

2023 State of Tech Talent Report

Acquiring and Retaining Technical Talent in 2023

May 2023

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2023 State of Tech Talent Report

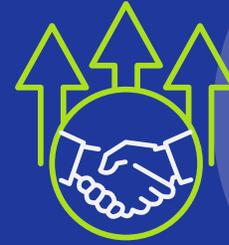
Economic concerns caused 59% of organizations to revise their 2023 technical hiring plans primarily by freezing new positions, but **more plan to increase hiring than decrease.**



New hiring continues to focus on developers and newer technologies, while senior technical roles bear the brunt of job cuts (45%).

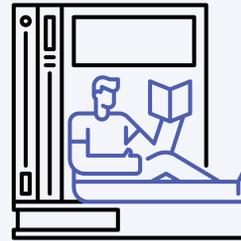


Both cloud and managed service providers (65%) and telecommunications organizations (65%) are **more likely to increase their technical staff in 2023.**

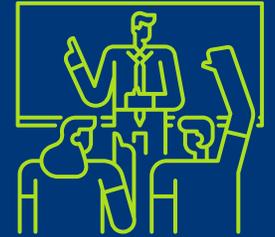


Organizations increasing their hiring in 2023 are focusing on newer technologies: cloud / containers (50%), cybersecurity (50%), and AI / ML (46%).

70% of organizations surveyed provide training opportunities for existing technical staff on new technologies.



When unable to find suitable technical candidates, organizations trained existing employees (58%) more often than hiring consultants (38%).



64% of respondents agreed that recruitment is costly, time-consuming, and can lead to the wrong candidate and quick turnover. **Almost one out of three new hires (29%) depart within six months of being onboarded.**



25% of organizations have increased their reliance on training and certification incentives in 2023.



Most respondents agree that **certification (73%) and pre-employment testing (81%) are necessary** to verify skills, addressing the challenges of finding the right candidate.

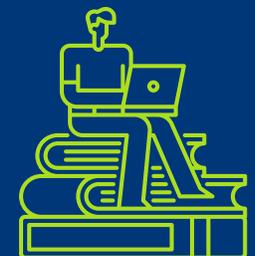


Respondents felt that upskilling (91%) and certifications (77%) are more important than a university education (58%) to address technology needs.

53% of respondents felt upskilling is extremely important to acquire the skills and knowledge your organization needs.



Training is a significant strategy for organizations; half of those reducing (52%) or freezing (50%) their hiring plan to upskill to address talent needs.



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Foreword

I am thrilled to present the findings of the 2023 State of Tech Talent Survey. This report is a valuable resource for organizations seeking to understand the current and future technology staffing requirements and skills needed within their teams.

The report sheds light on the impact of economic concerns on technical hiring plans, revealing that more than 50% of organizations surveyed have revised their hiring plans due to ongoing global economic uncertainty. However, the report also shows that despite these challenges, the demand for skilled tech talent remains strong, particularly in newer areas such as cloud / containers, cybersecurity, and AI / ML.

Training and upskilling are essential strategies for organizations looking to address the changing hiring landscape. The report highlights that 70% of organizations surveyed provide training opportunities for their existing technical staff on new technologies, demonstrating a commitment to ongoing development and growth.

Upskilling is becoming more important for recruitment, with organizations choosing to train existing employees more often than hiring consultants when they cannot find suitable external candidates. This recognizes the value of investing in existing staff and the challenges of finding the right external candidates.

The report also shows that certifications and pre-employment testing are becoming necessary tools for organizations to verify the skills of potential candidates. At Linux Foundation Training & Certification, we understand the importance of certifications in demonstrating technical proficiency and validating expertise. We design our certification programs to equip individuals with the skills and knowledge needed to succeed in today's fast-paced tech industry and assure prospective employers that candidates demonstrate the required skill sets.

As the tech industry evolves, we recognize the crucial role of ongoing learning and development in staying ahead of the curve. The 2023 State of Tech Talent Report provides valuable insights into the ongoing changes and challenges in the tech industry workforce. We encourage hiring managers to use this report as a resource in their training and staffing efforts and look forward to continuing to provide valuable research and training resources for the tech industry.

Clyde Seepersad
SVP & General Manager, Training & Certification, The Linux Foundation

Executive Summary

The 2023 State of Tech Talent Report provides valuable insights into the current and future technology staffing requirements and skills needed within organizations. This report is based on a global survey conducted by Linux Foundation Training & Certification and Linux Foundation Research in February and March 2023 of over 400 hiring managers and staffing professionals addressing the needs of both end-user organizations and technology providers.

Impact of economic concerns

One of the report's key findings is the impact of economic concerns on technical hiring plans. More than 50% of organizations surveyed reported revising their hiring plans by freezing new positions. This is likely due to the ongoing global economic uncertainty caused by the COVID-19 pandemic and other factors, including inflation and geopolitical conflicts.

Demand for skilled technical talent

More organizations plan to increase their technical staff than decrease. This is a positive sign for those seeking employment in the tech industry. The demand for skilled tech talent remains strong, particularly in newer areas such as cloud / containers, cybersecurity, and AI / ML. Respondents identified these areas as the primary focus for hiring in 2023.

Shift in technical roles

Another interesting finding is the shift in the types of technical roles being hired for. While senior technical roles have seen the biggest job cuts, new hiring focuses more on developers and IT management. This suggests organizations seek skilled individuals who can contribute to project implementation, management, and technical development.

Training and upskilling

To address the changing hiring landscape, training and upskilling are becoming increasingly important strategies for organizations. The report highlights that 70% of organizations surveyed provide training opportunities for their existing technical staff on new technologies. This is a positive sign, as it suggests a commitment by organizations to the ongoing development of their employees and keeping their staff up to date with the latest technologies and practices.

Upskilling is also becoming more important for recruitment purposes. When unable to find suitable technical candidates, organizations train existing employees more often than hiring consultants. This suggests that organizations recognize the value of investing in their existing staff and the challenges of finding the right external candidates.

Certification and pre-employment testing

Respondents felt that certification and pre-employment testing are necessary to verify skills to address the challenges of finding the right candidate. This tool is useful to ensure organizations hire the right people for the job. It also gives candidates a clear understanding of the skills they must demonstrate to succeed in the role.

Conclusion

The 2023 State of Tech Talent Report provides valuable insights into the ongoing changes and challenges in the tech industry workforce. As the tech industry continues to evolve, it is clear that a commitment to ongoing learning and development will be crucial for individuals and organizations seeking to stay ahead of the curve. We hope hiring managers find this report useful in their training and staffing efforts and encourage you to participate in future Linux Foundation research projects.

