Sizing programming language communities

How many developers are using each leading programming language in Q1 2024?

/DATA

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About SlashData

SlashData is the link between the developers and the organisations that serve them. We bring you all the data to understand who developers are, what they need and expect from your product and how you can engage with them.
We reach out to developers to hear their views across 11 development areas: Web apps, Mobile apps, Desktop apps, Cloud / Backend services, AR/VR, Games, IoT, ML/AI & Data Science, Embedded software, Apps/extensions for 3rd-party platforms, DevOps and more!
Understand developers. Inspire the future of technology.

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About Developer Nation

Developer Nation is a global developer community, committed to creating a space where all software creators can set the right foundations for their career, learn how they stack up against emerging software development trends, get tips and discover opportunities for professional growth as well as plan wisely their next moves.
Our vision is to empower developers to shape the future!
www.developernation.net
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The analyst of the developer economy | formerly known as VisionMobile

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THANK YOU

We'd like to thank everyone who helped us reach 13,000+ respondents, and create this report. Our Media Partners - Microsoft, VMware, web3dev, WeMakeDevs, Zup, 诚需猿 - Shanghai Yigu Technology Co. Ltd, Zup, and so many others.

PARTNERS

Our Developer Committee supported our efforts once more, to create the most up-to-date and detailed survey. Special thanks to our members: Camille, Christopher, Deborah, Dominic, Dylan, Ioannis, Ivan, Javier, Julia, Ken, Mateo, Oswaldo, Rajasekar and Thien for your help with reviewing survey content, translations, and suggesting prizes.

Our survey was translated into nine different languages - Simplified Chinese, Traditional Chinese, Korean, French, Japanese, Portuguese, Russian, Spanish, and Vietnamese. Thanks to our linguistics partner Palex Group who supported us to create an inclusive survey. In addition, our prize payments partner, Chimoney.

ABOUT THE REPORT SERIES

SlashData's Developer Nation survey is the leading research programme on mobile, desktop, industrial IoT, consumer electronics, embedded, third-party app ecosystems, cloud, web, game, AR/VR and machine learning developers, as well as data scientists, tracking developers' experiences across platforms, technologies, programming languages, app and API categories, revenue models, segments, and regions.

The 26th edition of the Developer Nation survey reached more than 10,000 respondents from 135 countries around the world. This research report delves into key developer trends for Q1 2024 and beyond.

In this report, we provide estimates of the number of software developers using various important programming languages, across the globe and all kinds of programmers. We also explore the effect that coding experience has on the adoption of each language.

We hope you will enjoy this report and find the insights useful! If you have any questions or comments, or are looking for additional data, you can get in touch with Stathis Georgakopoulos, Product Marketing Manager for SlashData at stathis@slashdata.co.
You can download and access this report and more free resources at slashdata.co/free-resources

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KEY INSIGHTS

- JavaScript continues to reign as the largest language community (25.2M) and continues to grow in line with global developer population growth. →
- Python has overtaken Java as the second most popular language, driven by the interest around ML/AI increasing the number of developers using Python. →
- Rust (4M) is the fastest-growing language, increasing by 30% over the last year alone. →
- Developers in the middle of their career (three to ten years of experience) are using the most languages on average (3.7), compared to those with less (3.1) or more (3.4) experience. →
- JavaScript sees the lowest adoption among early-career developers (less than three years of experience) with 52% using it, but it is still the most popular language for this group. →
- More experienced developers are more likely to use C# and PHP. →

