.²

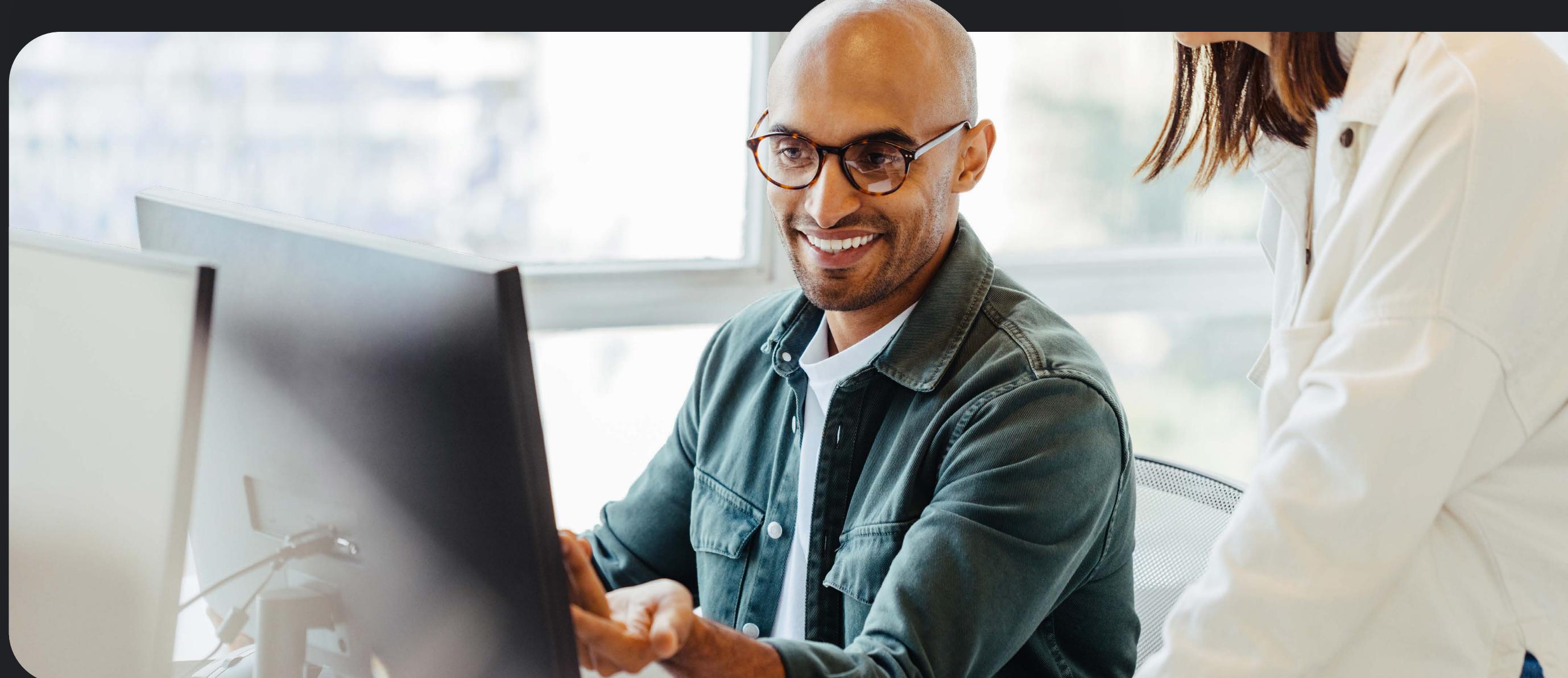
To be sure, it’s hard to create the space for excellence in software development. Across teams, a lot gets in the way of staying in a “flow” state and doing consistently great work. Barriers for tech workers range from interruptions and insufficient resources, to a lack of clear goals and poor team dynamics.³ Development teams also face human challenges like long feedback cycles, slow decision making, and lack of experience, among many other friction points.⁴

2. DevOps.com, 2023, [CDF Report Reveals Lack of DevOps Maturity](#).

3. Emerald Insight, 2023, [Exploring barriers that prevent employees from experiencing flow in the software industry](#).