PART 1

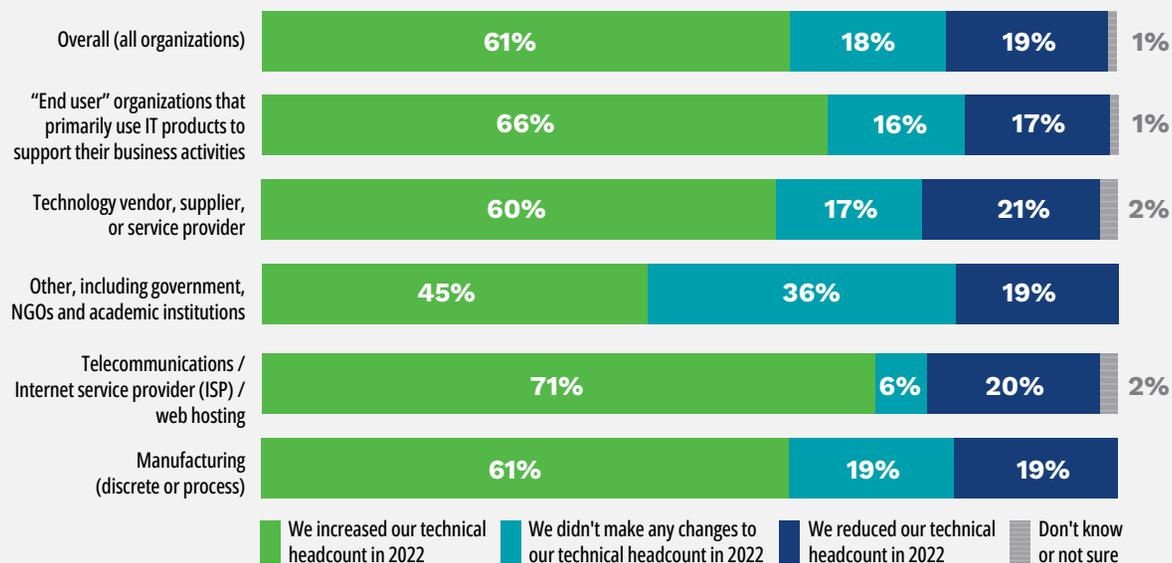
The technical hiring picture in 2023



FIGURE 1 CHANGES TO TECHNICAL HEADCOUNT IN 2022

What changes did you make to your technical headcount during 2022? (Q15)

2023 Tech Talent Survey, Q10-Q12 (Which response best describes the organization you work for?) segmented by Q15, sample size = 418.



Approximately what percent of the organization's technical headcount did you lay off or resigned in 2022? (Q16)

2023 Tech Talent Survey, Q10 (What type of organization do you work for? [Asked if the organization reduced technical headcount in 2022]) segmented by Q16, sample size = 80.

	MEAN	MEDIAN
Total	32.7%	20%
"End-user" organizations that primarily use IT products to support their business activities	24.7%	18%
Technology vendor, supplier, or service provider	39.3%	35%

Organizational preparedness for economic uncertainty began in 2022

The hiring picture remains strong despite the widely publicized layoffs at technology vendors at the end of 2022, which has extended at times into 2023. The top part of **FIGURE 1** shows three views into how organizations intend to address staffing: all organizations; a segmentation of the sample by end users, vendors / service providers, and others; and selected industries. The overall assessment is positive, with 61% of organizations increasing staffing, 18% waiting to see how the economic uncertainty evolves, and just 19% implementing staff reductions. The most variability is shown at the individual industry level because of the narrower functional focus of each industry.

Hiring in the "telecommunications / Internet service provider (ISP) / web hosting" sector was particularly strong, with 71% of organizations increasing their technical headcount. Most other organizations' industries (not shown) also increased their technical headcounts. For more information on the industries represented in our sample, see **TABLE A12**.

The top part of **FIGURE 1** shows that 66% of end-user organizations (those who primarily consume technology to support their business activities) were able to increase technical staff in 2022 compared to 60% of technology vendors and service providers. End-user organizations also fared better in tech staff decreases, with 17% of their ranks reducing technical staff compared to 21% for technology vendors and service providers.

PHOTO BY CAMILA MARTINEZ ON UNSPLASH



KEY TAKEAWAY

Despite the economic concerns and layoffs that have impacted the tech industry, the 2023 State of Tech Talent Survey data suggests that hiring trends remain strong, with the ongoing demand for skilled technical talent, especially at the more entry level for professionals with developer skills. This is particularly true for certain sectors, such as cloud and telecommunications, which continue to play a critical role in the technology adoption landscape. The outlook for hiring in the tech industry remains positive, with many organizations planning to increase their technical headcount in the coming years.



The bottom part of **FIGURE 1** combines both involuntary (layoffs) and voluntary (retirements and resignations) technical headcount reductions. Layoffs often result in a redistribution of responsibilities, which sometimes can be significant and will precipitate additional resignations as remaining staff evaluate their roles, workloads, and opportunities. For this reason, **FIGURE 1** staff reductions are best described as turnover because of their voluntary and involuntary components. Vendor / service provider organizations experienced very high turnover, at 39%. Meanwhile, end-user organizations averaged 25% turnover, more in line with typical pre-pandemic levels.

For an evaluation of staff reductions segmented by company size (number of employees), see **TABLE A17**.

The impact of economic concerns on technical staff hiring in 2023

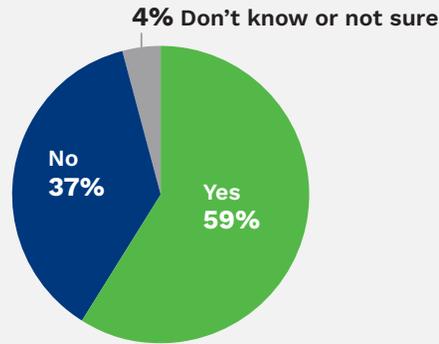
Economic concerns beginning in 2022 and extending into 2023 have impacted hiring plans, especially in North America.

As shown on the top half of **FIGURE 2**, 59% of surveyed organizations reported revising their technical hiring plans in response to these concerns, 37% elected to leave their technical hiring plans unchanged, and 4% said they didn't know or were not sure (DKNS). The majority of organizations (59%) have concerns about how to plan for 2023, but 41% did not expressly state concerns about how the economy would impact their technical hiring plans in 2023.

FIGURE 2 THE IMPACT OF ECONOMIC CONCERNS ON TECHNICAL STAFF HIRING

Did economic concerns beginning in 2022 cause your organization to change or revise your 2023 technical headcount hiring plans?