Sizing programming language communities

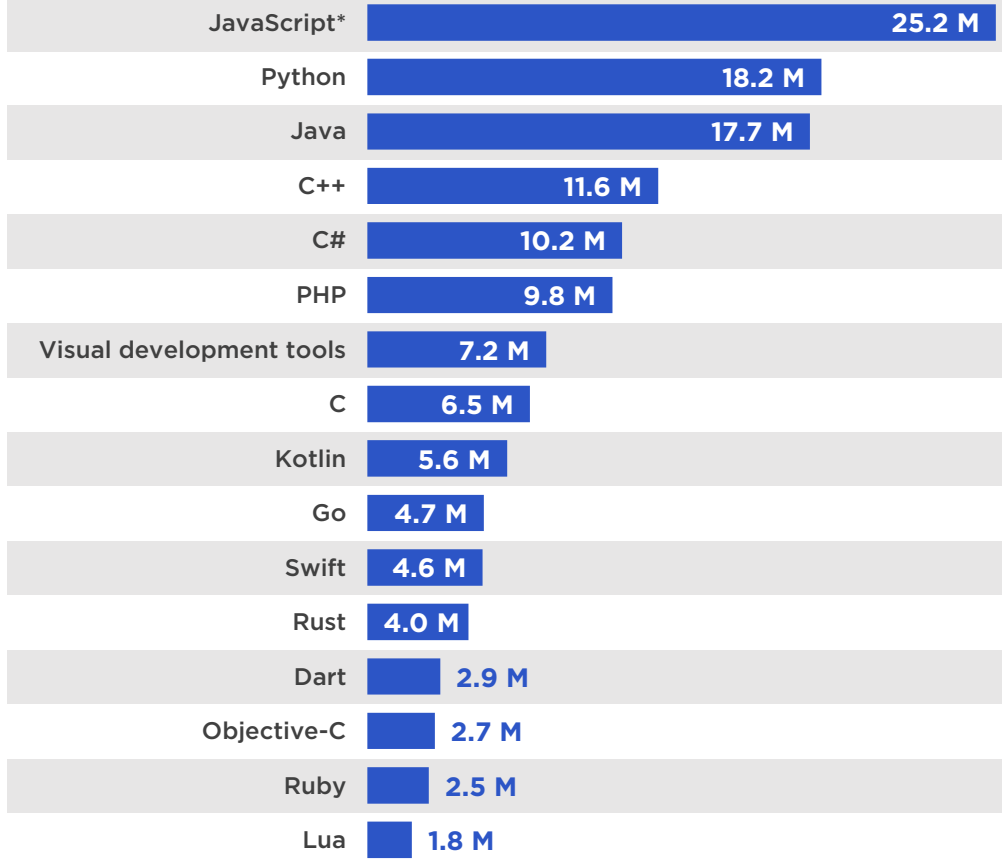
The choice of programming language can greatly influence the roles, projects, and general opportunities that a developer has. Languages are a classic subject of debate and represent the foundation of some of the strongest developer communities. Tracking language use is not just for developers, however; languages and their communities' matter to tool makers too, as they want to ensure they provide the most useful SDKs.

It can be challenging to accurately assess how widely a programming language is used. The indices available from sources like Tiobe, Redmonk, GitHub's Octoverse report, and Stack Overflow's annual developer survey are great, but offer mostly relative comparisons between languages, providing no sense of the absolute size of each community.

The estimates we present here look at software developers using each programming language; across the globe and all kinds of programmers. They are based on two pieces of data. First is our independent estimate of the global number of software developers, which we published for the first time in 2017. We estimate that, as of Q1 2024, there are 43 million active software developers in the world. Second is our large-scale, low-bias surveys, which reach tens of thousands of developers every six months. In these surveys, we have consistently asked developers about their use of programming languages across 13 areas of development. This gives us a rich and reliable source of information about who uses each language and in which context.

Sizing programming language communities

Size of programming language communities in Q1 2024



	Most popular in	Least popular in
JavaScript*	Web	AR/VR
Python	Machine Learning/AI	Mobile
Java	Backend Services	AR/VR
C++	Embedded	Web
C#	Desktop	Machine learning/AI
PHP	Web	Machine learning/AI
Visual development tools	AR/VR	Backend services
C	Embedded	Web
Kotlin	Mobile	Web
Go	Backend Services	Mobile
Swift	Mobile	Backend services
Rust	Embedded	Mobile
Dart	Mobile	Web
Objective-C	On-device (consumer electronics)	Desktop
Ruby	On-device (consumer electronics)	Web
Lua	On-device (consumer electronics)	Mobile

*including TypeScript/CoffeeScript

JavaScript remains the largest language community

JavaScript continues to take the top spot for programming languages, with approximately 25.2M active developers worldwide. JavaScript's dominant position is unlikely to change anytime soon, with its developer population increasing by 4M developers over the last 12 months, with a growth rate in line with the global developer population growth. However, JavaScript sees its lowest adoption rate among early-career developers (52%), those with less than three years of experience, compared to more than 62% of developers with three or more years of experience.

