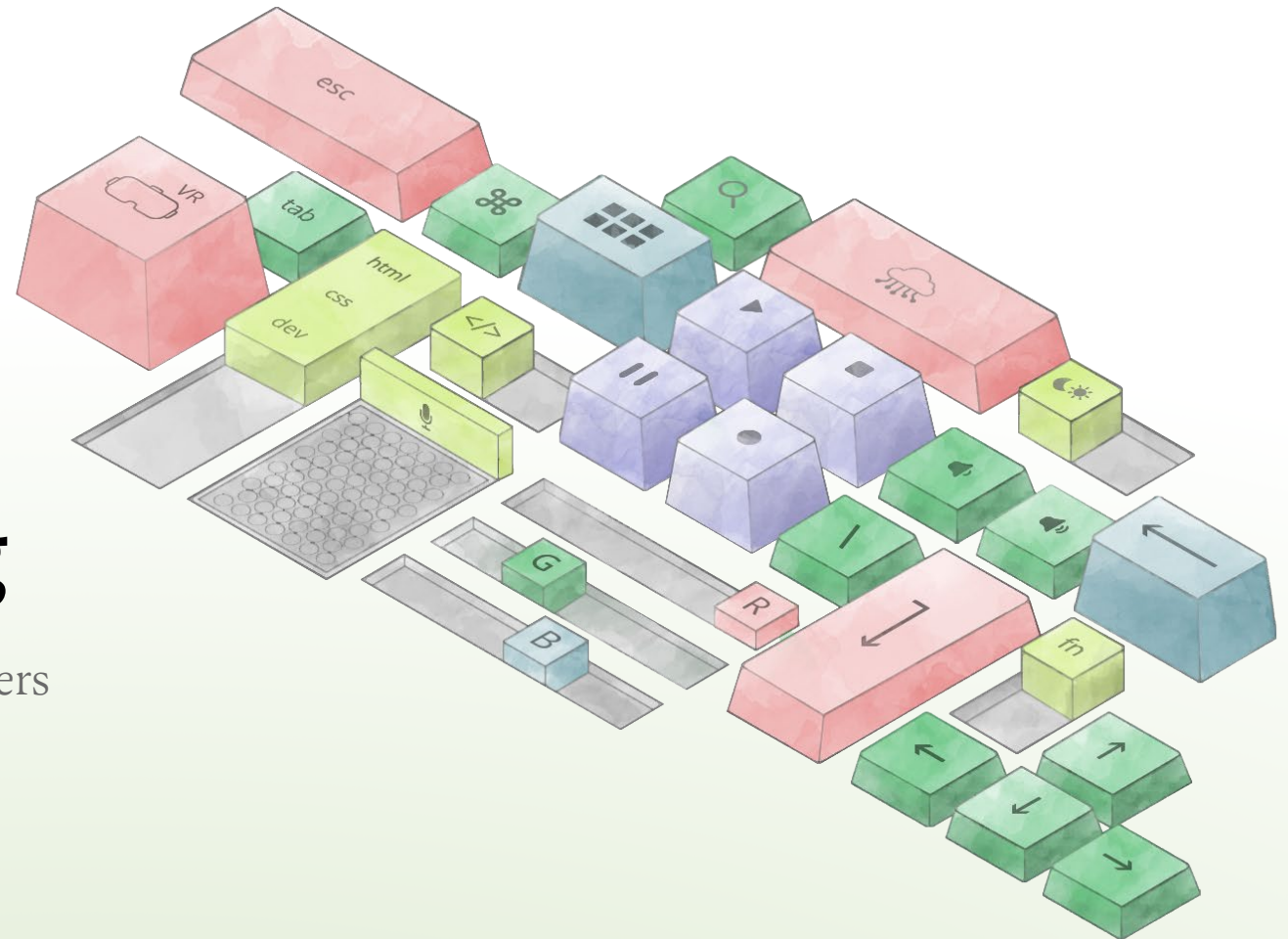


March 2024

Engineering Series

The State of Engineering

A deep dive into 2024 priorities for engineering leaders



About the research

Explore the series

R&D is increasingly becoming a bigger line item in total spend and **a key differentiator for companies**, yet it is often the function that organizations have the **least visibility into**. Unlike finance or sales and marketing, it is also challenging for engineering leaders to find relevant or publicly available data and insights to benchmark their engineering team performance.

In this series

We use organizational data and industry perspectives to **provide detailed answers to the key R&D questions** we receive from SaaS leaders. Although engineering and product development are closely tied, this series will be focused **primarily on engineering-specific metrics and challenges**. We will examine topics spanning the state of modern-day engineering orgs, **developer productivity, compensation, org structure, and engineering operations**, in order to share best practices and proprietary benchmarks to help you scale your engineering organization.

In this report

We aim to analyze **the state of modern-day engineering organizations in 2024 and provide predictions for the future**, with a particular focus on topics like **R&D spend, developer experience, DevOps maturity, and the impact of AI**.

Chapters in The Series

ICONIQ Growth's Engineering Series provides detailed answers to **key questions across the following operating and executive hiring topics** utilizing proprietary data¹ and industry perspectives from 200+ B2B SaaS leaders and 100+ engineers at SaaS companies.

➔ The State of Engineering	- The future of engineering - DevOps maturity - Developer experience - Impact of AI
Product Leadership	- Hiring your next Head of Product from \$0-\$50M ARR - Hiring your next Head of Product from \$50M ARR to IPO
Engineering Leadership	- Hiring your next Head of Engineering from \$0-\$50M ARR - Hiring your next Head of Engineering from \$50M ARR to IPO
Building Engineering and Product Teams	- Org structure and make-up of engineering teams - Typical headcount ratios - Diversity in engineering
Compensation & Incentives	- Compensation for engineering and product teams - Performance evaluation
Engineering Operations	- Developer productivity - Capacity allocation - Tooling and DevOps

**The Engineering
Reporting Guide**

**Engineering
Board Slides**

Notes: (1) Please refer to page 6 for methodology and data sources for the Product Leadership Study.

There can be no such assurances that any plans or operational characteristics of a company discussed herein will continue or be realized on the terms expressed herein or at all, and such plans are subject to uncertainties and risks.

Supporting founders through pivotal milestones and various stages of growth

Executive Hiring

Talent and Leadership Advisory

Guidance to attract and unlock the power of talent through advisory, connections and research

“ICONIQ delivered the best reference check I’ve ever seen, overnight.”



Eleven Labs

Mati Staniszewski
Co-founder and CEO

Product and Go-to-Market Strategy

Technical Advisory and Go-to-Market Boards

Strategic advisory from industry leaders with hands-on experience in technology, digital innovation, go-to-market, and more

“It has been so valuable to lean into ICONIQ’s expertise, network, and advice. What you do is a total game changer.”



PIGMENT

Eléonore Crespo
Co-founder and CEO

Revenue Acceleration

Portfolio Operations
Digital and Growth Advisory Boards

Strategic and commercial connections across industries to support global expansion goals

“The customer introductions have been incredibly valuable. ICONIQ’s relationships are truly deeper.”



SIERRA

Bret Taylor
Co-founder and CEO

Category Leadership + Operational Optimization

Analytics and Insights

Data-driven insights to support decision making across business operations and strategy

“Working with ICONIQ has been a dream partnership, they’ve gone above and beyond at every step.”



WRITER

May Habib
Co-founder and CEO

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Follow our research



Go-To-Market Series

Guides to sales, customer success, marketing compensation – and more



Decoding the SaaS IPO Landscape

The metrics that matter and the market realities of 2024 and beyond



2023 Growth & Efficiency Report

Explore our research on best-in-class SaaS growth and efficiency



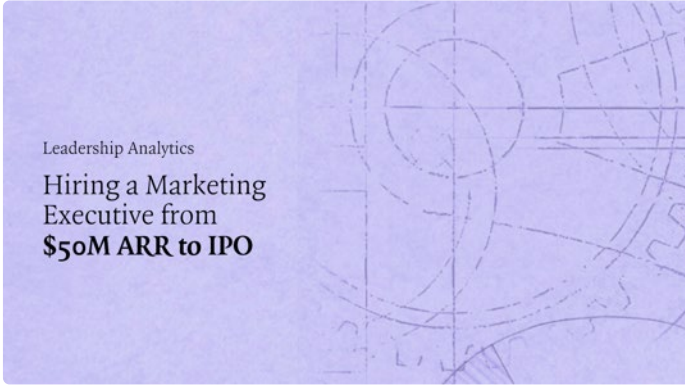
The ICONIQ Growth Enterprise Five

Key performance indicators of Enterprise SaaS companies



The SaaS Glossary

A guide to understanding and tracking key SaaS metrics



Hiring Your Next Marketing Leader

What to prioritize when hiring a Marketing executive from \$50M ARR to IPO

Data Sources & Methodology

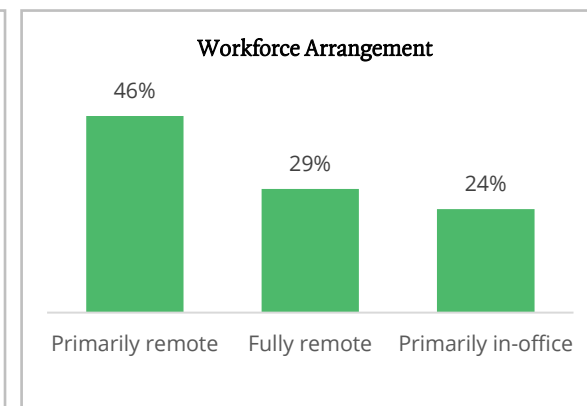
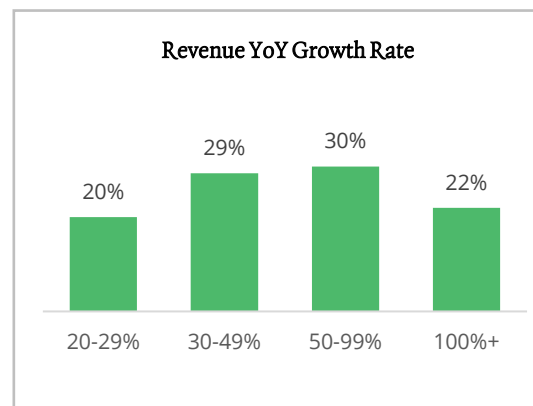
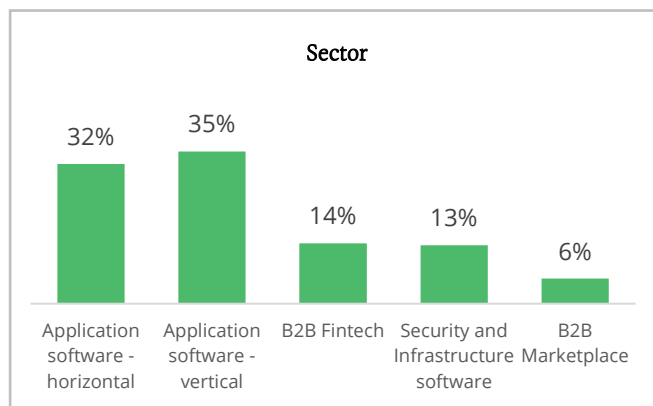
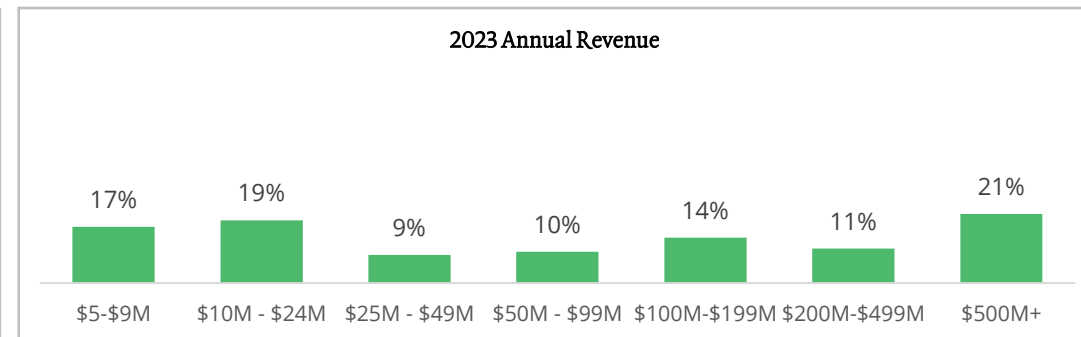
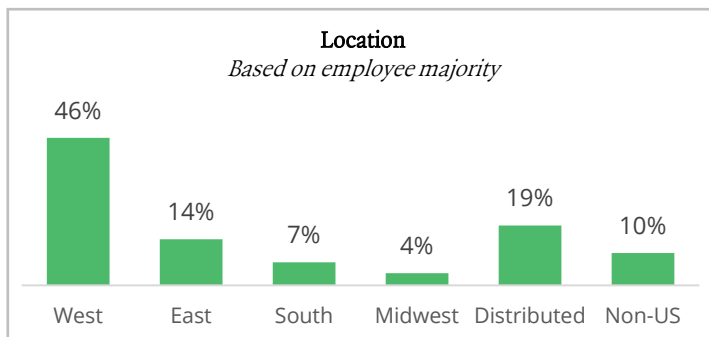
This study summarizes data from a December 2023 survey¹ of **200 engineering executives** at B2B SaaS companies, including CTOs, founders, and VPs of Engineering.

Slides leveraging this dataset will be marked with this legend **CTO Survey**

Notes: (1) This data was collected anonymously by an external survey. Survey responses include some but not all ICONIQ Growth portfolio companies as well as companies not part of ICONIQ Growth's portfolio.

Data from Engineering Leaders

Firmographics

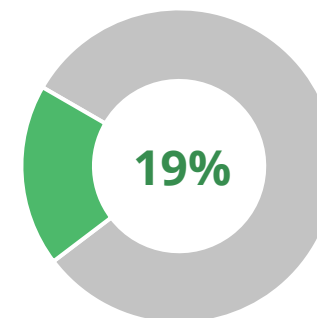


Methodology

In this series, select companies are referred to as “top performers” because they meet the following criteria

- **Scale:** Annual Recurring Revenue (ARR) > \$10M
- **Growth:** 2023 YoY ARR growth >50%
- **Retention:** Annual net dollar retention 120%+

Top Performers
% of respondents



Data Sources & Methodology

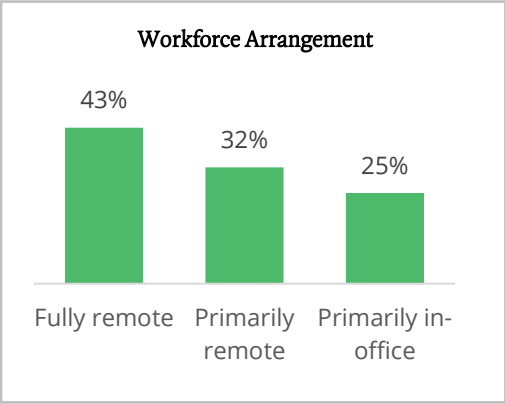
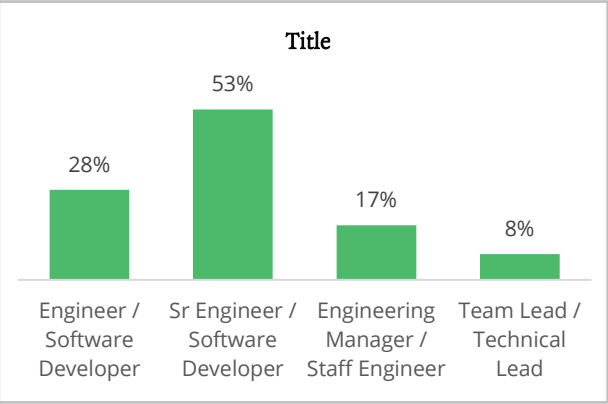
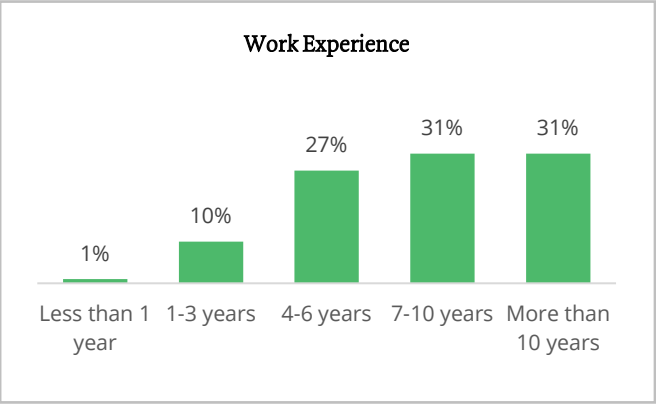
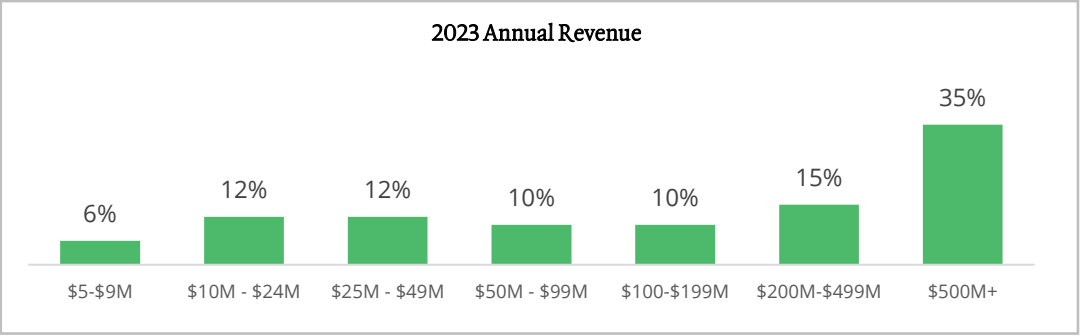
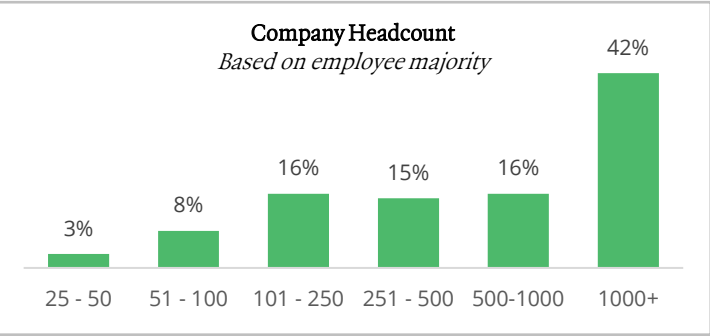
We also include data from a December 2023 survey¹ of **100 engineering employees** at B2B SaaS companies, including engineers, senior engineers, and engineering managers.