4. IEEE Explore, 2022, [The Human Side of Software Engineering Teams: An Investigation of Contemporary Challenges](#).

Another challenge? The technology itself has become more powerful, yet more complicated. There's been an explosion of viable software solutions in everything from web and testing frameworks, to programming languages, databases, messaging engines, logging, compute runtimes, and more. Today's developer is expected to be proficient in a massive toolchain, all while delivering more resilient and secure software, faster. Between building new systems, understanding existing ones, and keeping them all online and up-to-date, no wonder productivity can feel "stuck".



What can be done to make this better? First, you need to know where your team stands today. Are your developers given the space and support to keep improving, or are they stuck in a rut? Let's take a look at how you can get a baseline picture.

04

How to measure developer productivity

At face value, measuring the productivity of your developer team seems simple enough. Those without much experience in software development typically default to effort and output metrics.⁶ This can include things like time spent coding, or how many lines of code or story points are completed.

Yet these metrics paint a wildly incomplete picture. Delivering quality software takes so much more and involves cross-functional teams.

Developers collaborate on business requirements and logic, develop API specs, study existing code, hunt for “edge cases”, test code resilience, research and experiment with software, and much more.⁷ It’s a team sport, and it’s why you should be measuring outcome and impact metrics instead.

This is what smart leaders are doing. They measure what matters at the team level through the lens of business outcomes, and then use the insights to unleash every developer’s productivity.

Yet what, exactly, do these metrics look like? Two-thirds of leaders say that finding the right metrics is a big roadblock when measuring team performance.⁸ And there’s no single answer. The metrics your business needs will depend on why you’re on this journey. Do you want data to inform staffing decisions? To optimize the developer experience? To enhance processes and eliminate weak spots in those processes?

Do you want data to inform staffing decisions?

To optimize the developer experience?

To enhance processes and eliminate weak spots?

6. The Pragmatic Engineers, 2023, [Measuring developer productivity? A response to McKinsey](#).

7. Forrester, 2023, [Should You Care About Developer Productivity?](#).

8. LeadDev, 2023, [The LeadDev Engineering Team Performance Report 2023](#).



Using DORA and SPACE help measure performance

Two solid frameworks exist for measuring team-based outcomes: [DORA](#) and [SPACE](#). These academically rigorous frameworks can help steer you away from measuring individual performance metrics like effort and output, and instead broaden the lens to look at how your whole team performs. In doing so, they help you identify friction points and build an ideal culture of continuous improvement.

For nearly a decade, the DORA team at Google has been investigating what a high-performing, technology-driven organization looks like. The elite possess a performance-oriented culture, fair work distribution, strong job security, easy knowledge sharing, and a singular focus on the user.



Any delays or disruptions to searching for the best travel deals not only potentially impacts sales but also leaves travelers with less options.

To improve platform stability, we partnered with Google Cloud to find, implement, and validate a solution based on DORA research.

Not only that, but Google Cloud helped our teams apply DORA capabilities — which led to improved organizational performance.”

Michael Spoonauer, Senior Software Engineer, Priceline

In a similar vein, the SPACE framework encompasses satisfaction and well-being, performance, activity, communication and collaboration, and efficiency and flow. Encouraging a wide range of metrics to capture the different dimensions of productivity, SPACE reiterates that productivity cannot be reduced to a single metric and that team-based outcome metrics are what matter most.

Just remember that, sometimes, the developer who contributes the fewest lines of code is actually your most valuable employee.⁹ Someone who builds tools and mentors others won't visibly contribute to output metrics, but has a 10x impact on the team. That's why measuring productivity should be about assessing a range of team metrics, not individual performance.



Getting started with a baseline snapshot

With [DORA](#) and [SPACE](#), there are many metrics to consider — from things like employee satisfaction and burnout, to the ability to stay in flow. Yet diving straight in with these tools can feel a little overwhelming. Here's a quick exercise to help you get started and give you a sense of where you stand today.