This suggests that its growth is a result of more experienced developers adding the language to their roster, rather than being primarily driven by the influx of less experienced developers. Nonetheless, early-career developers are more likely to use JavaScript than any other language community, meaning that even if JavaScript's meteoric rise slows, it is unlikely to be dethroned anytime soon.

The JavaScript community grew by 4M users in the last 12 months

JavaScript's large community is driven by the widespread use of the language across all types of development projects, with at least 25% of developers in every project type using it. Even in development areas not commonly associated with the language, such as on-device coding for IoT projects, JavaScript still sees considerable adoption.

Sizing programming language communities

Python and Java continue to battle it out for the second spot, with Python receiving the silver medal in Q1 2024 with 18.2M developers compared to Java's 17.7M. This comes about after Python added more than 2.1M net new developers to its community over the last 12 months, compared to Java which only increased by 1.2M developers. Python's growth can be, in part, attributed to the current fervour around machine learning and AI, for which Python has many well-established packages with supportive communities.

Java has seen an increase in its usage among developers involved in backend services and web application development, but has maintained the same proportion of mobile developers and a decreasing proportion of desktop application developers. This altogether means that while Java is still one of the most popular languages, Python has overtaken it over the last year.

After Java, we see a gap of roughly 6M to the next largest community, C++ with 11.4 M developers, closely trailed by C# (10.2M) and PHP (9.8M). At the other end of the spectrum, of the remaining leading languages Objective-C (2.7M), Ruby (2.5M), and Lua (1.8M) are the smallest language communities.

Contact us to explore all segmentation options.

Rust continues its fast growth

As highlighted previously, JavaScript's top position is unlikely to be challenged in the near future, especially as the growth rate of JavaScript (17%) over the last year gives it a substantial lead over Python (13%) and Java (7%). Of the top three, only JavaScript is growing in line with the overall developer population (17% over the last 12 months).

Among the smaller language communities, we see much more dynamic changes in their populations. Rust is the stand-out community for its growth, almost doubling its number of users over the past two years (from 2M in Q1 2022 to 4M in Q1 2024) and by 33% in the last 12 months alone.

Rust has nearly doubled in size over the past two years, growing from 2M to 4M users.

Rust has developed a passionate community that advocates for it as a memory-safe language which can provide great performance, but cybersecurity concerns may lead to an even greater increase. The USA and its international partners have made the case in the last six months for adopting memory-safe languages[1]. While Rust is not unique in this capability, its performance benefits alongside being memory-safe are likely to lead to further growth in this developer community.

[1] NSA Press Release: U.S. and International Partners Issue Recommendations to Secure Software Products Through Memory Safety