Slides leveraging this dataset will be marked with this legend **Engineer Survey**

Notes: (1) This data was collected anonymously by an external survey. Survey responses include some but not all ICONIQ Growth portfolio companies as well as companies not part of ICONIQ Growth's portfolio.

Data from Engineers

Firmographics

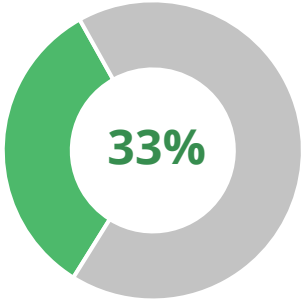


Methodology

In this series, select employees are categorized as having strong job satisfaction if the average self-reported score is above 4 out of 5 for the following questions:

- My productivity level is very high
- The code, infrastructure, processes, and documentation at my company enable me to maintain a high development velocity
- I feel my work is adequately recognized and appreciated
- I am satisfied with the compensation (salary, bonuses, benefits) I receive
- I am satisfied with the level of autonomy and independence I have in my work

High Job Satisfaction
% of respondents



Collaborators & Industry Perspectives

Throughout this series, we also weave in **perspectives, insights, and best practices from engineering executives** in the ICONIQ Growth SaaS portfolio and network.

Perspectives were gathered via interviews with the following collaborators as well as other generational leaders via ICONIQ Growth communities and events.

All industry perspectives shared in this report have been anonymized to protect company-level information.



1Password
Pedro Canahuati
Chief Technology Officer



BetterUp
Amol Kher
VP Engineering



DRATA
Daniel Marashlian
Co-founder, Chief Technology Officer



ezcater
Erin DeCesare
Chief Technology Officer



Nayya
Arik Gaisler
Chief Technology Officer



recharge
Joseph Mosby
Director of Engineering



virtru
Dana Morris
SVP, Product & Engineering



Wealthsimple
Diederik van Liere
Chief Technology Officer



WRITER
Waseem AlShikh
Co-founder, Chief Technology Officer

And additional insights from the **ICONIQ Technical Advisory Board**



Aditya Agarwal
Former CTO at Dropbox
Formerly: Co-founder at Cove, Director of Product Engineering at Facebook



Anantha Kancherla
VP ADAS at General Motors
Formerly: Head of AI Platform at Meta, VP Engineering at Lyft Level 5



Matt Eccleston
Former VP Growth at Dropbox
Formerly: Chief Architect at VMware



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Introduction

Engineering leaders are focused on key priorities spanning product development, accelerating developer velocity, and improving underlying infrastructure and processes

Top Priorities for Engineering Leaders in 2024

% of Respondents Mentioning in Top 3

		Product Development & Innovation	Developer Productivity	DevOps & Infrastructure
Building new features and/or products for customers (including AI add-ons)	89%	✓		
Improving engineering team operations, tooling, and processes	59%		✓	✓
Hiring and retaining talent	46%		✓	
Improving infrastructure	39%		✓	✓
Managing technical debt	32%		✓	✓
Increasing the security posture of the team / organization	23%			✓
Gaining better visibility into the work engineers are doing	11%	✓	✓	✓
Other (e.g., embedding AI)	1%	✓	✓	✓

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Key Priorities for Engineering Leaders

Many of the priorities listed by engineering leaders can be grouped into 3 broad categories across developer productivity and experience, the evolution and maturity of DevOps, and driving innovation / efficiency (with the main focus being around embedding AI).

The subsequent pages in this study will dive into each of these priorities in detail including the actions modern-day engineering organizations are taking and relevant benchmarks across different stages of growth and business models.

1 Developer Productivity & Experience

There is no widely accepted definition of developer productivity and even different perceptions across CTOs and engineer ICs based on our research. We believe developer productivity should be assessed through a holistic framework that captures business impact, performance and reliability, developer effectiveness, and culture.

“

We are **keeping headcount flat in 2024**, so a big focus for me this year is striking a balance between individual development goals and organization needs with a **major focus on efficiency**. We need to motivate our engineers to do more, and part of that **involves tracking and measuring developer productivity**.

*Engineering Leader
Infrastructure & Security
Growth Stage (\$100-300M ARR)*

2 Evolution and Maturity of DevOps

A key factor to improving developer productivity and experience is **the state of the underlying infrastructure and processes powering engineering teams**. Modern-day engineering organizations have adopted the DevOps mindset in varying forms and rather being a nice-to-have, embracing DevOps has **now become ubiquitous for engineering organizations**.

“

We have a lot of **tech debt to clean up** this year and are doubling down on **refactoring and overall simplification** – how do we make it **easier and faster for developers to commit features**? The goal is to enable the team to spend **less time on time-suck / low ROI activities that can be automated**.

*Engineering Leader
Fintech
Late Stage (\$300M+ ARR)*

3 Driving Innovation & Efficiency via AI

In our conversations with CTOs, the universal questions around AI have been around **where to start, the most impactful use cases for internal productivity, and what are other companies seeing in terms of early ROI**.

“

A key priority for me this year is to **unlock ML and uplevel our existing engineers**. We have **not seen measurable results yet with Copilot** so we are trying to better understand **best practices for embedding AI and getting true ROI** from these solutions.

*Engineering Leader
Consumer & Internet
Late Stage Late Stage (\$300M+ ARR)*

Executive Summary

1 Developer Productivity & Experience

There is no widely accepted definition of developer productivity and even different perceptions across CTOs and engineer ICs based on our research. We believe developer productivity should be assessed through a holistic framework that captures business impact, performance and reliability, developer effectiveness, and culture.



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*Engineering Leader
Infrastructure & Security
Growth Stage (\$100-300M ARR)*

- Developer productivity lacks a standard definition or approach, with **varying opinions among engineering leaders and employees**
- CTOs **prioritize clear goals and requirements for productivity**, while engineers **highlight the need for focused time, a conducive development environment, test automation, and a healthy codebase**
- We believe **developer productivity needs a definitional refresh and should include both perspectives**. We recommend engineering leaders use a holistic framework to monitor and enhance team performance¹:
 - **Business Impact**: Engineering leaders face a difficult mandate of doing more with less in the current macroeconomic environment. To judiciously use engineering resources and dollars, leaders must have a sense of the **ROI across engineering investments and how much is being spent across people vs. infrastructure**
 - **Performance and Reliability**: Developer productivity also entails **understanding and managing the reliability of what is being shipped**. For example, issues in quality tend to spike with engineers who have 1-3 years of work experience before generally stabilizing to ~18% of commits requiring revisions
 - **Developer Effectiveness**: Factors like work arrangement, job satisfaction, and tenure often have a direct impact on developer effectiveness. In addition to frequent manager feedback, the **underlying code, infrastructure, processes, and documentation** were found in our analysis to have the strongest correlation to productivity
 - **Culture**: Beyond tools and processes, we know that developer satisfaction also has a direct impact on productivity. It's critical to build a **culture across the engineering team that promotes growth and developer fulfillment**
- As engineering teams grow beyond 100 members, **tracking developer productivity becomes more prevalent and often involves developer satisfaction surveys and DORA metrics**

Notes: (1) SPACE is a holistic framework that is well-researched and one that we wholly agree with. However, it sometimes has limitations as it relates to understanding and communicating engineering impact to the rest of the organization, specifically in the context of CTOs acting as stewards of engineering resources and investments. Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Executive Summary

2 Evolution and Maturity of DevOps

A key factor to improving developer productivity and experience is the state of the underlying infrastructure and processes powering engineering teams. Modern-day engineering organizations have adopted the DevOps mindset in varying forms and rather being a nice-to-have, embracing DevOps has now become ubiquitous for engineering organizations.



We have a lot of **tech debt to clean up** this year and are doubling down on **refactoring and overall simplification** – how do we make it **easier and faster for developers to commit features**? The goal is to enable the team to spend **less time on time-suck / low ROI activities that can be automated**.

*Engineering Leader
Fintech
Late Stage (\$300M+ ARR)*

Roadmap Planning

- In the **early stages of scaling (<\$25M)**, companies analyzed tend to follow a **fluid process** of continuous planning and releases. As companies continue scaling and reach critical inflection points, **companies often switch back to a more sequential planning approach** (perhaps to ensure they can meet key requirements as they move up-market). However, as companies scale past \$100M, **companies typically settle into a regular planning cadence or adopt scaled agile**.

Release Cadence

- In the early stages of growth, **continuous deployment augmented with experimental releases allows companies to move fast** and iterate quickly on customer feedback. However, this becomes **more challenging to coordinate as companies scale and need to maintain a higher standard of quality and reliability**. In fact, a greater percentage of **top performers use continuous delivery to pre-production or continuous integration** (as opposed to continuous deployment), likely given a focus on maintaining a higher standard of quality.

Testing Automation

- Most companies build out **automated testing processes as early as \$25M in revenue**. It is worth noting differences across sectors, with a higher percentage of **respondents in vertical SaaS still relying on manual testing**, likely because certain industries like healthcare which have regulatory restrictions and a higher standard of quality. Most companies allow developers to see the **results of integration / unit testing weekly**, with top performing companies having faster testing processes that show **results as quickly as daily or several times a day**.

CI/CD Tools

- As companies scale, the implementation of tools enabling continuous integration and deployment appear to be critical to allow engineering teams to do their best work, with **76% of companies in the \$250M+ revenue range having full implementation and integration of CI/CD tools**. Notably, **90% of top performing companies analyzed have fully implemented CI/CD tools as early as \$25M in revenue**.

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Executive Summary

3 Driving Innovation & Efficiency via AI

In our conversations with CTOs, the universal questions around AI have been around where to start, the most impactful use cases for internal productivity, and what are other companies seeing in terms of early ROI.



A key priority for me this year is to **unlock ML and uplevel our existing engineers**. We have **not seen measurable results yet with Copilot** so we are trying to better understand **best practices for embedding AI and getting true ROI** from these solutions.

*Engineering Leader
Consumer & Internet
Late Stage (\$300M+ ARR)*

Building AI-Enabled Products

- Around 70% of companies analyzed have an AI component in their product suite, with ~90% of companies in the \$250M+ revenue range having an AI-enabled customer-facing product
- Most companies (~60-70% of respondents) are also **planning to embed new AI or introduce AI-related products in the next 12 months regardless of scale**.
- **72% of respondents are planning to hire at least 1 AI-related role** in 2024; top roles specified by respondents include **machine learning engineers, data scientists, and data engineers** in 2024
- Since building new AI products takes significant time and upfront investment, most **companies are first experimenting with leveraging internal AI applications to boost productivity**

Leveraging AI for Internal Productivity

- Early-stage companies seem to be **adopting and using AI tools more frequently compared to growth-stage companies** which often have data sensitivity hurdles to navigate or ingrained ways of working
- The most common functions **using AI for internal productivity include engineering, marketing, product management, and customer success / support**.
- Preliminary estimates of impact reveal notable **productivity gains of 20-30%**, with HR, engineering, marketing, and strategy seeing the biggest gains
 - **Average cost savings are estimated to be around ~17% of organizations**, with HR and customer success / support seeing the greatest cost savings
 - The average total revenue increase driven by AI tools is expected to be around **16% for companies surveyed**¹

Notes: (1) Please see Slide 57 for further information on this finding

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Engineering Predictions for 2024 (and Beyond)

1 The mandate of developer productivity

In today's era of efficient growth where engineering leaders are **pressured to do more with limited resources, understanding and tracking developer productivity will be essential**. However, rather than tracking individual productivity, we believe the focus should be on **driving team-level efficiency and improving developer experience**.

Page 17-37

2 The rise of platform engineering

The push for a better developer experience requires building **an ecosystem that allows developers to be more autonomous**. This means **better interfaces, enhanced integration, and streamlined workflows to reduce friction in the development process**. This could take the shape of mass adoption of **internal developer platforms (IDPs), Kubernetes, or ephemeral environments** allowing for faster experimentation.

Pages 39-46

3 The death of agile

The agile manifesto often **does not work for modern day SaaS engineering organizations who frequently deal with unplanned work, customer needs, and technical constraints**. In fact, the **rise of DevOps and platform engineering may further reduce the need for a full embrace of agile** as they achieve many of the same goals of faster time to market and increased efficiency. Modern engineering organizations will likely adopt a hybrid agile model that **optimizes for iterative releases while leveraging the operating model and processes from the DevOps mindset**.

Pages 39-46

4 The AI multiplier

Incorporating generative AI and large-language models into internal workflows will become **table-stakes for engineering teams, driving both increased efficiency and quality improvements**. While some companies may not see immediate cost savings or revenue impact, leveraging tools like Copilot will allow engineers to **easily code with new languages, speed up workflows like code reviews and testing, and identify bugs and resolutions faster**.

Pages 48-57

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Developer Productivity

How organizations define developer productivity,
perspectives across engineering leaders and employees,
and ways to improve developer experience

Key Priorities for Engineering Leaders

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*Engineering Leader
Consumer & Internet
Late Stage (\$300M+ ARR)*

Spotlight: Tracking Developer Productivity



DRATA

Daniel Marashlian

Co-founder & Chief Technology Officer (CTO)



We have made a lot of changes to our organization structure and processes as the business has scaled through a period of very fast growth. As our team has grown to 200+ engineers, we have been on a journey to make the development team move faster and are always experimenting. This year, I'm focused on scaling our ephemeral environments in addition to QA automation to further improve developer velocity. I'm also experimenting with a team that meets at least twice per week in-person to test whether a semi in-person team can lead to higher efficiency and ROI than our remote teams.



Operational Changes to Improve Velocity

- Designed engineering organization structure to consist of leaner pods owned by true technical managers (vs. purely people managers). Tech leads will typically spend ~20% of their time on development and provide cover for the rest of team on incidents or backup as needed
- Distilled the mindset that engineers don't have QA to rely on and every engineer should assume the ticket they're writing will not be QA'd. This means that engineers need to test their own code and automate test cases. While this has led to slower features in some cases, this has contributed to less incidents and a better product overall
- The leadership team posts customer releases in the Slack channel to showcase the "why" behind releases of new customer features; this has helped engineering teams understand the direct outcome and revenue impact of what they're building

Metrics Tracked

We track a variety of metrics to understand our activity and developer effectiveness, including:

- Delivery: % of the roadmap delivered vs committed
- Thrashing – ping pong between QA and engineering
- Deployed story point velocity over time
- Engineering time allocation (e.g., time spent on new capabilities, quality improvements, customer enhancements, or KTLO)
- New stories going into sprint vs. carry over from prior sprints

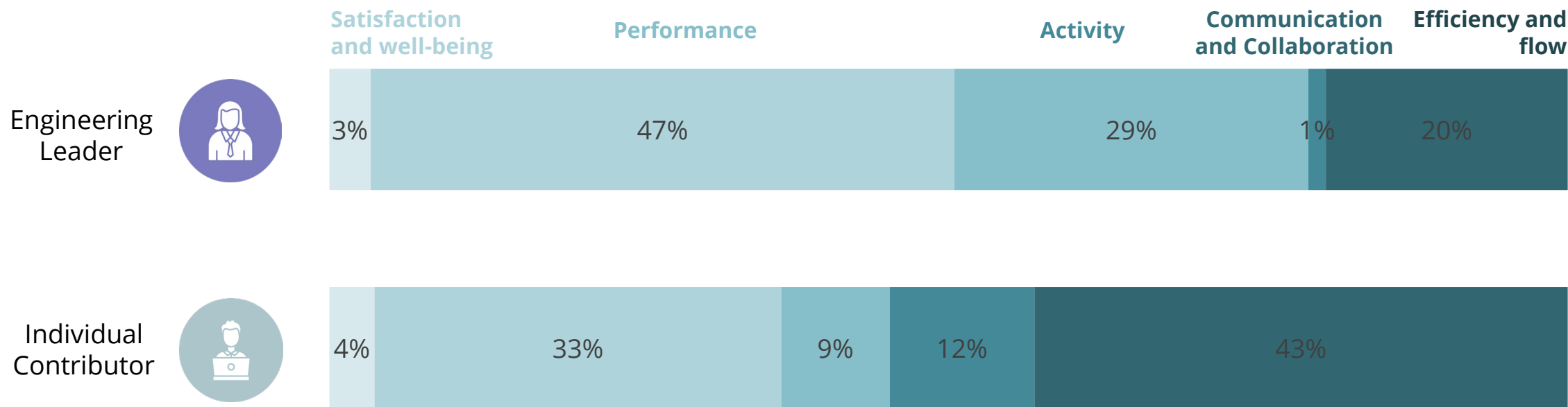
Source: Interview with Daniel Marashlian (Dec 12, 2023)

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Developer productivity is a topic that is often contentious and hard to define; in fact, even engineering leadership and employees have differing opinions on what constitutes developer productivity

How would you define developer productivity?