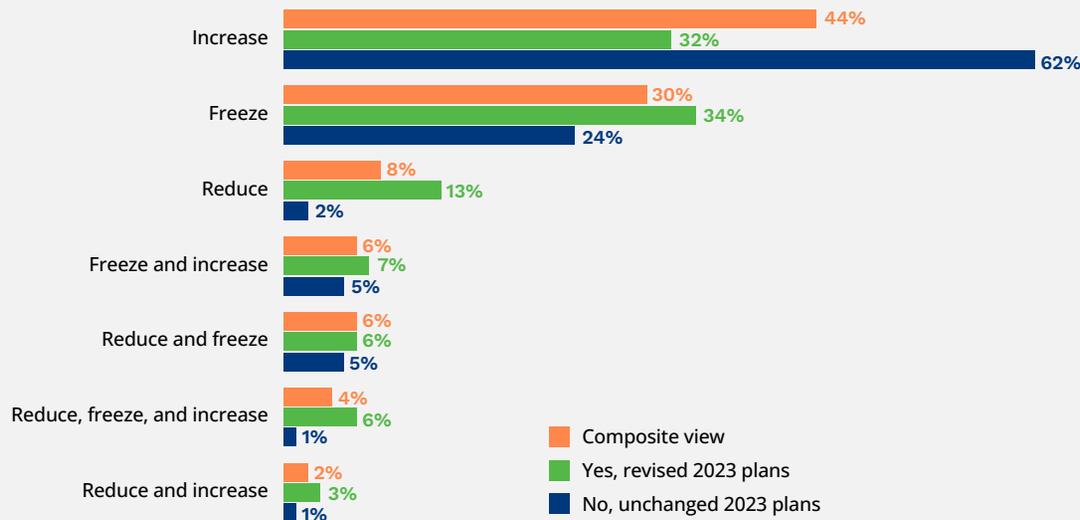
2023 Tech Talent Survey, Q20, sample size = 418.



How did concerns about the 2022 economy impact your 2023 technical staff hiring plans?

2023 Tech Talent Survey, Q34 (contingent on Q20), sample size = 247, valid cases = 247, total mentions = 313.

2023 Tech Talent Survey, Q35, sample size = 171, valid cases = 171, total mentions = 193.



The chart on the bottom part of **FIGURE 2** shows the difference between those organizations where the economic concerns caused a revision of plans and those organizations that were not as concerned about the economy and left their 2023 hiring plans unchanged. The same figure also shows a composite view when you combine all the organizations together. Various responses to the questions included increasing staff, freezing staff hires, reducing staff, or DKNS. Respondents could select multiple responses. This chart, therefore, shows all the possible response permutations in descending order based on the overall composite view.

Perhaps the most interesting finding is that despite economic headwinds, the overall composite view shows more organizations were planning to increase their staff in 2023 (44%) but did not anticipate any reductions or freezes to balance those increases. Looking across all the strategies that involved staff hiring, 56% of organizations intended to hire in 2023 even if other activities such as staff reductions or freezes were also involved. This is encouraging and suggests that while organizations are economically concerned about 2023, they are not amending their hiring plans.

Part of the concern that does exist is expressed by the 30% of organizations overall that elected to solely put staffing freezes in place and the additional 6% that were looking to first freeze and then hire, the 6% that were going to reduce staff and then freeze, and finally the 4% looking to reduce, freeze, and then ultimately hire. This shows that strategies involving staff freezes were a preferred path forward in 2023 and represent a conservative but not overly punitive approach to dealing with an uncertain economy.



KEY TAKEAWAY

Organizations are generally reluctant to reduce technical staff, primarily due to the difficulty in finding, hiring, and retaining skilled technical talent. When faced with economic uncertainty, organizations prefer implementing a temporary hiring freeze and, if necessary, reducing compensation rather than resorting to laying off staff. This brings up an important question about how organizations can keep their technical staff engaged and enhance their technical skills when hiring is not an option.

At 8% overall, reductions alone were not the only strategy used to scale back technical staff. More complex strategies that involved reducing technical staff included:

- Reducing staff and implementing a hiring freeze (6% overall)
- Reducing staff, implementing a hiring freeze, and then hiring (4% overall)
- Reducing staff and then hiring (2% overall)

While 20% of organizations overall did showcase strategies that involved staff reductions, 6 percentage points out of these 20 did involve hiring as well.

Looking at the 59% of organizations that expressed economic concerns, the primary strategy for addressing these concerns was to freeze hiring (34%), followed by a focus on hiring (32%) and staff reductions (13%).

This contrasts significantly with the 41% of organizations that did not express economic concerns. Among these organizations, 62% only intended to increase hiring, followed by 24% that only indicated they would freeze hiring and just 2% that would primarily reduce their technical headcount.

Changes to hiring plans in 2023 by industry focus on increasing or freezing technical staff

Organizations across different industries reported mixed results in their hiring plans. Some industries showed growth, while others faced significant challenges, as shown in [FIGURE 3](#). On average, 57% of all organizations reported increased hiring plans, indicating cautious optimism about the future. However, 46% of organizations also reported freezing staff hiring, and 20% were reducing staff, highlighting the continued uncertainty and challenges facing businesses. The reason these percentages do not add up to 100% is shown on the bottom part of [FIGURE 2](#). Organizations sometimes pursue complex hiring strategies that initially combine a staff reduction or freeze on hiring with a later decision to hire all within a single year.

The industries with the highest percentage of organizations planning to increase their workforce were cloud service providers, telecom ISP / Web hosting, and healthcare, with an average of 65% reporting an increase in hiring plans. These industries seem to