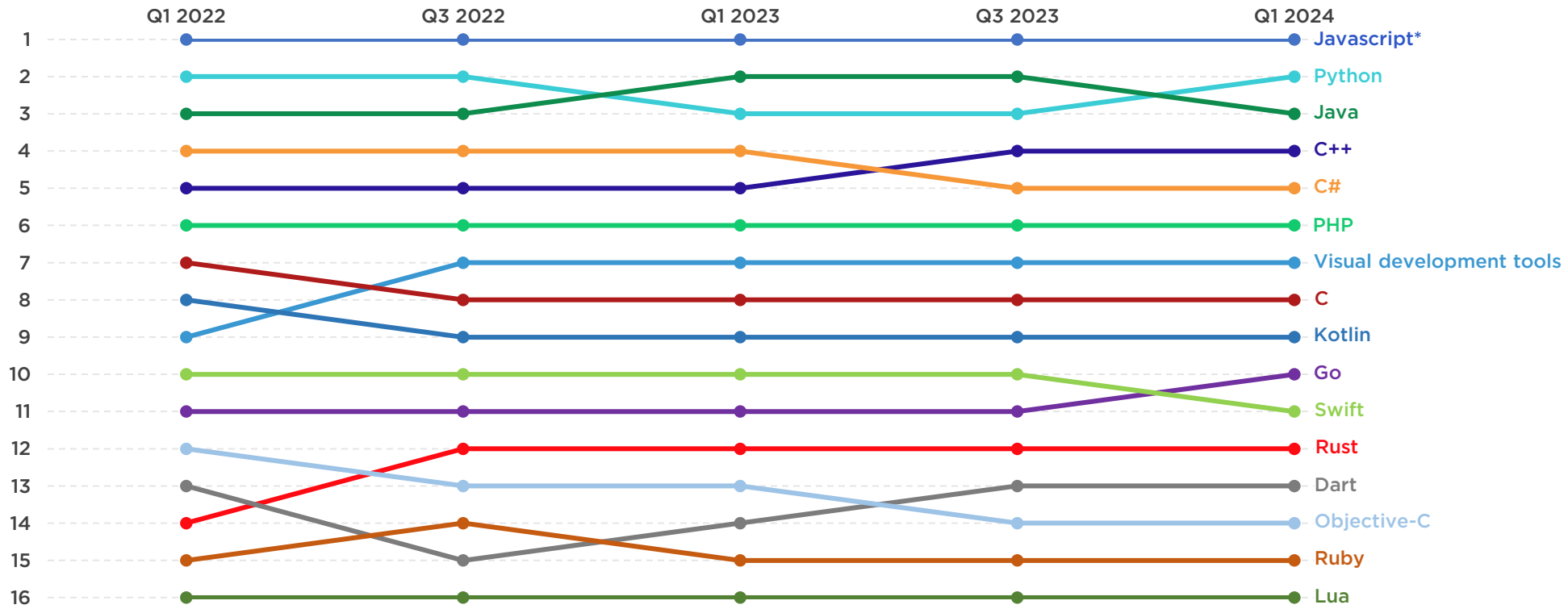
Sizing programming language communities

Go had previously been outpacing the global developer population growth, growing by 55% over the past two years, from 3M in Q1 2022 to 4.7M in Q1 2024. However, Go has only seen its developer population grow by 10% over the last year. This may represent a cooling off of Go's rise or merely a small period of reduced growth. Go overall is an appealing language due to its performance capabilities, simplifying concurrency, and being easy to read. This has led to it being used by 10% of backend service developers, as well as among games developers (5%). Go's comprehensive standard library that reduces reliance on third-party dependencies likely benefits its popularity among those working in backend services, as this can help reduce a software's attack surface.

In contrast to Rust and Go's strong growth, Objective-C has stagnated for the last two years. The number of Objective-C users has hovered around 2.5M developers over this period and in terms of language rankings, it has dropped from 12th to 14th, being overtaken by both Dart and Rust. While Apple continues to support the language, we do not anticipate a growth in users in the coming years or a reversal of this trend, especially with Swift being the go-to language for all Apple platforms. Swift has seen a small growth over the past 12 months (5%) to 4.6M developers, which led to it being overtaken by Go. However, over the past 24 months, Swift added more than 1.1M developers to its community. While Swift is continuing to grow, we would expect Rust to be a larger language within the next year if both continue their current growth trajectories.

Sizing programming language communities

Ranking of programming languages over the last two years



*including TypeScript/CoffeeScript

PHP and C# are less popular among early-career developers

While many factors determine what programming languages developers use, in this section, we intend to highlight some divides that exist based on the experience levels of developers. In general, mid-career developers (those with three to ten years of software development experience) are using more languages, on average (3.7), than both early-career developers with less than three years of experience, (3.1) and experienced (3.4) developers who have 11 or more years of experience. This is likely because early-career developers are still exploring and learning, and more experienced developers have specialised their focus, while mid-career developers are working across a range of projects of different scales and complexities.