% of Responses



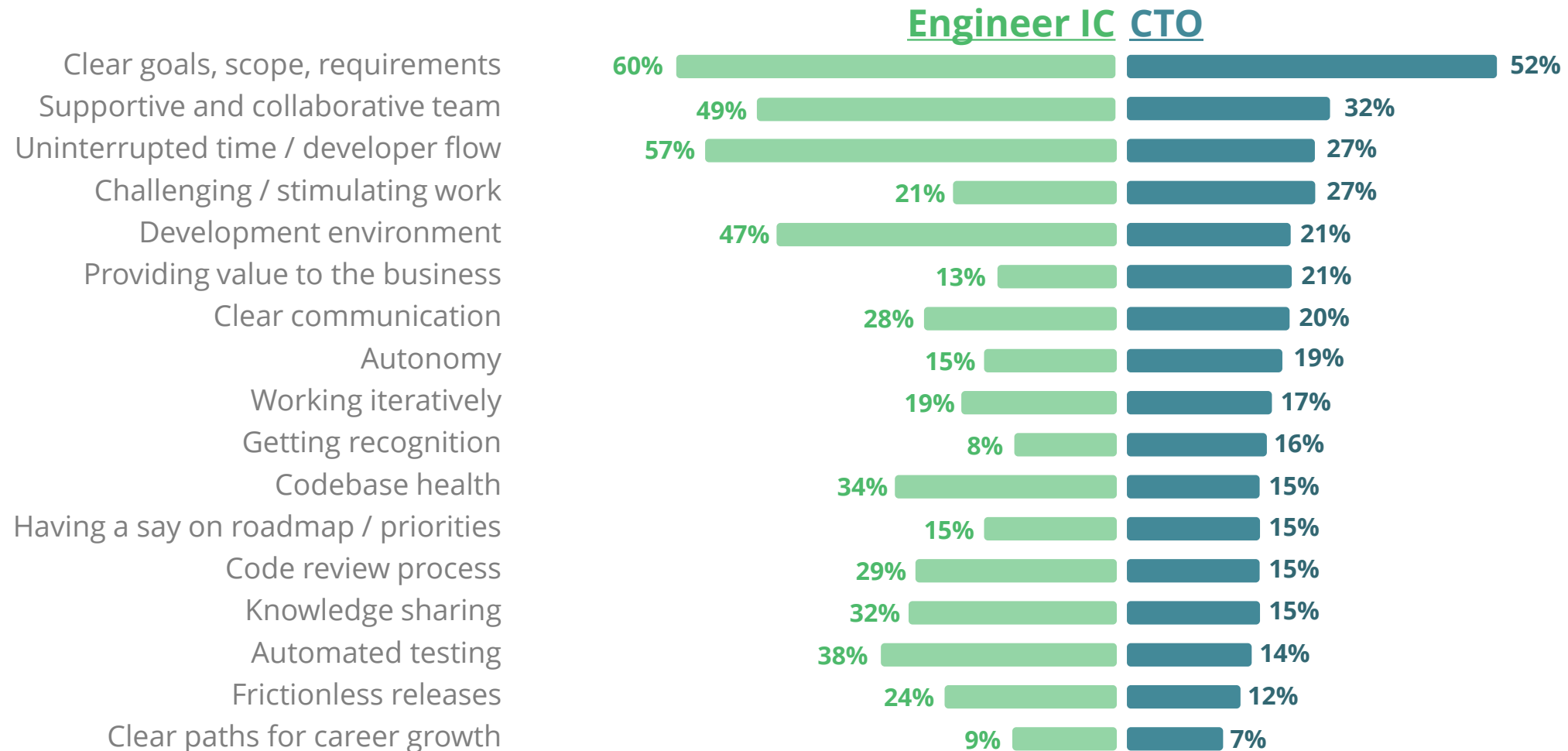
In this analysis, free-form responses from survey participants were mapped to associated categories under the [SPACE framework](#)¹, a research-based framework to developer productivity. Engineering leaders were found to be more **tied to business outcomes with a larger percentage of responses focused on aspects like quality (Performance) or quantitative metrics (Activity)**, compared to engineering ICs who focused on **factors impacting individual experience like developer flow (Efficiency) and teamwork (Communication and Collaboration)**.

Notes: (1) Source: The SPACE of Developer Productivity (March 19, 2021); The information herein was prepared by a third party and ICONIQ Growth makes no representation regarding its accuracy
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Engineering leaders and employees also have different opinions on how to improve developer productivity

Which factors do you think are most important to improve developer productivity?

% of Respondents who listed each aspect in top 5 ranking

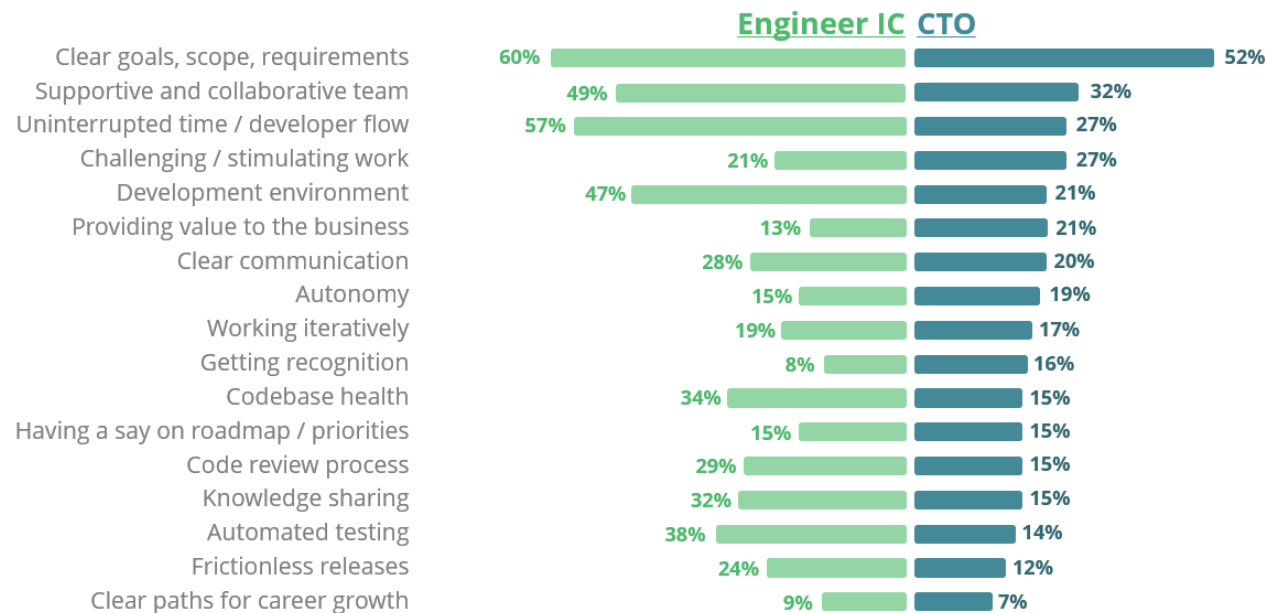


Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

While CTOs believe the most important factor is setting clear goals and requirements, engineers believe that uninterrupted time, development environment, automated testing, and code base health are also critical

Which factors do you think are most important to improve developer productivity?

% of Respondents who listed each aspect in top 5 ranking



There are **clear disconnects** even between CTOs and engineers around the factors behind developer productivity.

CTOs believe the most important factor to improving developer velocity is **assigning clear goals, scope, and requirements**. While engineers agree that is important, they also believe **uninterrupted time, their dev environment, automated testing, and codebase health** are significant drivers.

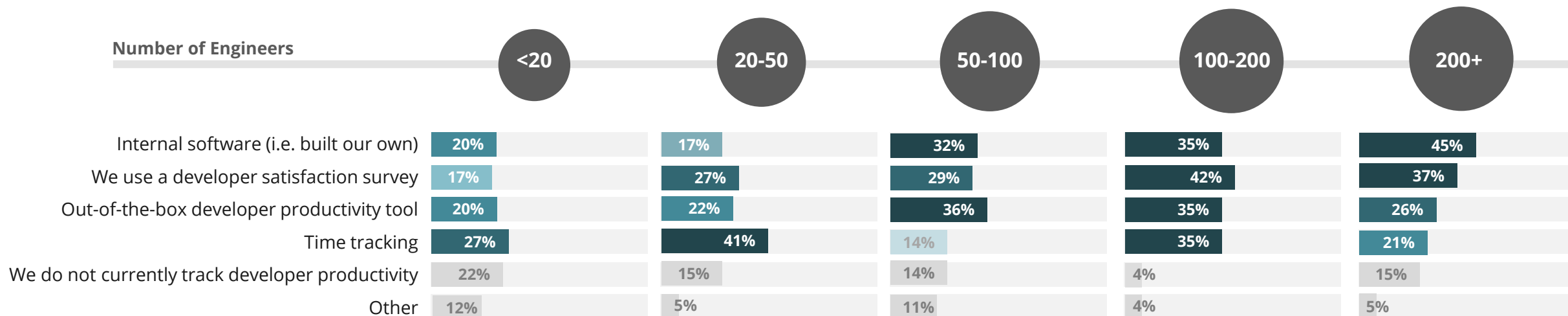
Generally, we **recommend companies focus on performance rather than activity**. However, developers often may **have better insight into potential leverage opportunities** to improve efficiency.

We believe CTOs should **start by understanding the factors called out by developers** points with a filter for impact on performance / outcomes.

Tracking developer productivity becomes more common as companies reach 100+ engineers, with most companies using some combination of a developer satisfaction survey and DORA¹ metrics

How do you track developer productivity?

% of Respondents



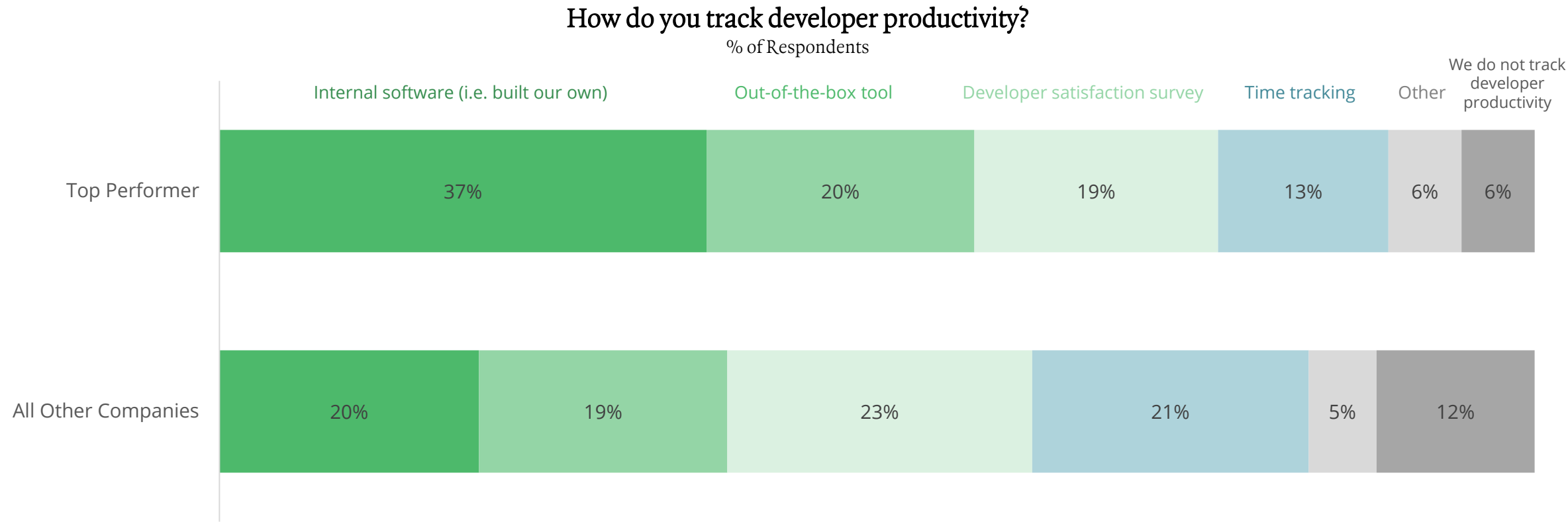
By **50-100 employees**, most engineering companies are tracking developer productivity in some form

Tracking developer productivity becomes more common as companies reach 100+ engineers, with most companies using some combination of a developer satisfaction survey and DORA¹ metrics (used by 28% of respondents). This can be done either via in-house tool (35-45% of respondents) or an out-of-the-box developer productivity tool (~25-35% of respondents).

Notes: (1) DevOps Research and Assessment metrics (<https://dora.dev/>)

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Understanding and reporting on developer productivity can have a direct impact on business impact, with 76% of top performing companies tracking productivity via developer productivity tools or a developer satisfaction survey

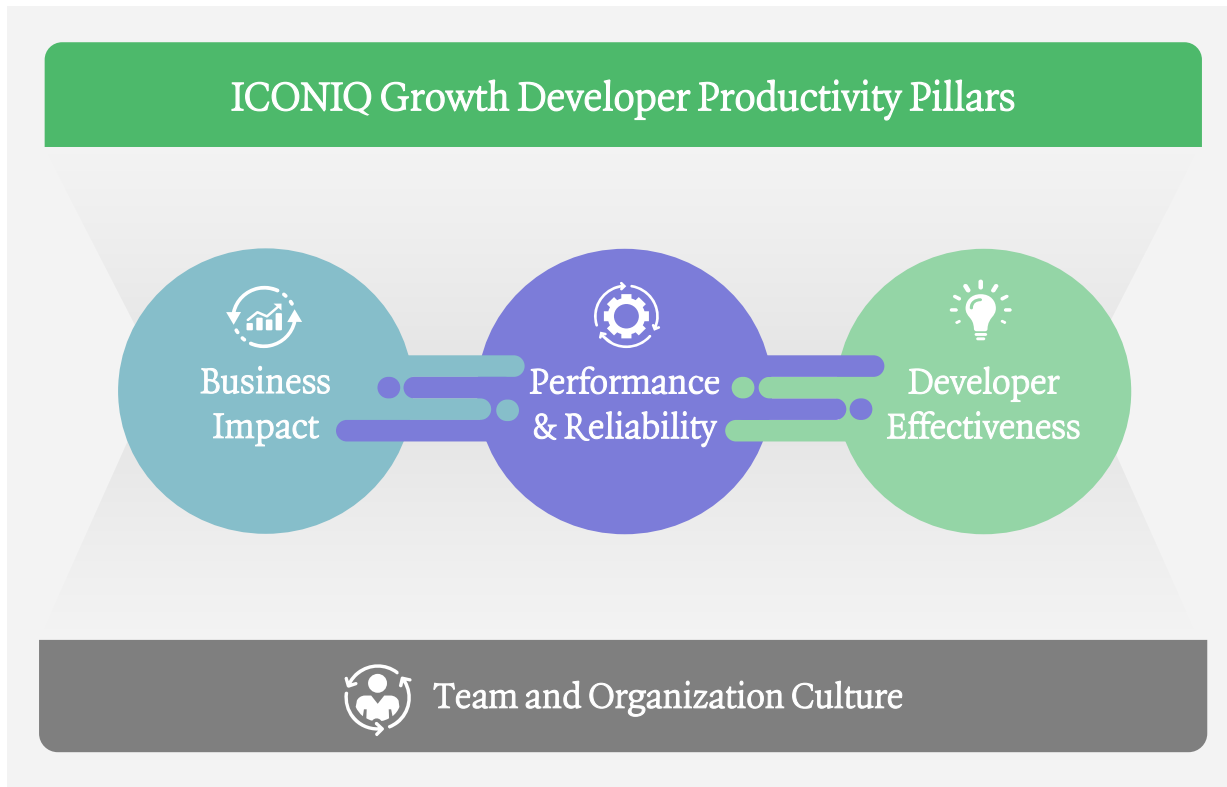


Tracking and understanding developer productivity can have a direct business impact. A greater percentage of top performing companies were found to track developer productivity (~76% of respondents) compared to other companies (~62% of respondents).

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Our Approach to Developer Productivity: The Metrics that Matter

At its core, software development is a **team-based activity**. Rather than using developer productivity metrics to evaluate individual performance, we believe engineering leaders should track and understand various factors impacting developer productivity to **improve overall team performance and allow them to be a better steward for dollars spent on engineering**. This means understanding both business outcomes and the factors affecting individual developer experience, such as how feature development is **contributing to overall business outcomes**, the **timeliness and speed of development velocity**, the **performance and reliability of what is being shipped**, opportunities to **reduce friction in the development process** via tools and processes, and **overall developer satisfaction**.



How does what we're working on contribute to overall business outcomes and success?

Example metrics: % delivered vs committed, % time spent on building new capabilities / features, R&D spend as % of revenue



Is what we're shipping high-quality, on-time, and reliable?

Example metrics: Cost of poor quality, % roadmap shipped on time, # critical defects, # defects



Are developers set up with the right tools and processes to minimize friction and efficiently complete work?

Example metrics: PR to Release time, Time spent on code review, DORA metrics



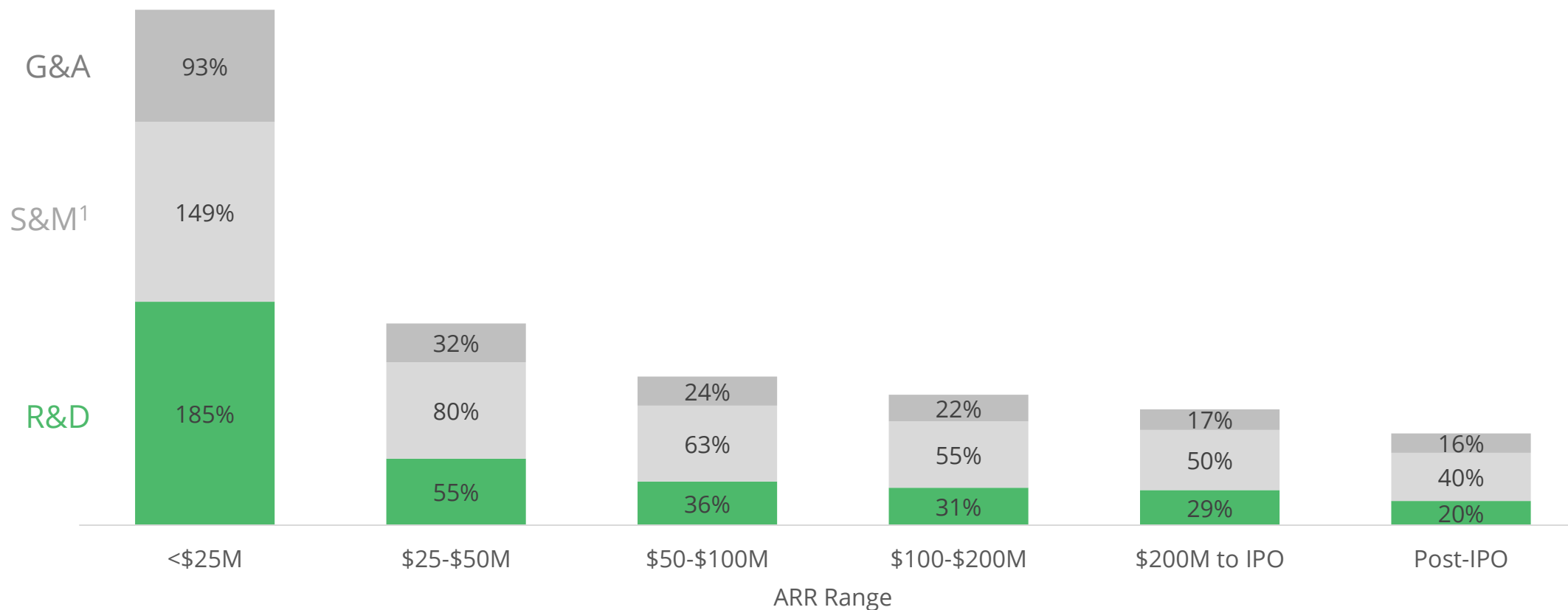
Are developers fulfilled and happy? Is the organization effectively set up to support developers and enable collaboration?