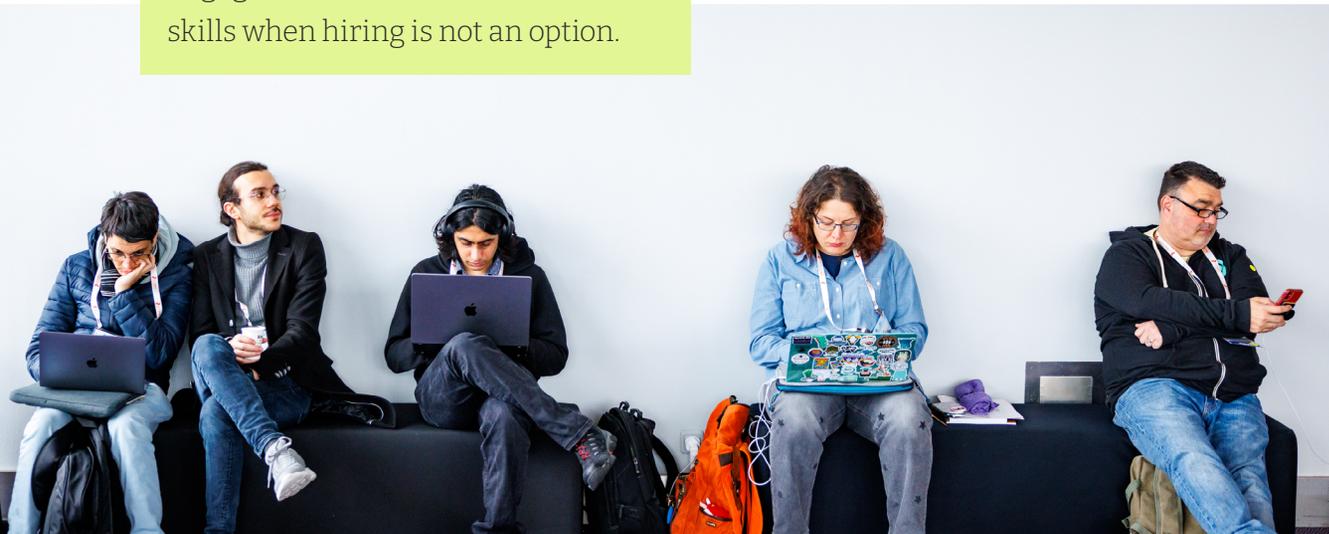
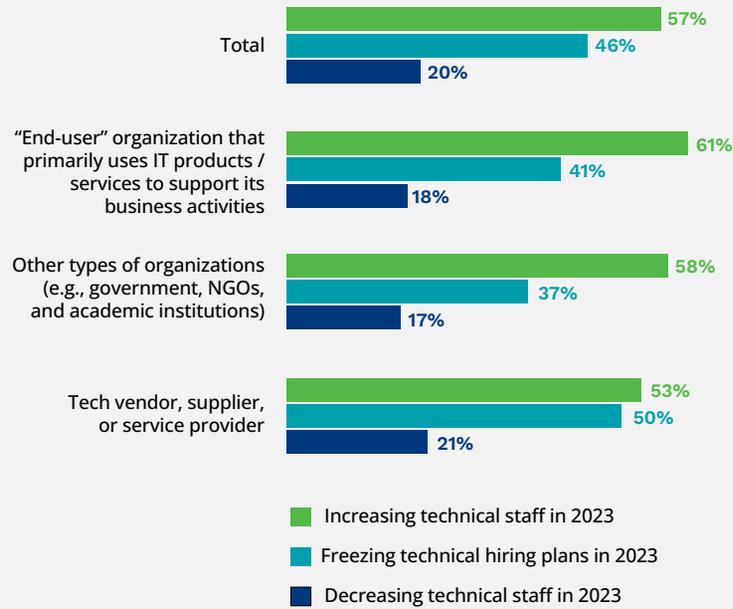


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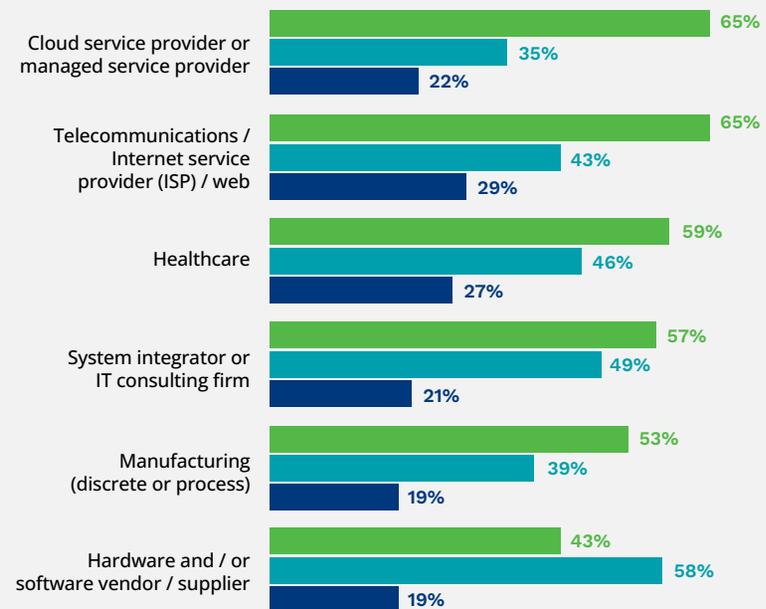
FIGURE 3 CHANGES TO HIRING PLANS IN 2023

2023 Tech Talent Survey, Q10-Q12 segmented by Q34 and Q35, sample size = 418, valid cases = 418, total mentions = 506, DKNS responses excluded from the analysis.

2023 staffing changes by organization type



2023 staffing changes by industry



benefit from the growing demand for digital services and the ongoing impact of the COVID-19 pandemic.

The system integrator / IT consulting industry and the manufacturing industry also reported a positive trend in hiring, with an average of 57% of organizations planning to increase their workforce. These industries benefit from the increasing demand for

expertise in digital transformation and the economic recovery from the pandemic.

On the other hand, the hardware / software vendor or supplier industry reported the lowest percentage of organizations planning to increase their workforce at 43% and the highest percentage of organizations freezing technical staff hiring at 58%. This trend may

be due to increasing competition and a shift toward more cloud-based solutions, leading some organizations to cut back on staff.

Overall, the mixed results in hiring plans across different industries suggest that organizations will need to remain adaptable and agile to navigate the ever-changing landscape of the future of work.

Long-term staffing plans reflect cautious optimism beyond 2023

The long-term plans of organizations are based on the strategies they have identified when addressing 2023 technical staff changes, as shown in **FIGURE 4**. Organizations could select multiple strategies (hire, freeze, reduce) and more than one longer-term approach for each strategy. While this complicates the analysis, there is room for cautious optimism.

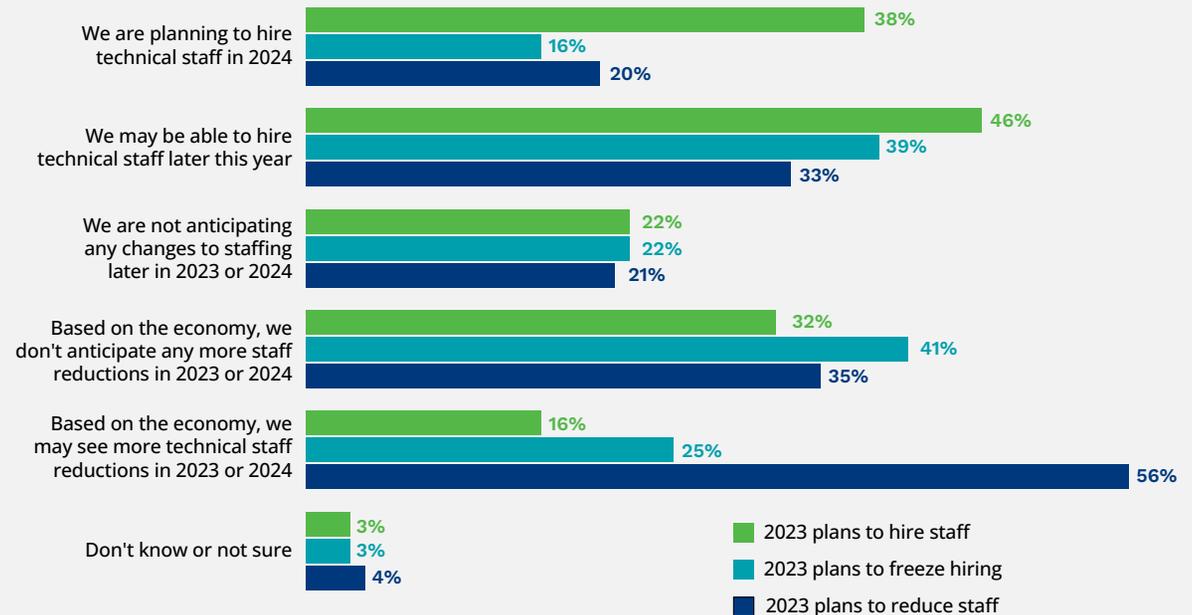
For organizations planning to hire in 2023, 46% may be able to hire in 2023; additionally, 38% are planning to hire in 2024. Only 16% of these organizations are concerned about further staff reductions in 2023 and 2024.