JavaScript sees its lowest adoption rate among early-career developers (52%) compared to mid-career and experienced developers (63% and 62%, respectively). While the adoption proportion is substantially lower than developers at later stages of their careers, it is still the most popular language among early-career developers. However, it also suggests the entrenched ubiquity of JavaScript is a self-fulfilling prophecy, as developers adopt it as they gain experience and exposure to work with projects that already use JavaScript due to its existing popularity. This then helps further foster JavaScript's dominant position at the top and continues the cycle.

Sizing programming language communities

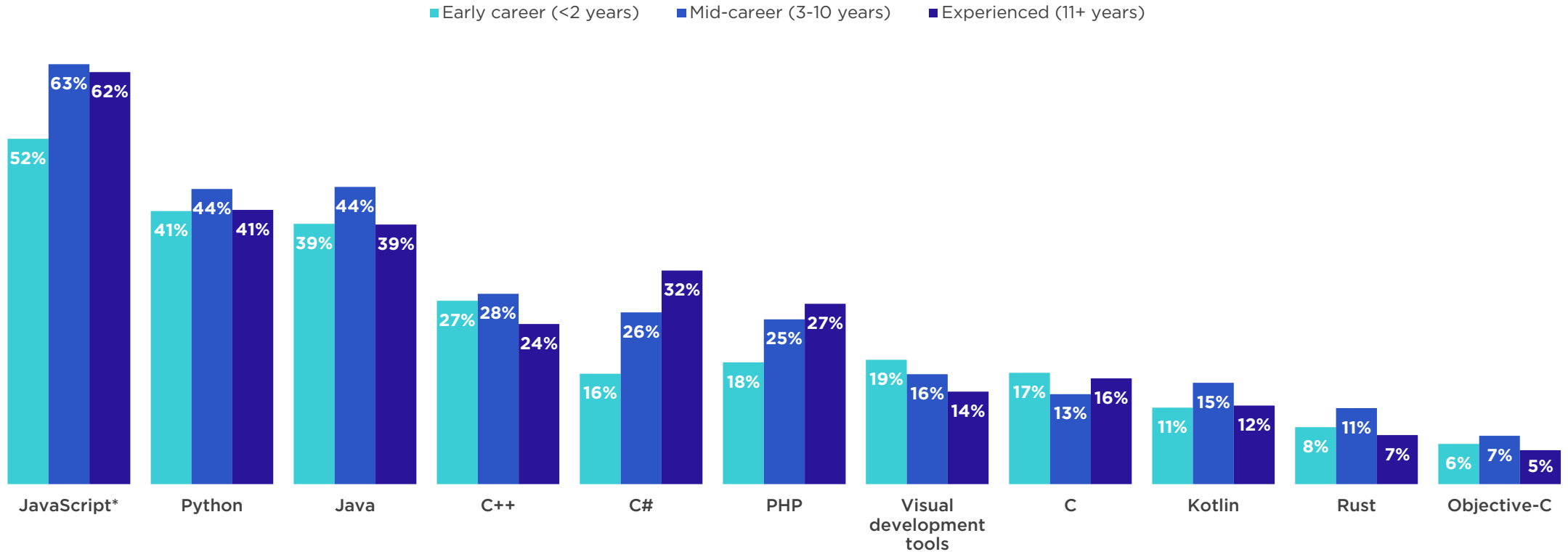
Our research also suggests that the more experienced developers are more likely to use C# and PHP than their early-career peers. This is especially apparent for C#, where experienced developers (32%) are twice as likely to use it compared to early career developers (16%). For C#, this is partly driven by the greater concentration of experienced developers in the desktop and backend services development areas. These two development areas have much higher usage of C# (39% and 31%, respectively) than the global average (24%), and C# usage is also more popular in these two areas among experienced developers. This leads to an overall increase in the prevalence of C# among experienced developers.

