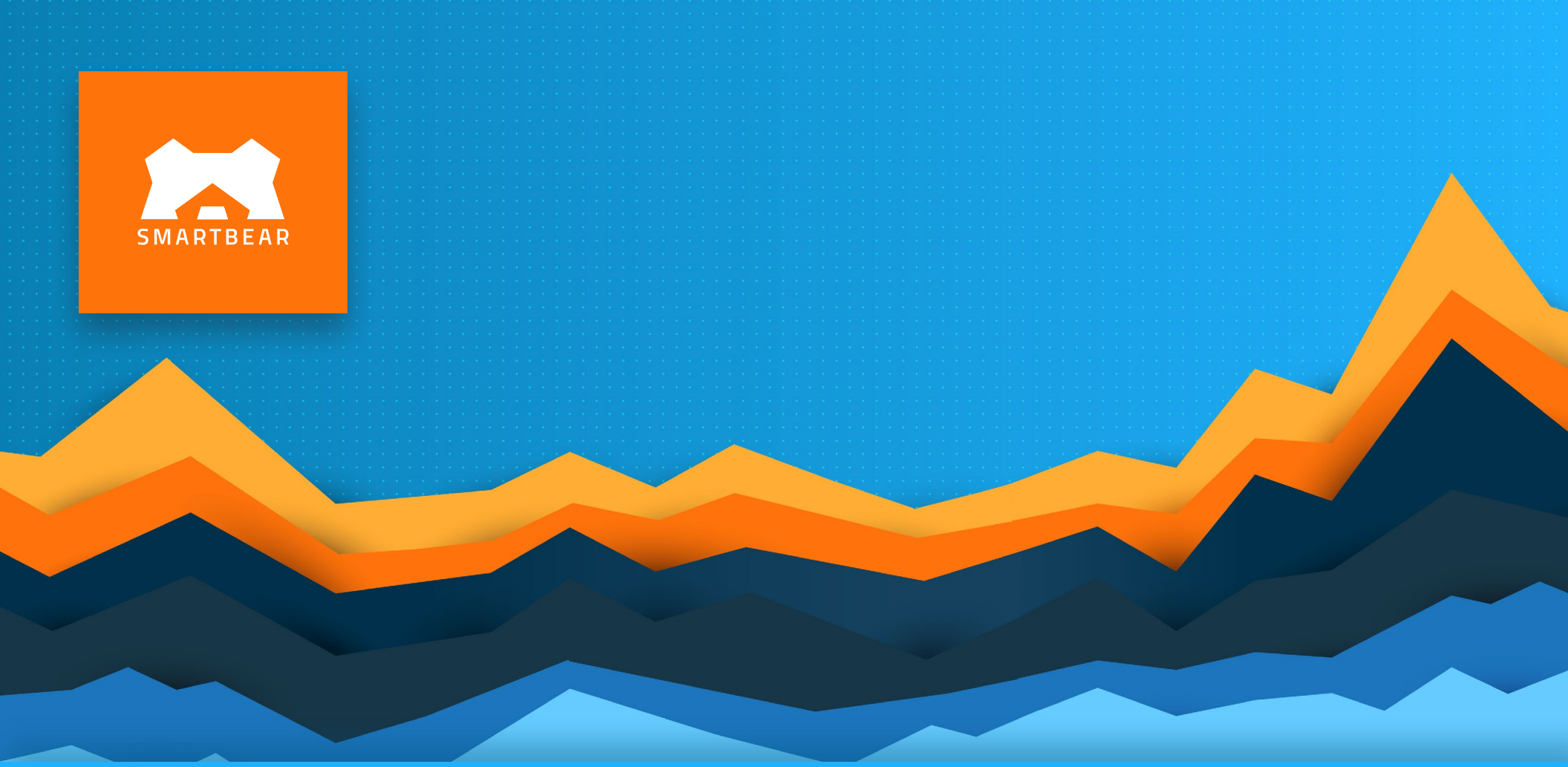
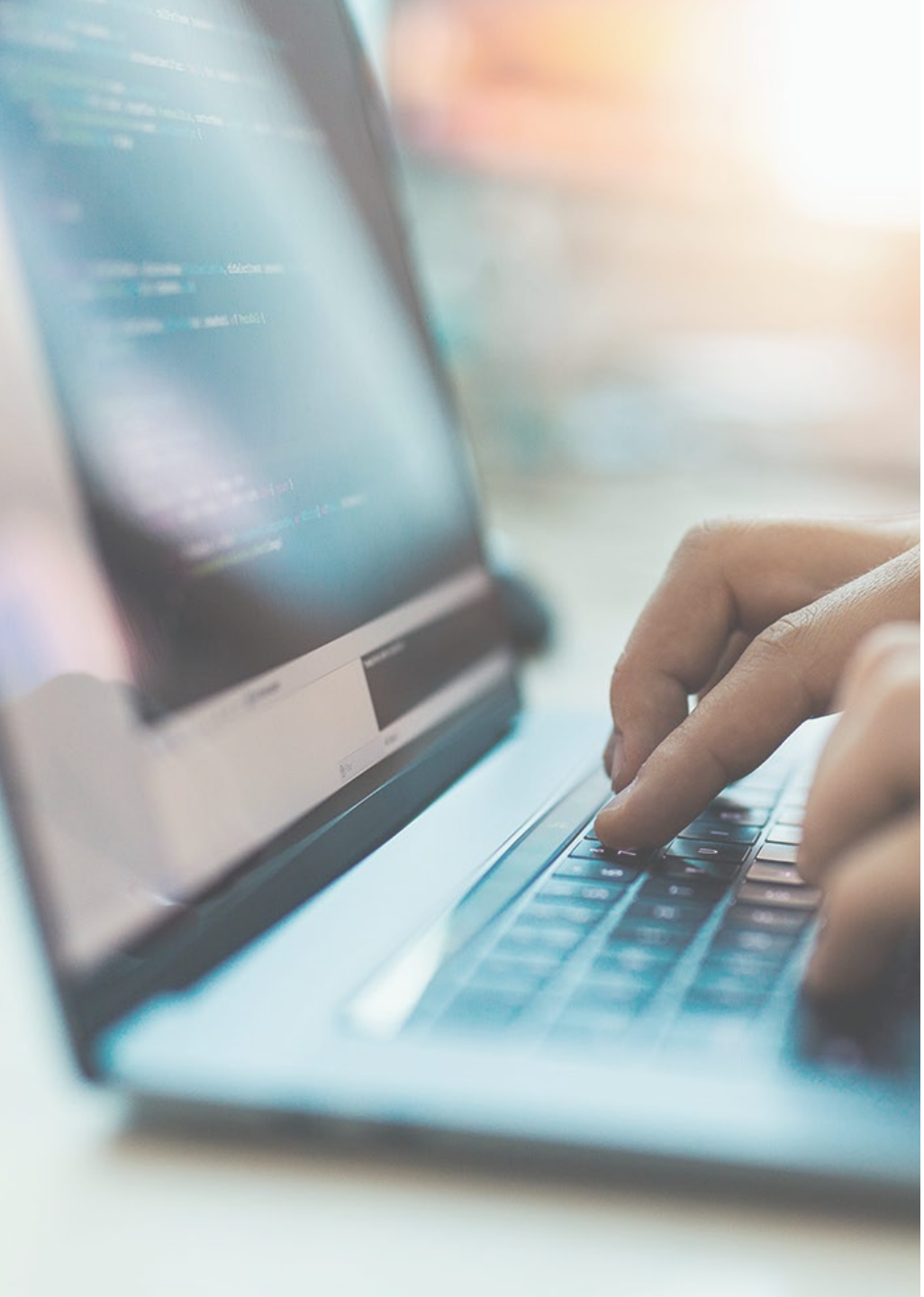


State of Software Quality | API

Latest Trends & Insights for 2023



Introduction

First published in 2016, the State of Software Quality | API report from SmartBear has continuously surveyed the API community to identify industry benchmarks regarding the trends, best practices, methodologies, and tools used by software teams to manage the API lifecycle.

Our break in 2022 notwithstanding, our goals remain the same: provide insights on the API industry, how it continues to evolve, and identify what factors contribute to its growth in the future.

In that vein, please note this survey is from the viewpoint of the API provider. With increased technology adoption serving as a backdrop, and with responses from over 1,100 API practitioners from more than 17 different industries globally, we at SmartBear are excited to share the current State of Software Quality within the API market.

The feedback from real users helps guide our decisions so we can adhere to our core quality principles. The answers in this report are meant to inform not only you, but us as well.

Methodology

The findings presented here are based on responses from manual testers, automation engineers, developers, consultants, QA managers, and analysts located around the globe.

To gather the following insights, SmartBear conducted a 61-question survey late 2022 into early 2023. More than 1,100 respondents shared their insights based on firsthand experience creating, managing, and working with APIs at organizations around the globe.

Two incentives for full participation were offered: a copy of this report for every participant, and entry into a random drawing to receive one of five $100 Visa gift cards. Please note that for the purpose of analysis, percentages are rounded to the nearest whole number.

SmartBear does not describe this as a scientific study, and it is not an attempt to fully describe the API market. We asked what we thought were interesting questions to members of the API community and are sharing insights from their responses.

We hope these responses and analysis prompt interesting discussions within the community.

61

Questions

1,100

Respondents

Contents

Key Findings

1

Formal testing processes are becoming more common.

Organizations are making strides to have formal testing processes in place. In 2023, we saw a 15% decrease in companies not making testing a priority.

2

APIs supporting events & messaging increase.

While Web APIs remain the top experience APIs are supporting (88%), we are seeing Mobile growing steadily as well as Events & Messaging increasing.

3

Positive outlook for documentation.

90% of respondents have documentation in place or plan to in the future, while 60% of organizations Agree or Strongly Agree they have strong documentation processes in place to ensure their APIs are secure.

4

Top challenges remain the same.

Standardization and security continue to be the top challenges that organizations want to solve, 51% and 40%, respectively.

5

There's an execution gap with APIs.

Provider and consumer expectations around what's important for APIs are generally equal but there's an execution gap.

Key Findings

6

Microservices are the top driver for API growth but not without investment.

62% of respondents attribute microservices as the key API growth driver, while 53% believe the top challenge for its success hinges on having the right experience and skills.

7

AI emerges as new driver for API growth.

Although microservices are the main catalyst, AI is increasingly seen as a driver in future API growth by 38% of respondents.

8

APIs are seen to improve automation.

As teams try to do more with less across the delivery process APIs are seen as catalysts to improve efficiency, extend functionality and enable scale.

9

Practitioners expect API tooling to integrate.

As APIs cover most organizational capabilities, it's important they work with existing tooling.

10

Contract testing helps restore service outages.

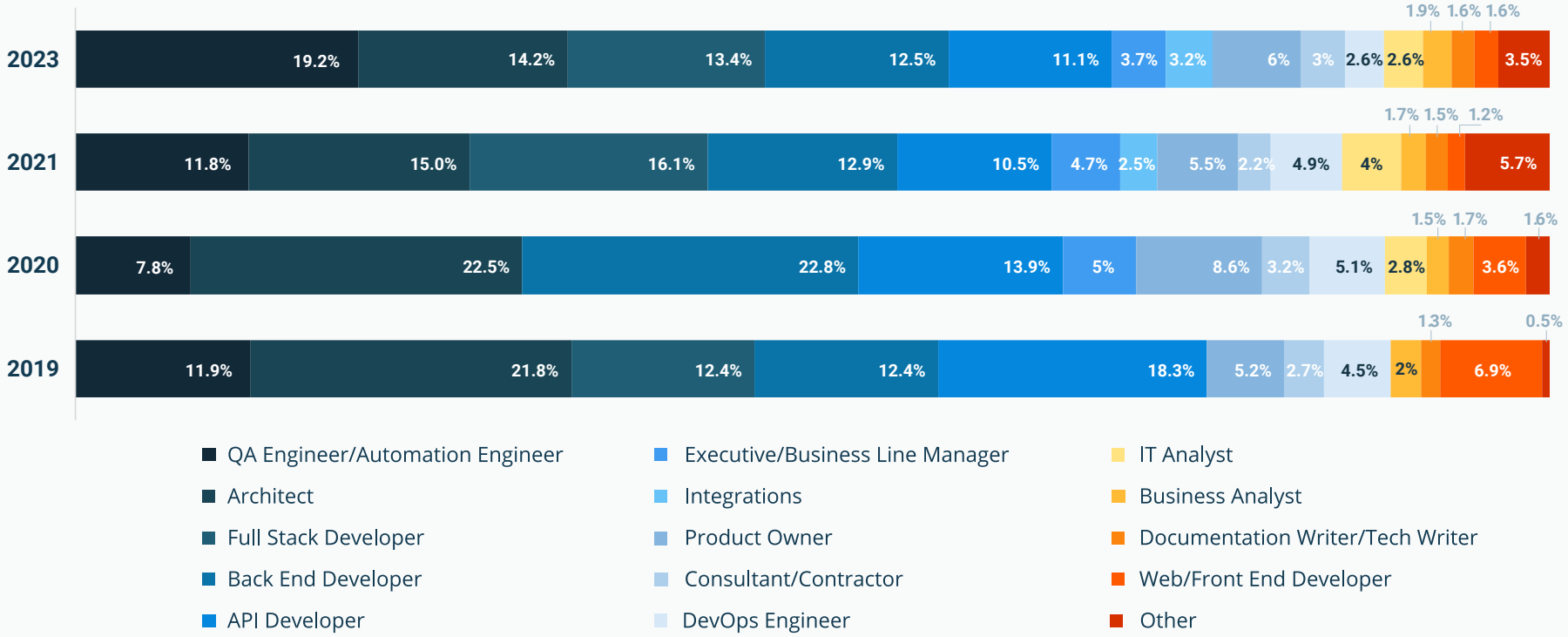
64% of respondents can restore service outages within two hours. Add contract testing to the mix, and that number increases by 2%.

Demographics

With multiple years of data, we now see a blend of emerging trends and some consistent outcomes across the demographic. This year's report, like those in the past, has collected feedback and insights from a range of roles, industries, and organization sizes.

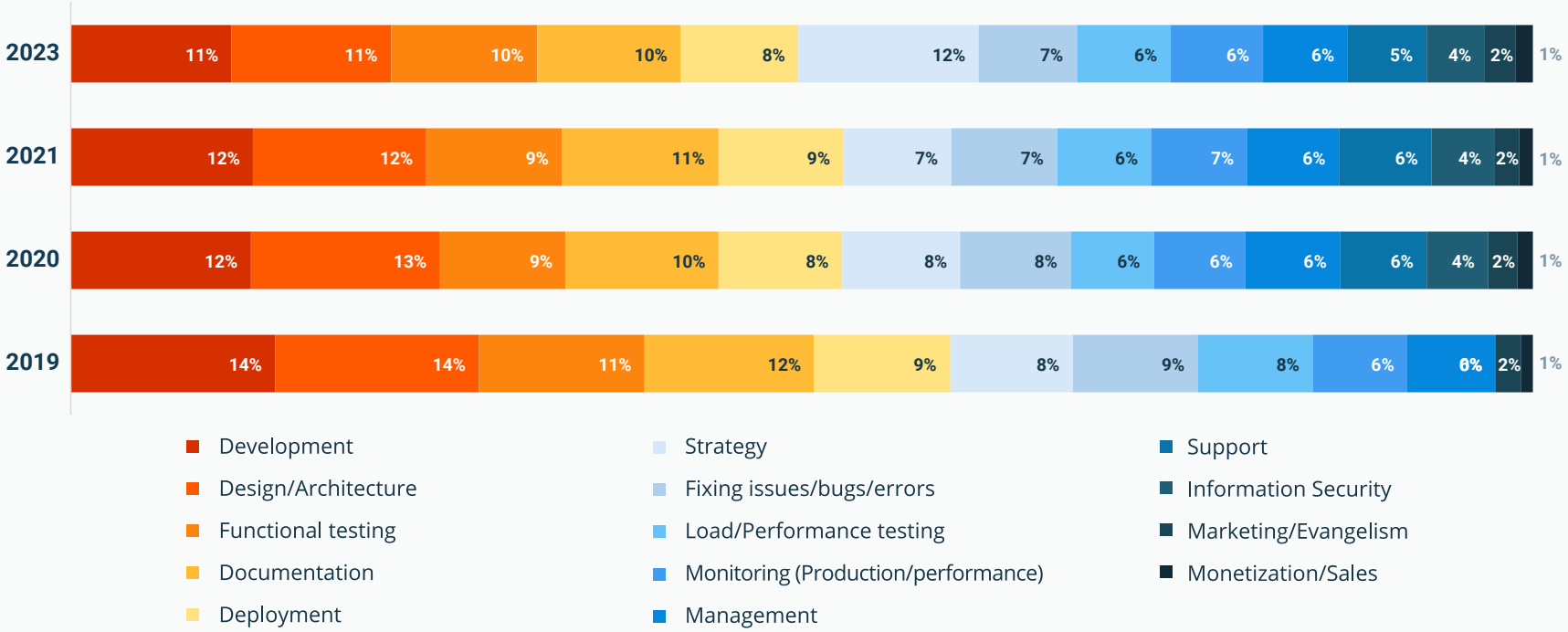
We see a consistent trend across the years in relation to the most common roles of respondents: QA Engineers, Architects, and Developers. QA Engineer/Automation Engineer came out on top in 2023 at 19%. Of the Developer category, comprising Full Stack, Front End, and Back End, Full Stack was most common both in 2023 and 2021. The grouping of these three make up one-third of respondents this year, a 2% decrease from 2021. Architect respondents have been consistent the last two years but decreased 5% since 2019 and 2020 *(fig. 1)*.

We Continue to See Responses From Across Software Development Teams *(fig. 1)*



Role in Development

Development and Design/Architecture are Where Most Respondents Spend Their Time *(fig. 2)*

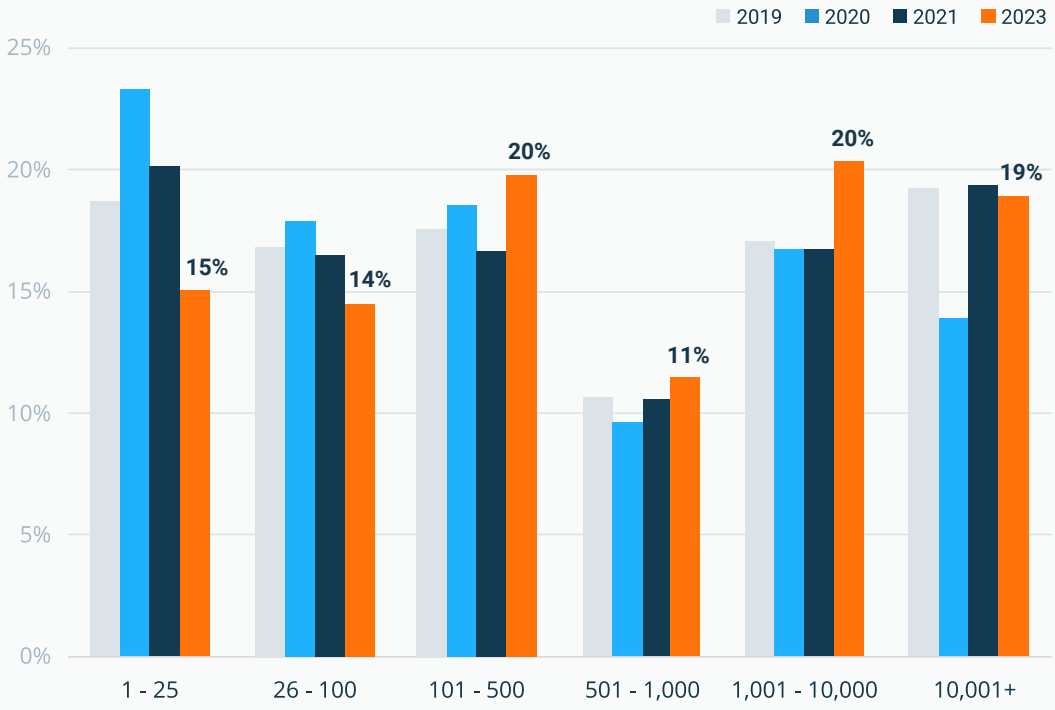


So, where are respondents spending most of their time? Top responsibilities have not varied much over the past four surveys. Development (11%) and Design/Architecture (11%) are still the highest ranking this year, with a similar split to 2021 ***(fig. 2)***.

There has been an increase in Functional Testing, which we can attribute to the higher number of QA Engineers/Automation Engineers who participated in this year's survey.

Deployment, Strategy, and Fixing Issues, Bugs, and Errors have remained consistent despite the difference in roles completing the most recent surveys. This fact highlights that these are shared responsibilities within the team.