Of those organizations that are engaging in hiring freezes in 2023, 41% do not anticipate addressing staff reductions in 2023, and 39% feel they may be able to hire later in 2023. While 25% of these organizations are concerned about potential staff reductions in 2023 or 2024, 16% plan to hire technical staff in 2024. The sentiment from these organizations is that they will weather this storm and look forward to returning to a more normal approach to technical staffing.

Organizations who indicated that they would need to reduce technical staff were the most pessimistic. Still, it is important to note that only 20% of overall respondents¹ indicated that 2023 staff reductions were already planned. Of the 56% of organizations

¹ Question 41 shows a sample size of 82, which is 20% of the total survey sample size of 418.

FIGURE 4
MAJORITY ANTICIPATE INCREASED HIRING LATER IN 2023 / 24
What are your long-term technical staffing plans?



2023 Tech Talent Survey, Q50 (hire strategy), sample size = 235, valid cases = 235, total mentions = 369.

2023 Tech Talent Survey, Q45 (freeze strategy), sample size = 189, valid cases = 189, total mentions = 276.

2023 Tech Talent Survey, Q41 (reduce strategy), sample size = 82, valid cases = 82, total mentions = 138.

planning to reduce staff in 2023, 35% of these organizations also said they did not anticipate anymore staff reductions in 2023 or 2024. 33% reported they might be able to hire later in 2023, and 20% were planning to hire in 2024.

Overall, the survey results suggest that organizations have mixed outlooks for hiring and staff

reductions in 2023 and 2024, with some anticipating the possibility of technical staff reductions due to the economy. Others expressed confidence in their ability to hire technical staff later in the year or in 2024. However, a significant portion of respondents reported that they do not anticipate any significant changes to staffing levels, indicating a relatively stable outlook for their organization.



PART 2

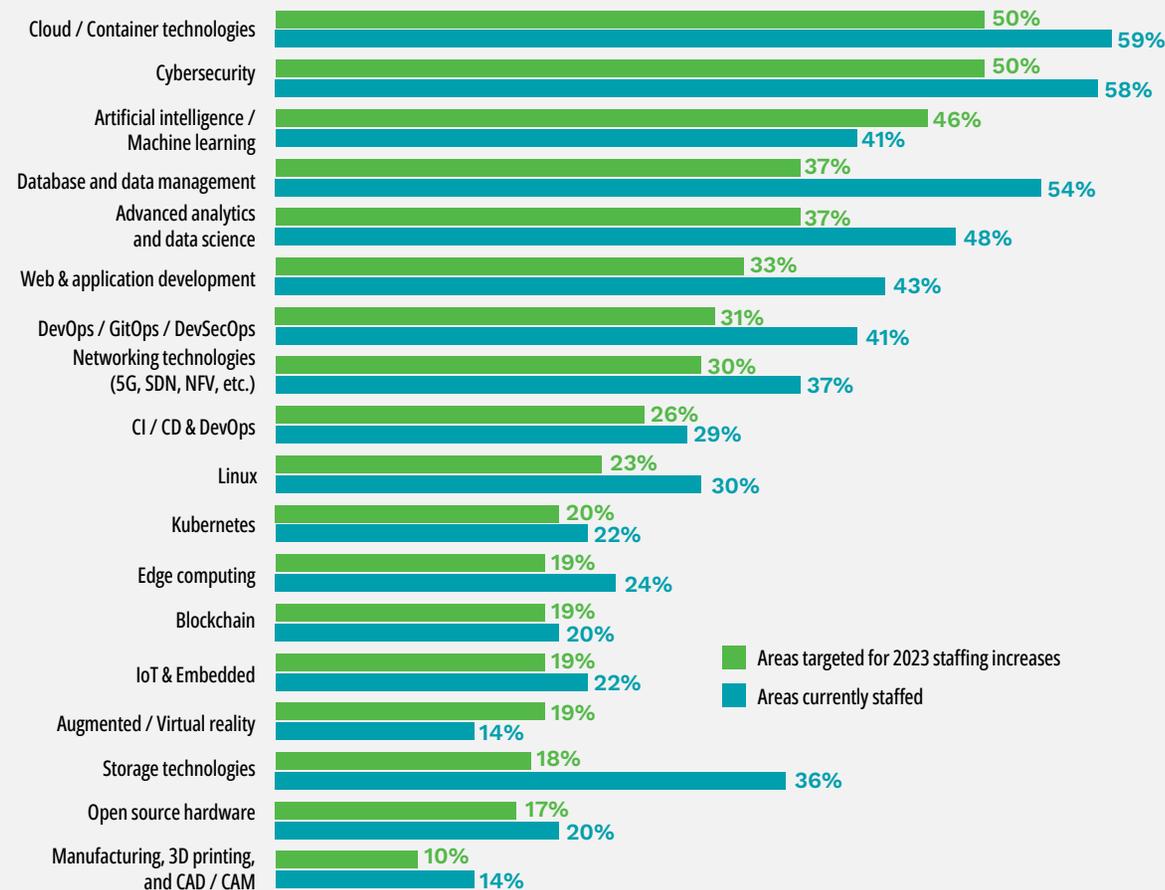
The upskilling trend in 2023

FIGURE 5 TECHNOLOGY AREA OPPORTUNITIES FOR GROWTH-ORIENTED ORGANIZATIONS

In which technology areas are / will you be hiring technical staff in 2023?

[Asked if the respondent's organization is reducing technical headcount in 2023]

Which of the following technology areas are staffed by technical headcount?



2023 Tech Talent Survey, Q51 (areas where hiring will occur), sample size = 235, valid cases = 235, total mentions = 1,195.

2023 Tech Talent Survey, Q21 (areas currently staffed), sample size = 418, valid cases = 418, total mentions = 2,569.

Technology opportunities in growth-oriented organizations

FIGURE 5 compares the focus of organizations planning 2023 staffing increases to the staffing focus of all organizations in the sample. There is a wealth of information in FIGURE 5, and it warrants careful analysis.

There are two dynamics at work in FIGURE 5.