9. Dan North & Associates Ltd, 2023, [The Worst Programmer I Know](#).



What's your productivity profile?

Answer these 5 questions to assess your organization's approach to developer productivity and identify next steps to unleash your full potential.

Choose the answer that best reflects the average across your entire organization.

Do your developers feel they are creating value and working effectively?
Are they mostly satisfied with their job?

Yes — Sometimes — No

Do your teams deliver innovative solutions, adapt to change, and work efficiently?

Yes — Sometimes — No

Do your teams invest in learning about new tools and processes?
Are they using AI platforms to improve productivity?

Yes — Sometimes — No

Do your teams collaborate to share and scale ideas for technology and process improvements?

Yes — Sometimes — No

Do your teams feel energized by their work and have sufficient time to stay focused?

Yes — Sometimes — No

Find out your results





How did you answer?

Mostly ‘yes’

You’re in full flow.

Your organization thrives when you’re fearlessly pursuing innovation. Your developer teams are in full flow; driven, agile, and working together seamlessly towards a common goal. Keep forging ahead, but have a plan for how to stay on course and intact if you don’t get there right away.

A bit of both

You’re finding flow.

Your organization balances its time between progress and protection. When a new opportunity crosses your path, you prefer to ensure your teams are connected and coordinated before launching an effective response. Maintain the accuracy of your methods, but not at the expense of agility.

Mostly ‘no’

You’re thinking it through.

Your organization is generally cautious when it comes to change. Rather than following the flock, you’re more comfortable observing from a distance and playing it safe. But your processes may have you feeling ‘stuck’ on productivity, or obscuring opportunities to advance.



Taking action with the results

Once you start measuring productivity and performance metrics for your team, you're empowered with data to help make decisions across different levels of the organization. Focus on rolling up the metrics that truly matter. For example, a software team leader can use individual and team-based performance metrics to make operational and cultural changes to the team, while a C-level leader can use broader business data to help them decide which investments have the most strategic impact.

Across it all, you can use productivity data to identify, amplify, and correct problems in the software delivery process and ultimately gain a competitive advantage. And the good news? You can put AI-powered tools to work across the software development lifecycle to help up-level productivity and improve performance.

05

Gen AI is making a big difference to productivity

History is full of examples of quantum leaps in productivity and progress. From the printing press and the steam engine, to assembly lines and electronic computers, so much has changed. And so much continues to change. In the last fifteen years alone, we've seen smartphones, cloud computing, and containerization have a huge impact on how we work.

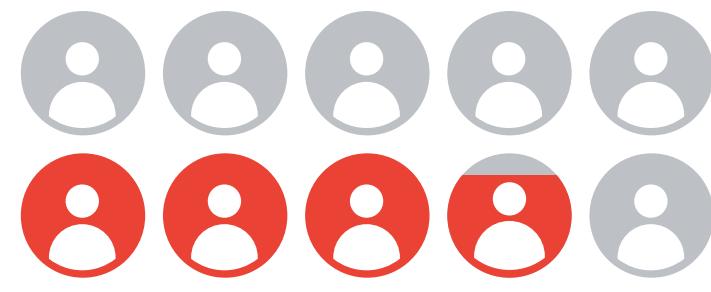
AI and, more specifically, gen AI mark the next quantum leap. Already, organizations are embracing gen AI's potential to transform productivity and business performance, and its impact is being felt across many areas of work — including software development. Here are just a few examples of how gen AI is transforming the developer experience.





Shorter onboarding time for new technologies

With AI, the onboarding process for new technologies will become more personalized and guided. And learning will transform, as gen AI summarizes complex topics in ways we can better understand and offers tailored learning journeys suited to our starting point.