This Year We Saw a Trend Toward Mid- to Large-Sized Organizations *(fig. 3)*



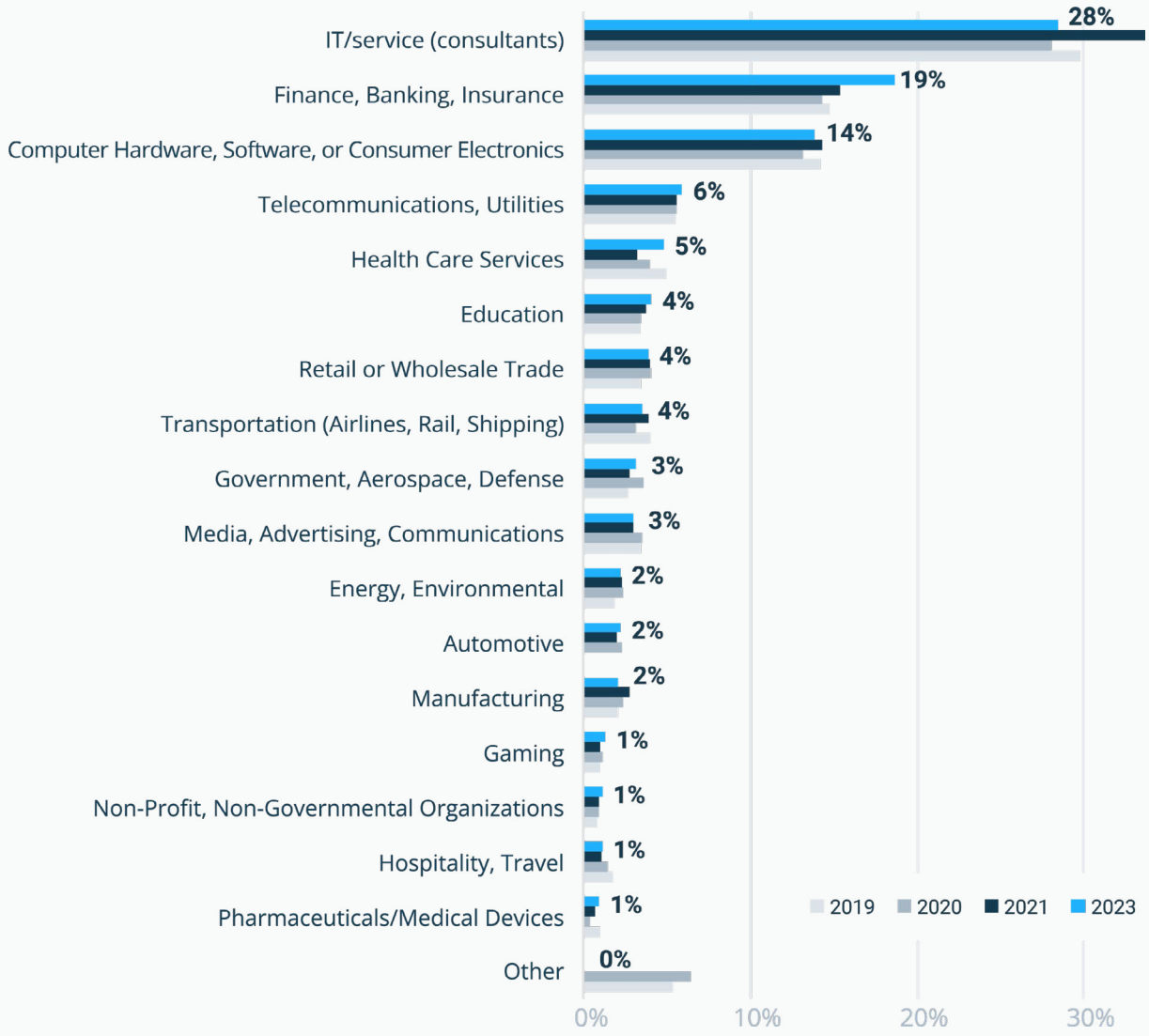
Company Size

Year-over-year we attract respondents from organizations of all sizes, which gives us a balanced view of the industry. For the 2023 survey, there was a slight increase in medium to large organizations participating. Year-over-year, there has been a 5% decrease in participants from the smallest cohort, which are organizations of 1-25 employees *(fig. 3)*.

Industry

The respondents work across a broad spectrum of industries. These industries include IT/Service (consultants), which had the largest increase year over year, Banking, Finance, Insurance, and Computer Hardware, Software, or Consumer Electronics. Some of the more regulated industries, including Health Care Services (also experiencing an increase year over year) bring a point of view valuable across the board, providing insights from which everyone learn *(fig. 4)*.

We Saw an Increase in Respondents From IT/Service Industry in 2023 *(fig. 4)*



API Development Strategies

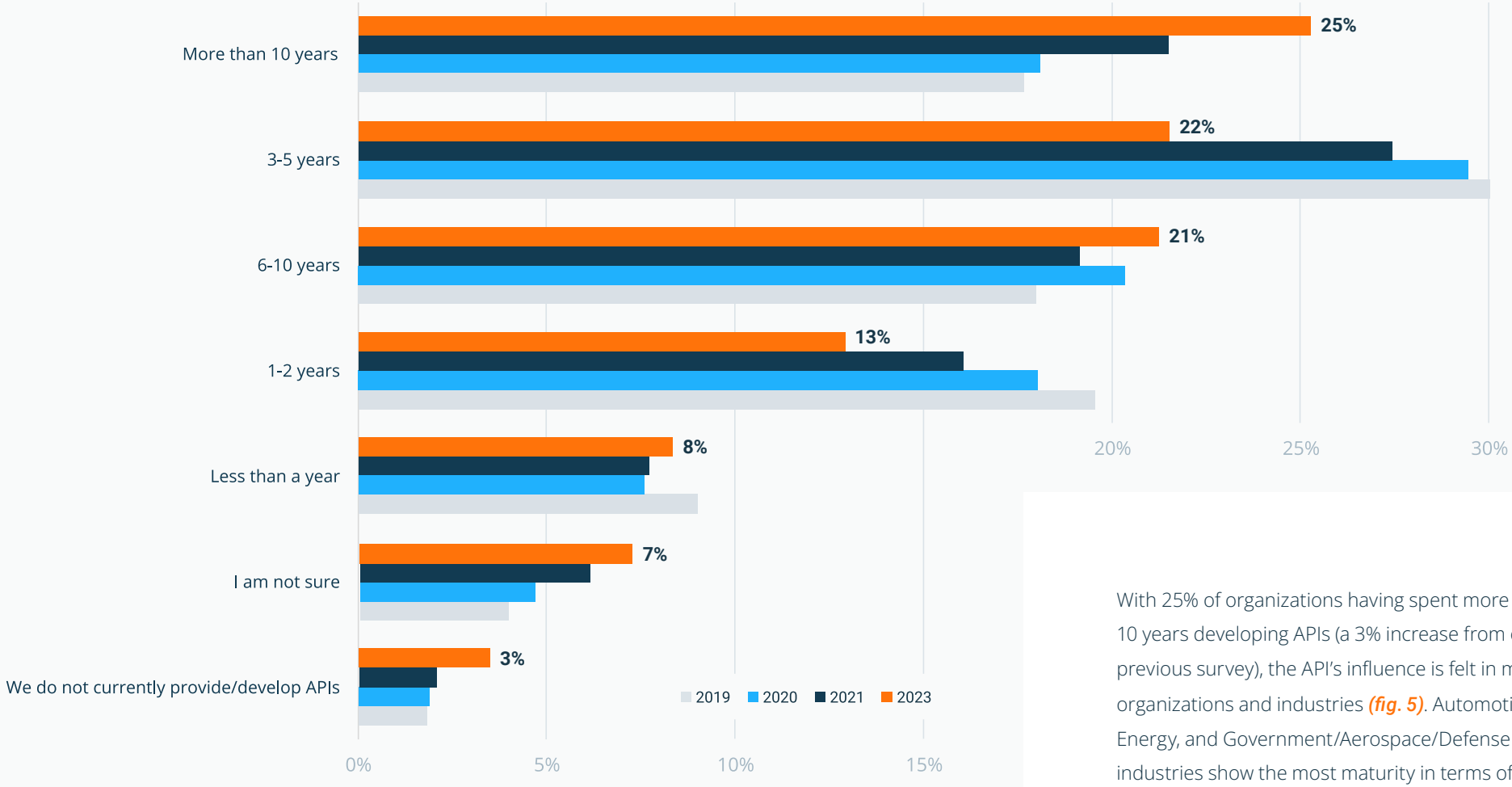
APIs are becoming more central to business operations, enabling a value exchange both inside and outside the enterprise.

An API strategy describes an organization's drivers for, and approach to, APIs in several aspects. It can include business strategy alignment, technology readiness, implementation strategy, operational strategy, go-to-market, and promotional strategies, as well as socio-technical challenges related to an organization and its culture.

By having an API strategy, there's an understanding in the role APIs play within other organizational strategies, and more informed decisions can be made.

In this section of the survey findings, we'll examine the factors that can shape an organization's decisions surrounding API adoption.

API Adoption and Development Maturity is Increasing in Organizations, Shifting from 3-5 Years and Entering 6+ and Even 10+ Years *(fig. 5)*



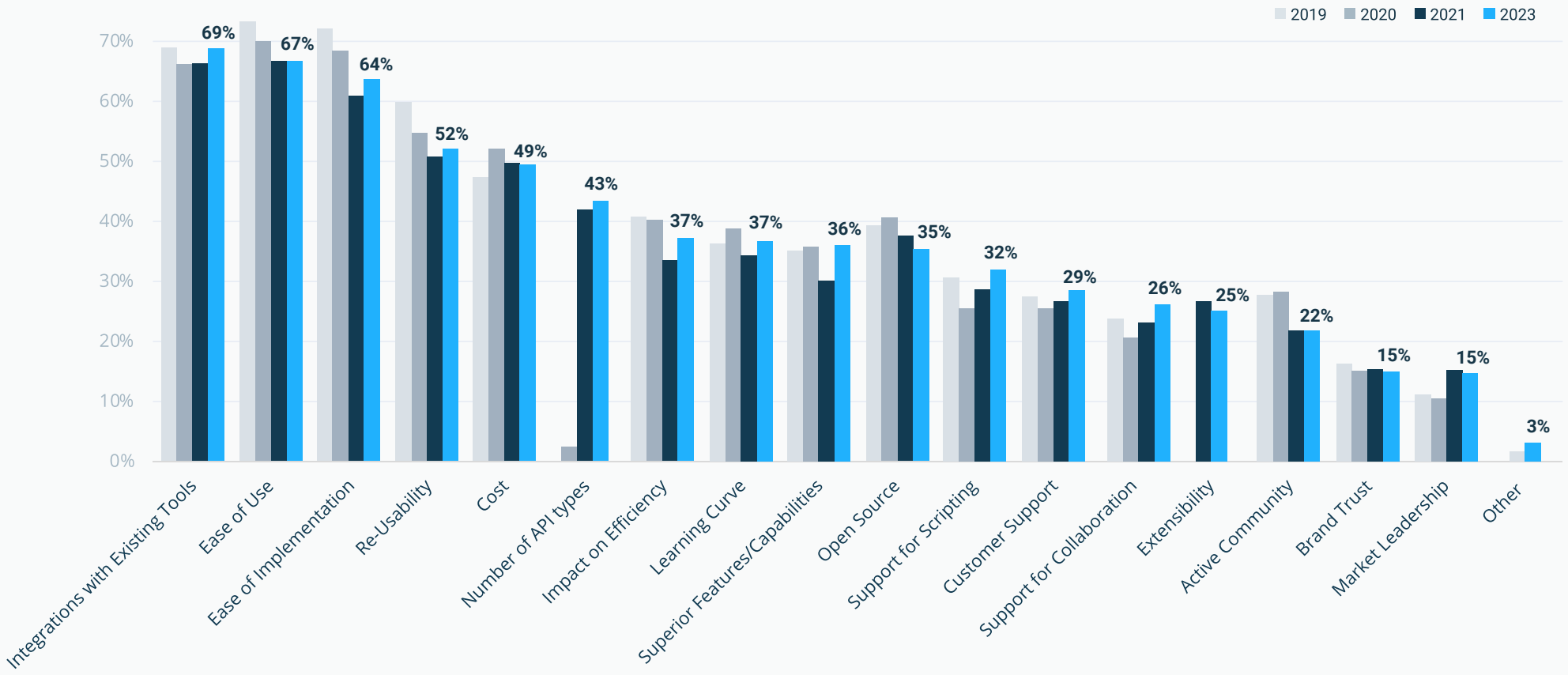
With 25% of organizations having spent more than 10 years developing APIs (a 3% increase from our previous survey), the API's influence is felt in many organizations and industries *(fig. 5)*. Automotive, Energy, and Government/Aerospace/Defense industries show the most maturity in terms of years spent developing APIs.

Over the past few surveys, there has not been much movement in drivers of API development. The desire to reduce development cost/time and a desire to increase internal interoperability have remained the main drivers for API development .

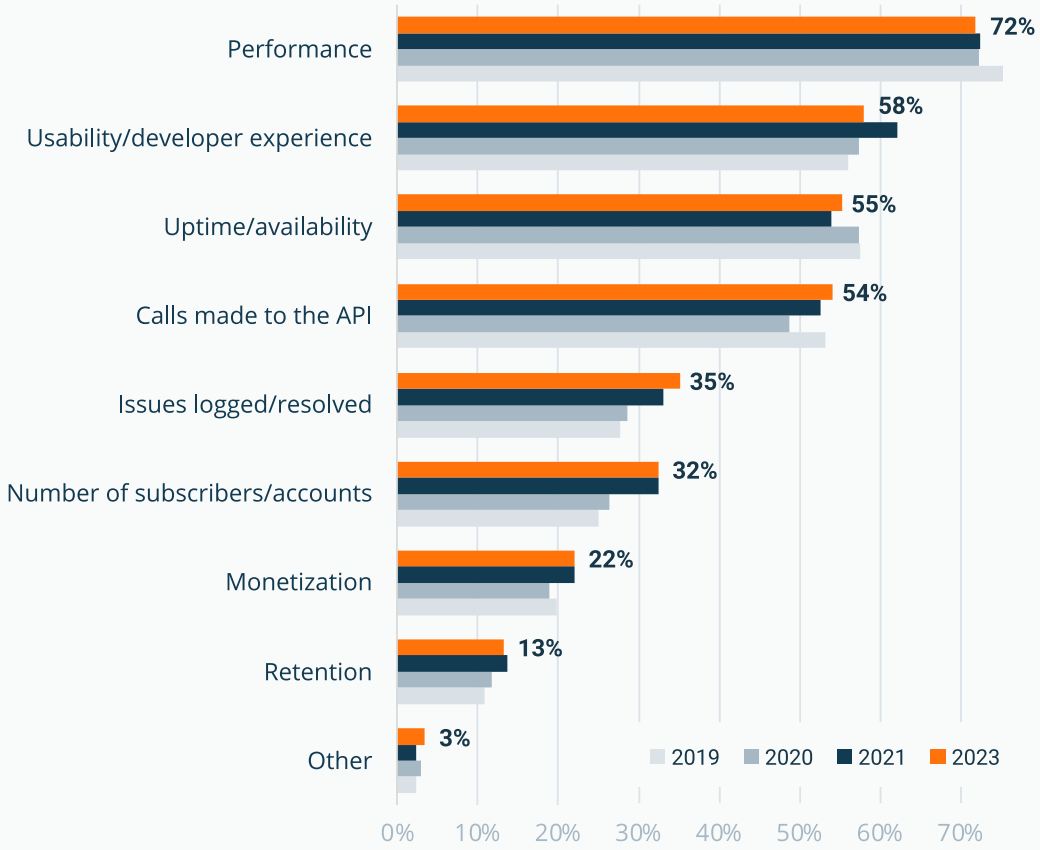
One interesting data point is that 30% of respondents cite Powering Mobile Applications as a driver. Although there was no change from 2021, there is a 9% decrease from 2019 ***(fig. 6)***.

We also see variation in drivers based on industry. For Healthcare organizations, interoperability is the biggest driver for API development, while Powering Mobile Applications is the biggest driver for Hospitality.

The Desire to Increase Development Interoperability and Efficiencies, and Extend Functionality are Driving API Development ***(fig. 6)***



Performance and Developer Experience are Top Measures for API Success *(fig. 7)*



Performance has consistently ranked as the #1 overall measure for API success over the past few years.

Both developers (Backend, Full-stack) and QA professionals see performance as the biggest measure of success ***(fig. 7)***. In the past, we've seen a trend that API consumers are less loyal to the APIs they work with when faced with performance issues. Usability/developer experience is #2. This is because API Product Managers rated this as the #1 measure of success.

This highlights how documentation and ease of use are important to the successful adoption and perceived success of an API from a go-to-market perspective.

API Tools, Technologies and Methodologies

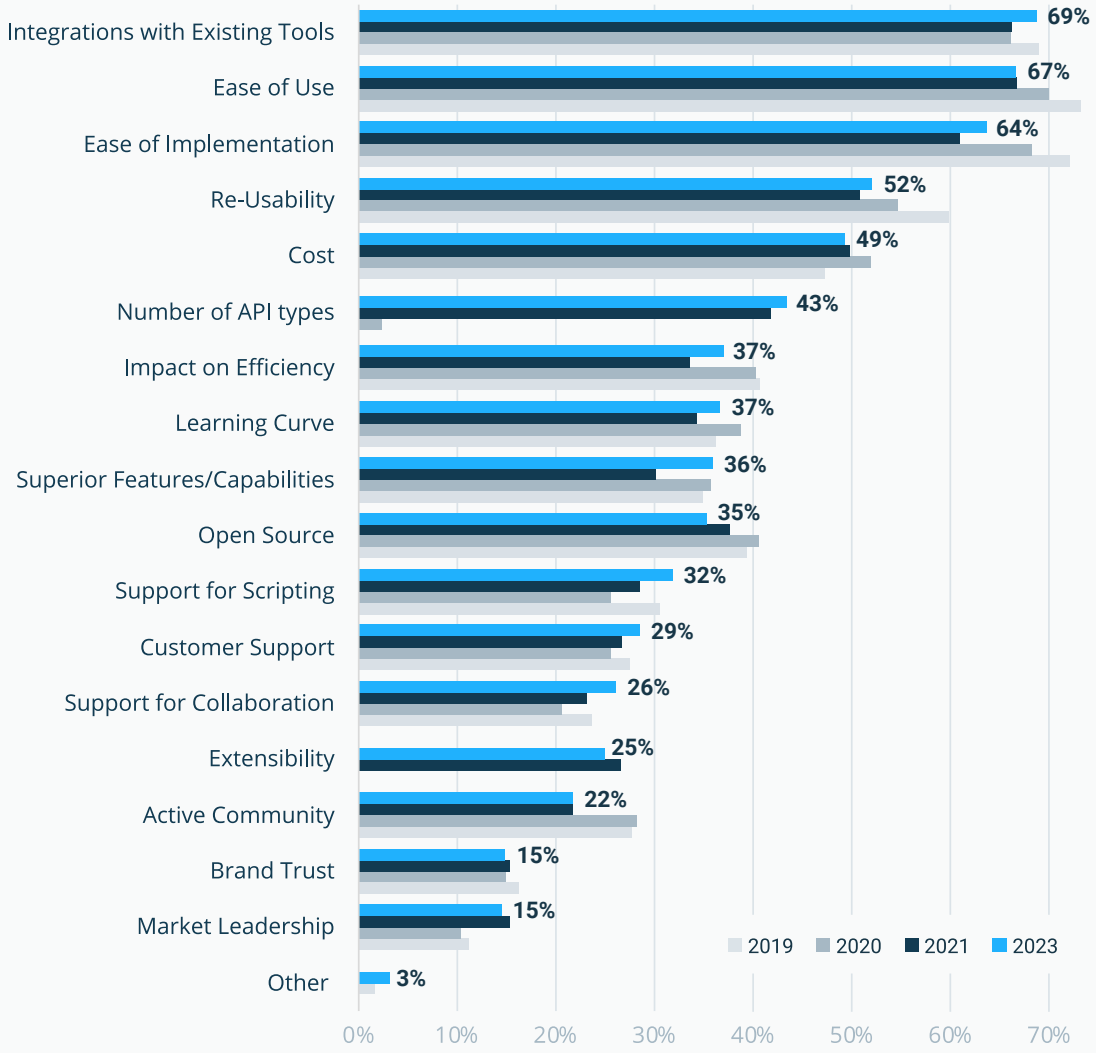
Delivering software is a complex activity. Technical professionals rely on standards, tooling, and methodologies to deliver quality software with a repeatable cadence.

APIs by their nature are crafted for consumption by other developers and their tooling, and therefore must work with the delivery cycles of the API consumer. Our view is the selection of well-known API specifications, which come with a rich ecosystem of tools, improves provider delivery velocity.

This enables the automation of the stages in the API lifecycle and helps with consistency. It also reduces developer effort to find and use the APIs produced, which accelerates adoption and improves the overall developer experience.

In this section of the survey findings, we focus our attention on the tools and methodologies organizations use to accelerate the API lifecycle and deliver high-quality APIs.

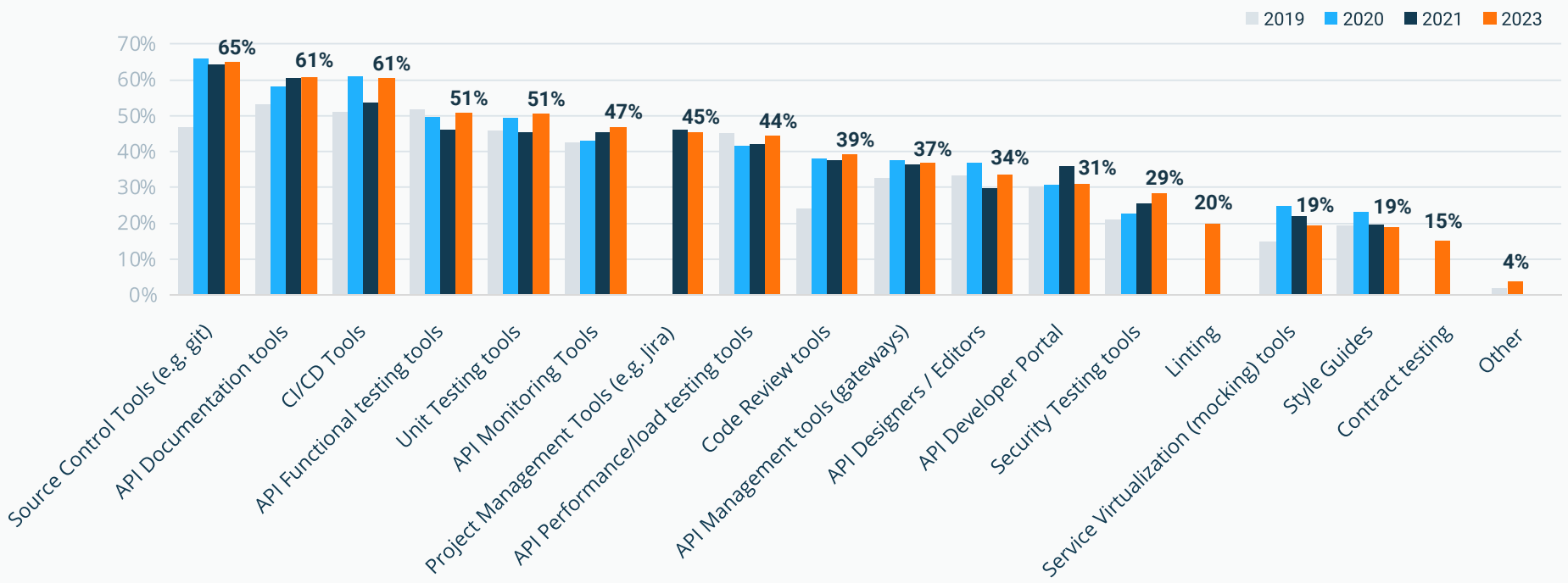
Ease of Use and Integrations with Existing Tools are the Top Factors Driving API Tool Choice *(fig. 8)*



It's interesting to see that Integration with Existing Tools is scored higher than Ease of Use this year. It is truly about usability and meeting customers where they are.