1. The first dynamic is the percent (volume) of organizations looking to increase technical staff in a technology area.
2. The second dynamic is the priority organizations attach to hiring in a technology area. This priority is the ratio of organizations targeting an area for staff increases divided by the current staffing level in that area. This ratio is expressed as a percent—the ratios in FIGURE 5 range from 51% to 137%. Ratios of 90% or above show high priority, and ratios of 75% or below suggest a low priority.

FIGURE 5 shows that a high volume of organizations are looking to add technical staff in the following technology areas: cloud / container technologies (50%), cybersecurity (50%), AI / ML (46%), database and data management (37%), and advanced analytics and data science (37%).

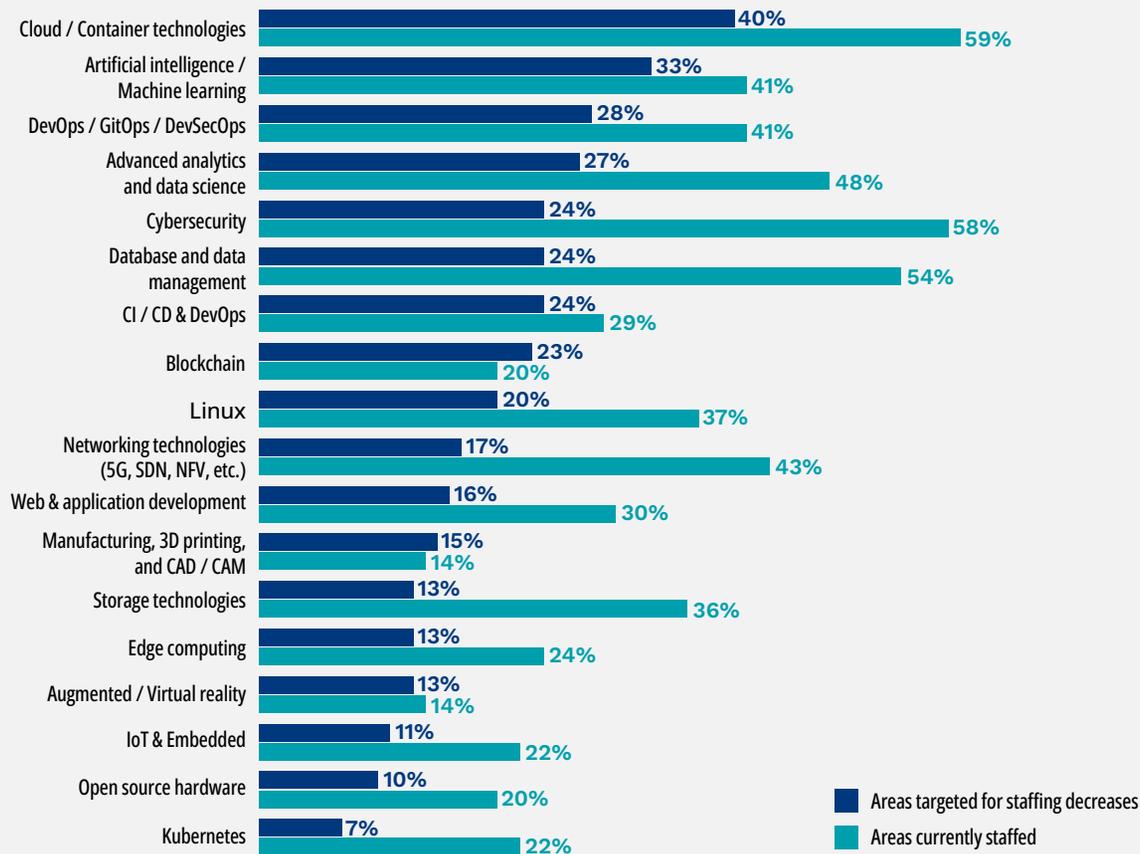
The leading technology areas where organizations prioritize hiring include augmented / virtual reality (137%), AI / ML (110%), blockchain (98%), CI / CD and DevOps (91%), and Kubernetes (90%).

FIGURE 6 TECHNOLOGY AREA OPPORTUNITIES FOR MORE RISK-AVERSE ORGANIZATIONS

In which technology areas are / will you be reducing technical staff in 2023?

[Asked if the respondent's organization is reducing technical headcount in 2023]

Which of the following technology areas are staffed by technical headcount?



2023 Tech Talent Survey, Q42 (areas where reductions will occur), sample size = 82, valid cases = 82, total mentions = 302.

2023 Tech Talent Survey, Q21 (areas currently staffed), sample size = 418, valid cases = 418, total mentions = 2,569.

AI / ML is the only technology area that shows a high volume of organizations looking to increase staff and is an area where organizations prioritize technical staff hiring.

Technology opportunities in more risk-averse organizations

Using the same approach to evaluate volume and priority in [FIGURE 5](#), we can analyze the hiring plans of minority organizations (~20% of respondents) who are planning 2023 staffing decreases shown in [FIGURE 6](#). We label those organizations who are planning to decrease staff as being risk averse. This is because these organizations are sufficiently concerned about the economy they already have or are planning to decrease staff in 2023. These actions characterize organizations—many of whom are successful—that prioritize stable financial metrics and wish to shed some financial risk in various aspects of their operations where they feel overextended. We do not equate risk averse with impending financial difficulty. It is just an organizational recognition acknowledging that minimizing disruptions to investors and shareholders is important.

[FIGURE 6](#) shows that the technology areas where the greatest percentage of risk-averse organizations are looking to decrease technical staff include cloud / container technologies (40%), AI / ML (33%), and DevOps / GitOps / DevSecOps (28%). The magnitude of these volumes is less than we saw in [FIGURE 5](#) and

reflects a moderate percentage of organizations seeking to decrease technical staff in these areas.

High-priority areas for decreasing staff based on calculated priority ratios (percent of organizations decreasing staff divided by percent areas currently staffed) include blockchain (118%), manufacturing, 3D printing, CAD / CAM (107%), and augmented / virtual reality (98%).

Interestingly, the technology areas with the highest percent of risk-averse organizations seeking to decrease technical staff attach only a moderate priority to decreasing technical staff in those areas. The priority ratio for cloud / container technologies and DevOps / GitOps / DevSecOps is just 68%. The ratio for AI / ML is somewhat higher at 80%. What this tells us is that organizations are most interested in shedding technical staff from technology areas

that were complex and speculative areas of investment that likely didn't generate the expected ROI.

Technology areas that have a low priority ratio for decreasing technical staff include Kubernetes (33%), storage technologies (38%), web & application development (39%), cybersecurity (42%), database and data management (45%), and open source hardware (49%). The low priority of reducing staff in these areas reflects the more mission-critical nature of these technologies to the organization, which means higher job security.