Example metrics: Developer satisfaction, attrition rate

Source: Perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

R&D typically comprises the largest portion of spend as companies scale to \$25M, before plateauing to ~20%-30% of revenue as companies reach critical scale

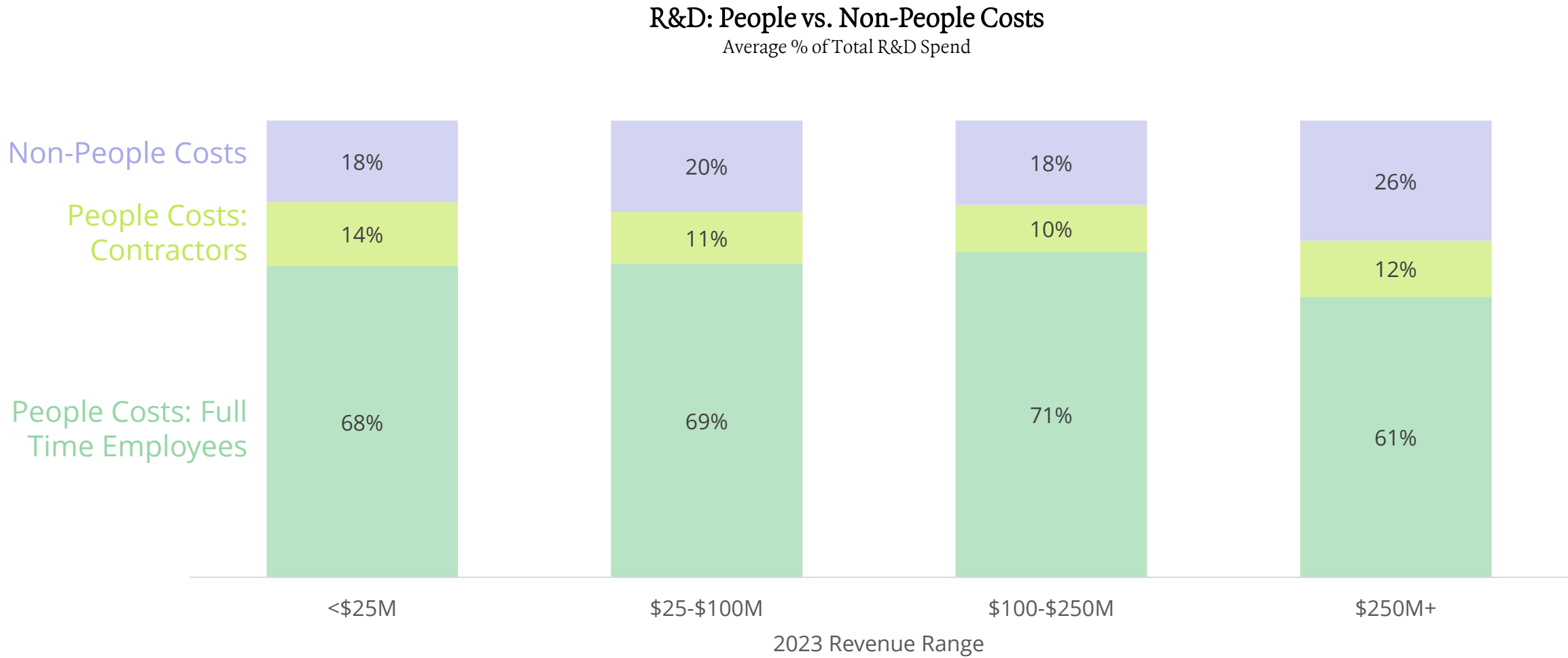
OpEx as a % of Revenue by Type
Median by ARR Scale



Notes: (1) Total Sales & Marketing OpEx includes Customer Success

Source: ICONIQ Growth 2023 Topline Growth & Efficiency Report; based on quarterly operating and financial data from ICONIQ Growth companies from 2013 – Q4 2023

Personnel costs comprise the largest portion of R&D spend, usually accounting for ~70-80% of total spend

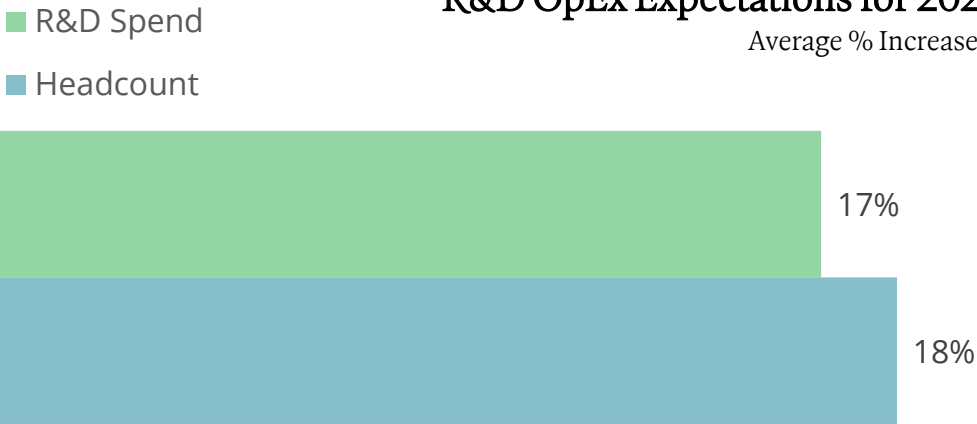


Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

On average, companies expect to increase R&D spend across OpEx and headcount by ~12-13% YoY in 2024, with top performing companies planning for larger increases

R&D OpEx Expectations for 2024: % YoY Increase

Average % Increase



Top Performer

Average 2023 Revenue: **\$389M**

Average R&D as % of Revenue: **35%**

“

After scaling back engineering in the last few years, we’ve realized that we’ve actually cut too much for the stage of growth we’re in and are planning to grow the engineering organization significantly this year.

CTO, Infrastructure / Security Company
Growth Stage (\$100-300M ARR)

”

All Other Companies

Average 2023 Revenue: **\$302M**

Average R&D as % of Revenue: **29%**

We are seeing significant cost savings via lower-cost geographies and are planning to grow headcount and backfill in 2024 primarily using offshore resources”

CTO, Infrastructure / Security Company
Early-Stage (<\$100M ARR)

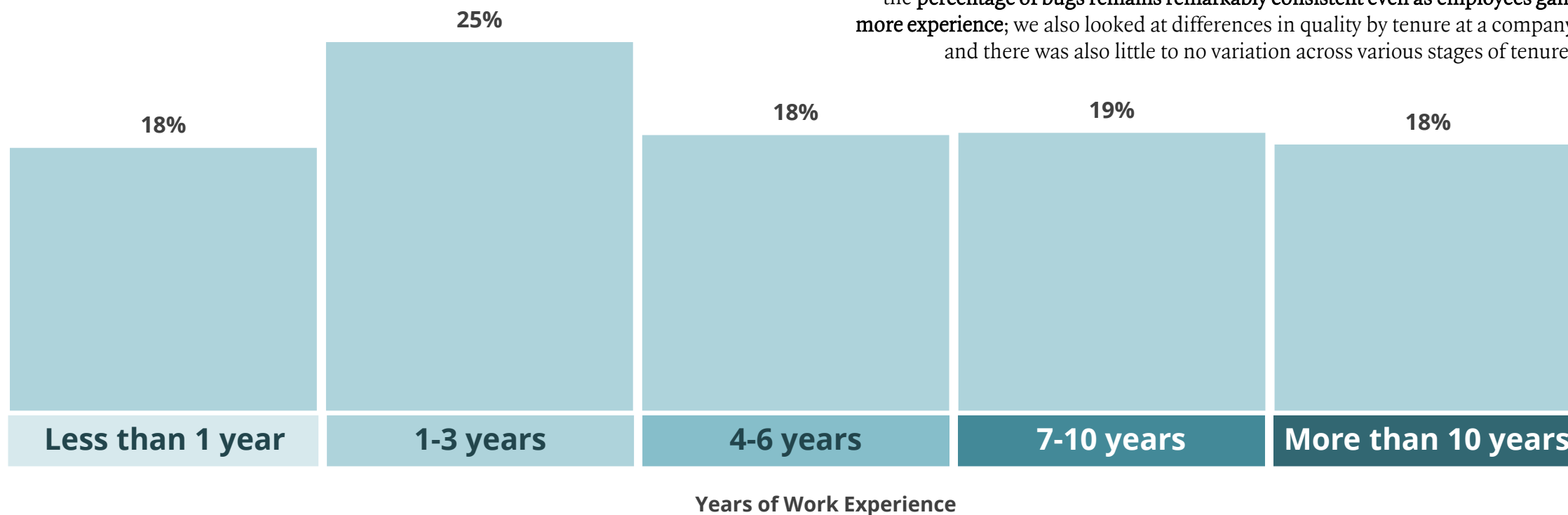
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8 (February 2024)

Quality is an important component of developer velocity; issues in quality tend to spike with engineers who have 1-3 years of work experience, before generally stabilizing to ~18% of commits requiring revisions

On average, what percentage of your commits require revision due to bugs or errors?

Average % of Commits

Beyond the spike at 1-3 years of work experience, it is interesting to note that the **percentage of bugs remains remarkably consistent even as employees gain more experience**; we also looked at differences in quality by tenure at a company and there was also little to no variation across various stages of tenure.



Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

When analyzing survey responses from ~90 engineer ICs, factors correlated to development velocity beyond those self-reported included the underlying processes / infrastructure, frequency of feedback, and work arrangement

Multivariable Correlation Analysis of Developer Experience Factors to Developer Velocity

Multivariable regression analysis, N=93



Outcome Variable: How does your development velocity at your current company compare to prior companies?
(Numerical score 1-5)

Correlation Coefficient to
Developer Velocity

Explains the effect on the outcome variable in a multivariable regression, relative to other independent variables

Input Variables

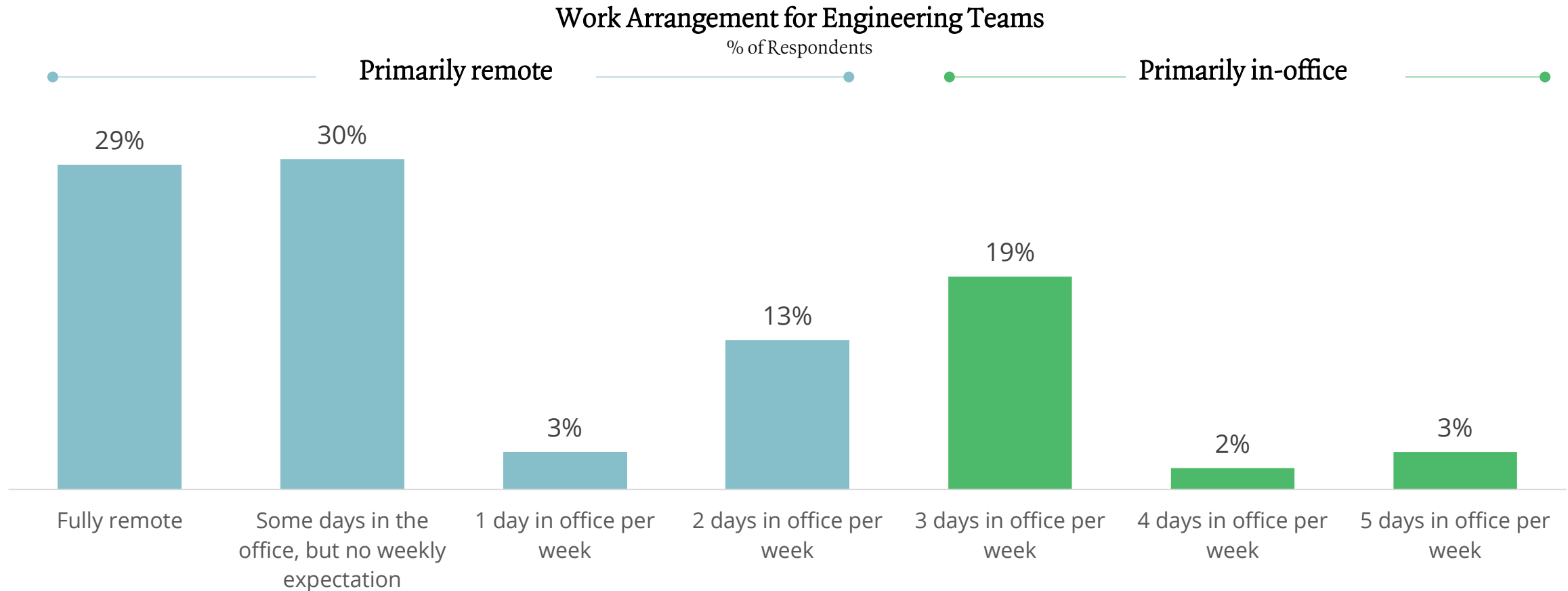
The code, infrastructure, processes, and documentation at my company enable me to maintain a high development velocity	0.58
I frequently receive feedback that helps me grow as a developer	0.19
I am primarily in-office (respondents categorized as primarily in-office if 3+ days in office)	0.10
I am satisfied with the level of autonomy and independence I have in my work	0.06
I often feel overwhelmed by my workload	0.00
On average, I spend X hours collaborating with teammates	0.00
I am satisfied with the compensation (salary, bonuses, benefits) I receive	0.00
I feel my work is adequately recognized and appreciated	-0.12

More detail in
DevOps Maturity
section

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

76% of respondents have engineering teams that now operate with a remote-first office arrangement; however, this presents challenges for engineering leaders managing distributed teams

As covered in our 2022 report [Engineering in a Hybrid World](#), we believe distributed workforces have fundamentally changed how engineering teams collaborate with each other. The majority of respondents now operate with a remote-first hybrid arrangement.

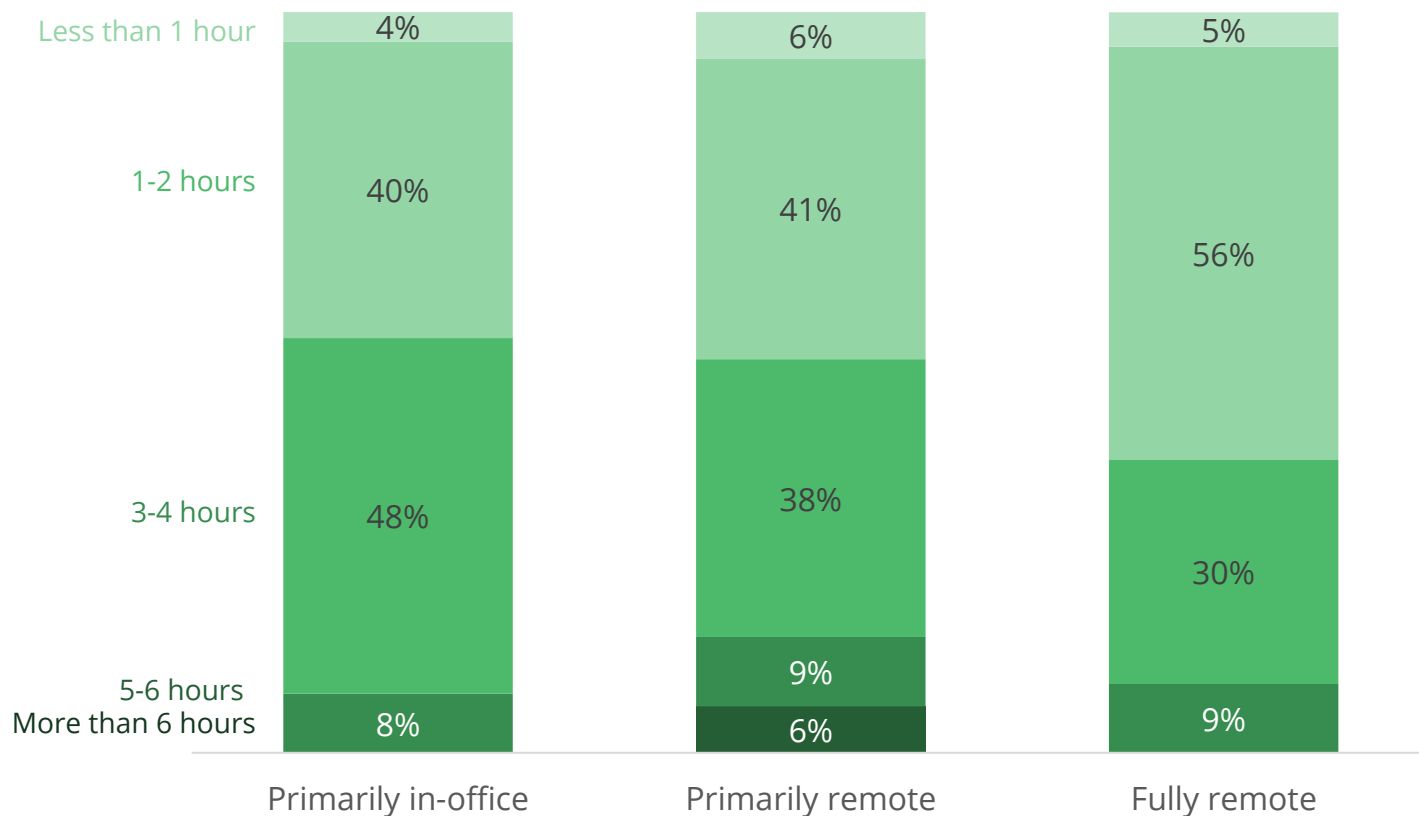


Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Engineers who are primarily in-office or work 1-2 days in office each week (primarily remote) actually tend to get more hours of coding done per day compared to fully remote engineers

On average, how many hours of coding do you get done per day?