The data here indicates the longer a company has been developing/providing APIs (10+ years), the more inclined they are to factor Market Leadership and Customer Support into their decision making. Additionally, Cost has decreased 8% since 2019, indicating that customers are not as price conscious *(fig. 8)*.

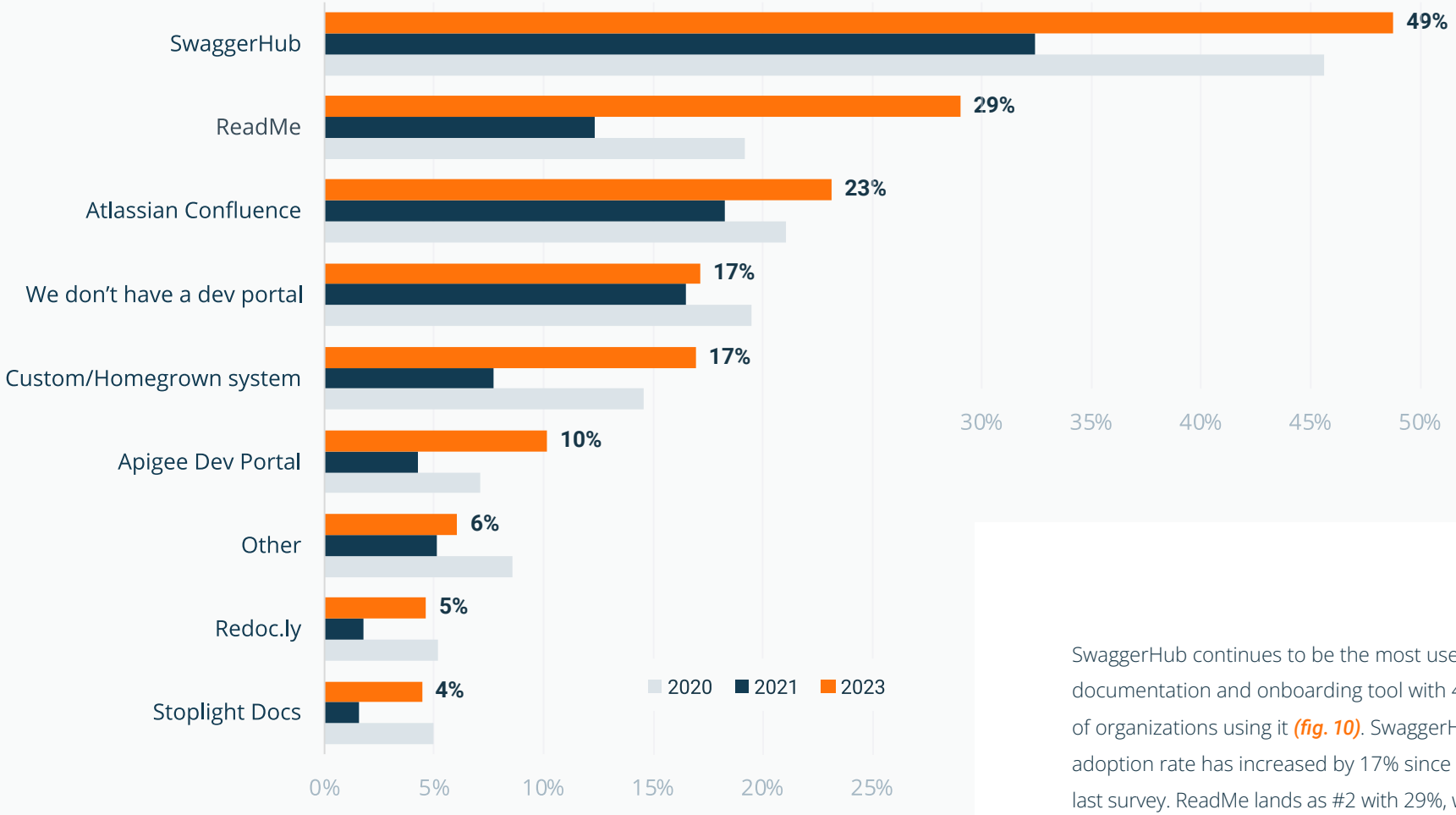
API Development Continues to be a Highly Collaborative Process *(fig. 9)*



No major change has been observed in tool selection over the years. Our surveys show that SCM, API Documentation, and CI/CD tools are extremely important to developing high-quality APIs. These tools are especially important to organizations that have provided APIs for at least three years.

Project management tools like Jira and Trello are still prevalent in the API development space *(fig. 9)*. This year, we added a new section for contract testing, with 15% of respondents selecting they currently use contract testing. With the rise of microservices, it will be interesting to observe the progress of this section in the future.

SwaggerHub Remains Top Choice for API Documentation and Onboarding *(fig. 10)*

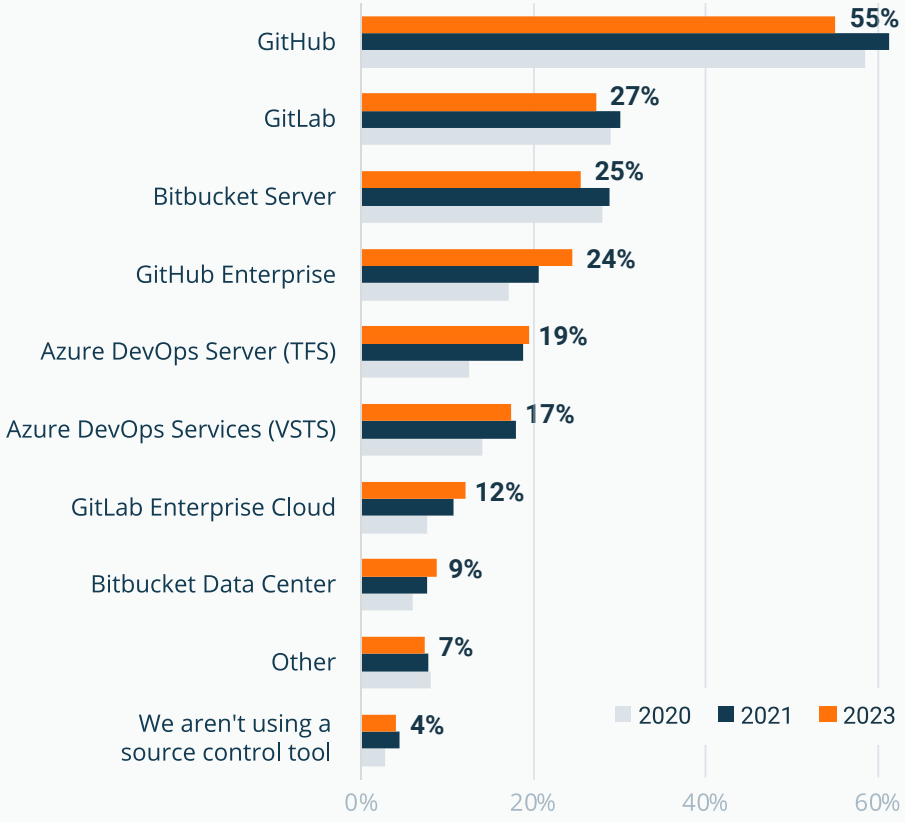


SwaggerHub continues to be the most used API documentation and onboarding tool with 49% of organizations using it *(fig. 10)*. SwaggerHub adoption rate has increased by 17% since our last survey. ReadMe lands as #2 with 29%, with almost a 50% increase from the previous survey.

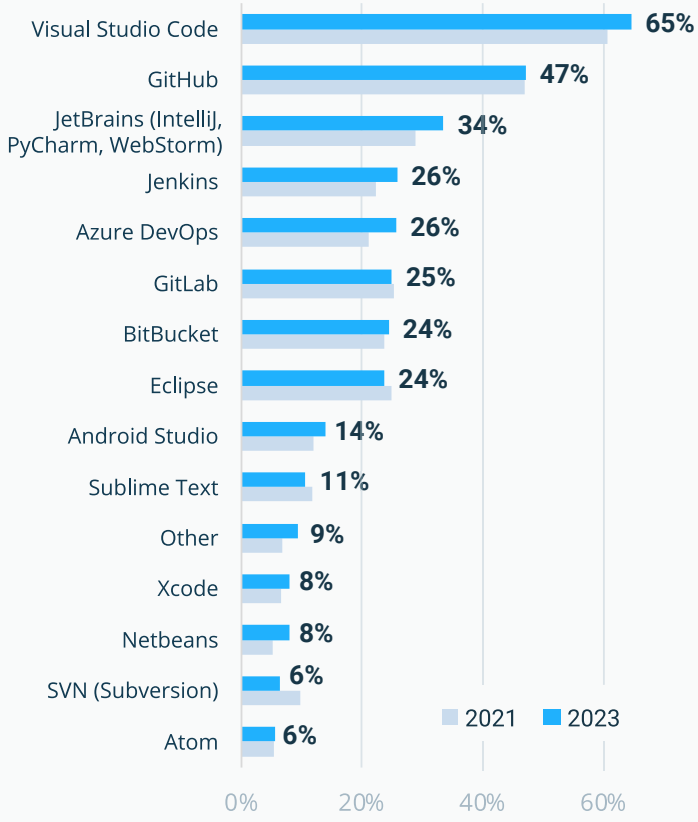
The growth of distributed software development teams working across functions and times zones means a reliance on SCM tools to collaborate and maintain order *(fig. 11)*. Topping the list of SCM tools by a wide margin is GitHub, used by 55% of all the people surveyed. This is more than doubleGitLab at 27%.

Visual Studio Code is the most trusted tool for development and deployment to come from this year's survey, with GitHub being #2 *(fig. 12)*. These leading tools have doubled the others, including Azure DevOps, GitLab, and BitBucket.

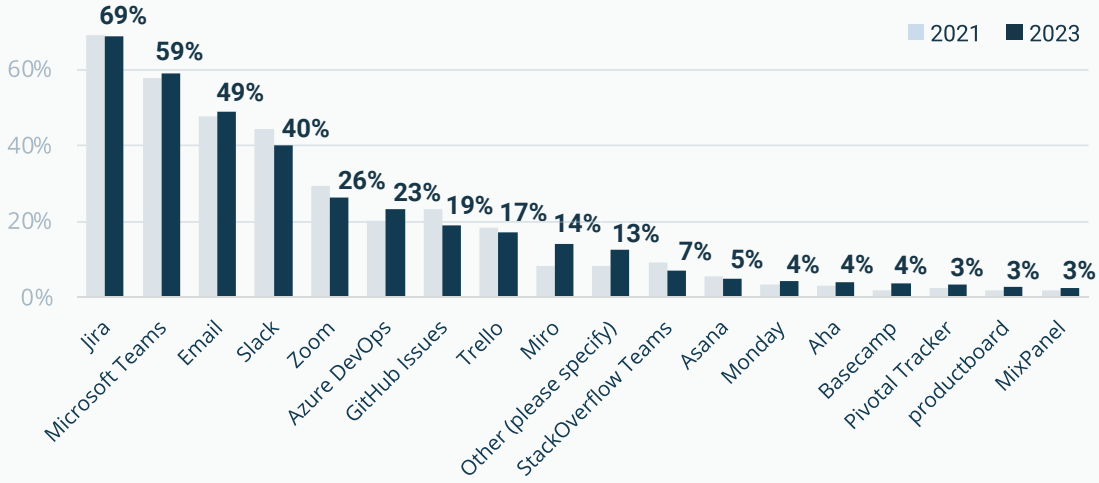
Git Remains the Tool of Choice *(fig. 11)*



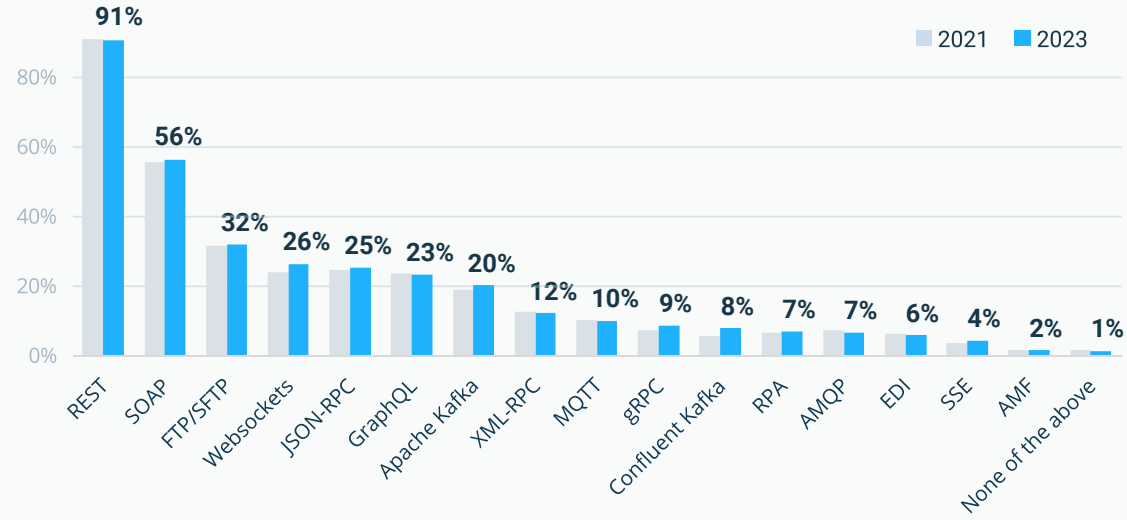
Visual Code Comes Out on Top *(fig. 12)*



Jira Continues to be the Tool of Choice for API Development Teams *(fig. 13)*



API Practitioners Continues to Operate in a Multi-Protocol Landscape Even Though REST Dominates *(fig. 14)*



We know API development is becoming a collaborative process that spans across different functions and time zones. Teams need tools that can help them stay connected, allowing them to collaborate effectively. The top three tools for the second year in a row are Jira (69%), Microsoft Teams (59%), and Email (49%) ***(fig. 13)***.

REST continues to dominate, but our survey shows growth in the use of other protocols including GraphQL and Kafka ***(fig. 14)***. The analysis did show a slight decrease in use of GraphQL this year. SOAP continues to hang around in the #2 spot.

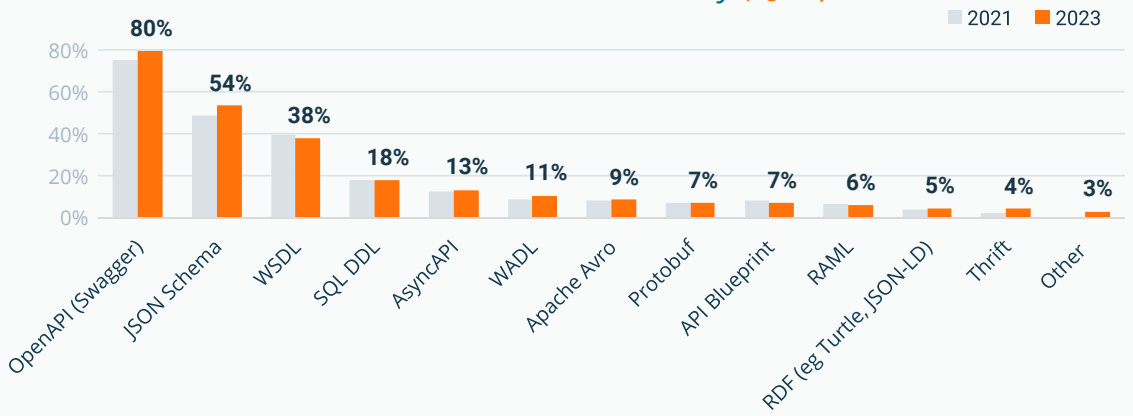
It is important to note there is no change in API protocol usage from our previous survey. New specifications will continue to become more popular than existing ones. This contributes to the increased need for tooling to meet teams where they are, regardless of protocols or specifications.

OpenAPI Specification continues to be the overwhelming choice by respondents. Originally, this API standard was introduced as Swagger in 2011. In 2017, it was formally released as the OpenAPI Specification. Today, 80% of the survey respondents cite OpenAPI as their API standard of choice ***(fig. 15)***. There was also an increase in respondent selection of JSON Schema, indicating that organizations are using multiple standards.

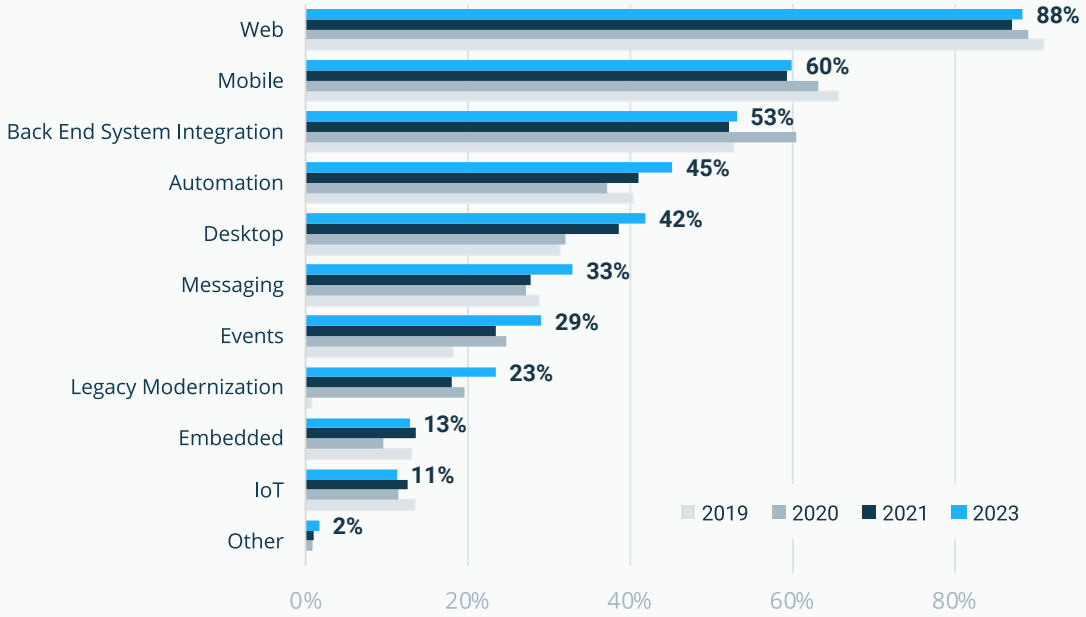
Around 88% of organizations involved in our survey indicated that support for Web APIs remains top priority ***(fig. 16)***. Mobile APIs remain steady in the #2 spot at 60%. However, there was also an increase increase in support for Events and Messaging.

This likely relates to the increase of microservices, using multiple APIs, and a mix of protocols. Lastly, there has been a 23% increase in year over year support for Legacy Modernization, with 23% of respondents stating they support it. This is 5% increase from the previous survey. Could this be because companies are adopting microservices architecture? This may be worth following up with respondents to find out why.