TABLE 1 THE IMPACT OF NET STAFFING CHANGES ON TECHNOLOGY AREA EMPHASIS

2023 Tech Talent Survey, Q51 and Q42 compared to Q21.

TECHNOLOGY AREAS	2022 RANK	NET 2023 STAFFING IMPACT ON RANK	2023 RANK
Cybersecurity	2	+1	1
Cloud / Container technologies	1	-1	2
Artificial Intelligence / Machine Learning	6	+3	3
Database and data management	3	-1	4
Advanced analytics and data science	4	-1	5
Web & application development	5	-1	6
Networking technologies (5G, SDN, NFV, etc.)	8	+1	7
DevOps / GitOps / DevSecOps	7	-1	8
CI/CD & DevOps	11	+2	9
Kubernetes	13	+3	10
Linux	10	-1	11
IoT & Embedded	14	+2	12
Edge computing	12	-1	13
Augmented / Virtual reality	18	+4	14
Storage technologies	9	-6	15
Open source hardware	15	-1	16
Blockchain	16	-1	17
Manufacturing, 3D printing, and CAD / CAM	17	-1	18

The overall impact of technical staffing changes on technology area emphasis

FIGURES 5 and 6 evaluated how staffing increases and staffing reductions impact the volume and priority of technical staffing changes across technology areas. TABLE 1 shows the combined impact of staffing increases and reductions on the overall ranking of technology areas. This analysis was based on the number of organizations increasing their technical staff (N=235) and reducing technical staff (N=82). Comparing technology areas originally staffed by technical headcount with the net impact of increasing and reducing staff yields a modest change in the rank order of technology areas being staffed.

TABLE 1 indicates that most technology areas changed by only + / - 1 position. This will not have



KEY TAKEAWAY

According to the 2023 State of Tech Talent Survey, upskilling remains an essential aspect of newer technology areas such as cloud / containers, cybersecurity, and AI / ML. As technology evolves and new areas emerge, the survey data indicates that continued upskilling will be critical for organizations to stay competitive in the tech industry. Organizations are adopting various approaches to upskill their employees, including offering training opportunities and hiring new talent with relevant experience in these areas.

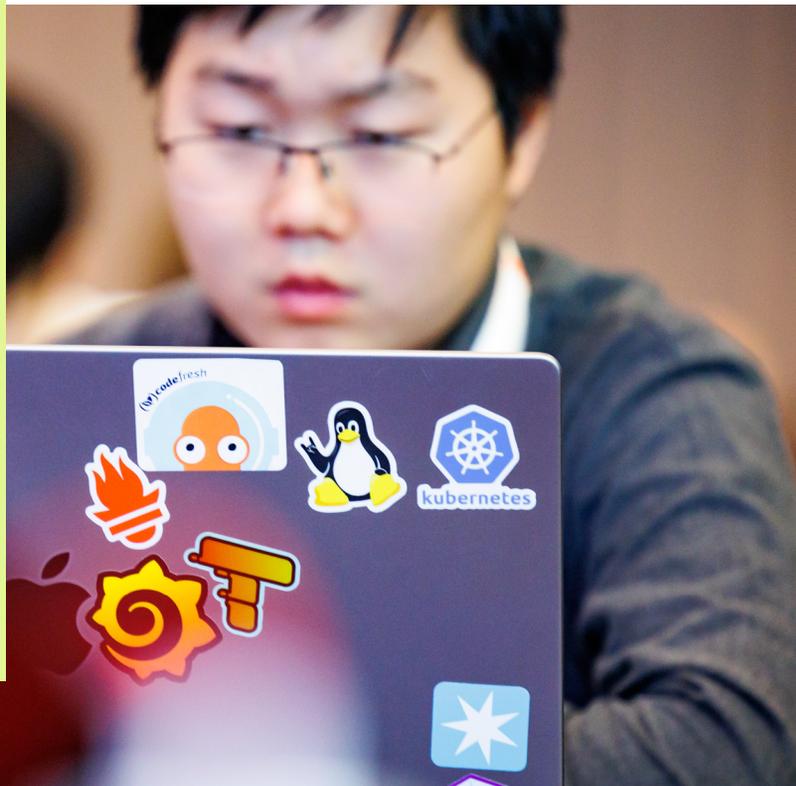
a significant bearing on the importance of these areas in the eyes of an organization. However, as technology areas change by $+/-2$, $+/-3$, or even more positions, this signals a newfound increasing or diminishing importance of these areas to the organization. The information in [FIGURE 5](#), [FIGURE 6](#), and [TABLE 1](#) provides several ways to interpret how technical staffing actions will play out in technology markets.

Over the last two years, cybersecurity has become an important technology area for organizations. [TABLE 1](#) shows that cybersecurity was ranked #2

in 2022 and is projected to be ranked #1 in 2023 based on organizational plans to increase and decrease staff. Cybersecurity will therefore emerge as an important area for adding technical staff and a correspondingly marginal number of staff reductions.

Another key area is cloud / container technologies. Our findings show that a high percentage of organizations are planning to both increase and decrease technical staff in this area. This is not a case of a split personality: cloud and containers are important technologies that most organizations are investing in. As organizations gain or lose economic ground, they will need to expand or contract staff. Cloud / container technology, by virtue of its pervasiveness, qualify it as an area that will see technical staff changes. However, [FIGURE 5](#) and [FIGURE 6](#) both show that staff changes in clouds and containers are likely to be far more positive than negative.

Augmented / virtual reality (+4), AI / ML (+3), and Kubernetes (+3) are technology areas that are seeing increasing attention in 2023 because of their significant increase in technology area ranking. Augmented reality, with its smaller organizational footprint and high priority for both staff increases and decreases, will see hiring volatility. AI / ML has a bigger footprint, and its priority leans strongly toward hiring, lending it considerable stability as a technology opportunity for technical staff. Kubernetes is also uniquely positioned. Although not a high-volume technology area, its priority ratio is 90% for those increasing staff and just 33% for those decreasing staff. This helps explain its rapid rise in its stack ranking.



PART 3

Addressing tech talent shortages in 2023



Organizations are turning to training existing employees and hiring new talent to address the need for upskilling in these emerging areas. **FIGURE 7** shows that 71% of organizations cite hiring new IT professionals with experience in that new technology as a step taken to ensure their technical staff have the right skills. At the same time, 70% of organizations

provide training opportunities for existing technical staff when there is an introduction of new technology.

These two approaches to addressing organizational technology needs are popular because they are highly effective and complementary. Hiring new IT professionals can be a very effective way to

introduce new skills into an organization. Still, it can be risky given the time required to find the right staff and to onboard them and the high turnover rate if the cultural or economic fit is compromised. Alternatively, upskilling existing staff offers a way to incentivize existing staff and backfill with less senior staff where the supply of candidates is better and finding an optimal employee / employer fit is less complex. Taken together, these two approaches form the foundation of how organizations should expand and improve their portfolio of technology skills.