39%

of organizations say employee expertise skills are a challenge to implementing gen AI¹⁰

Reduce waiting time for “expert” assistance

One of the biggest productivity killers for software developers? All the waiting around. That is, waiting for people to become available to review architecture or test code. Or waiting for clarification on requirements. No wonder the two biggest bottlenecks reported by engineering teams today are a lack of clarity and prioritization, and insufficient headcount.¹¹

Gen AI can help reduce these bottlenecks and waiting periods. Think of it like an always-on expert assistant that accelerates code reviews by better explaining or refactoring code, suggesting changes, performing security scans, or recommending the right reviewers.

50%

higher software delivery performance in teams with faster code reviews¹²

“

Gemini in BigQuery has helped our data team at L'Oréal accelerate our transformation by making it easier for us to explore, understand, and use our data. With Gemini, we can quickly query our data to get the insights we need to make better decisions for our business. We are excited to continue working with Gemini to further our transformation and achieve our business goals.”

Antoine Castex, Data Platform Architect,
L'Oréal



10. Enterprise Strategy Group, 2023, [Beyond the GenAI Hype: Real-world Investments, Use Cases, and Concerns](#).

11. LeadDev, 2023, [The LeadDev Engineering Team Performance Report 2023](#).

12. Google Cloud, 2023, [State of DevOps Report](#).

Limit context switching and maintain “flow”

Developers today can spend as much time searching for solutions as they do writing code. A well-trained and integrated gen AI solution can provide answers in place, serving up information faster than a search for solutions across different online platforms could. It all serves to enhance the developer experience. In fact, 94% of developers that use gen AI-powered tools either somewhat or strongly agree it helps them stay in “flow”.¹³

94%

of developers that use gen AI tools say they help them stay in “flow”

“

Gemini in BigQuery’s contextual awareness extends our investment in Google Cloud’s integrated data platform. We see this as an architectural advantage, eliminating the need to train, host, and manage custom models. This allows us to focus on the business questions we are trying to answer, rather than the mechanics of writing SQL queries, making our analytics teams that much more productive.”

VP, Data Engineering Aritzia

50%

faster test case creation with AI



Improve quality and security earlier in the development cycle

The cheapest time to fix bugs and product issues is during development. Once you’ve shipped, it’s usually harder and more expensive. A productive AI solution will offer and verify secure coding practices upfront, while continuously checking for any quality issues. According to McKinsey, gen AI can automate testing processes and simulate edge cases, allowing teams to develop more-resilient software prior to release.¹⁴ Using AI for test creation can lead to a 50% reduction in test case creation time.¹⁵

“

One important highlight of Gemini is their approach to safety and confidential information — it lets us keep our code outside of the model training or downstream analysis similar assistants may perform, and that’s really important to us.”

Kai Du, Director of Engineering, Turing

13. McKinsey, 2023, [Unleashing developer productivity with generative AI](#).

14. McKinsey, 2023, [Technology’s generational moment with generative AI: A CIO and CTO guide](#).

15. Cigniti, 2023, [Minimizing Business Risks Through Right Quality Software in the Age of AI](#).



Accelerate code development

While output is certainly not the only metric that matters when it comes to developer productivity, the ability to produce lines of code faster can help free up time to focus on outcome-oriented results. By automating a lot of the grunt work, gen AI is proving a game-changer in this area — helping software engineers develop code 35 to 45% faster and refactor it 20 to 30% faster.¹⁶

35-45% faster

for software engineers to develop code with gen AI

“

Gemini is one of the top coding assistants we've tried. Our early experience with Gemini has been very promising with productivity gains around 33%. We're trying out newer features right now like indexing and debugging, which we expect to push productivity even higher.”

Kai Du, Director of Engineering, Turing

87%

of developers that use gen AI can focus on satisfying and meaningful work

“

At Wayfair, developer productivity is top of mind for us. We are excited to incorporate Gemini in our efforts to have developers across Wayfair build applications incredibly fast. With Gemini, we can increase developer productivity and joy at the same time.”