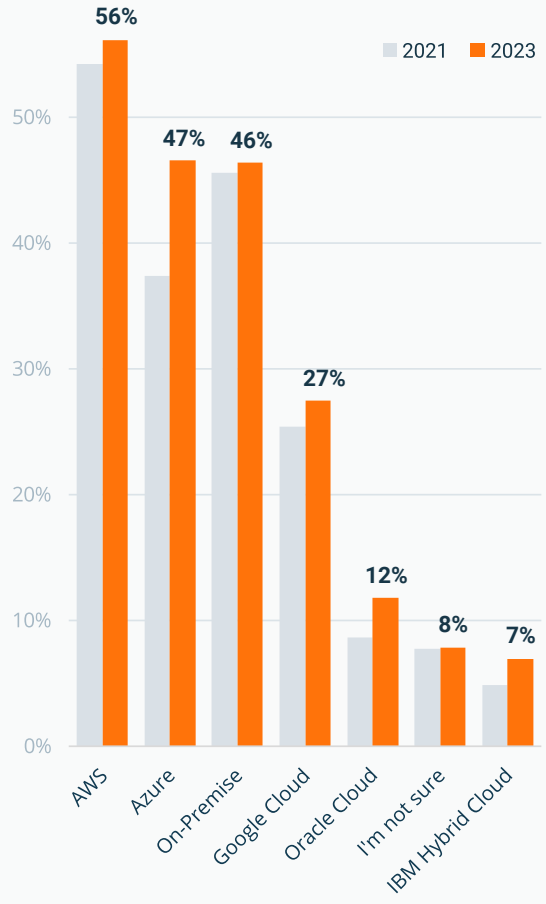
OpenAPI (Swagger) Continues to Dominate but Growth in Other Standards Remain Steady *(fig. 15)*



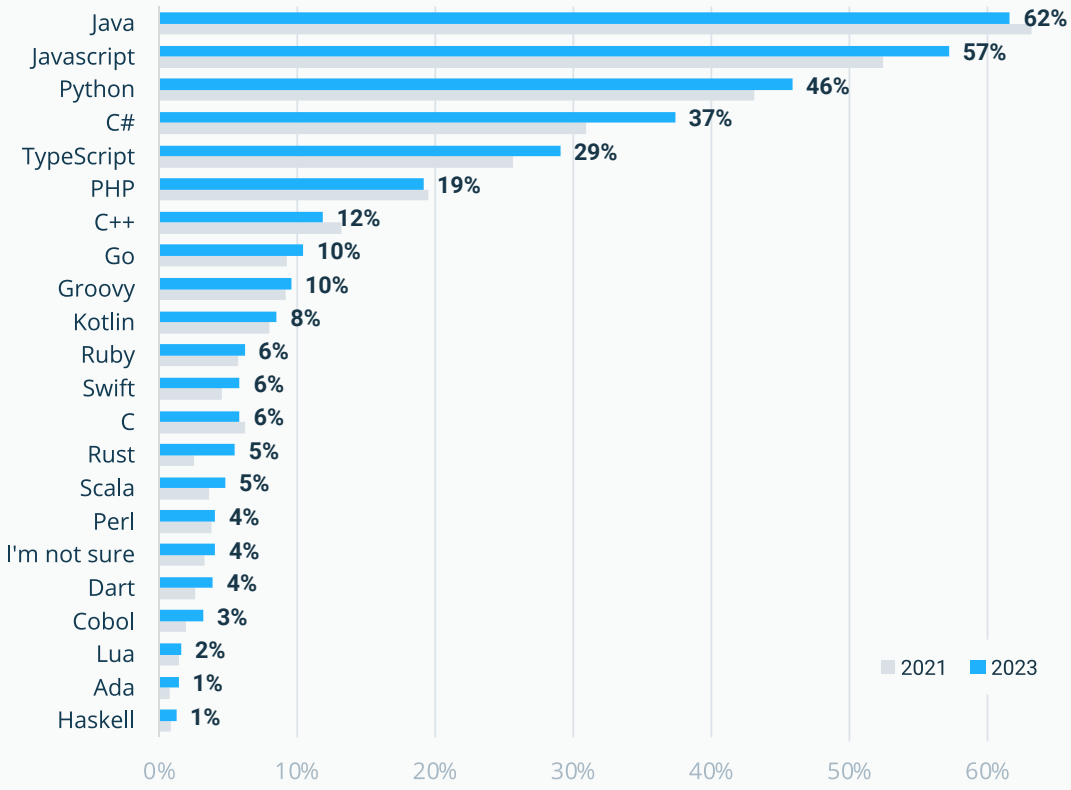
Web APIs Continue to Domnate in Terms of Experience but there is an Increase in Year-Over-Year Support for Events *(fig. 16)*



AWS Lands Top Spot for Computing Platform *(fig. 17)*



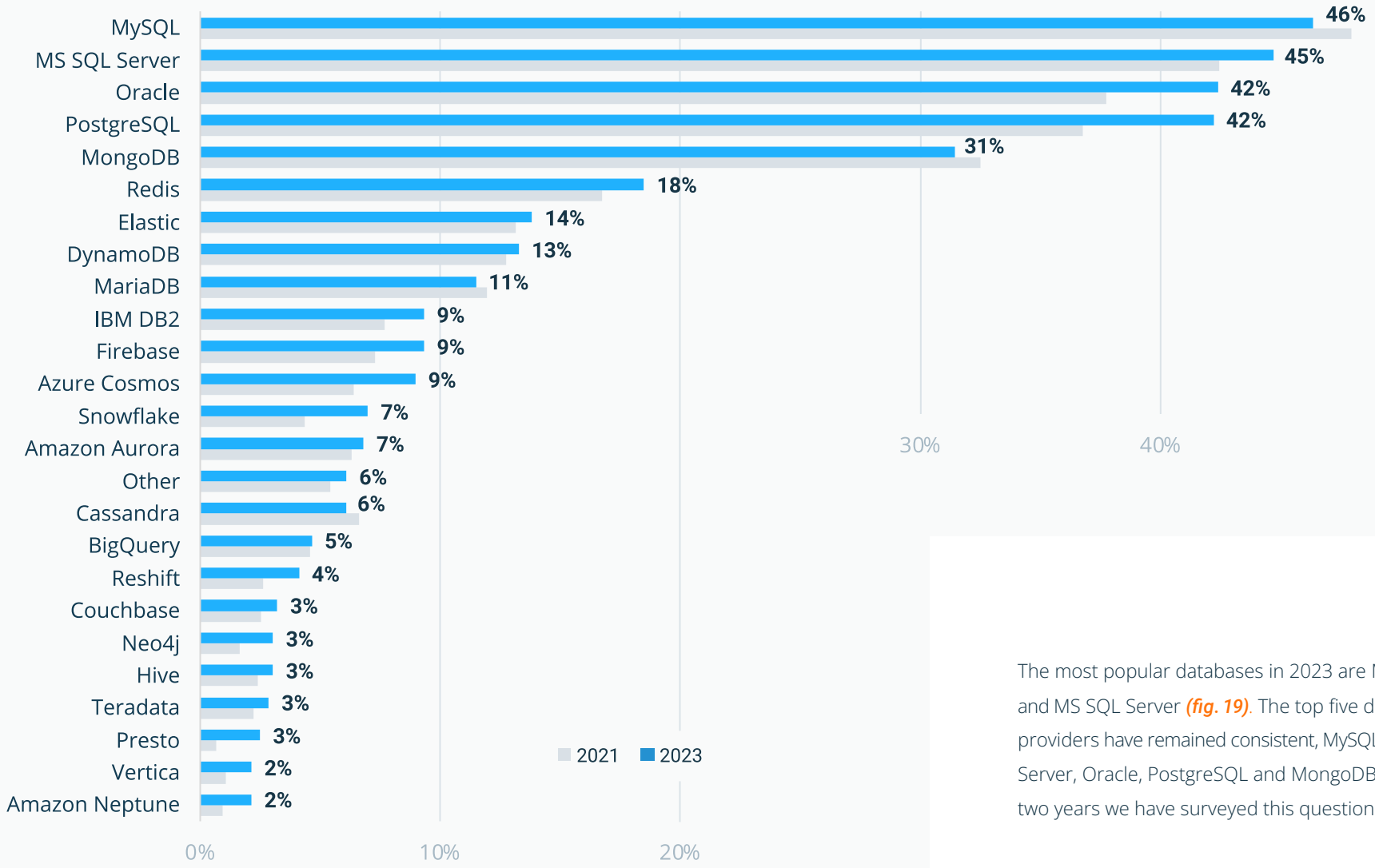
Java is the Top Programming Language *(fig. 18)*



AWS is a leading cloud provider, and it's not surprising to see that they are top of the list in this year's survey *(fig. 17)*. More organizations are expanding out to other providers, such as Azure, which saw a 10% increase, and Google Cloud Platform, which also saw a slight increase.

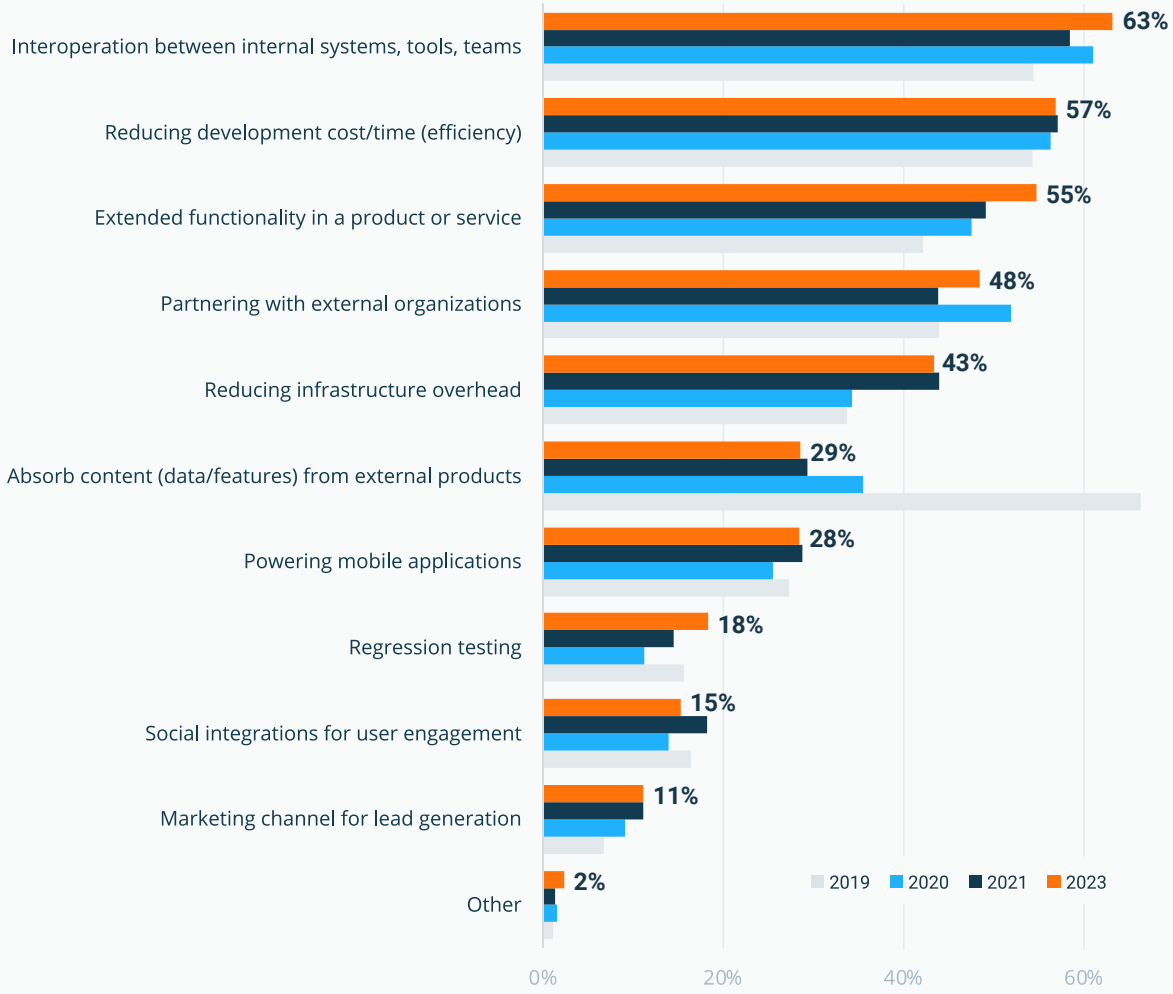
Java remains the programming language of choice for organizations building and interacting with APIs. However, we're seeing a year-over-year increase in JavaScript (7%), Python (3%), C# (6%), and TypeScript (3%) *(fig. 18)*.

The Top Database Providers Remain Unchanged *(fig. 19)*



The most popular databases in 2023 are MySQL and MS SQL Server *(fig. 19)*. The top five database providers have remained consistent, MySQL, MS SQL Server, Oracle, PostgreSQL and MongoDB, in the two years we have surveyed this question.

Interoperability, Extended Functionality, and Cost/Time Continue to Drive API Consumption *(fig. 20)*



It's all about doing more with your time, whether it's between internal systems/tools, gaining time/cost efficiencies, or easily extending a product or service. APIs are an important business tool, not just a technology. They are increasingly viewed as a strategic asset to gain these important benefits. 63% of organizations cited "Interoperation Between Internal Systems, Tools, Teams" as the top reason for API consumption – a 5% increase from our last survey *(fig. 20)*.

Additionally, when it comes to external APIs, a similar amount of organizations to the prior year are exposing public APIs via a gateway. Twenty-three percent of respondents are not using an API management tool (this could be because they do not expose public APIs), and for the remaining cohort, AWS API Gateway is the most popular tool followed by in-house built API management tools.

API Consumption

Much of the API space focuses on designing and delivering consistently beautiful APIs. More APIs are consumed than produced, so this is a natural part of the API economy (a trend that will increase).

The consumption of APIs lets organizations not only focus on their own value proposition, but ingest the usefulness of others into their own value chain. This reduces the need to reinvent the wheel, thus fueling organizations to innovate upon their own business models and digital channels.

Developers see APIs as fundamental to the platform they build their own applications on, and often decide which ones to use on behalf of the company.

The role of the API consumer has arguably elevated in the API industry due to heighted digital immediacy expectations. The consumer experience is crucial, and any APIs not meeting developer expectations will end up not being used.

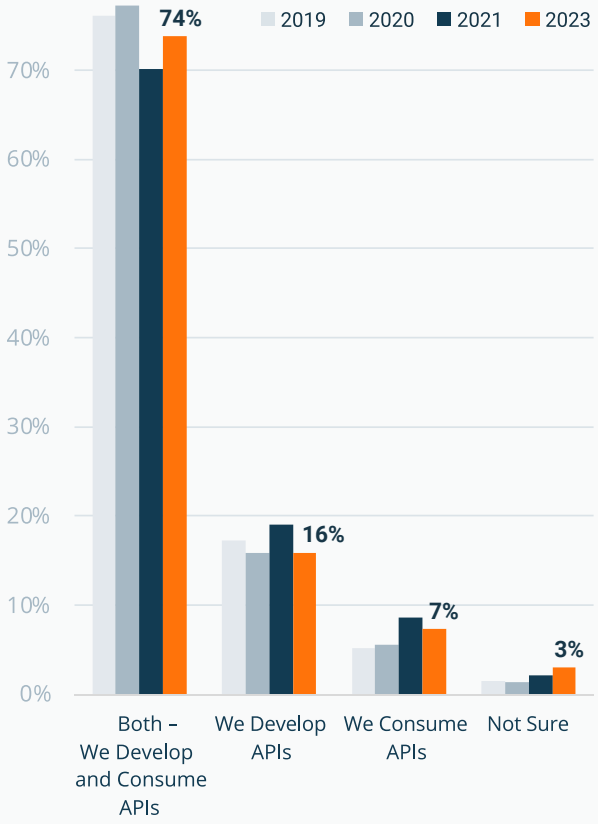
This section looks to better understand the needs and expectations of API consumers. As we discuss in this section, there's a great deal of overlap between teams that develop and consume APIs.

Seventy-four percent of participants develop and consume APIs ***(fig. 21)***. This rate is similar to the responses we have seen in the past. However, this year there was a slight decrease in the respondents that develop APIs alone, a 3% decrease from 2021.

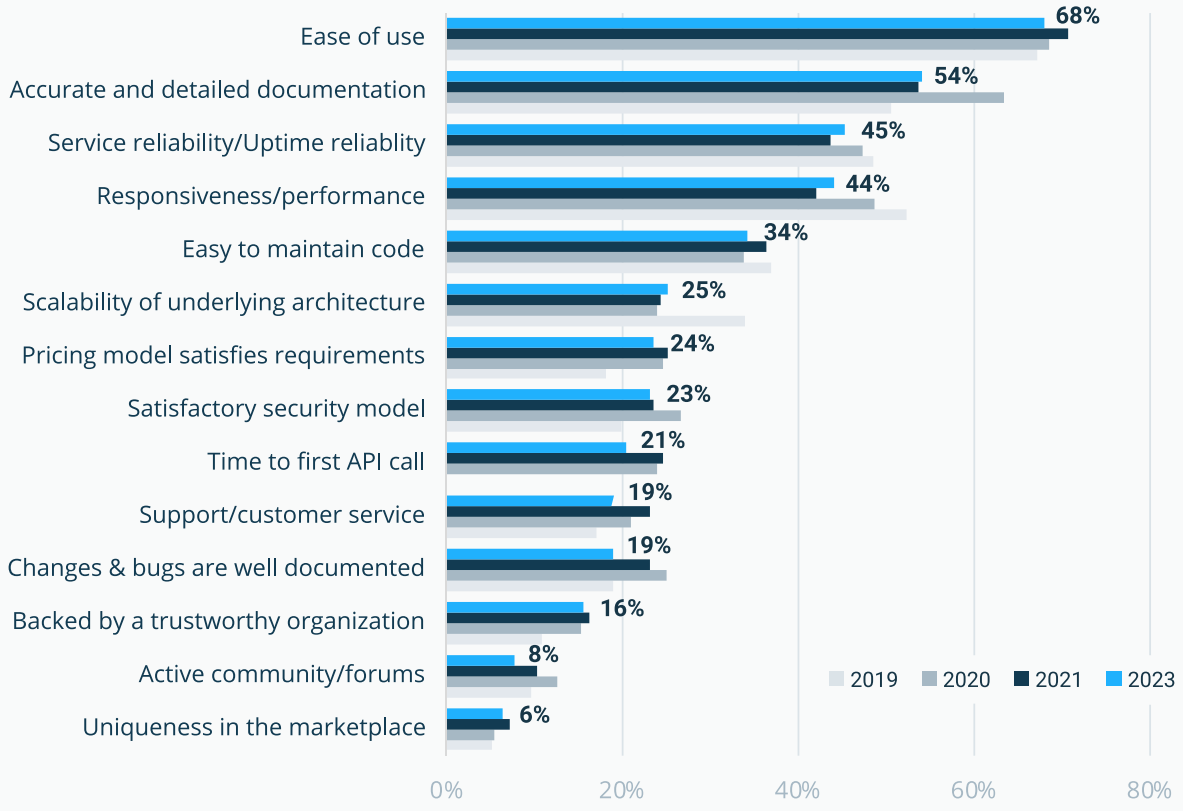
We found no significant differences between how consumers/developers, or those who do both, answered survey questions. This shows us that ease of use, quality, and performance are critical for both APIs being developed by software teams as well as APIs consumed by applications and internal systems.

For the fourth year in a row, Ease of Use has dominated in terms of what API consumers want ***(fig. 22)***. There's a lot that can encompass ease of use, but documentation and reliability are certainly two key components. The data highlights that API providers should focus on keeping things simple for their consumers, ideally via a self-service model.

Majority of Organizations are Developing and Consuming APIs *(fig. 21)*



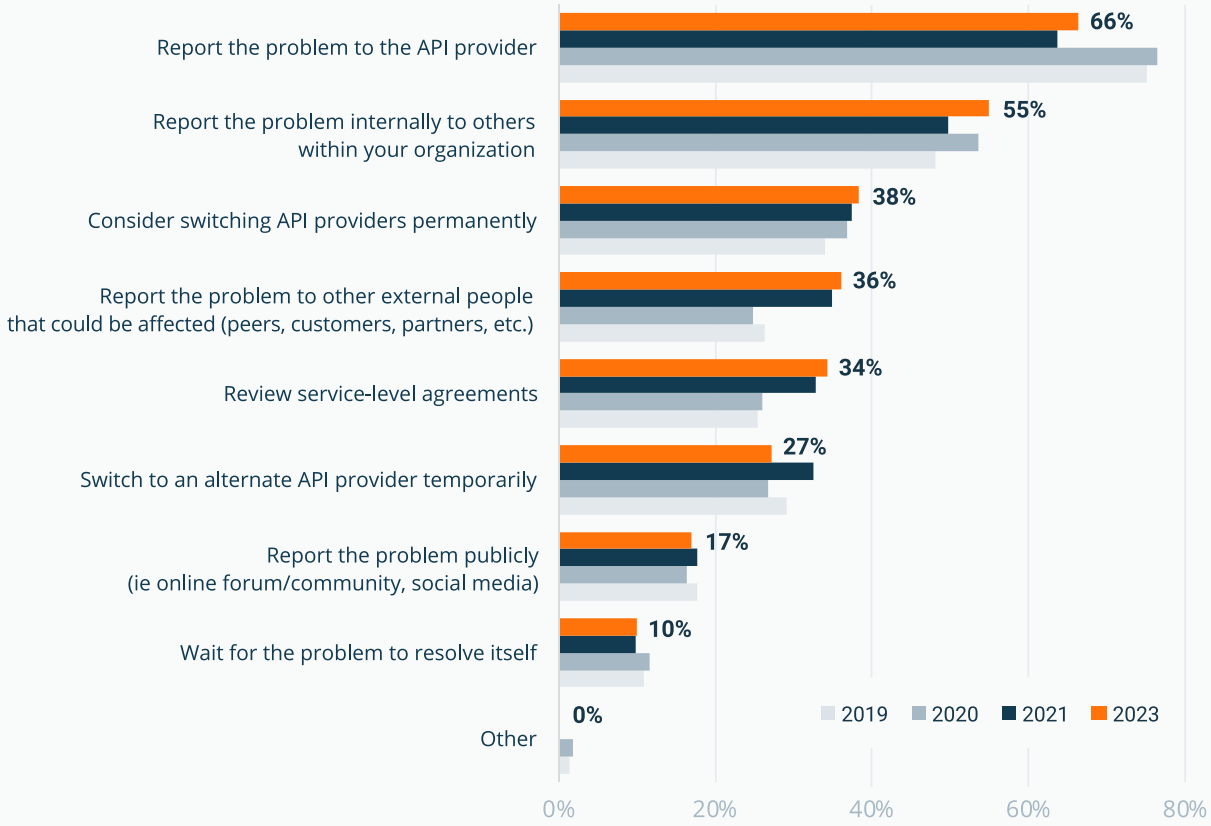
Ease of Use Continues to Top the Charts for API Consumers *(fig. 22)*



Last year, we found that consumers will report the problem directly if they run into quality or performance issues with third-party APIs. We are happy to report that that is still the status quo for API consumers.