% of Respondents



In-person time can contribute to potentially better developer flow, enabling more hours of coding. This is likely because more complicated development tasks require collaboration across different teammates and having in-person time can help engineers address blockers or dependencies quicker.

I believe being in-office is especially critical when you are in the early stages of building a company. However, as companies scale it becomes important to give employees flexibility. A remote work arrangement also allows you to stay competitive in the current hiring market.

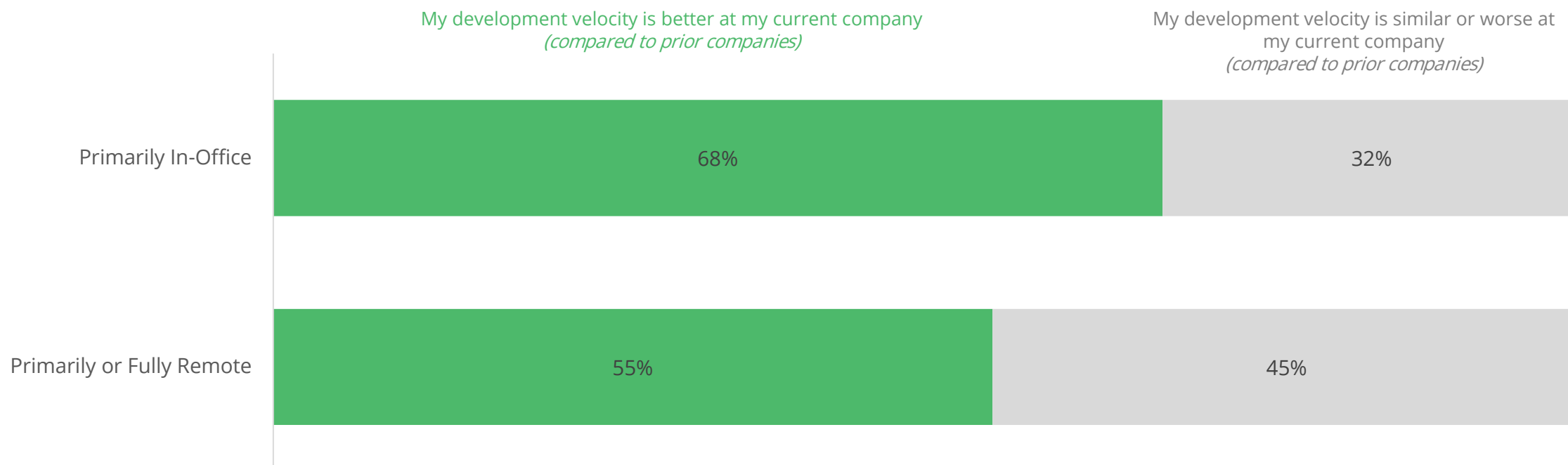
CTO, Operations
Early-Stage (<\$100M ARR)

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Beyond hours of coding time, work arrangement was also found to have an impact on a developer's self-reported development velocity

Impact of Work Arrangement on Developer Velocity

% of Respondents



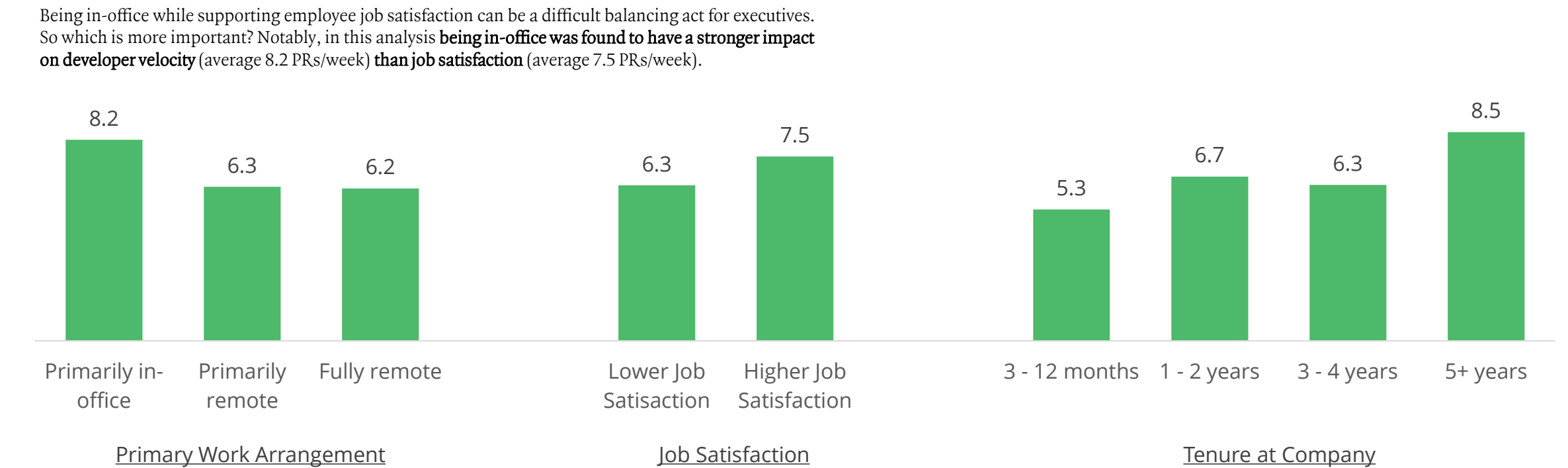
Notably, a **greater percentage (68%) of in-office employees reported they have higher development velocity at their current company, compared to 55% of remote employees.**

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Factors like job satisfaction and tenure at company also have a direct impact on developer velocity

A large volume of commits does not necessarily indicate high code quality. It is important to not fixate on purely tracking output metrics like pull requests submitted at the individual engineer level since these can be easily gamified and can incentivize the wrong behaviors. However, it is interesting to note the impact of factors like work arrangement and job satisfaction on developer velocity as shown below. Notably, engineers who are primarily in-office tend to generate a larger number of pull requests (PRs) on a weekly basis compared to remote peers. Similarly, developers who have higher job satisfaction or are more experienced submit a larger number of pull requests on average.

On average, how many pull requests do you submit per week?
Average pull requests / week

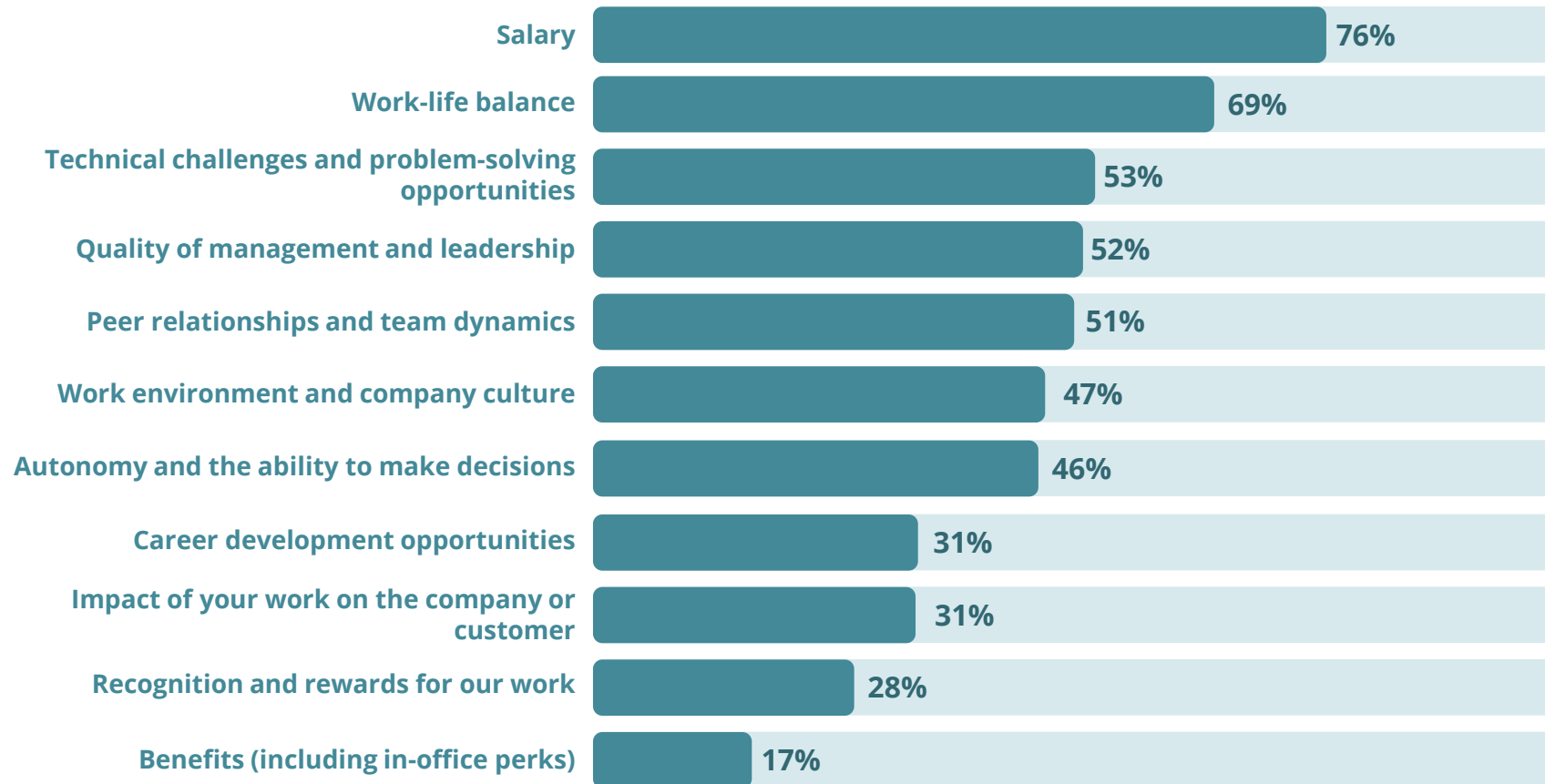


Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Factors most tied to job satisfaction for engineers include salary, work-life balance, technical challenges and problem-solving opportunities, quality of management / leadership, and team dynamics

Factors tied to Job Satisfaction

% of Respondents who listed each aspect in top 5 ranking, N = 100



Existing research shows developer satisfaction has a direct correlation and positive impact on overall productivity¹.

Factors most tied to job satisfaction for engineers include salary, work-life balance, technical challenges and problem-solving opportunities, quality of management / leadership, and team dynamics.

There is also some degree of self-selection in these factors; for example, a greater percentage of remote employees rated factors like work-life balance as important compared to in-office employees.

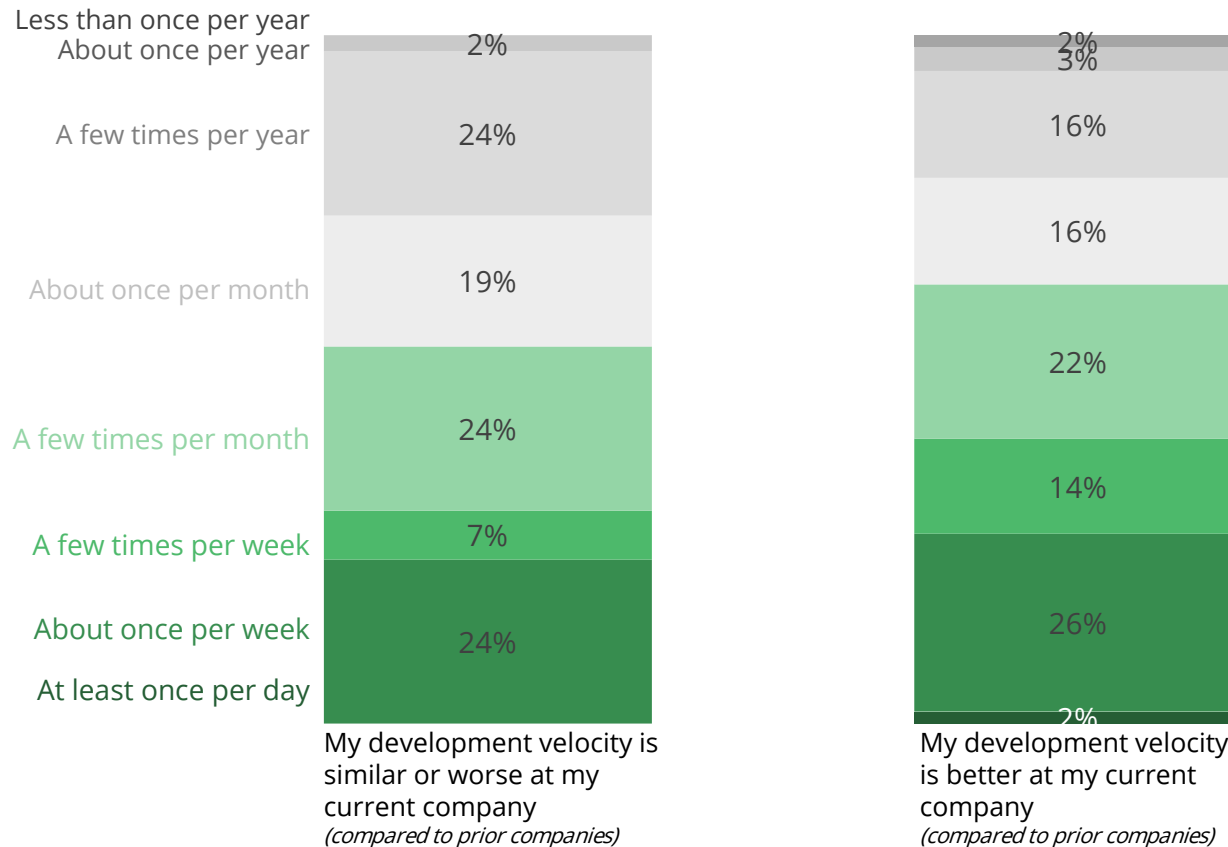
Notes: (1) Margaret-Anne Storey, 2019: [“Towards a Theory of Software Job Satisfaction and Perceived Productivity”](#)

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

One immediate and actionable tactic for engineering leaders to improve developer effectiveness is by providing more frequent feedback to developers

How often do you receive feedback from your supervisors that helps you grow as a developer?

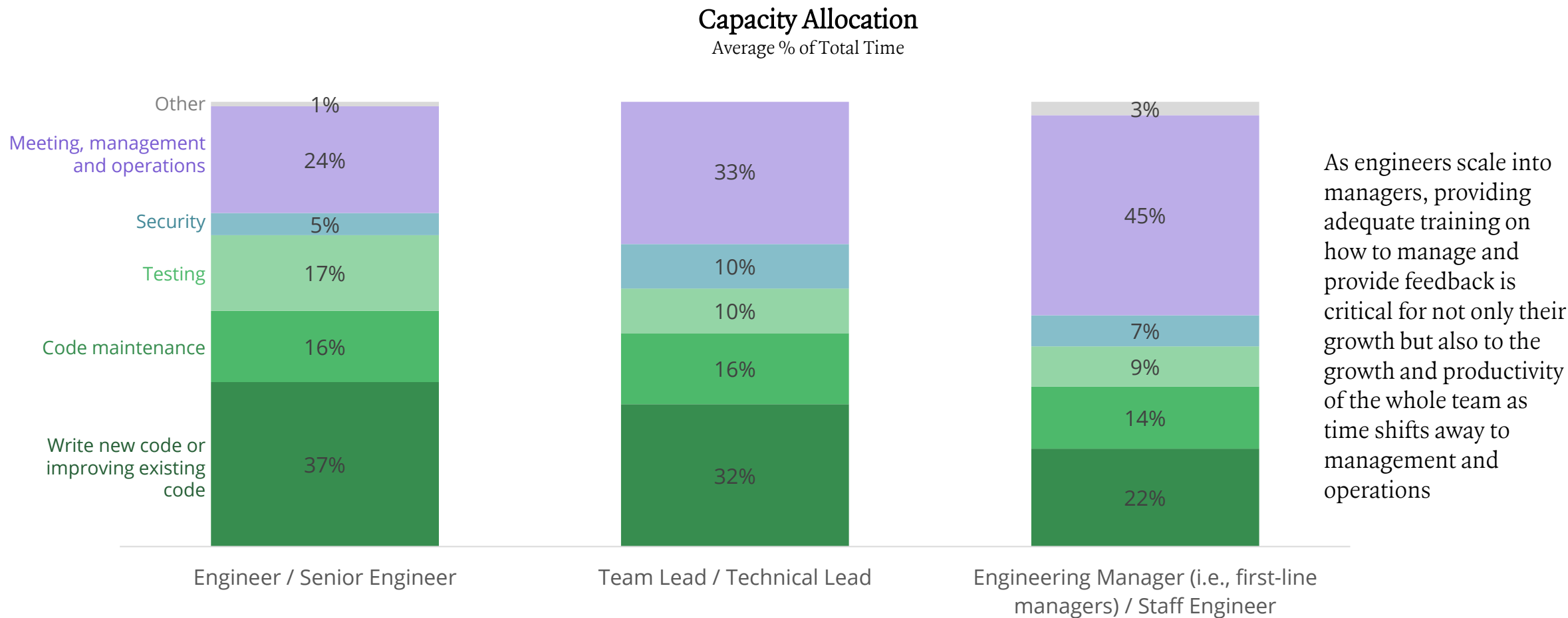
% of Respondents



41% of developers who feel their development velocity has improved at their current company receive feedback from supervisors frequently (as often as daily or multiple times a week).