Mark Quigley, Director of Engineering Enablement, Wayfair

Unleash team creativity and spark experimentation

High-performing teams learn quickly through experiments, and transform that learning into better user experiences. When gen AI becomes a brainstorming partner while also removing toil from day-to-day work, your team will find themselves spending more time exploring and shipping. In fact, with gen AI, 87% of developers are able to focus on satisfying and meaningful work, compared to just 50% when developers don't use gen AI.¹⁷

16. McKinsey, 2023, [Technology's generational moment with generative AI: A CIO and CTO guide](#).

17. McKinsey, 2023, [Unleashing developer productivity with generative AI](#).



06

Google Cloud's generative AI tools for developers

Individual developers want to reduce learning curves, minimize context switching, design better solutions upfront, and collaborate with others more easily. Leaders want to ensure their teams can focus on meaningful work, while building an inclusive, user-centric culture that fosters continuous learning.

Google Cloud's AI-based tools satisfy both sets of goals, while making AI assistance as ubiquitous as syntax highlighting in your integrated development environment (IDE).

Gemini Code Assist enables AI-assisted application development to help your team get more done, faster. It's like a well-connected specialist that works the same hours as you, always right

beside you, while also unlocking a more collaborative and open working environment.

From coding assistance to troubleshooting, Gemini Code Assist provides a helping hand across the entire software development lifecycle. And, while it's designed to improve productivity, it is also enterprise-grade — with security, compliance, cost controls, and legal protections at the center.

Gemini Code Assist drives productivity in four key ways.



01

Produce trusted code faster

With integrations into popular IDEs like Visual Studio Code and JetBrains products like IntelliJ, Gemini Code Assist can complete lines of code, generate entire classes and functions, and create unit tests. It is specifically trained with expert content so you can get quality results that represent good practices for modern applications.

02

Quickly understand existing code and make improvements

Few developers work solely on new code. Most inherit existing code, configuration files, SQL scripts, and architectures. It's nearly impossible to predict the time it will take to understand existing code, and this exercise is a source of uneven productivity. Gemini Code Assist offers a powerful "explain this code" feature that uses gen AI to unravel legacy code, Dockerfiles, YAML, and more — saving developers invaluable time.

03

Stay in “flow” with an integrated chat experience

A chat experience that answers questions with limited distraction helps developers maintain a “flow” state. The chat experience isn’t just integrated into IDEs — it’s ubiquitous in the Cloud Console itself. From either place, developers can have rich, multi-turn conversations with an expert agent that can answer questions about general technology (“What are Java streams and how do I use them?”) or Google Cloud services (“How do I decide between GKE and Cloud Run to host my web app?”). With the chat experience in play, developers can avoid jumping around the Internet seeking answers.

04

Resolve issues faster by summarizing operational data

Gemini Code Assist isn’t just for application developers. It helps operators too. Gemini in Cloud Logging offers natural language log queries, and an “explain this” button that takes logs and generates a more understandable summary of the content to help with troubleshooting. SREs and DevOps engineers have access to a Console-integrated chat that’s tuned to provide expert insights to assist with root cause analysis and issue remediation.



07

The time is now for generative AI

Across the whole software development lifecycle, Google offers a unique set of services that leverage gen AI to help your team deliver better quality software, faster. From Gemini for Google Workspace's help in writing design docs, to Gemini for Google Cloud's help in writing and operating the application itself, there are many ways to achieve meaningful productivity improvements across your development team.

If you're looking to regain or maintain your competitive advantage while using software to differentiate, it's time to revisit what gets in the way of your team's productivity and remove any blockers that keep them from doing their best work.

Remember, no one can sell you a product that "fixes" productivity. As we've seen together in this paper, software delivery requires both cultural and technological investments. But, as we've also seen in this paper, gen AI is an incredibly powerful tool to help your team keep getting better at what they do.

It really could be the difference-maker that transforms developer productivity in your organization.



Ready to get started with generative AI?



We're here to help you improve all aspects of your organizational performance.

Try [Gemini Code Assist](#) and see how an expert AI assistant enhances team productivity.