Sixty-six percent of respondents will report the problem directly, 70% of respondents will take more than one action, and 57% are taking three or more actions ***(fig. 23)***. Often, the end user will look for help inside or outside their organization while searching for an alternative API.

Consumers are Still Reporting API Issues Directly to the Provider... While Telling Others Something's Wrong *(fig. 23)*



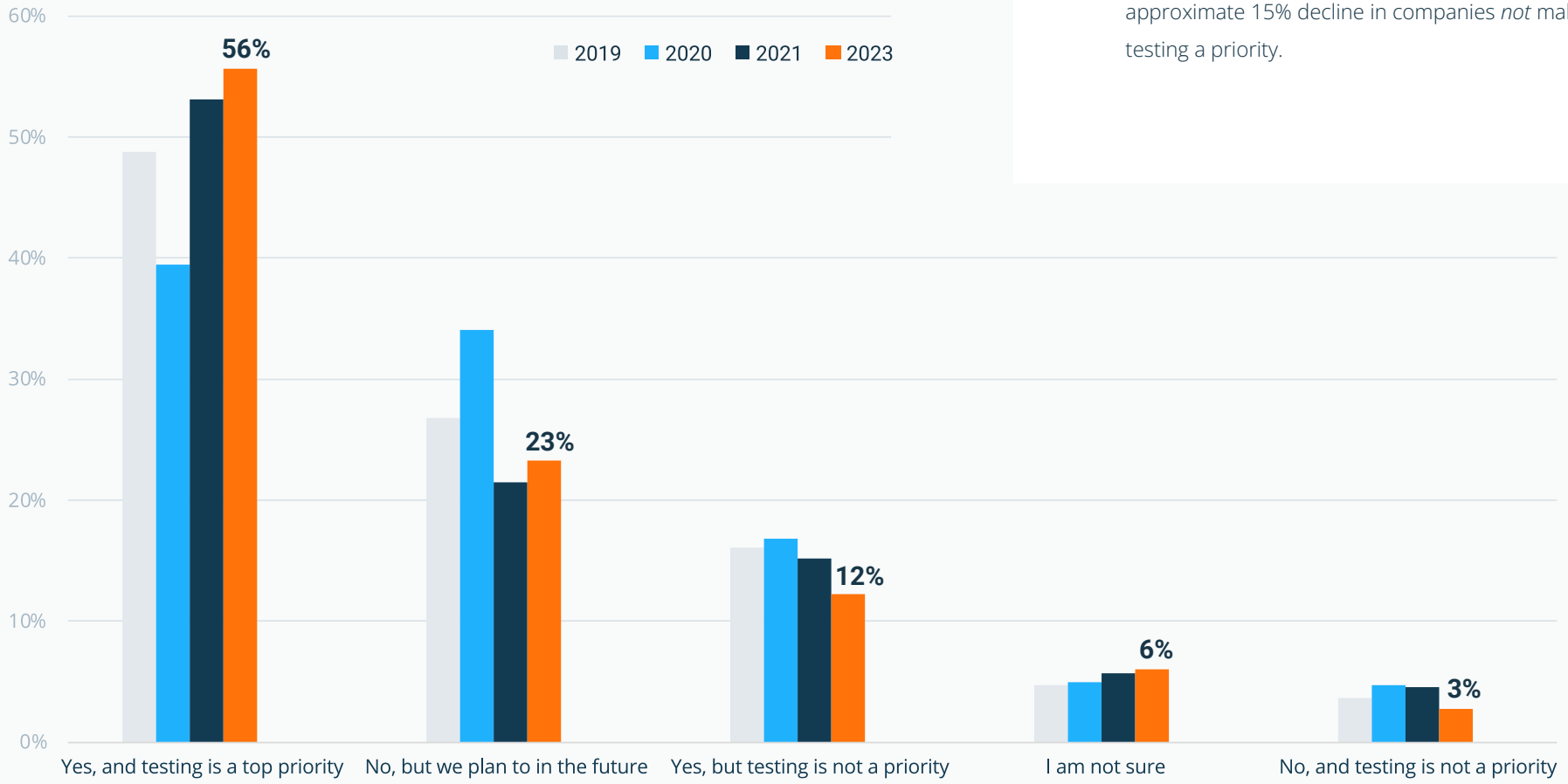
API Testing and Quality

As the need for digital immediacy increases, software development teams are pressured to deliver fast and frequently. All provides are faced with the challenge of ensuring sustainable quality throughout the lifetime of an API.

APIs represent a contract between providers and consumers, which can often be between an organization and its customers (business to business or business to consumer), and a poor-quality API affects all its consumers which can have far-reaching consequences.

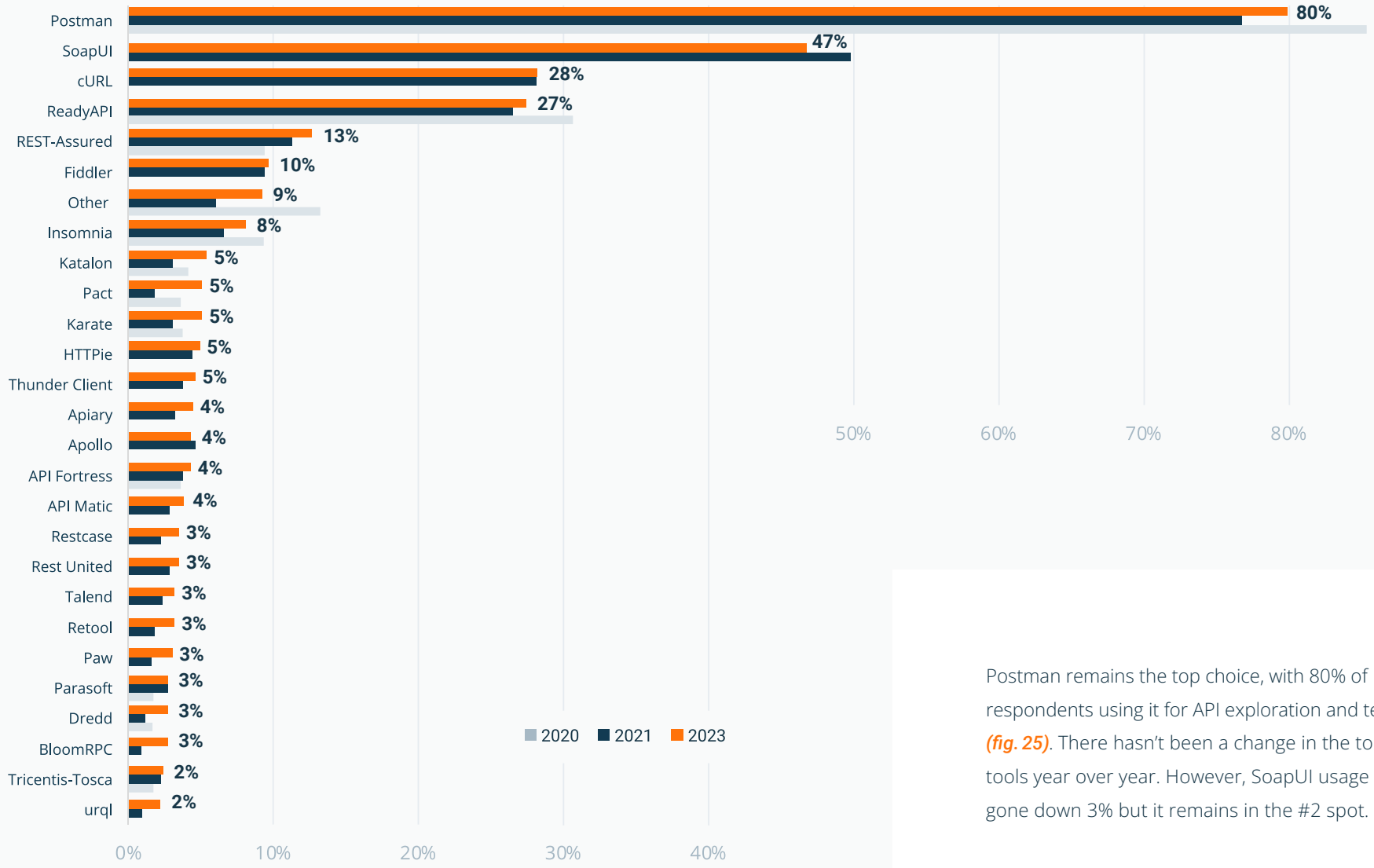
This section offers a look at how software professionals think about API testing and quality in 2023 and year over year. We'll look at common obstacles to ensuring quality, associated risks with poor quality, and how organizations view API quality as a business priority.

Everyone is Testing but the Larger You are, the More Likely You are to Have a Formal API Testing Process *(fig. 24)*



We love seeing how the answers vary year to year, but one thing that holds true for 2023 is that testing is a top priority for everyone ***(fig. 24)***. No matter the company size, strides are being made to get a formal testing process in place. Our survey shows an approximate 15% decline in companies *not* making testing a priority.

Postman Remains the Top Choice for Respondents *(fig. 25)*



Postman remains the top choice, with 80% of respondents using it for API exploration and testing *(fig. 25)*. There hasn't been a change in the top five tools year over year. However, SoapUI usage has gone down 3% but it remains in the #2 spot.

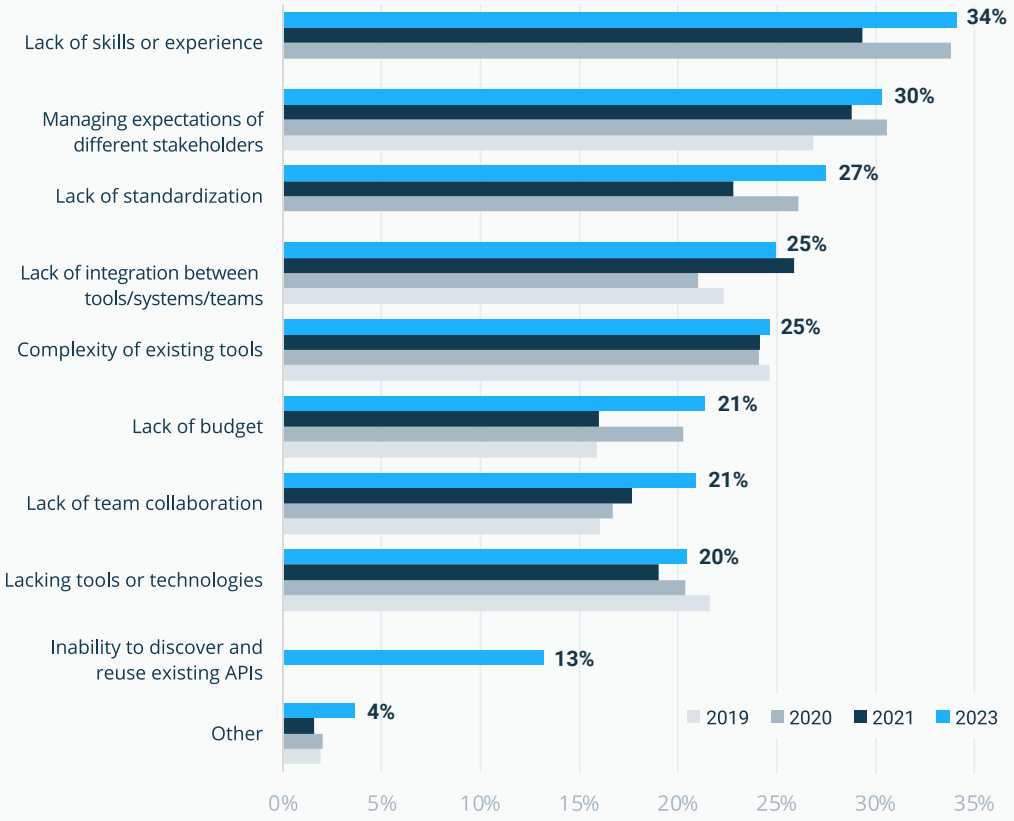
Maintaining quality is critical to coherently scaling any API practice. It's the biggest obstacle for organizations year over year, and unfortunately now they need to do more with less ***(fig. 26)***.

The need to speed up release cycles is at odds with the time available for testers/developers to ensure quality. The organizations that achieve API quality nirvana (if there is such a thing) will ultimately be the ones that successfully manage the tradeoffs that exist between speed, time, and workload.

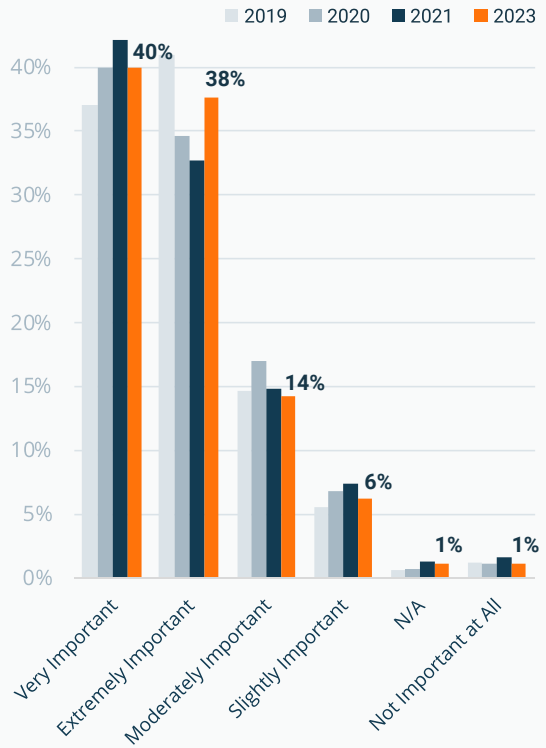
API quality continues to be viewed as important to organizations. 78% of respondents found it Very Important or Extremely Important, with a slight uptick in respondents finding it Extremely Important since our last survey ***(fig. 27)***.

Those that consider API quality Very Important or Extremely Important are more likely (51%) to agree that the biggest obstacle to ensuring API quality is "Increasing Demands for Speed of Delivery" vs. respondents who don't find API quality Very Important or Extremely Important (29%).

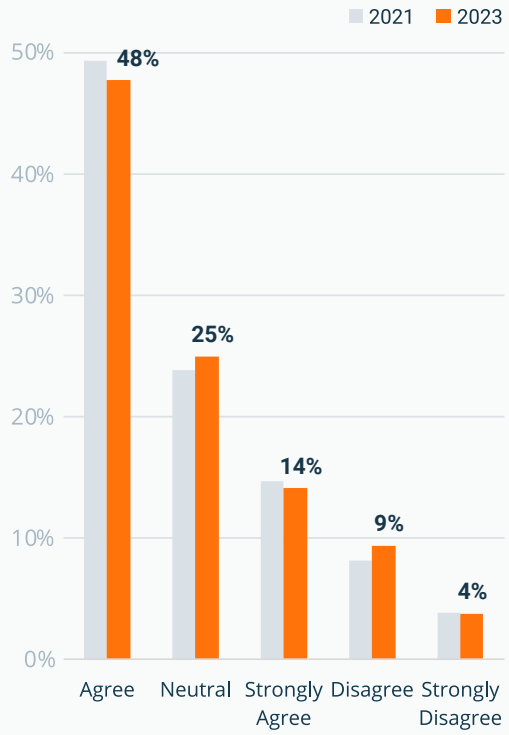
Increasing Demands for Speed of Delivery Remain the Biggest Obstacle ***(fig. 26)***



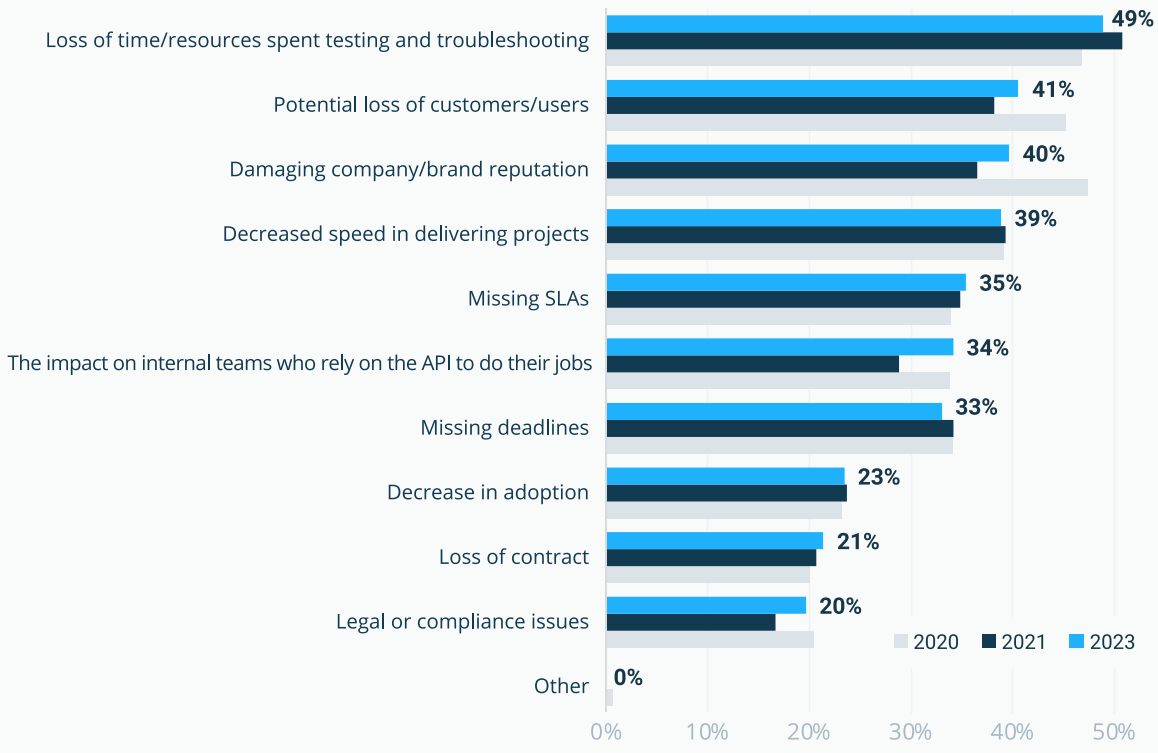
More Organizations Find that API Quality is Important ***(fig. 27)***



Almost Half of Respondents Believe their APIs are High-Quality With Minimal Risk of Failure *(fig. 28)*



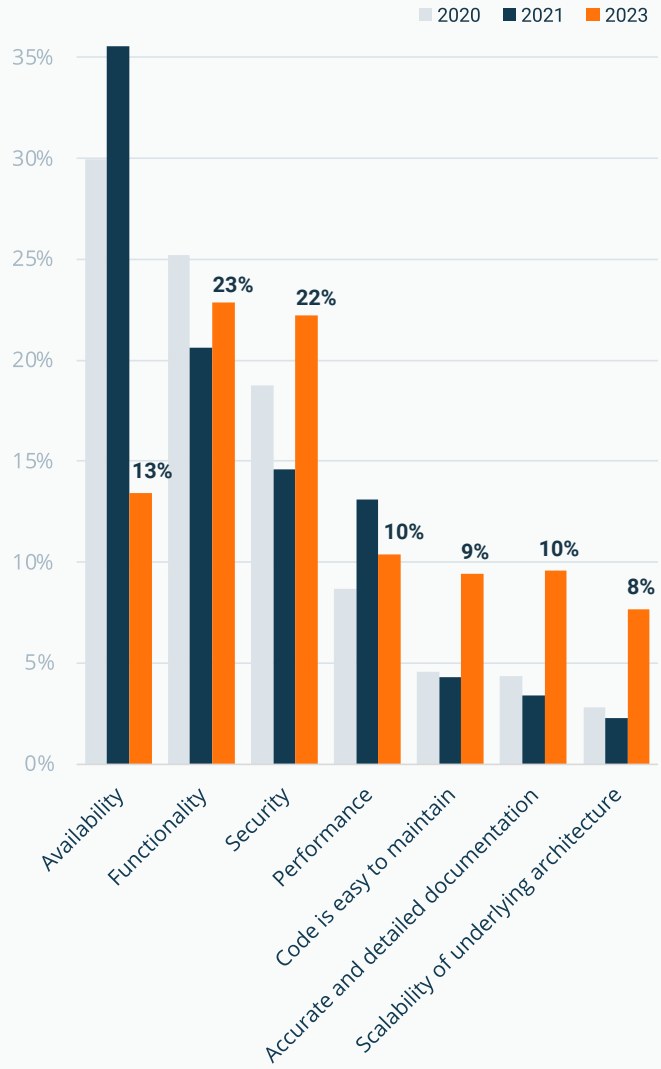
The Top Risk of Poor-Quality APIs Continues to be the Time and Resources Spent Troubleshooting Issues *(fig. 29)*



Almost half of organizations (48%) believe that their APIs are high quality and have minimal risk of failure ***(fig. 28)***. There is almost no change year over year, leading us to believe that companies are trying to deliver quality APIs.

Pressure from deadlines can result in teams not being able to ensure API quality. When rushed, development and testing teams produce poor-quality APIs. They then must expend time fixing them. Businesses that take the time to initially ensure API quality do not need to spend extra time fixing them, but instead invest in a quality-first approach for their next application ***(fig. 29)***.

Without a Shock, Security Ranks #2 in Top Concern... but Concerns are Growing in Other Areas *(fig. 30)*



As cybersecurity grows in importance globally, it's not surprising to see organizations more concerned with security now. Availability, Functionality, and Performance all fell in average position. However, Functionality was ranked #1 by more respondents this year than our previous survey, barely edging out security *(fig. 30)*. Respondents chose these concerns predominantly from the provider perspective (i.e., producing an API).

Additionally, we noticed a year-over-year increase in Scalability (8%), Code Maintenance (5%), and Documentation (4%). This is attributed to the increase in microservices and the need to scale faster to meet business demands.