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Time spent on writing or improving code decreases as engineers move up the ranks, with engineering managers only spending ~22% of their time in the codebase and most of their time on meetings / operations



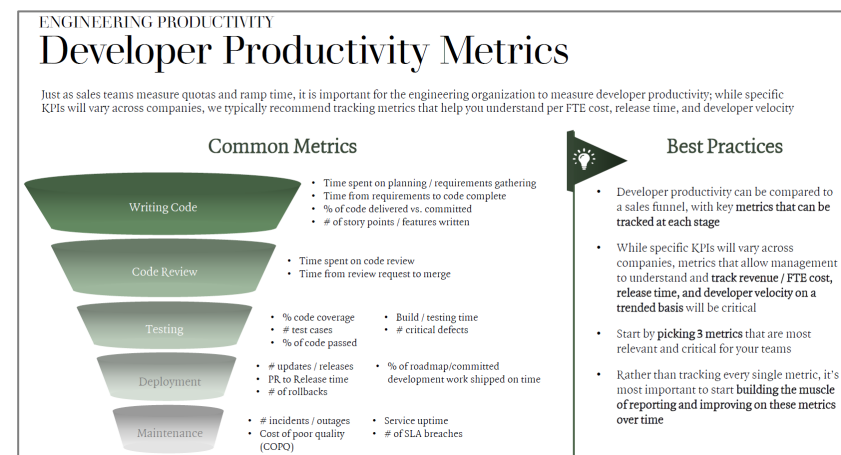
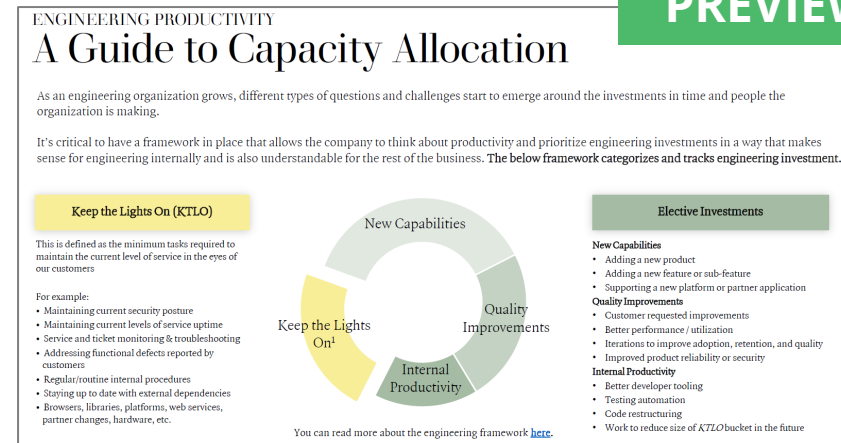
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

In our next chapter, we are excited to dive into all aspects of developer productivity, including best practices for tracking and reporting on key metrics, in addition to benchmarks across common productivity metrics

Key Questions Covered

- 1 **Capacity Allocation**
How should I prioritize different investments in time and resources and how do I understand the types of projects my team is spending time on?
- 2 **Developer Productivity Metrics**
What metrics should I start tracking and how do I get started?
- 3 **Developer Productivity Benchmarks**
How does the performance of my engineering team compare to other software companies?
- 4 **Improving Developer Velocity**
What actions are best-of-breed companies taking to improve developer velocity?
- 5 **Engineering Reporting for the Rest of the Organization**
How can I effectively report on engineering priorities and challenges for non-technical stakeholders like my executive team and Board of Directors?

PREVIEW



DevOps Maturity

The state of DevOps (infrastructure, people, and processes) across SaaS organizations

Key Priorities for Engineering Leaders

Many of the priorities listed by engineering leaders can be grouped into 3 broad categories across developer productivity and experience, the evolution and maturity of DevOps, and driving innovation / efficiency (with the main focus being around embedding AI).

The subsequent pages in this study will dive into each of these priorities in detail including the actions modern-day engineering organizations are taking and relevant benchmarks across different stages of growth and business models.

1 Developer Productivity & Experience

There is no universally accepted definition of developer productivity and even different perceptions across CTOs and engineer ICs based on our research. We believe developer productivity should be assessed through a holistic framework that captures business impact, performance and reliability, developer effectiveness, and culture.

“We are keeping headcount flat in 2024, so a big focus for me this year is striking a balance between individual development goals and organization needs with a major focus on efficiency. We need to motivate our engineers to do more, and part of that involves tracking and measuring developer productivity.

*Engineering Leader
Infrastructure & Security
Growth Stage (\$100-300M ARR)*

2 Evolution and Maturity of DevOps

A key factor to improving developer productivity and experience is the state of the underlying infrastructure and processes powering engineering teams. Modern-day engineering organizations have adopted the DevOps mindset in varying forms and rather being a nice-to-have, embracing DevOps has now become ubiquitous for engineering organizations.

“We have a lot of **tech debt to clean up** this year and are doubling down on **refactoring and overall simplification** – how do we make it **easier and faster for developers to commit features**? The goal is to enable the team to spend **less time on time-suck / low ROI activities that can be automated**.

*Engineering Leader
Fintech
Late Stage (\$300M+ ARR)*

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In our conversations with CTOs, the universal questions around AI have been around where to start, the most impactful use cases for internal productivity, and what are other companies seeing in terms of early ROI.

“A key priority for me this year is to **unlock ML and uplevel our existing engineers**. We have **not seen measurable results yet with Copilot** so we are trying to better understand **best practices for embedding AI and getting true ROI** from these solutions.

*Engineering Leader
Consumer & Internet
Late Stage (\$300M+ ARR)*

Spotlight: Building a DevOps Culture



i 1Password

Pedro Canahuati
Chief Technology Officer (CTO)



At Facebook, I led the production engineering team which scaled Facebook's infrastructure and ensured our services are available 24/7. I brought this mentality of operations at scale with me to 1Password and when I joined as CTO, I knew that we had to embed DevOps into the engineering mindset and culture. There was no room for argument – this is the way modern engineering organizations are doing it, and we must follow.



The Transition to DevOps

- Building an engineering organization that is effective requires a change in the cultural mindset and the transition is often very challenging
- It requires buy-in and shared ownership across the entire engineering team. Engineers need to shift their mindset completely and ops teams also need to be engaged earlier in the process with developers
- The only way to implement this is by revamping people processes like performance evaluation, hiring, and onboarding to make this mindset shift a requirement:
 - We worked with developers and operations teams resistant to change – helped them evolve, and if/when change wasn't effective, amicably parted ways
 - We also try to hire for developers with a DevOps mindset
 - We practice “dogfooding” which means developers must consistently use the product they've built just like the end user to figure out what works and what doesn't
 - We implemented developer bootcamps (2 week programs for new joiners) to accelerate onboarding for new hires and coach them on best practices across development, code reviews, testing, etc.

Metrics Tracked

We track a variety of metrics to understand developer sentiment around development processes and effectiveness:

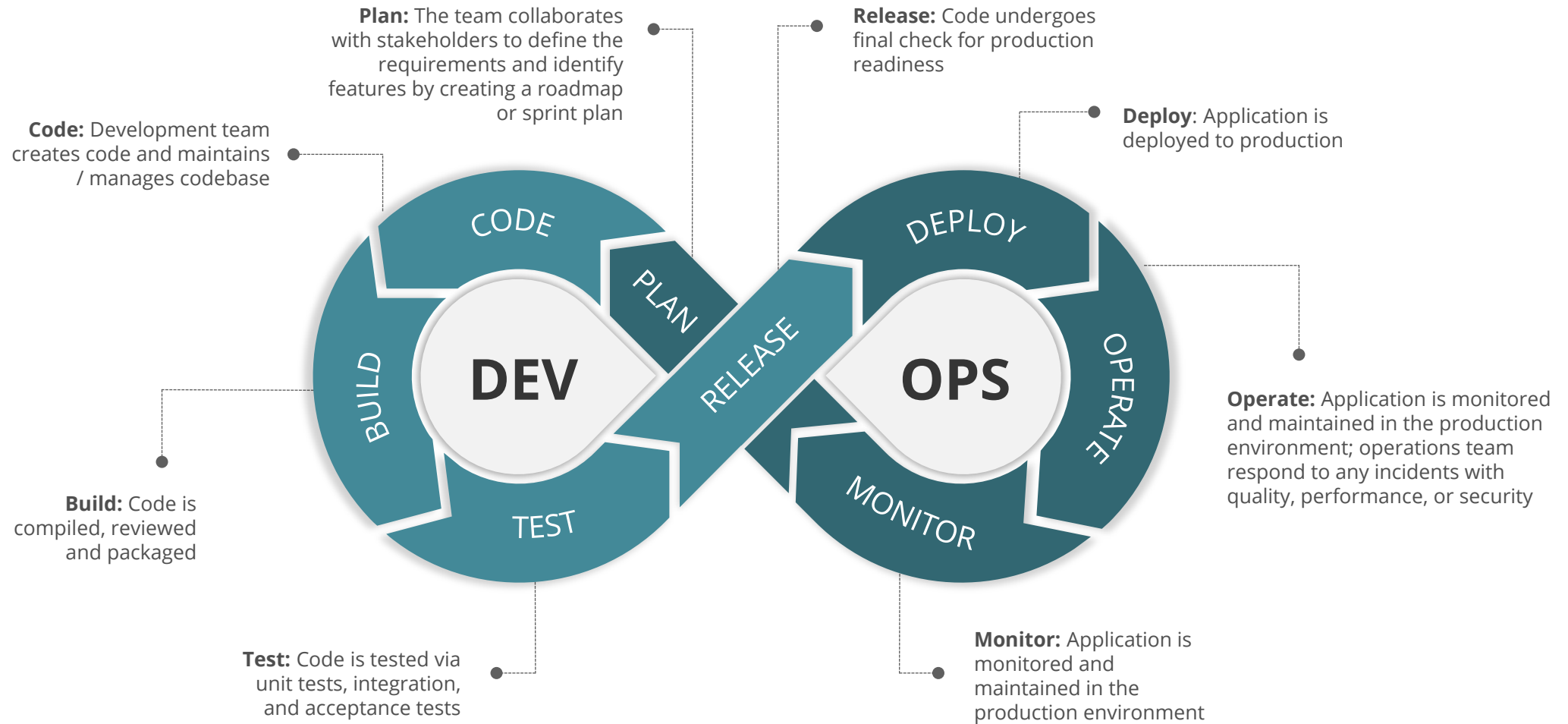
- How easy is it to develop, deploy code, etc.?
- Velocity metrics, including time to delivery and PRs

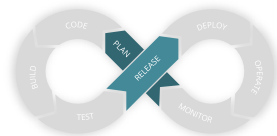
We review sentiment every 6 months via a developer survey and leverage these metrics to identify team improvements. Nothing is used as a performance evaluation mechanism.

Source: Interview with Pedro Canahuati (Feb 6, 2024)

Trademarks are the property of their respective owners. None of the companies illustrated have endorsed or recommended the services of ICONIQ. Not all companies on this page are ICONIQ Growth portfolio companies. For a complete list of ICONIQ Growth portfolio companies, please see the appendix. Insights from some but not all ICONIQ Growth portfolio companies as well as companies not part of ICONIQ Growth's portfolio.

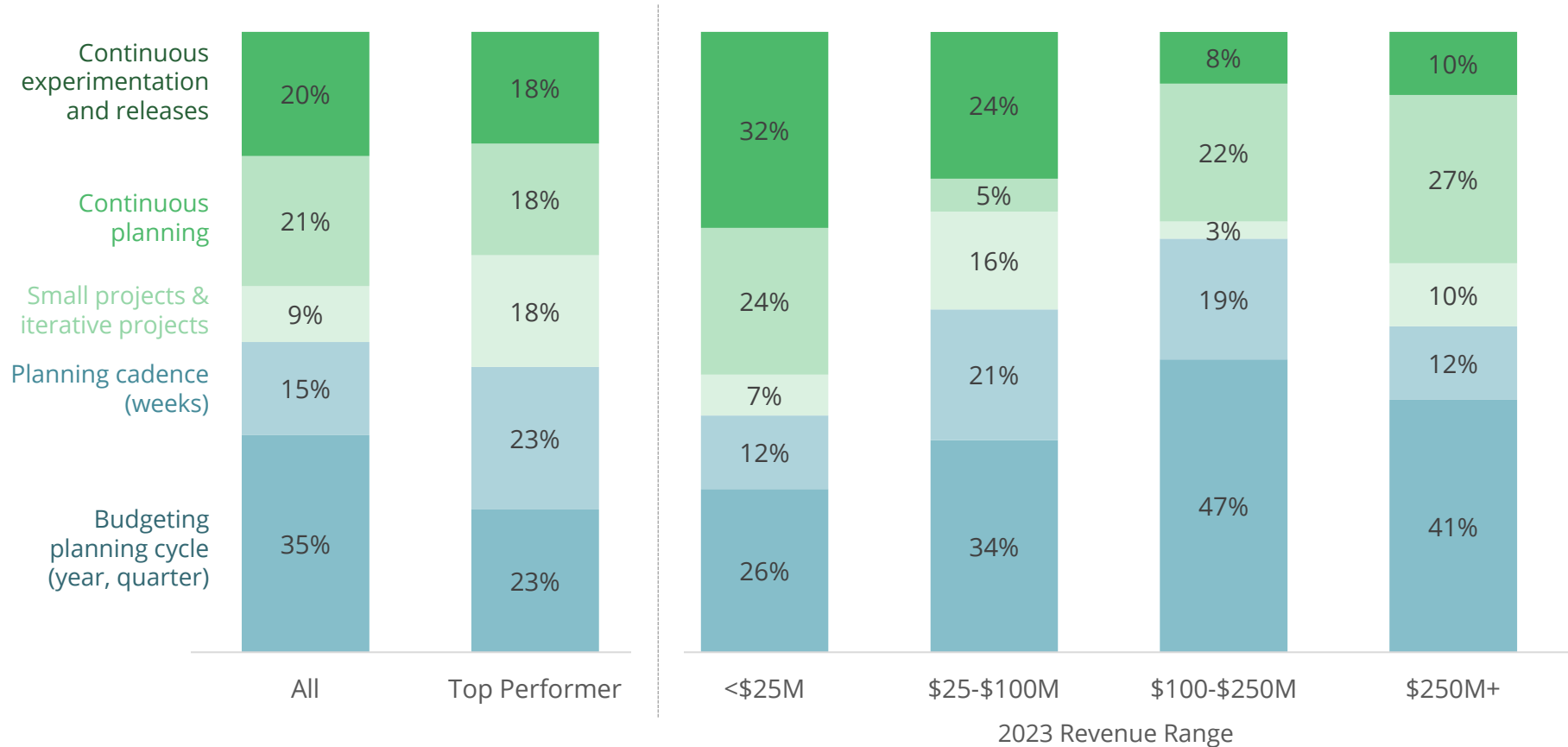
The DevOps lifecycle is an iterative and collaborative process used by modern-day SaaS organizations to delivery high-quality software, tailored to meet business and user requirements





Planning cadence evolves as companies scale, with early-stage companies typically using continuous planning before transitioning to a more regular planning cadence as they reach critical scale

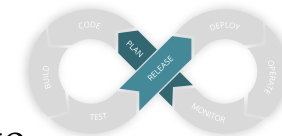
How would you describe the primary R&D project planning process in your company?
% of Respondents



In the **early stages of scaling (<\$25M)**, companies tend to follow an agile process of continuous planning and releases. As companies continue scaling and reach critical inflection points (e.g., \$25M, \$50M, etc.), it appears that **companies often switch back to a more waterfall approach to planning** (perhaps to ensure they can meet key requirements as they move up-market).

However, as companies scale past \$100M, **companies either settle into a traditional regular planning cadence or adopt scaled agile**. Notably, a **greater percentage of top performers utilize a more frequent planning cadence**.

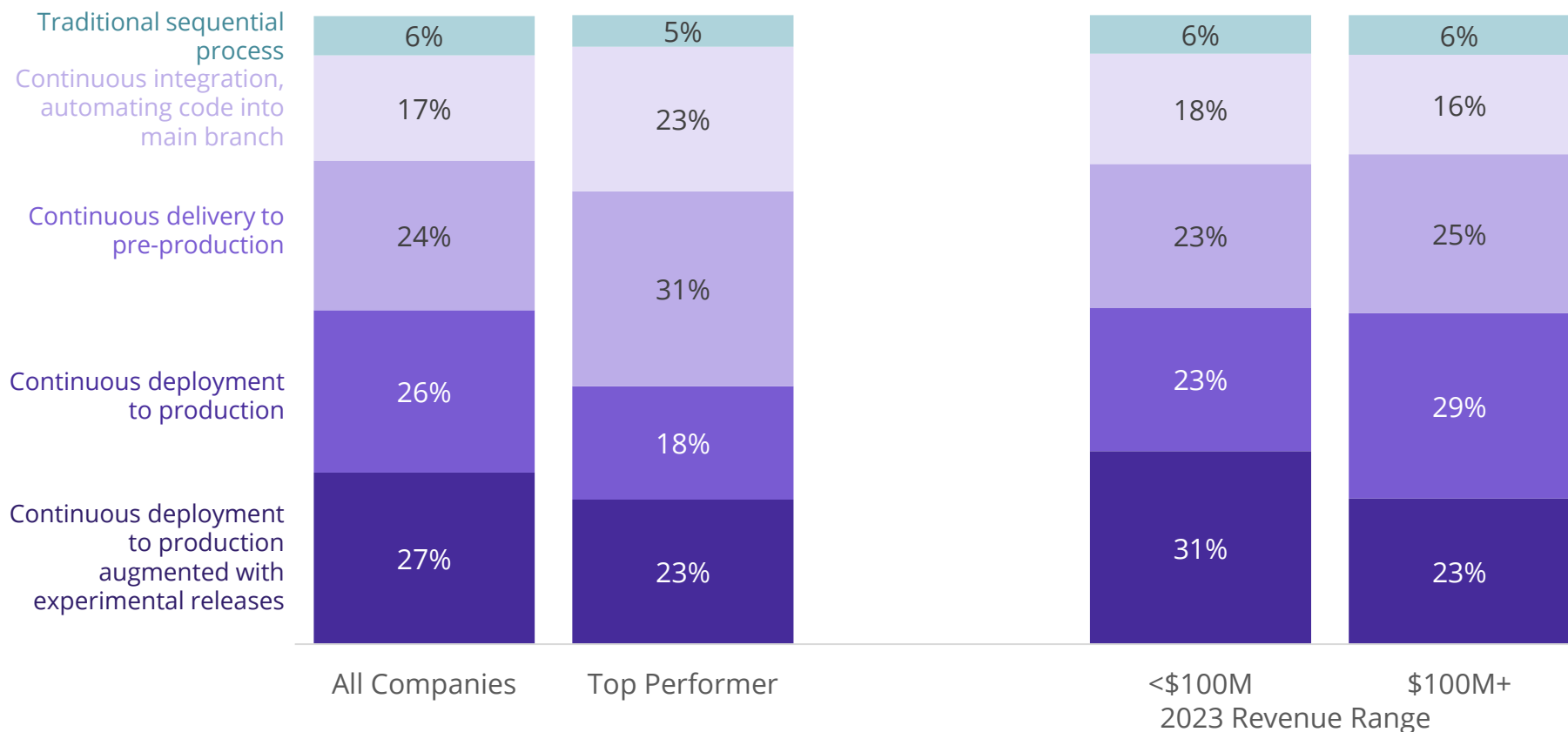
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8



Companies also employ a similar mindset to release schedules, typically transitioning from agile deployments to either continuous delivery to pre-production or scheduled but frequent deployments to production

How would you describe your typical release process?