The use of C# and PHP increases considerably among the more experience developers

PHP has no similar experience and area overlaps and it appears to be driven by an overall lower interest in PHP by less experienced developers. Even in areas where PHP is relevant and early-career developers are well represented, these developers are not adopting PHP. For example, among web application developers, less than 20% of early-career developers are using PHP in their projects, compared to more than 33% of experienced developers.

Sizing programming language communities

Adoption of programming languages by experience in software development



% of developers using each language at each experience level (n=10,275)

*including TypeScript/CoffeeScript

METHODOLOGY

The Developer Nation Survey

The 26th edition of the Developer Nation survey reached more than 10,000 respondents from 135 countries around the world. As such, the Developer Nation series of surveys continues to be the most global independent research on mobile, desktop, industrial IoT, consumer electronics, embedded, third-party app ecosystems, cloud, web, game, augmented and virtual reality, and machine learning developers and data scientists combined, ever conducted. The report is based on a large-scale, online developer survey designed, produced, and carried out by SlashData over a period of ten weeks between November 2023 and February 2024.

Respondents to the online survey came from 136 countries, including major app and machine learning development hotspots such as the US, China, India, Israel, and the UK, even stretching all the way to Kenya, Brazil, and Jordan. The geographic reach of this survey is truly reflective of the global scale of the developer economy. The online survey was translated into nine languages in addition to English, namely simplified Chinese, traditional Chinese, French, Spanish, Portuguese, Vietnamese, Russian, Japanese, and Korean, and was promoted by more than 75 leading community and media partners within the software development industry.

Our respondents came from a broad age spectrum, from young coders and creators who are under 18 to the seasoned ones over 55.

Respondents were asked which types of projects they are involved in out of the 13 under study, namely web apps / SaaS, mobile apps, desktop apps, backend services, augmented reality, virtual reality, games, data science, machine learning / artificial intelligence, industrial IoT, consumer electronics devices, embedded software, and apps/extensions for third-party app ecosystems. They also told us if they are into their areas of involvement as professionals, hobbyists, or students - or as any combination of these - and how many years of experience they have in each.

To eliminate the effect of regional sampling biases, we first weighted to correct for over-represented individual countries within regions. We then weighted the regional distribution across nine regions by a factor that was determined by the regional distribution and growth trends identified in our Developer Nation research. Each of the separate branches: mobile, desktop, Industrial IoT, consumer electronics, embedded software, third-party app ecosystems, cloud, web, games, augmented and virtual reality, and data science and machine learning were weighted independently and then combined.

To minimise other important sampling biases across our outreach channels, we weighted the responses to derive a representative distribution for technologies used and developer segments. Using ensemble modelling methods, we derived a weighted distribution based on data from independent, representative channels, excluding the channels of our research partners, to eliminate sampling bias due to respondents who were recruited via these channels. Again, this was performed separately for each of mobile, industrial IoT, consumer electronics, embedded software, third-party app ecosystems, desktop, cloud, web, games, augmented and virtual reality, and data science and machine learning.

For more information on our methodology please visit
Our methodology page

Dive into the data

Understand Developers. Make Data Backed Decisions

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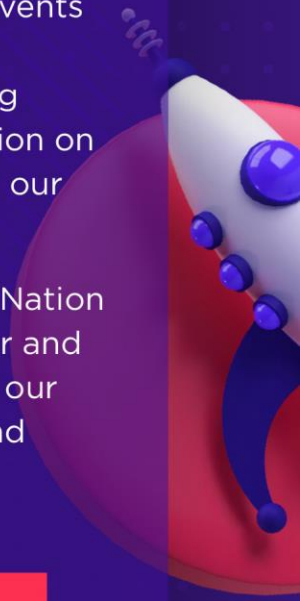
Or contribute to our Developer Nation Community as a content partner and get to organise workshops, join our podcast, record ho-to videos and many more.

LET'S TALK!



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