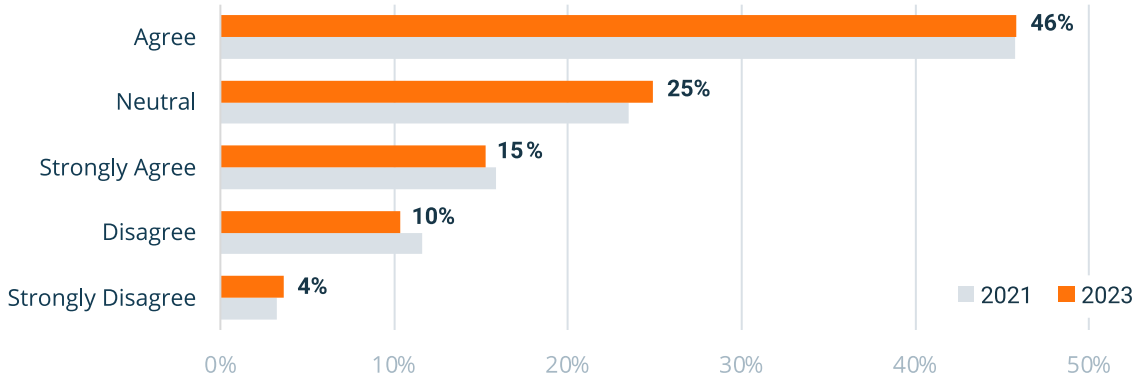
Industry has an impact on the top-ranked concern by the respondents: Finance, Banking, Insurance, Government, Defense, Aerospace, IT/Service (consultants) put Security as their #1 more often than the other industries. All others put Functionality as their top concern (except Manufacturing and Automotive, which put Availability and Functionality as their #1s, respectively).

For all industries except Manufacturing and Automotive, Functionality and Security are the top two concerns this year; Manufacturing saw Security as #6, while Automotive saw it as #4. When considering placement in top three, there is wide variety between the industries, though Functionality is the only concern that makes it into the top three of every industry.

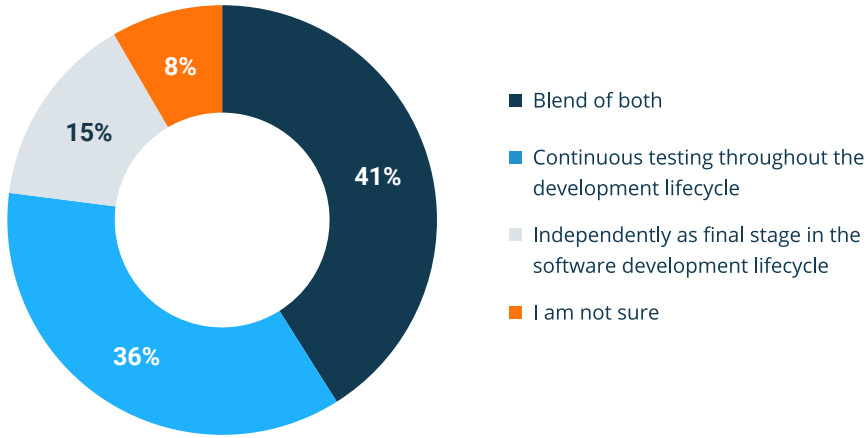
We introduced this question, "Organizations Continue to Feel Secure in their API Security Process," last year and there hasn't been a significant change. Companies still feel confident in their processes to ensure API security ***(fig. 31)***.

We added a new question inquiring about API testing strategies to our survey this year, and we were pleasantly surprised with the responses. Thirty-six percent of companies use continuous testing throughout the development lifecycle, with only 15% are independently testing at final stage in the software development lifecycle ***(fig. 32)***. Forty-one percent are doing a blend of both.

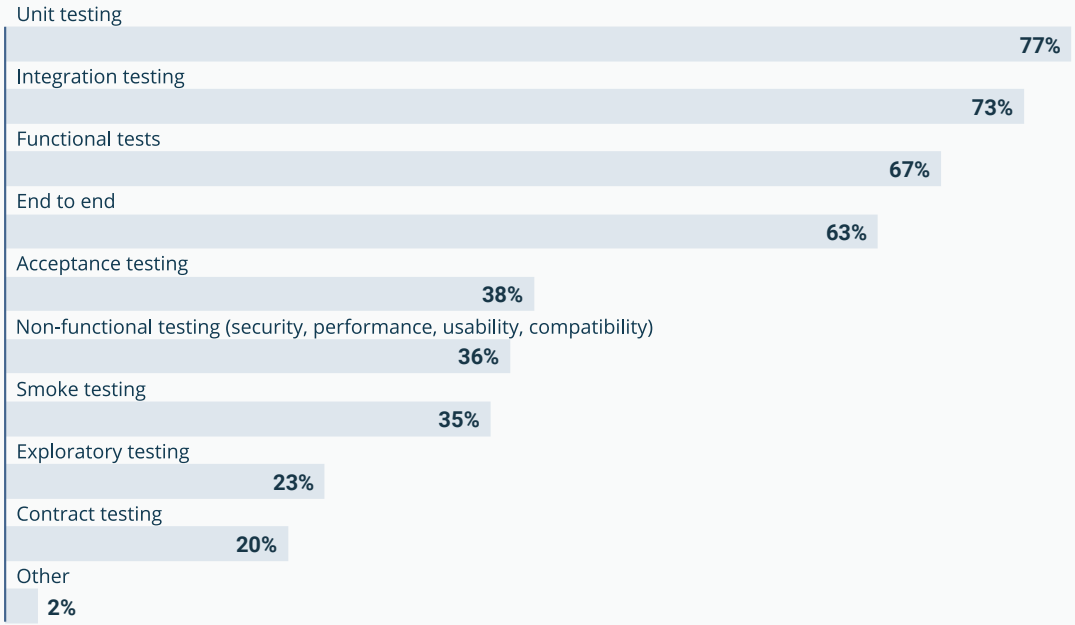
Organizations Continue to Feel Secure in their API Security Process *(fig. 31)*



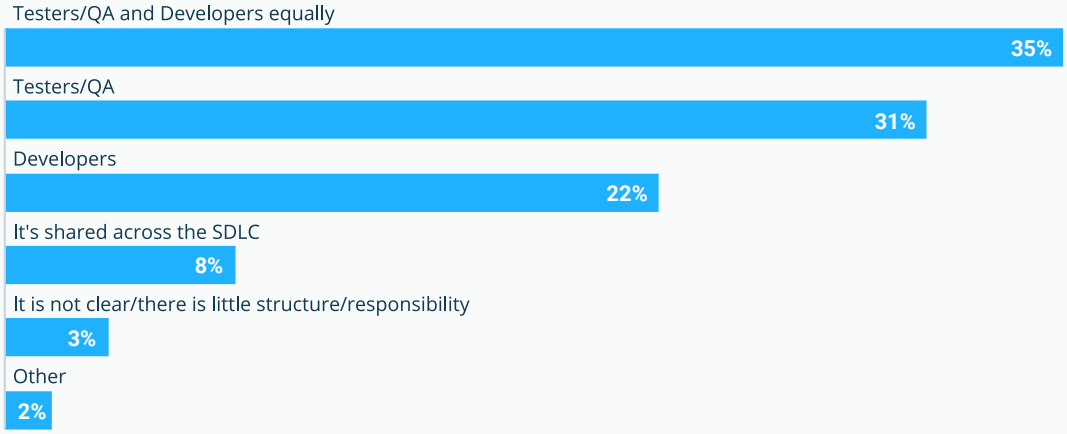
Most Organizations are Using a Blend of Testing Strategies *(fig. 32)*



Unit Testing is the Dominant Technique of Choice for Many Organizations *(fig. 33)*



Organizations are Relying on Testers/QA and Developers Equally When it Comes to Testing *(fig. 34)*



We added this section this year to get a pulse check on how people test their APIs and the verdict is in: Unit Testing is king. Seventy-seven percent of respondents selected Unit Testing as their dominant testing technique. Integration was in second place with 73% ***(fig. 33)***. For the organizations that consider API quality Very or Extremely Important, nearly 80% use Unit Testing.

Larger organizations (501+ employees) are more likely to use Integration Testing over Unit Testing, though the opposite is true for the smaller organizations (<500). Integration & Unit Testing are still the most common testing methods used across all company sizes.

We know organizations are doing more with less, so it makes sense to see them rely on both Testers/QAs and Developers to test ***(fig. 34)***. Our survey shows 35% of organizations rely on both Testers/QAs and Developers.

Smaller companies (<500 employees) are more likely to rely on Developers to perform testing (either alone or with Testers/QA). However, larger companies (501+ employees) are more likely to use Testers/QA (again, either alone or with Developers). This may be due to smaller companies lacking budget or organizational support to hire strict Testing roles. Instead they rely on the Developers to both create and test.

API Monitoring

Monitoring is critical for any API program. Providers need visibility into APIs to ensure they remain within the SLA. They also need to help providers know what to do when they receive real-time insights.

Additionally, monitoring data gives them the information to analyze and validate against key metrics to determine an API's success. Such data highlights consumer patterns and usage trends, which can help teams learn how to update their API. It can also tell providers how their end users are interacting with it.

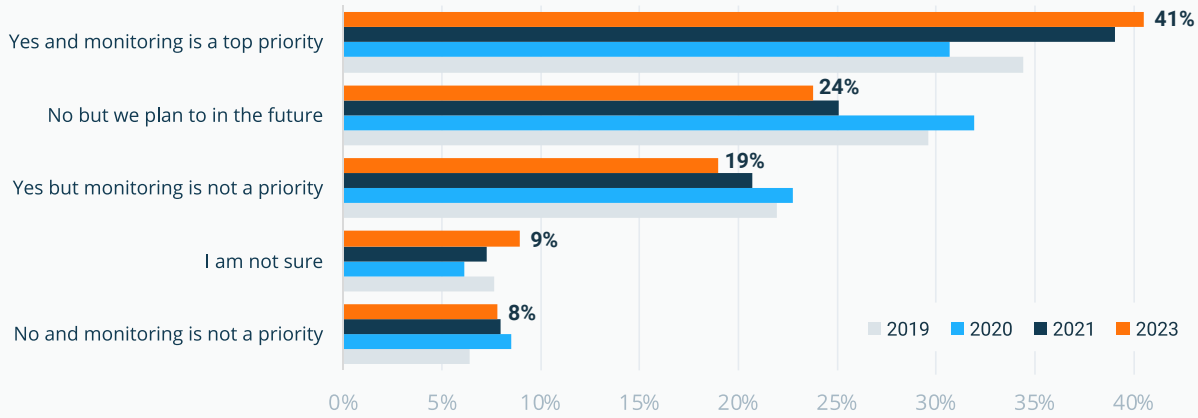
This section takes a high-level look at monitoring. We'll look at how organizations currently view the API monitoring process, top concerns, and expected results.

Around 60% of organizations monitor their APIs formally or informally, and only 8% do not consider it a priority. The survey shows a slight increase in respondents considering monitoring a top priority in 2023 than in 2021, though it still hovers around one-fourth of all responses and in the top position *(fig. 35)*.

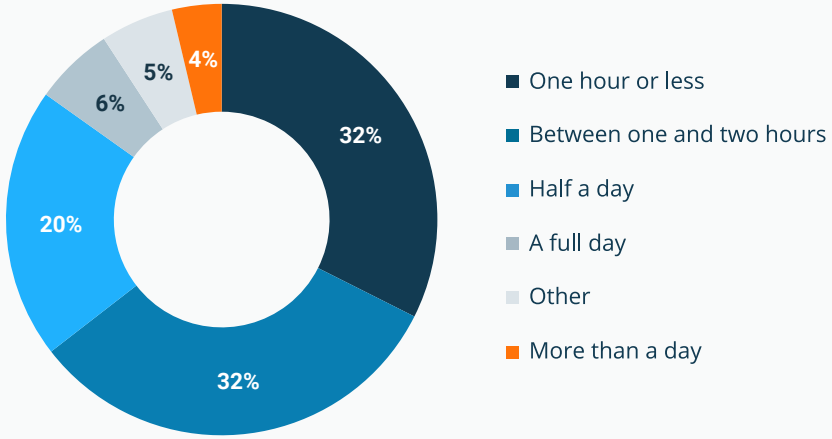
However, for those who consider API quality important, more of them consider monitoring a top priority, increasing by 1% year over year. Meanwhile, those that do not monitor or consider it a priority are diminishing year over year, both overall and within those that consider quality important.

This was a new addition into our list of questions for 2023, and most respondents can restore outages within two hours (64% of respondents overall) *(fig. 36)*. For those who use contract testing, 66% were able resolve within two hours, and only 8% take at least a day. When comparing by industry, Government, Aerospace, and Defense take the longest to restore service outages.

Monitoring is a Critical Step in Any API Development Process *(fig. 35)*



Contrast Testing Helps Resolve Service Outages *(fig. 36)*



API Documentation

Documentation for APIs is most beneficial when it is accessible, consistent, stays up to date, and is validated as part of the delivery cycle. Documentation allows for ease of use and alignment with API consumers and self-service users.

A lack of documentation is like navigating without a map – it leads to uninformed decisions which send you in the wrong direction. Of the factors that positively impact API quality, documentation is easily one of the simplest and should be non-negotiable for all teams. This section explores why its use by organizations is so critical to success in the API lifecycle.

This year, a substantial number of organizations reported they do have API documentation in place or, in the small case they do not (20%), they have intentions to do so in the future ***(fig. 37)***.

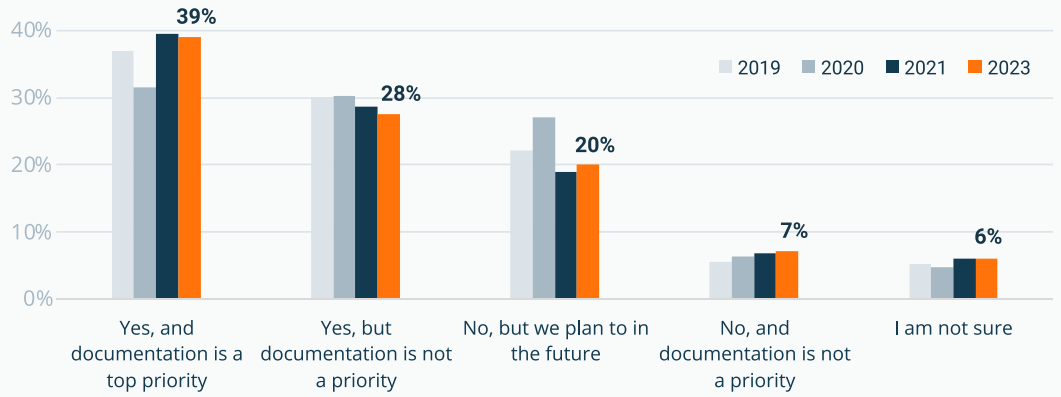
The value of API documentation is universally recognized across all organizations – especially those with more than 10,001 employees. Smaller organizations (fewer than 500 employees) have documentation in place, but it's less of a priority.

There is confidence, year over year, in documentation practices from the organizations we surveyed. A total of 60% of organizations Agree or Strongly Agree that they have strong documentation processes in place to ensure their APIs are secure.

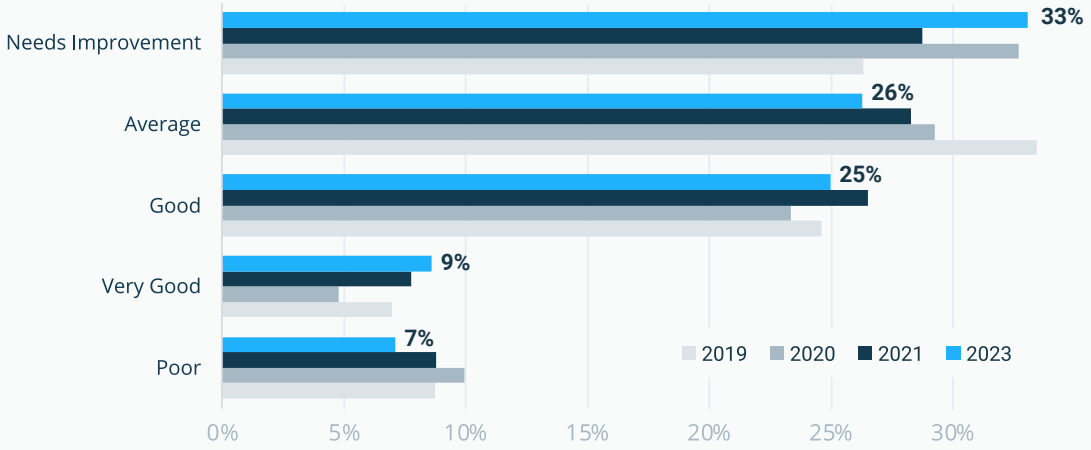
Comparing year-over-year data, this result is much the same as the previous report. Optimistically, we are pleased to report documentation is not suffering, considering changes in teams and organizations recently.

This positive outlook extends to organizations' ratings on their own documentation – the trend is consistent year over year since 2019. In 2023, we see that 34% of organizations rated their documentation as either Good or Very Good ***(fig. 38)***.

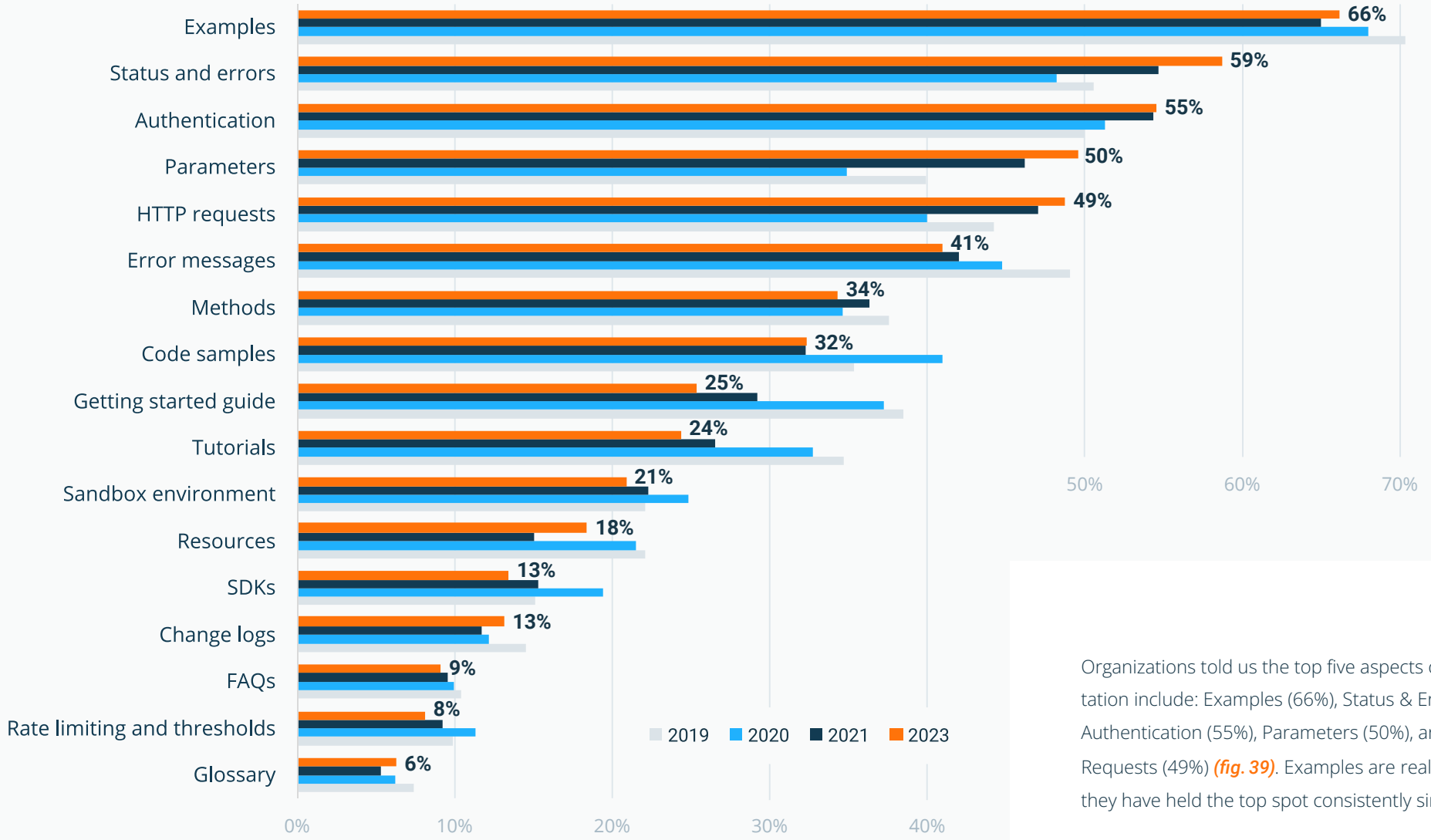
Almost 90% of Organisations Have API Documentation in Place or Plan to in the Future *(fig. 37)*



Organizations Have Decent Confidence In Their Current Documentation Practices *(fig. 38)*

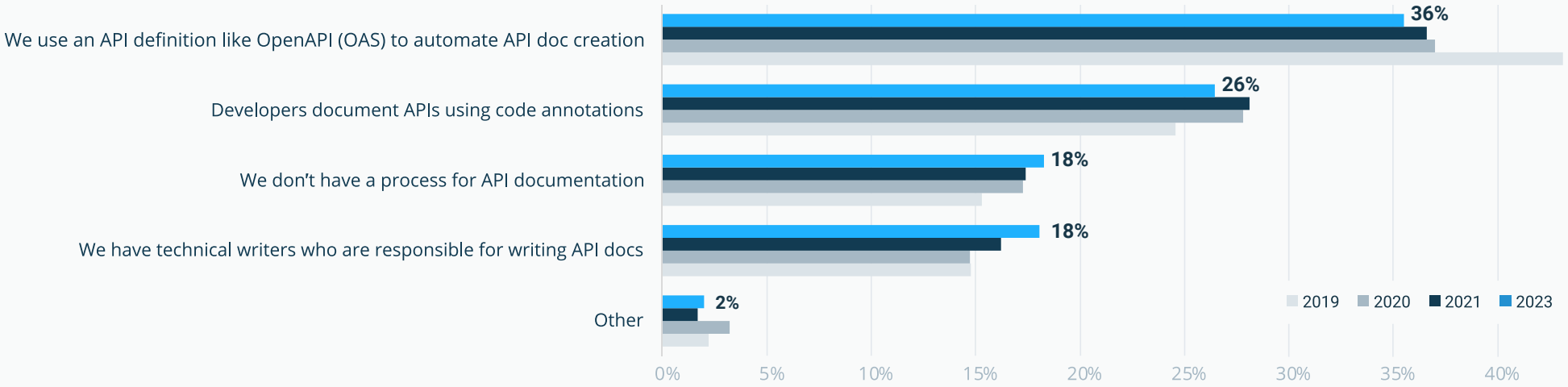


Examples are the Most Favored Aspect of Documentation *(fig. 39)*



Organizations told us the top five aspects of documentation include: Examples (66%), Status & Errors (59%), Authentication (55%), Parameters (50%), and HTTP Requests (49%) ***(fig. 39)***. Examples are really loved – they have held the top spot consistently since 2019.