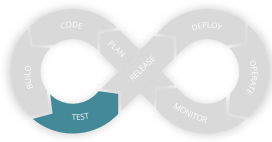
% of Respondents



In the early stages of growth, **continuous deployment augmented with experimental releases** allows companies to move fast and iterate quickly on customer feedback. However, this becomes **more challenging to coordinate** as companies scale and need to maintain a higher standard of quality and reliability.

A greater percentage of top performers **use continuous delivery to pre-production or continuous integration**, compared to other companies, likely given a focus on quality and integrations.

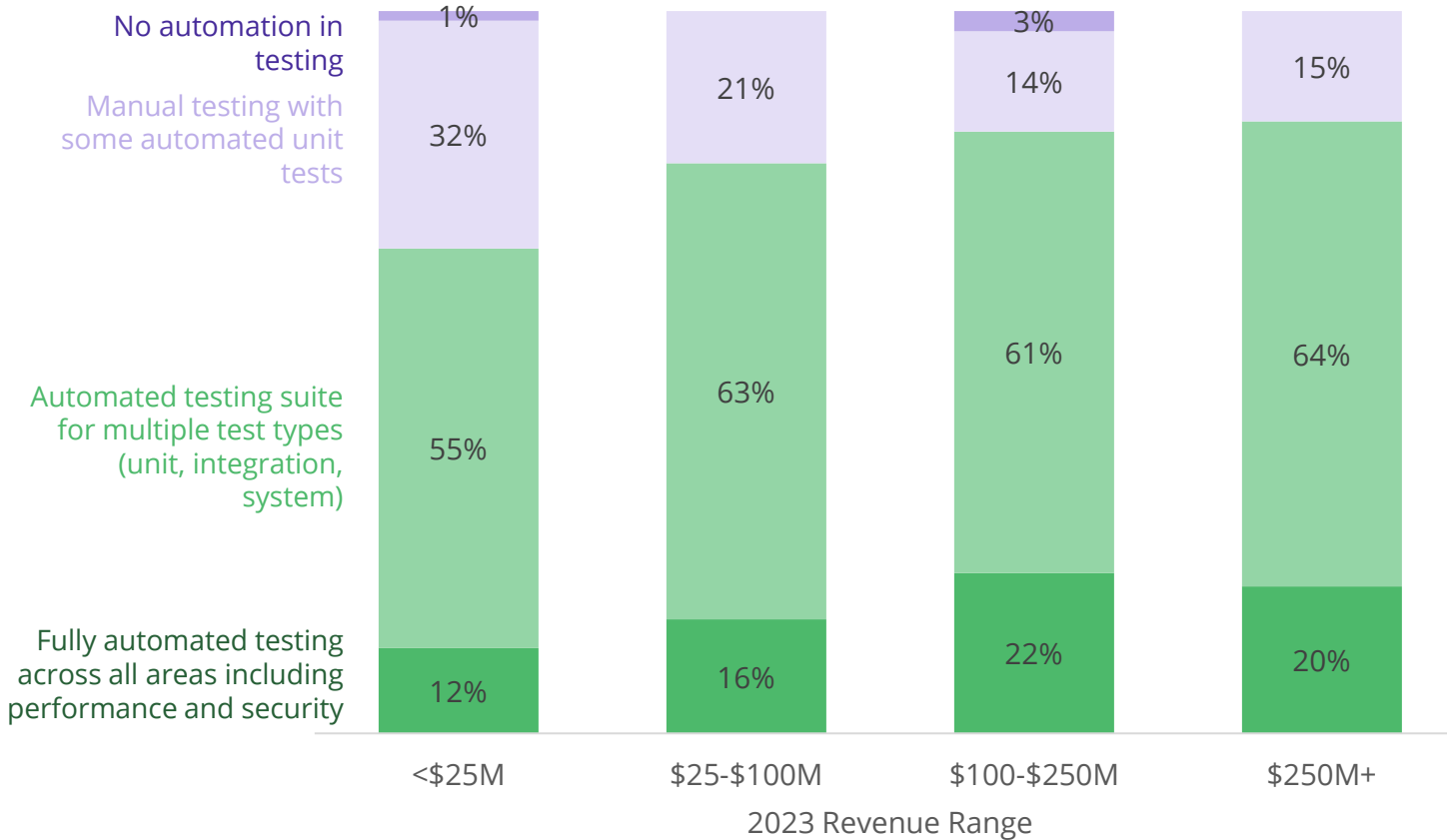
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8



Most companies build automated testing suites as early as <\$25M in revenue

How automated are your testing processes?

% of Respondents



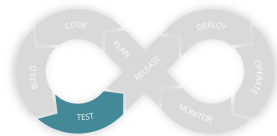
Most companies develop automated testing as early as \$25M in revenue.

There were some notable differences by sector. 100% of companies in the security / infrastructure sector had automated testing, whereas a higher percentage of respondents in vertical SaaS still relied on manual testing, likely because certain industries like healthcare have certain regulatory restrictions and a higher standard of quality that requires manual intervention.

By investing in testing automation this year, we expect to improve developer productivity significantly by generating greater test coverage and reducing the time to release.

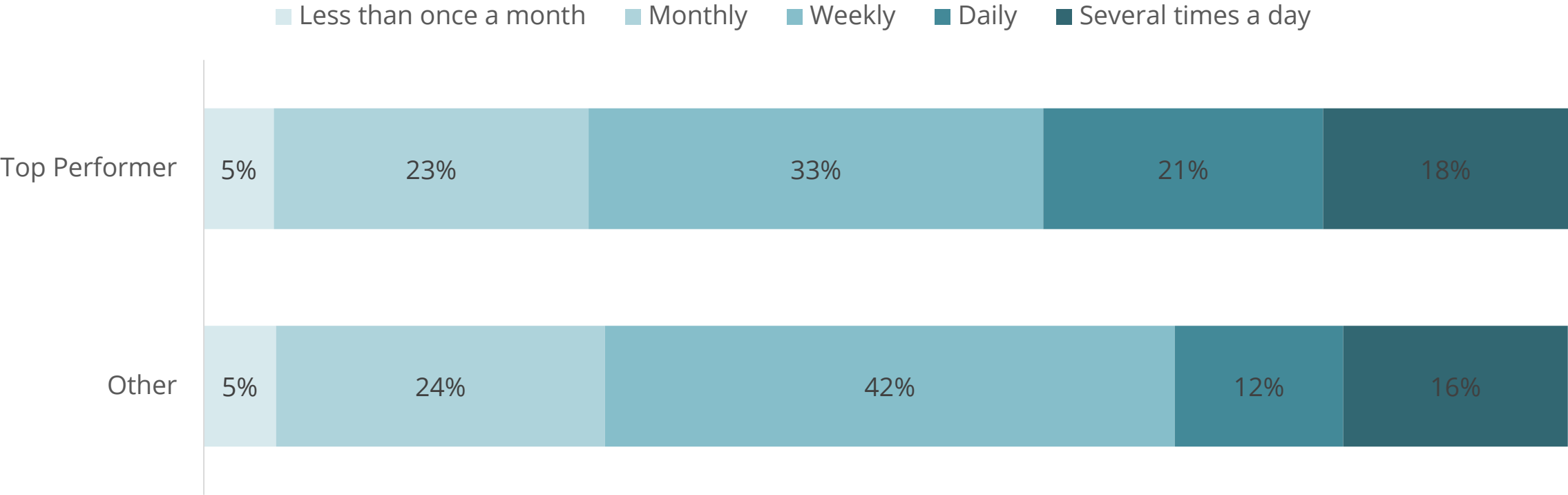
*CTO, Infrastructure & Security
Growth-Stage (\$100-300M ARR)*

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

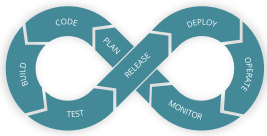


Most companies allow developers to see the results of integration / unit testing weekly, with top performing companies having faster testing processes that show results as quickly as daily or several times a day

How quickly can developers see the results of the integration / unit testing?
% of Respondents



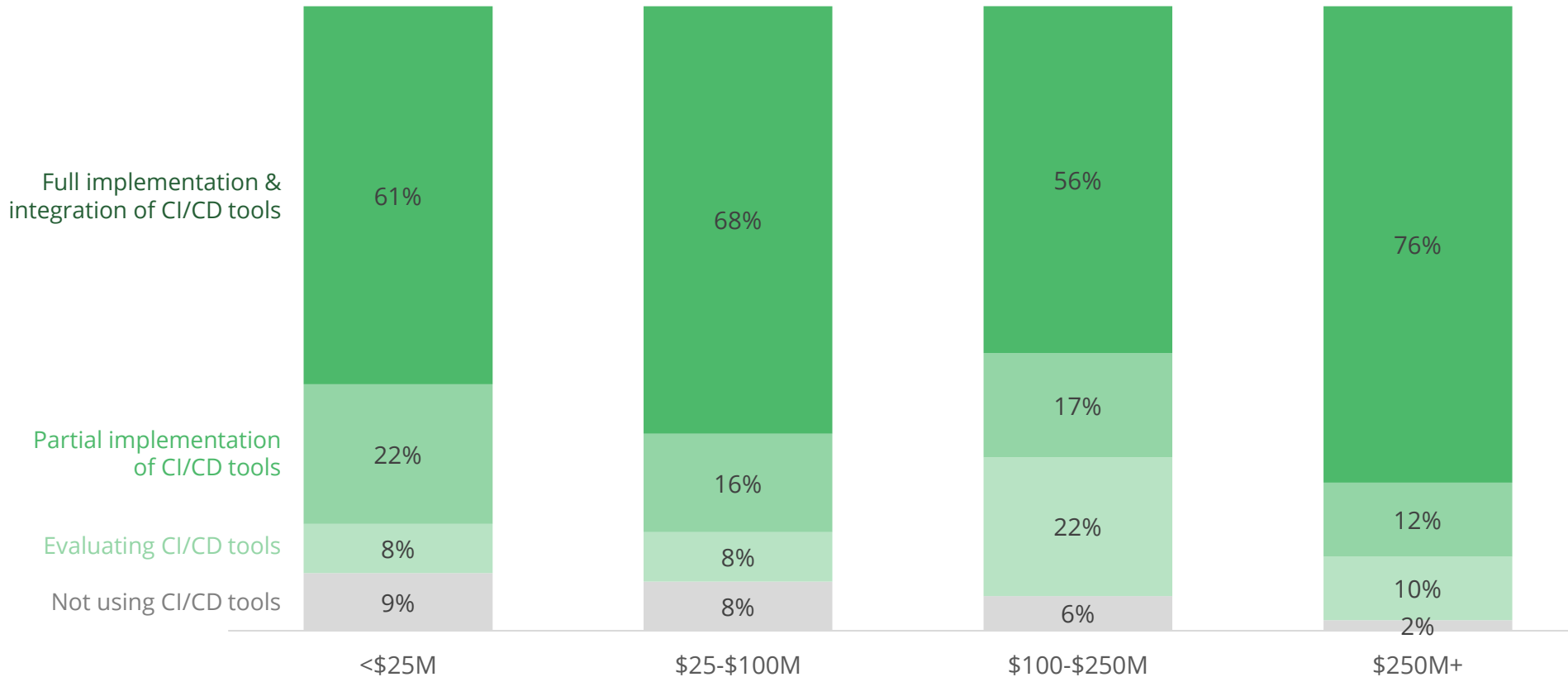
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8



Most companies surveyed have full implementation of CI/CD tools regardless of stage, with 98% of companies either evaluating or having implemented CI/CD tools by \$250M in revenue

To what extent does your team use CI/CD tools?

% of Respondents



As companies scale, the implementation of tools enabling continuous integration and deployment are critical to allow engineering teams to do their best work, with **76% of companies in the \$250M+ revenue range having full implementation and integration of CI/CD tools.**

Notably, **90% of top performing companies have fully implemented CI/CD tools as early as \$25M in revenue.**

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

AI Impact

How companies are leveraging generative AI / LLM across product and internal productivity use cases and the initial ROI

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*Engineering Leader
Fintech
Late Stage (\$300M+ ARR)*

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*Engineering Leader
Consumer & Internet
Late Stage (\$300M+ ARR)*

Spotlight: Leveraging LLMs to Drive Efficiency



Wealthsimple

Diederik van Liere

Chief Technology Officer (CTO)

“ At Wealthsimple we’ve found new and innovative ways to use GenAI to better support our clients and empower our employees. That’s why we’ve introduced ‘Wealthsimple Booster Packs’ which are packages of open-source LLMs built on our own cloud infrastructure to protect PII and IP. We’ve seen massive adoption among Wealthsimplers – weekly active users (WAUs) include 50% of the company. ”

The Wealthsimple Boosterpack

- We’ve made three types of knowledge bases available to all employees:
 - **Public:** Accessible to all employees, these datasets include source code, public financial data, or product and help content
 - **Private:** A private knowledge base is available to each employee where they can store and query their own personal documents
 - **Limited:** A shared knowledge base available to a limited set of co-workers
- We’ve seen most of the requests to be related to programming (e.g., debugging, code generation), content / copy generation, or querying and review of customer tickets

Tracking ROI of LLM Initiatives

Using LLMs which auto-transcribe all customer calls and analyzes the sentiment and quality of each call, we built a “Voice of the Customer” dashboard which tracks all inbound customer issues across web, email, chat, and voice classified by topics and sub-topics.

This has significantly reduced ticket queue time and saved an average ~620 days of manual operations annually.

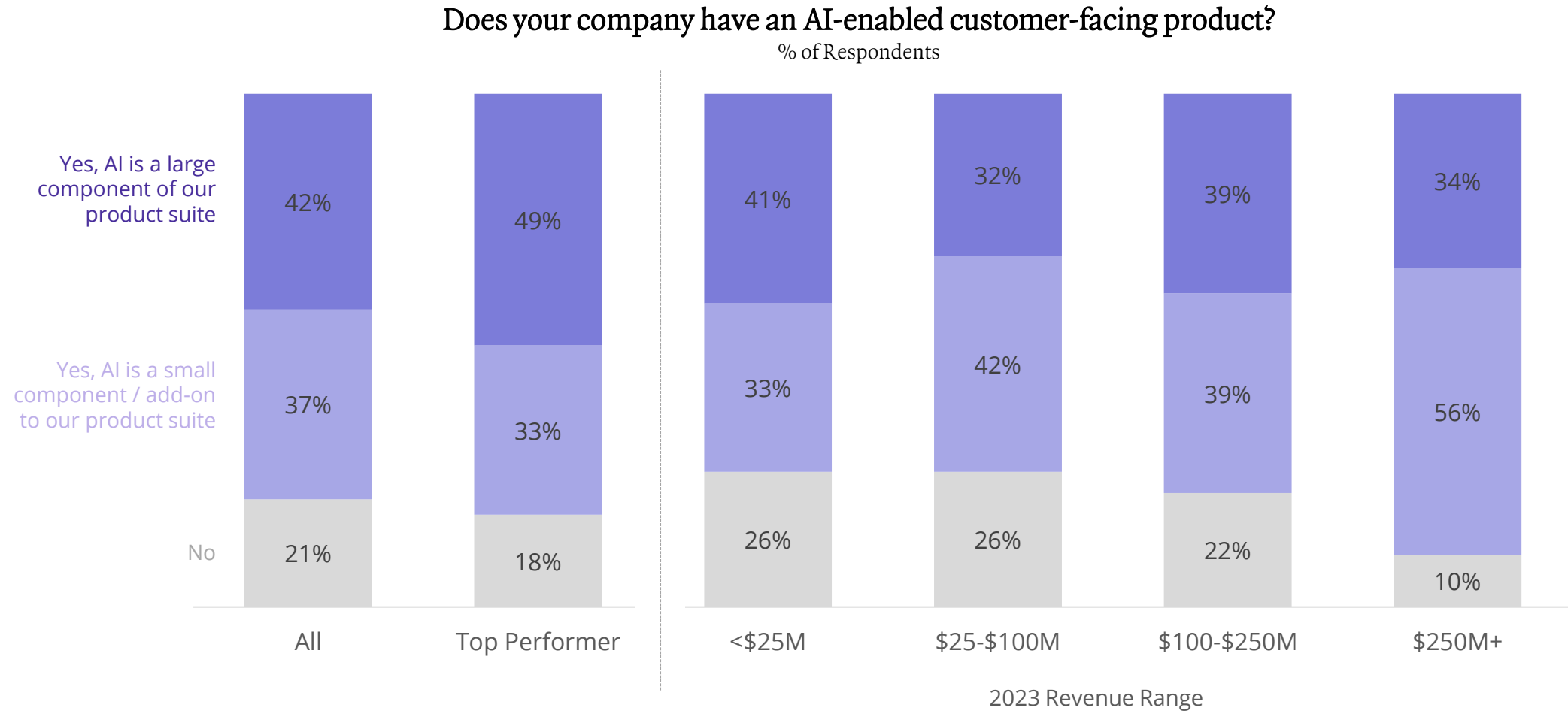
This dashboard has also become the missing link between engineering and customer experience. We are leveraging this dashboard to understand how new features we ship impact customer sentiment and can easily see if new features had a direct impact on reducing the volume for CX sub-topics.