OAS is Still the Top Tool to Automate API Documentation *(fig. 40)*

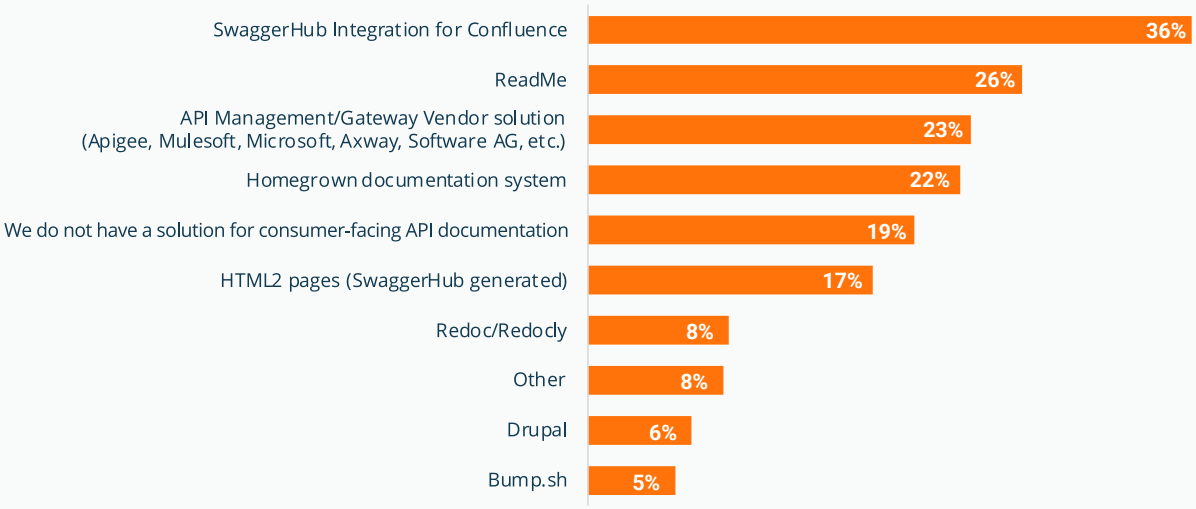


Consistent ratings around documentation can be attributed to how teams handle their API documentation, which, compared with 2021, has not changed (36% of teams are using OpenAPI to automate API documentation creation) ***(fig. 40)***.

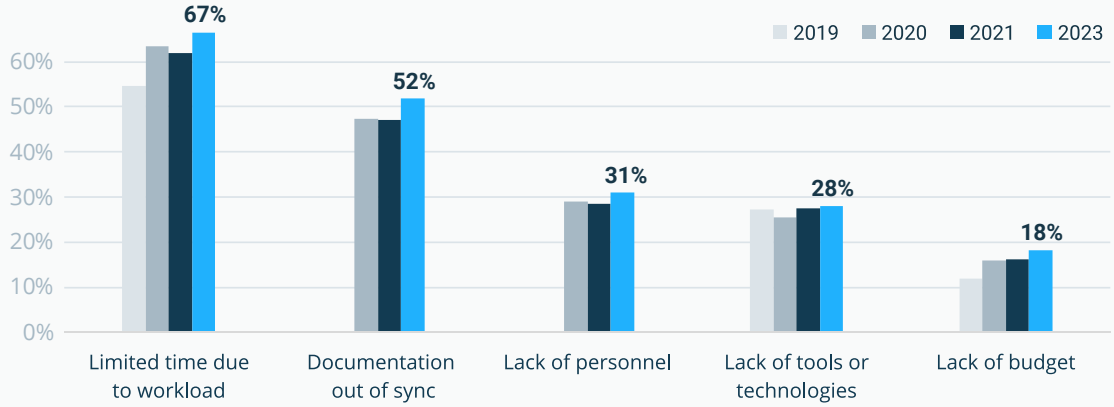
Manual processes are decreasing – year over year we have seen a slight decrease in the number of teams using code annotations created by their developers. The number of teams reporting they do not have a process for API documentation sits just below one-fifth of this year's respondents – not too dissimilar to the previous year – which is interesting to observe given the overall satisfaction with documentation processes.

To dive into this more, we asked those organizations with a formal API documentation process whether this was a priority or not. We found that placing importance on API documentation processes only makes a slight difference to the likelihood that the organization is using OpenAPI specification to automate API doc creation: 21% vs. 17%. This has been consistent since 2019.

Collaborative Tools are Popular for Consumer-Facing API Documentation *(fig. 41)*



The Largest Hindrance to API Documentation is Lack of Time Due to Workload *(fig. 42)*



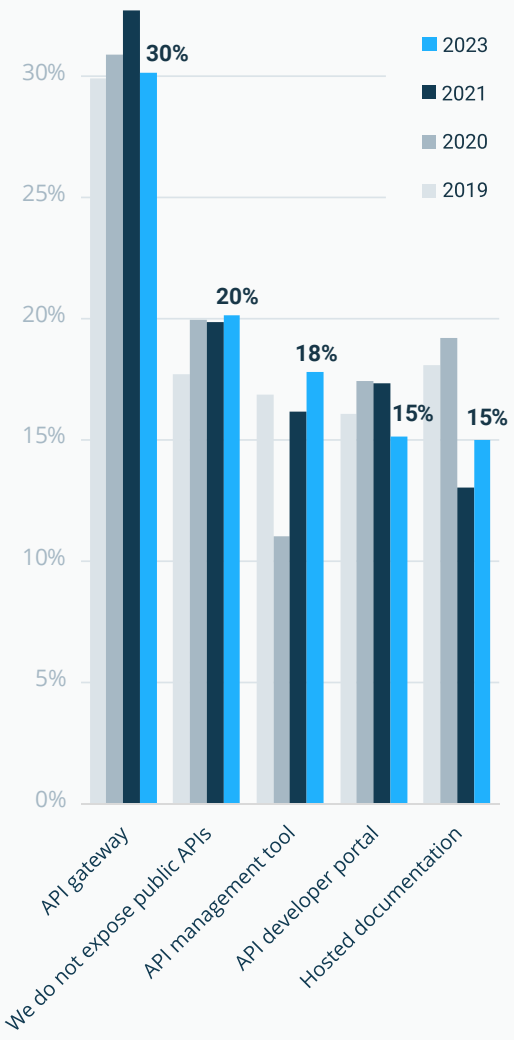
This is the first year we asked respondents about the tools they use for consumer-facing API documentation.

We found SwaggerHub Integration for Confluence was the highest ranked tool at 36% *(fig. 41)*. The SwaggerHub Integration with Confluence was launched in March 2022, so it is positive to see strong adoption since then.

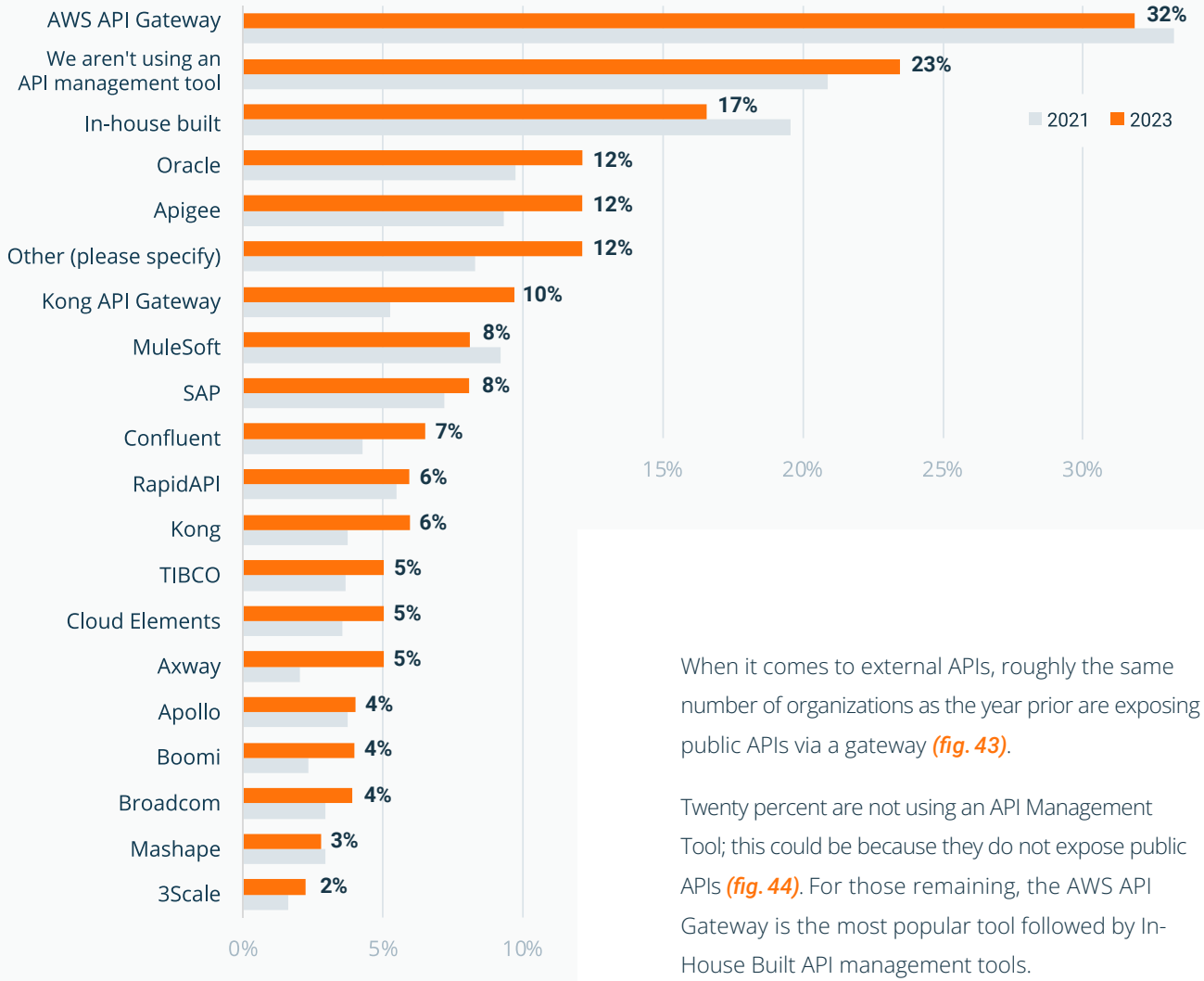
Despite most organizations having documentation in place (or plan to), obstacles to maintain documentation has not changed since 2020. Every obstacle saw a decrease in response rate, but Limited Time persists as the biggest obstacle to over one-third of respondents (67%). This is followed by Documentation is Out of Sync (52%), Lack of Personnel (31%), and Lack of Tools or Technologies (28%) *(fig. 42)*.

As teams globally expand, it's no surprise such a process might be dropping from the radar, but it certainly should not be an excuse.

Not all Organizations are Exposing Public APIs *(fig. 43)*



For Those Exposing Public APIs, AWS is Most Popular *(fig. 44)*



When it comes to external APIs, roughly the same number of organizations as the year prior are exposing public APIs via a gateway *(fig. 43)*.

Twenty percent are not using an API Management Tool; this could be because they do not expose public APIs *(fig. 44)*. For those remaining, the AWS API Gateway is the most popular tool followed by In-House Built API management tools.

API Design

APIs are built for consumption and should be designed with the consumer in mind. Understanding the consumer and the problems they face help designers approach API design with empathy. This leads to better API consumer experiences. Consumers expect the APIs they integrate into their own applications to be stable, performant, secure, and available throughout the lifetime of their application. API providers must meet the need for longevity through their API design practices.

In this section of the report, we'll gauge how organizations approach design as part of the API lifecycle and how they achieve collaborative design.

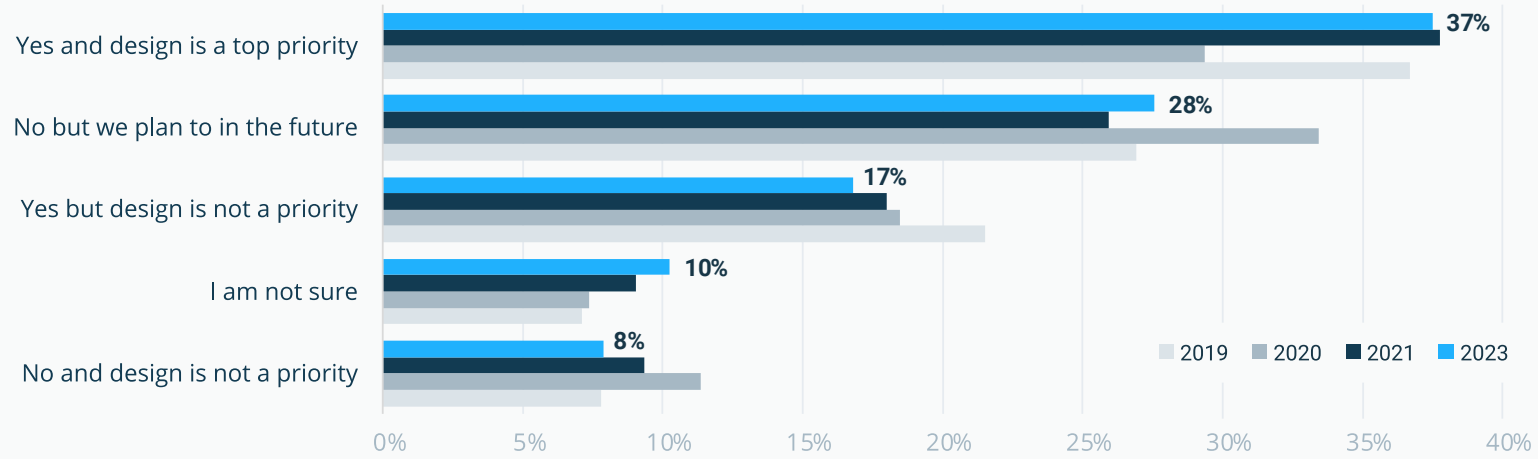
We have not seen any major changes in overall trends around API design processes year over year. Of those that have a formal documentation process, 55% also have a formal design process, consistent with last year's results and a slight increase since 2020 ***(fig. 45)***.

Larger companies (1,001+) are increasingly adopting formal design processes, growing by 4% year over year. Additionally, the largest companies (10,000+) consider design a top priority. Those who consider design processes a top priority grew 2% year over year, and those who do not dropped .5% year over year.

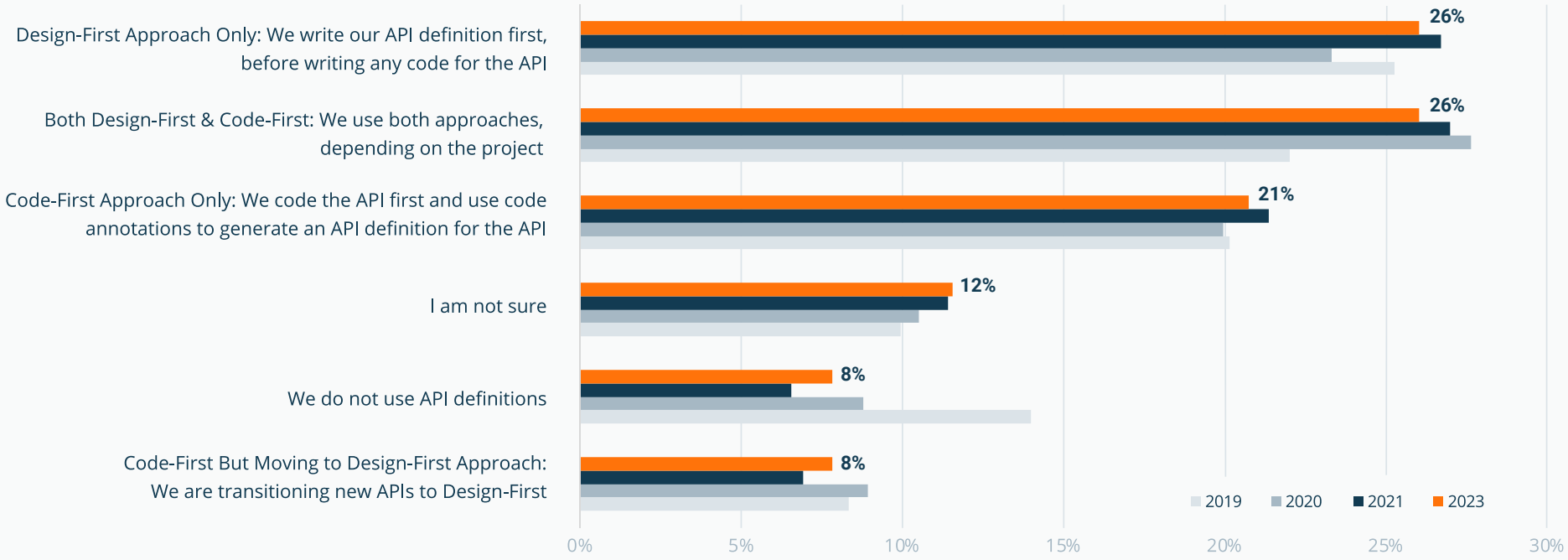
We have seen a 50% decrease in the number of organizations with 100 employees or fewer who have a design process in place and rate this as important. Since we know time due to workload is the major hindrance to good documentation, we can hypothesize this is a hindrance to good design processes, too.

Of the organizations that have a formal documentation and design process, 50% consider their APIs high quality (Agree or Strongly Agree), just as in 2021. Year over year, the organizations with formal processes that consider their APIs low quality (Disagree or Strongly Disagree) decreased 2%, indicating those with these processes have more trust in APIs.

A Formal API Documentation and Design Process go Hand in Hand Delivering Satisfactory Experiences ***(fig. 45)***



Design-First Approach is Favored by Organizations With Satisfactory Design and Documentation Processes *(fig. 46)*



Most companies with a formal design and documentation process take a design-first approach (over 50% in 2023). The percentage of organizations moving to design-first increased by .5% year over year ***(fig. 45)***.

Over 50% of companies with a formal design and documentation process are satisfied (Somewhat or Very Satisfied) with their formal documentation for their APIs. This increased 1% year over year. However, this is primarily driven by those who consider design a top priority; those who do not consider design a priority are more neutral toward their documentation, with slightly fewer respondents satisfied year over year.

The approach to API design does not vary much in relation to organization size

There is little variation when comparing responses by company size. For all company sizes except 501 – 1,000 increasingly fewer respondents do not have a formal design process and do not consider it a priority. We are seeing a decrease in response rate year over year.

The approach to API design varies slightly between industries

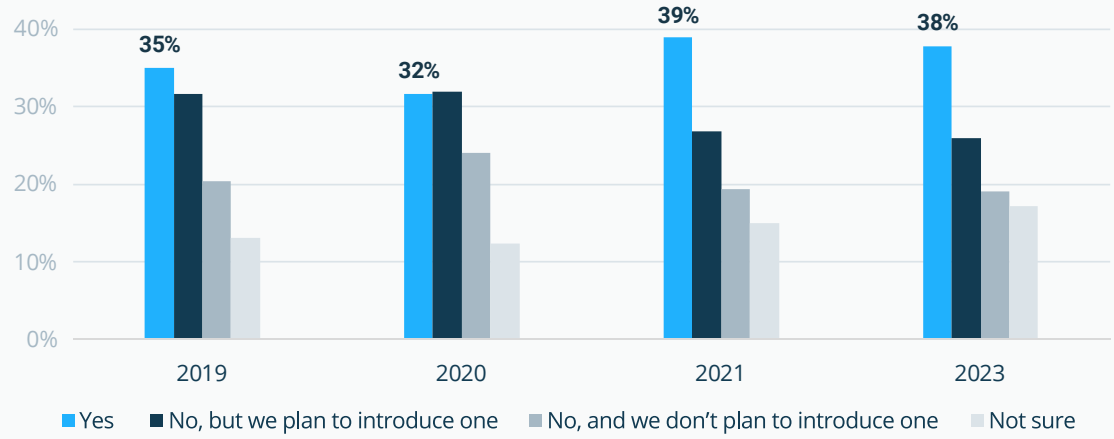
There is some variation in the response rates by industry. However, the most common responses for all industries except Government, Aerospace, and Defense are "Yes and Design is a Top Priority" and "No but We Plan to in the Future." Where Finance, Banking, & Insurance; Government, Aerospace, & Defense; and IT/Service (consultants) tend to have the similar trends in response rates, Government strays from that. Their top two are "No but We Plan To in the Future" and "No and Design is Not a Priority." Government agencies tend to be behind on technological trends, so it's not entirely surprising that API design is not currently implemented.

Design-first approach remains more popular than code-first approach across all organization sizes

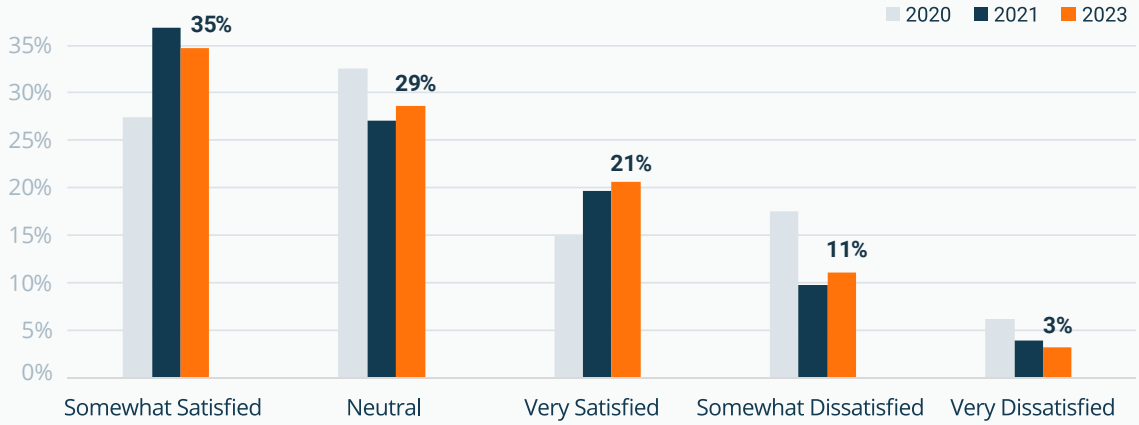
Design-first approaches continue to be most prevalent, used by over 25% of respondents. Code-first approaches decreased by 2.5% between 2021 and 2023. Company size does not seem to impact approaches used– design-first approaches are most common across all. Across all industries except Energy & Environmental, design-first is the most used approach (either alone or in combination with code-first). All the industries with design-first saw an increase in response rate year over year, except IT Service (consultant), which remained at the top but dropped in response rate year over. Energy & Environmental uses code-first approaches most often (either alone or in combination with design-first).

A style guide can ease the burden of API design processes. This year, one-third of respondents have or will introduce an API style guide, which has decreased slightly year over year.

More Organizations Have an API Style Guide *(fig. 47)*



Overall Satisfaction With API Design Processes is Positive *(fig. 48)*



Of all organizations in 2023 that use a formal API design process, 22% employed a design-first only approach, while 20% currently use, or plan to in the near future, a blend of design-first and code-first compared to 18% the year prior ***(fig. 47)***. Understandably, of those using a blend of approaches depending on the project, their commitment to design as a priority is lower (10%) than those who show commitment.

Year over year, we are seeing a stagnation in the growth of a design-first Approach to creating APIs, staying roughly at 40% for organizations using both a purely design-first and a blend of design & code-first.

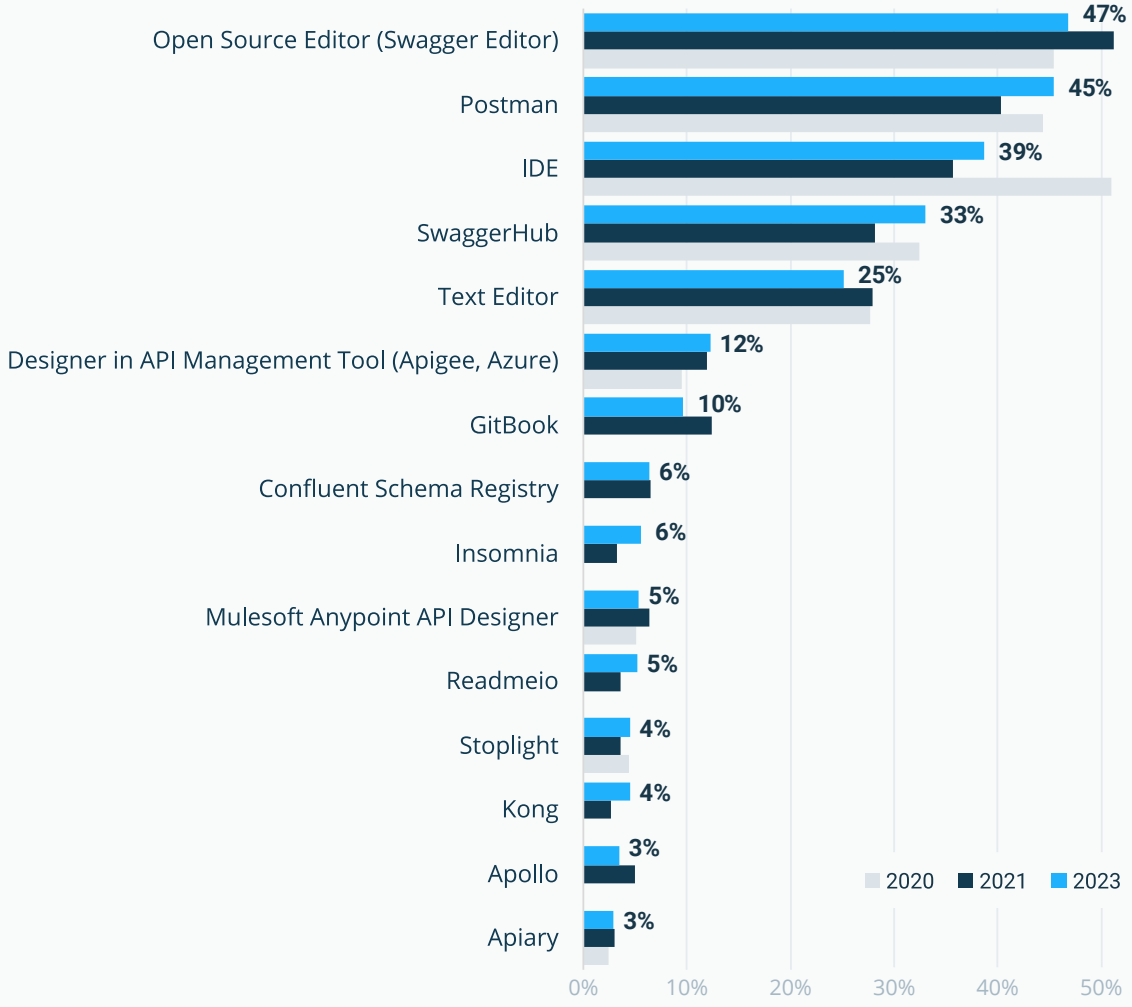
With many organizations having a design process in place, it is pleasing to see that the overall majority feel positive about their design processes. There has been a year-over-year increase in general satisfaction ***(fig. 48)***.

Tools for designing and documenting APIs are relatively the same. The top five are the same year over year, and the top five are the same for those that are code-first or design-first only (also year over year).

SwaggerHub gained share, year over year, for both code-first and design-first groups; however, so did many of the top five, comprised of Open Source Editor (Swagger Editor), Postman, IDE, SwaggerHub and TextEditor ***(fig. 49)***. This indicates that each of these tools are becoming increasingly popular for these two sub-groups, which is contrary to the overall population, where we see a decrease in users for the top five tools (excluding SwaggerHub).

The use of IDE to document and design APIs has been trending downward since 2021.

Tools for Documenting and Designing APIs Remain Consistent ***(fig. 49)***



API Challenges & Future Growth

Indicators point to a solid future for the API market, with microservices forecast to be the considerable driver for growth. The current industry challenges strike the right balance between speed, agility, security, and developer experience. These are arguably the most important considerations API providers and consumers must deal with moving forward.

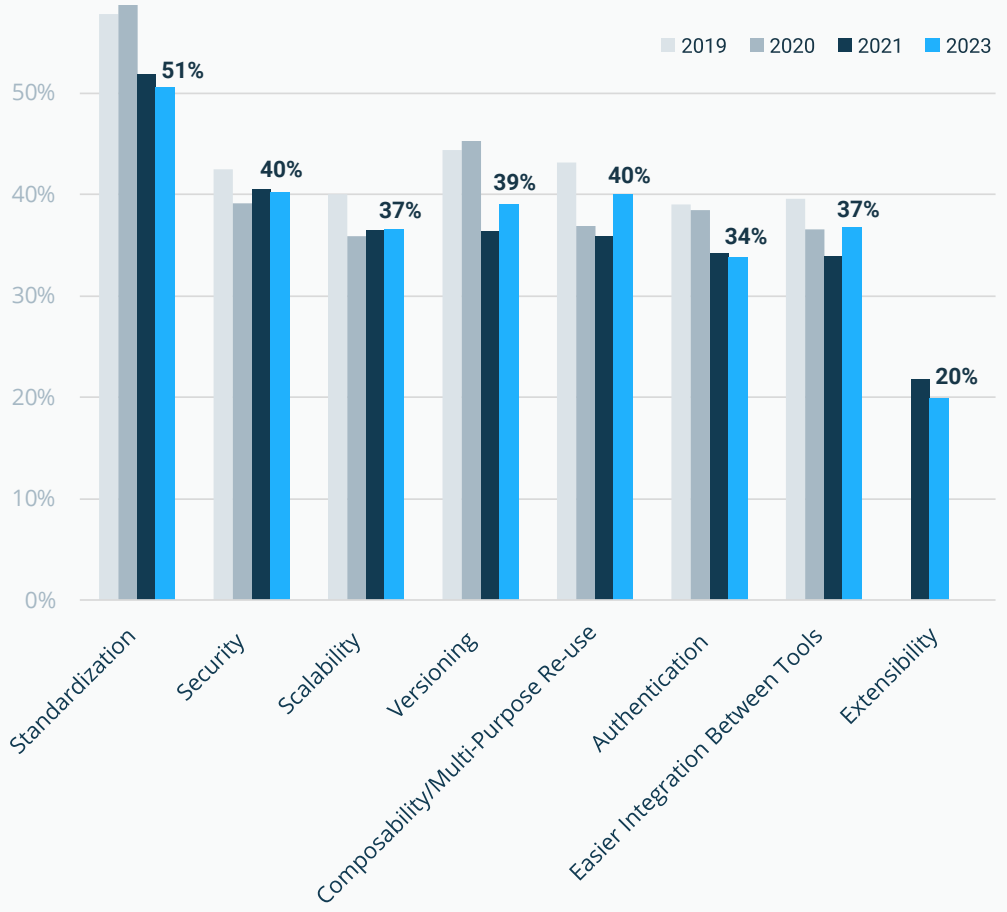
Leveraging specifications and tooling innovations, making a commitment to up-skilling teams, and refining processes to focus on APIs will give companies an advantage.

This section will look at what the future may hold for APIs and the challenges the industry will face.

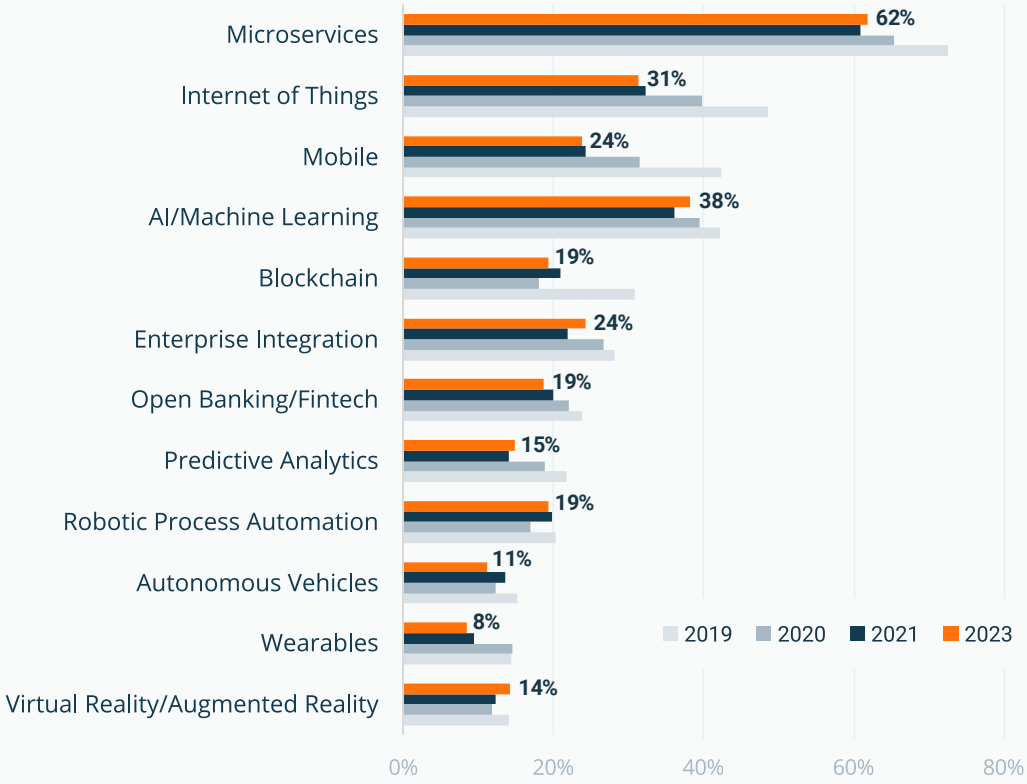
Challenges

It is no surprise that API Standardization (51%) and Security (40%) remain the top two challenges that organizations want to see solved in 2023. Composability/Multi-Purpose Re-Use (40%) continues to climb up the ranks from #5 in 2020 to #2 in 2023, indicating an appetite for efficiencies ***(fig.50)***.

API Standardization Remains a Top Challenge for the Industry ***(fig. 50)***



Microservices Remains the Top Driver for API Growth With AI/Machine Learning Making Notable Moves *(fig. 51)*



Future Technologies

Microservices (62%) and DevOps (42%) continue to be the two areas that will drive the most API growth ***(fig.51)***. Fewer companies (as a share of respondents) consider Microservices as a driver. However, year over year, of all the areas that drive change, none seem to be as impactful as Microservices.

It is hard to not notice that AI/Machine Learning (sitting at 38%) is closing in on DevOps, which is no surprise given the acceleration of this technology across industries.

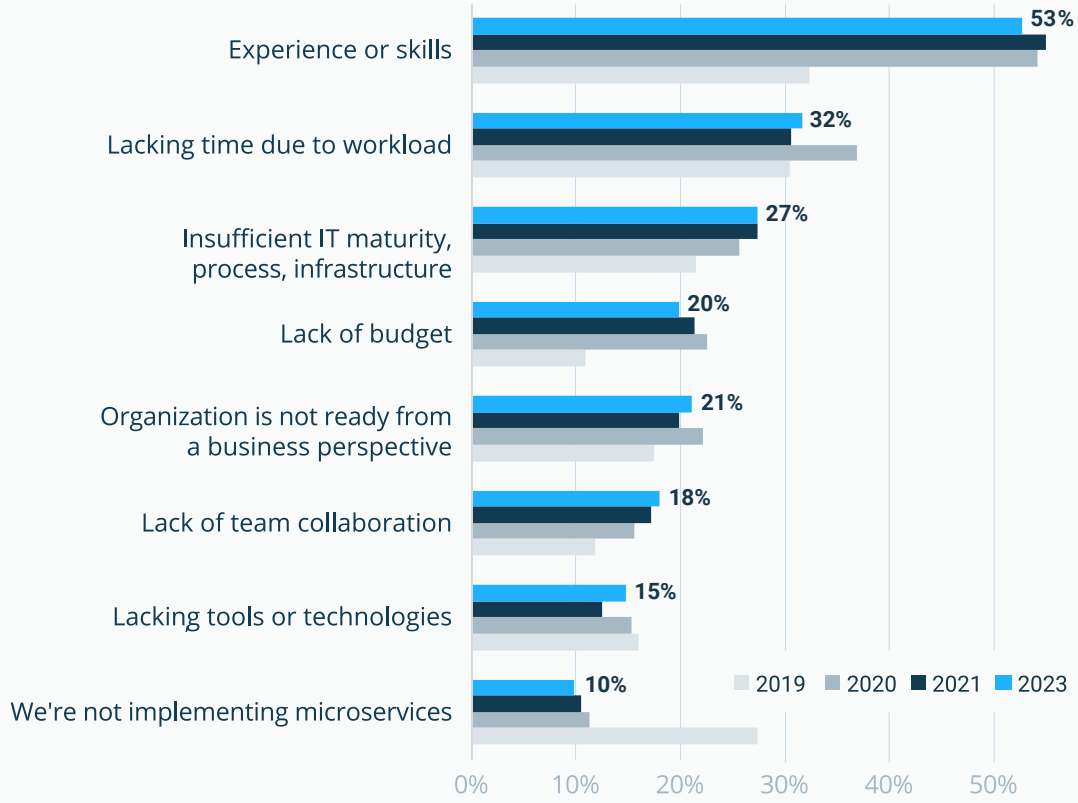
Microservices

The obstacles for implementing microservices remains consistent, but each obstacle did see a decrease in response rate year over year. This is a positive indictor toward broader adoption of microservices.

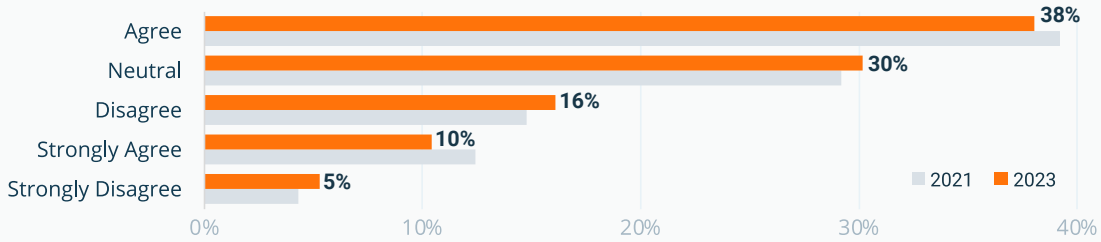
Most companies have the same top three challenges: Experience or Skills (53%), Lack of People (33%), and Lacking Time Due to Workload (32%). For most company sizes, these challenges have remained the top three year over year ***(fig. 52)***.

However, 10,001+ sized companies consider Insufficient IT Maturity as one of the top three challenges, rather than Lacking Time Due to Workload. Slow processes and legacy technologies can contribute to this. Development in people, before processes and tools, can help organizations level up their microservices capabilities.

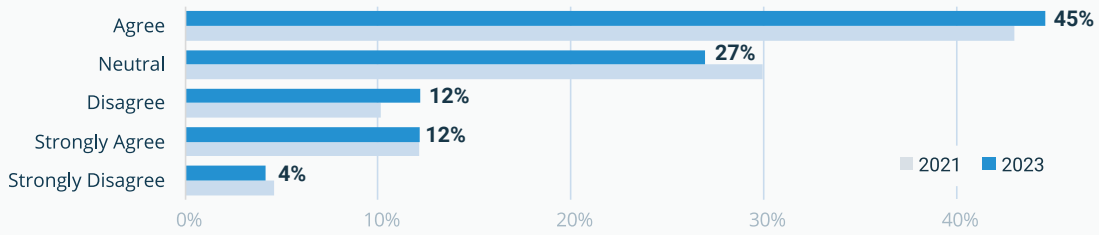
Adoption of Microservices Remains Held Back by Experience and Skills in Organizations *(fig. 52)*



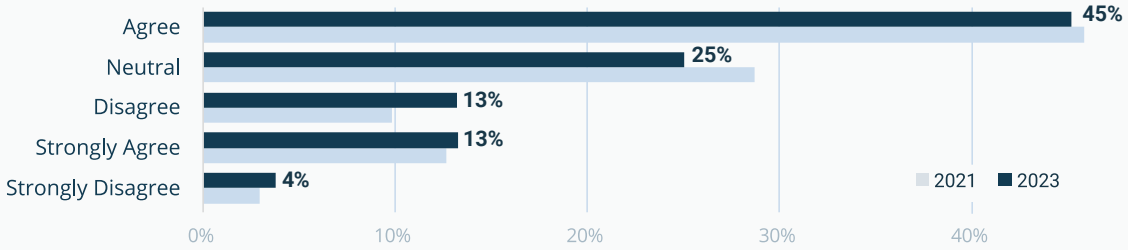
Our APIs are Well Documented for our API Consumers *(fig. 53)*



Our Organization has Good Processes in Place to Ensure APIs can be Consumed by Other Companies Efficiently *(fig. 54)*



Our Organizationhas Good Processes in Place to Ensure APIs can be Consumed by Other Groups Efficiently *(fig. 55)*



API Sentiment

Gaining insight on how teams view their APIs and processes to support their development and management is useful. Since 2021, we have collected data to understand changes in these areas. Let's dive into the year-over-year API sentiment trends – overall sentiment toward processes has not significantly changed year over year.

Confidence in documentation provided for API consumers has decreased year over year. In past years, 52% of respondents Agree or Strongly Agree they have good documentation in place vs. 49% this year ***(fig. 53)***.

According to the responses, most organizations provide APIs to external companies. Over 50% are confident in their processes, allowing other companies to use their APIs effectively ***(fig. 54)***. A small proportion, the 4% who Strongly Disagree, do not seem to have processes in place to support external API consumers.

For internal teams, roughly 60% viewed the processes they have in place as good enough to support other groups who use their APIs ***(fig. 55)***. More teams feel less confident in the processes they have in place to support API consumers year over year, an increase of 5%.

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