Source: Interview with Diederik van Liere (Feb 12, 2024)

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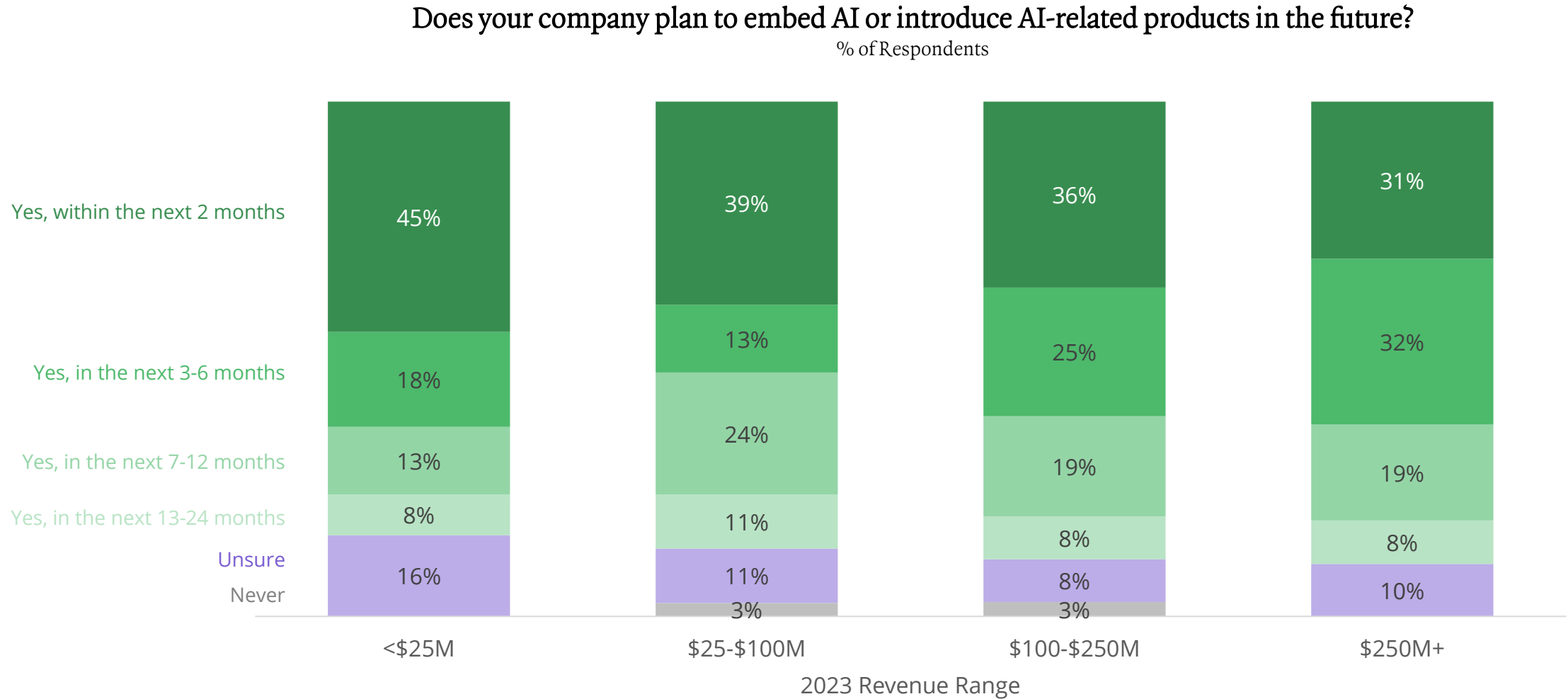
Building AI-Enabled Products

Around 70% of companies analyzed have an AI component in their product suite, with ~90% of companies in the \$250M+ revenue range having an AI-enabled customer-facing product



Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Most companies are also planning to embed AI or introduce AI-related products in the next 12 months regardless of scale



Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Around 35-45% of respondents surveyed are planning to hire AI-related roles such as machine learning engineers, data scientists, and data engineers in 2024

Is your company hiring any of the below roles specifically related to AI in 2024?

% of Respondents

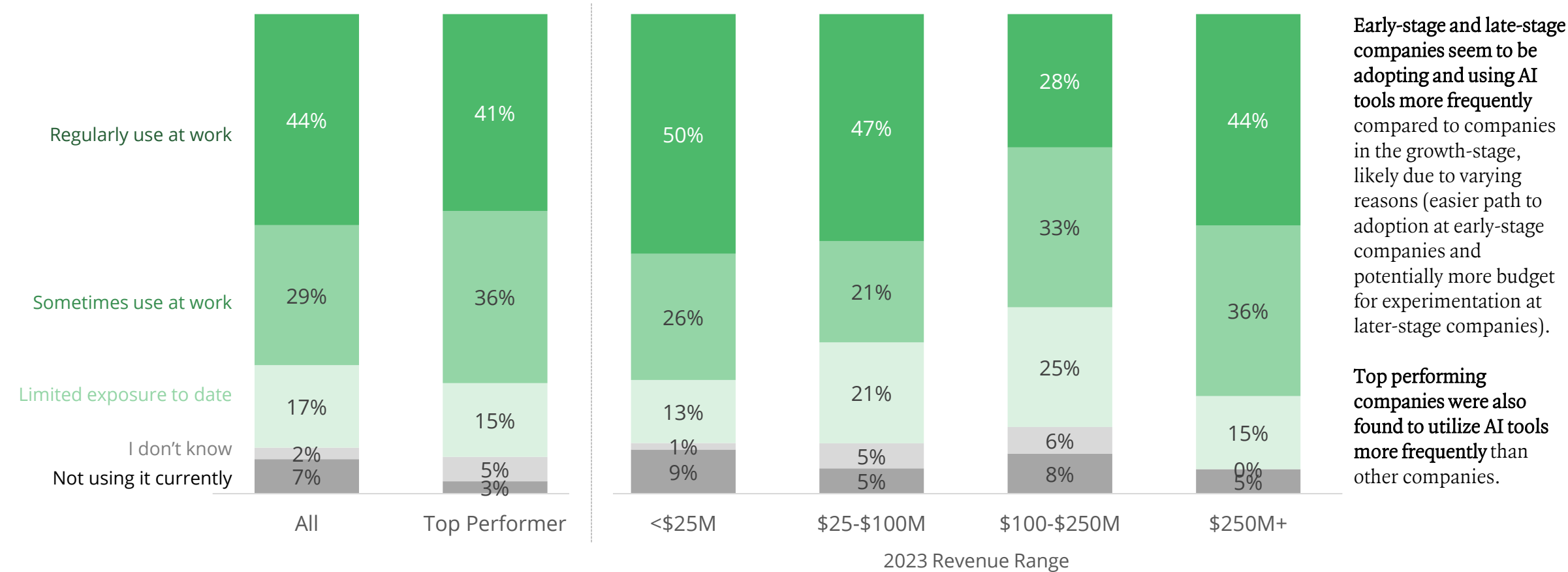


Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Leveraging AI Tools for Internal Productivity

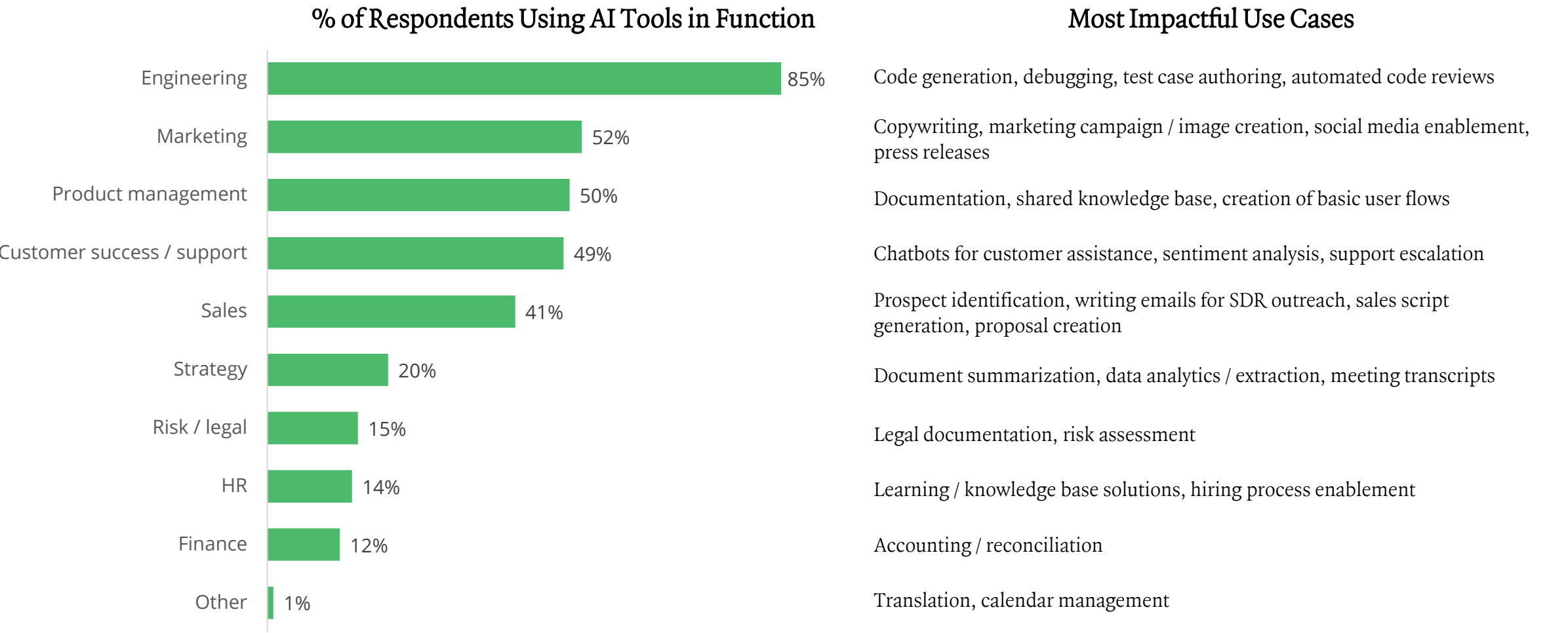
Since building new AI products takes significant time and upfront investment, most companies are first experimenting with leveraging internal AI applications to boost productivity

How often is your company's teams using AI tools at work for internal productivity?
% of Respondents



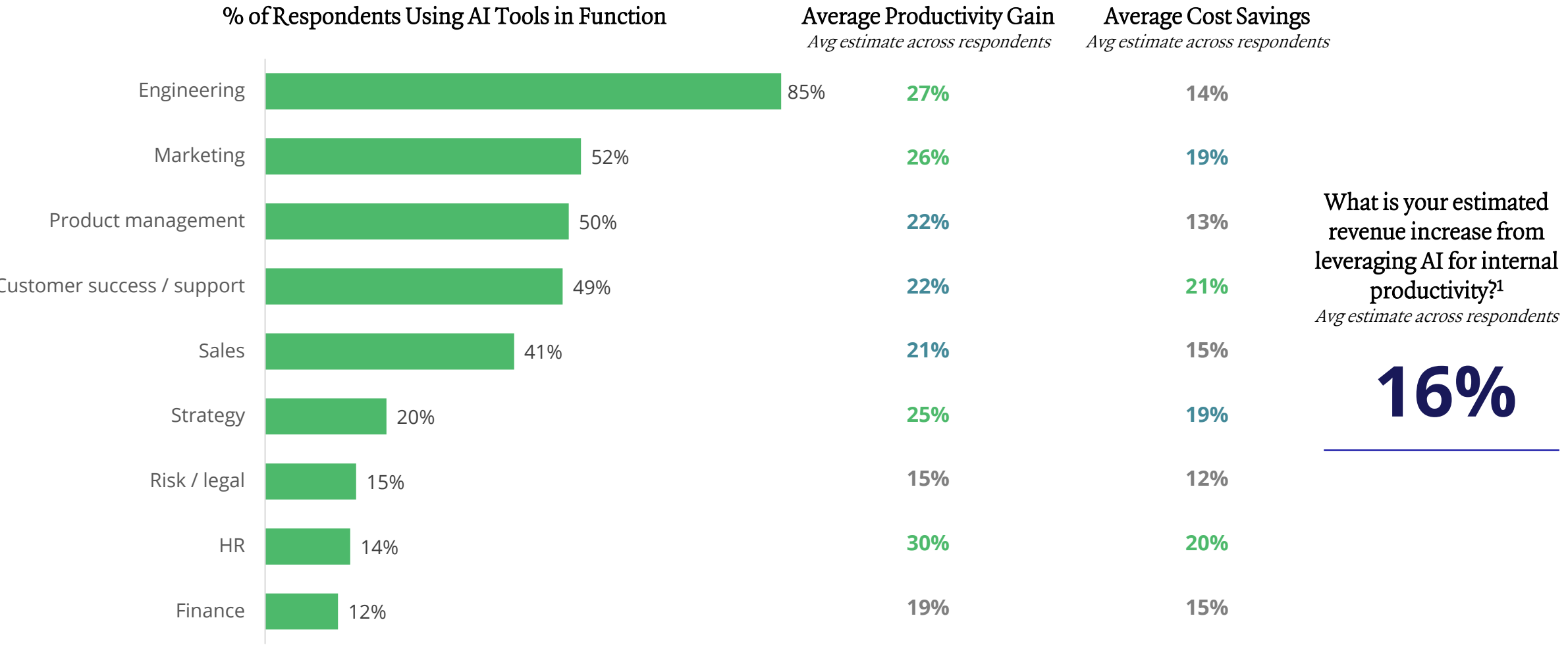
Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

The most common functions using AI for internal productivity include engineering, marketing, product management, and customer success / support



Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

Preliminary estimates of AI impact reveal notable productivity gains of 20-30%; notably, HR and customer success / support are seeing the greatest cost savings while finance and engineering are seeing the largest revenue increase



Notes: (1) The numbers, figures and case studies included in this presentation are derived from direct responses of survey participants and included for purposes of illustration only, and no assurance can be given that the actual results of ICONIQ or any of its partners and affiliates will correspond with the results contemplated in the presentation

Source: ICONIQ Growth Engineering Survey (December 2023) and perspectives from engineering leaders in the ICONIQ Growth network presented on Slide 8

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Other Research from ICONIQ Growth

The ICONIQ Growth analytics mission is to empower our portfolio and network with **proprietary insights that inform business operations and strategy**

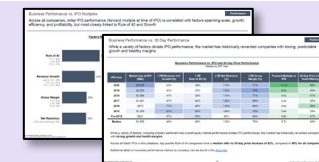
SaaS Topline Growth & Operational Efficiency

- Our annual report on the data behind scaling a B2B SaaS business: we answer key questions on how these companies scale quickly and efficiently and explore what we believe to be early indicators of long-term success
- *Data source: Quarterly financial and operating data from the ICONIQ Growth B2B SaaS portfolio*



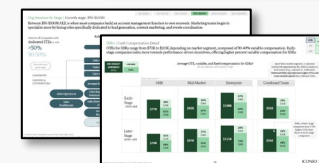
IPO Preparedness & Performance

- Our annual software, consumer, and healthcare IT IPO reports answer key questions across several major topics related to successfully planning for an executing an IPO
- *Data source: Public filings for IPOs from 2013 to now*



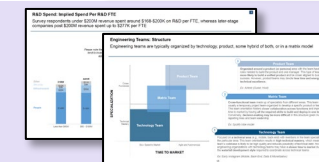
Go-to-Market Series

- Our annual report on the state of go-to-market, spanning topics across building go-to-market teams, compensation, and reporting best practices
- *Data source: Proprietary survey of 200+ GTM executives*



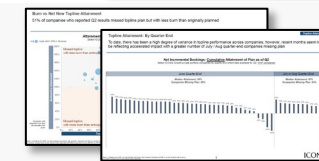
Engineering Efficiency

- Our annual report in collaboration with the ICONIQ Growth Technical Advisory Board on the data behind high-functioning engineering organizations
- *Data source: Proprietary survey of ICONIQ Growth portfolio and broader network*



*Quarterly Recaps

- Real-time insights into performance and attainment across top- and bottom-line forecasts, how key performance metrics have been impacted by the current market environment, and how companies are adjusting plan and strategy in response
- *Data source: Quarterly attainment and budget data from and proprietary surveys of the ICONIQ Growth portfolio*



Select research shown. We invite you to explore additional resources on our [ICONIQ Growth Insights page](#).

* These studies include proprietary information. Please reach out to iconiqgrowthinsights@iconiqcapital.com to request access.

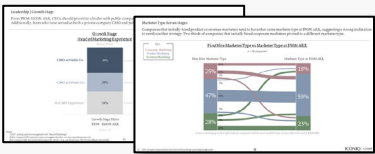
Other Research from
ICONIQ Growth

Leadership Analytics

Executive hiring is the final frontier within the modern organization that is yet to see a proliferation of data. Despite having data to guide nearly every other business decision, CEOs and Founders have heretofore been forced to rely on anecdotal evidence. **ICONIQ Growth Leadership Analytics helps de-risk hiring decisions by empowering CEOs and Founders with executive hiring data:** we study every leadership hire between founding and IPO at high-caliber SaaS companies to create a series of first-of-their-kind playbooks that help guide decision-making across the entire company lifecycle.

➔ **Chief Marketing
Officer Study:
Part 1 & Part 2**

- Quantitative analysis of the most prevalent – and most successful – operational backgrounds and qualifications for Heads of Marketing at private SaaS companies, segmented by Growth Stage
- *Data source: Proprietary dataset of >200 marketing leaders at 63 SaaS companies*



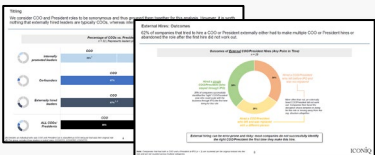
**Chief Revenue
Officer Study:
Part 1 & Part 2**

- Quantitative analysis of the most prevalent – and most successful – operational backgrounds and qualifications for Heads of Sales/CROs at private SaaS companies, segmented by Growth Stage
- *Data source: Proprietary dataset of >180 sales leaders at 72 companies*



***President & Chief
Operating Officer
Study**

- Examination of the advantages and challenges of having a COO and/or President role
- *Data source: Proprietary dataset of every past and current COO/President at 61 SaaS companies*



**Chief Financial
Officer Study**

- Quantitative analysis of the most prevalent – and most successful – operational backgrounds and qualifications for Heads of Finance at private SaaS companies, segmented by Growth Stage
- *Data source: Proprietary dataset of >170 finance leaders at 72 companies*



**Chief People
Officer Study**

- Quantitative analysis of the most prevalent – and most successful – operational backgrounds and qualifications for Heads of People at private SaaS companies, segmented by Growth Stage
- *Data source: Proprietary datasets of >100 people leaders at 59 companies; 2021 Cloud 100 People leaders*



Select research shown. We invite you to explore additional resources on our [ICONIQ Growth Insights page](#).

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A global portfolio of category-defining businesses



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