As indicated in **FIGURE 7**, differently sized organizations favor different approaches to expanding and improving their portfolio of technology skills. Specifically:

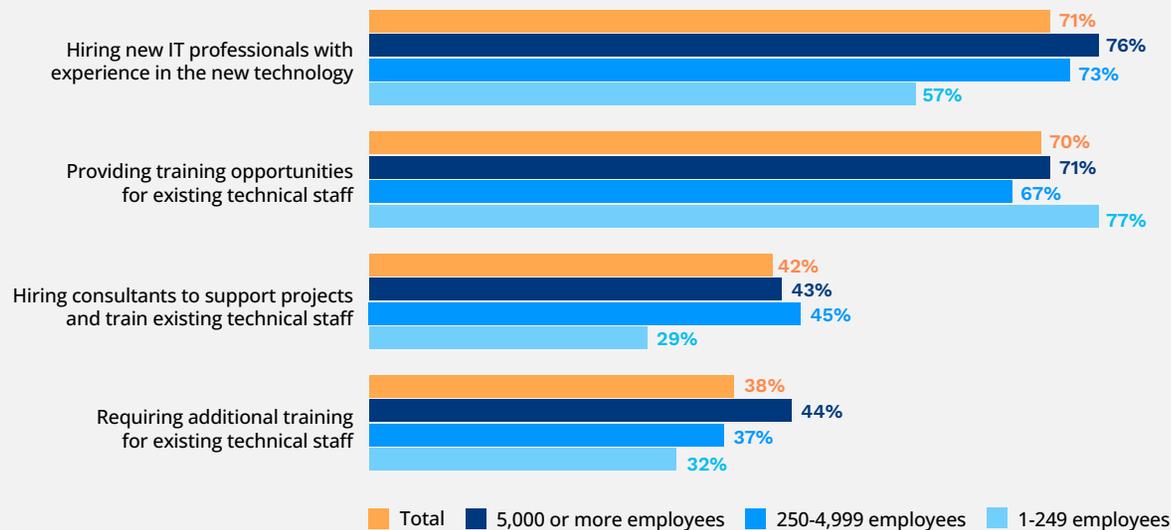
- Organizations with fewer than 250 employees focus more on training and less on new hires or hiring consultants.
- Organizations with more than 5,000 employees are more likely to hire new IT professionals or hire consultants.

Importantly, most organizations, regardless of size, see training as a must-include approach to enhancing the depth and breadth of their in-house tech talent resources.

End-user organizations are more likely than tech companies to try several approaches, as shown in **TABLE A24**, with 47% requiring training compared to 35% of tech companies and 77% providing training compared to 67% of tech companies.

FIGURE 7 APPROACHES TO EXPANDING AND IMPROVING AN ORGANIZATION'S PORTFOLIO OF TECHNOLOGY SKILLS

As new technology comes into use at your organization, what steps are you taking to ensure your technical staff have the right skills? *segmented by*
Please estimate how many total employees are in your organization.



2023 Tech Talent Survey, Q22 segmented by Q14, sample size = 417, valid cases = 417, DKNS responses excluded from the analysis.

Expanding and improving organizational technology skills when candidates are scarce

Organizations face the consequences of delayed projects and the need to seek training for existing employees when they cannot find candidates with the requisite skills, as shown in [FIGURE 8](#). The leading approach to expanding and improving organizational

technology skills when resources are scarce is to obtain training for existing employees. 58% of organizations seek training for their existing employees when unable to find suitable technical candidates, up from 50% the previous year and a 16% growth year over year.

The second leading approach to addressing the need for technical skills is to continue looking until the discovery of a close fit. 55% of organizations in 2023 endorse this approach, up from 41% in 2022, which reflects 34% growth year over year. While there

are cases where there is no substitute for a senior engineer with unique skills, this uniqueness means that there are fewer qualified candidates, so they are more difficult to find, acquire, and keep.

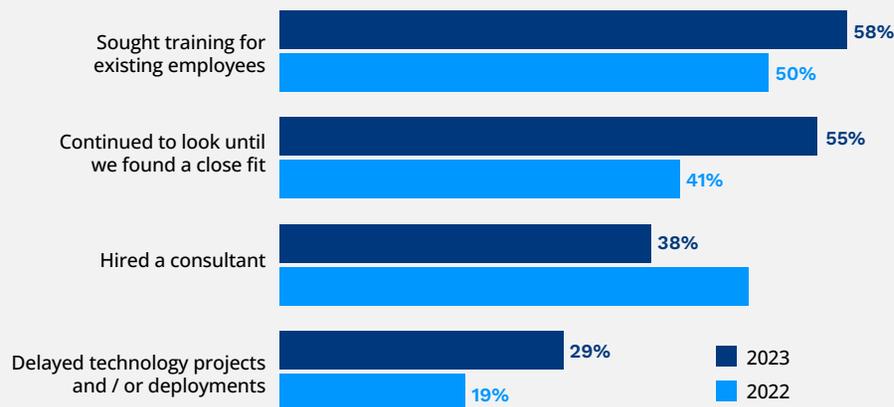
Additionally, hiring consultants is becoming less popular, with only 38% of organizations choosing this approach in 2023, down from 48% in 2022, leading to a decline of 21%.

Training has become an important employee incentive

Based on the responses of organizations shown in [FIGURE 9](#), the top incentives needed to retain technical headcount and prevent them from moving to another company in 2023 are increased salary and an opportunity for better work / life balance. Approximately half of the respondents chose both incentives, with 57% indicating an increased salary as an important factor and 50% indicating an opportunity for better work / life balance. Compensation, along with work / life balance and training / certification continue to be key levers for hiring and retention.

Other incentives chosen by a significant number of respondents include additional training opportunities or certification (50%), an opportunity for a flexible work schedule or telecommuting (49%), and the opportunity to be bonus eligible (43%). The training incentive increased from a 40% penetration rate in 2022² to 50% in 2023, which equates to 25% growth year over year.

FIGURE 8
TRAINING IS THE LEADING METHOD TO ADDRESS THE INABILITY TO FIND QUALIFIED CANDIDATES
If unable to find technical candidates with the skills you need, which of the following best describe how you have met your organization's requirements?



2023 Tech Talent Survey, Q25, 2023 sample size = 385, valid cases = 385, total mentions = 698. 2022 sample size = 477.

In 2022, the question asked hiring managers about finding professionals with open source-related skills. Not all answer choices are shown in the chart.

2 Source: The 10th Annual Open Source Jobs Report, The Linux Foundation, June 2022.

39% of respondents noted high recognition for accomplishments as a factor, while 29% expressed interest in the opportunity to contribute to open source projects they are interested in. 21% of respondents chose additional stock options / RSU / equity.

Overall, the data suggests that hiring managers believe that offering competitive compensation and benefits packages and opportunities for professional development and work / life balance are important factors in retaining technical headcount. In addition, providing incentives such as bonus eligibility and

recognition for accomplishments can also contribute to retaining talent. Finally, hiring managers feel that offering flexible work arrangements and the opportunity to contribute to projects of personal interest can be additional factors in attracting and retaining technical headcount.

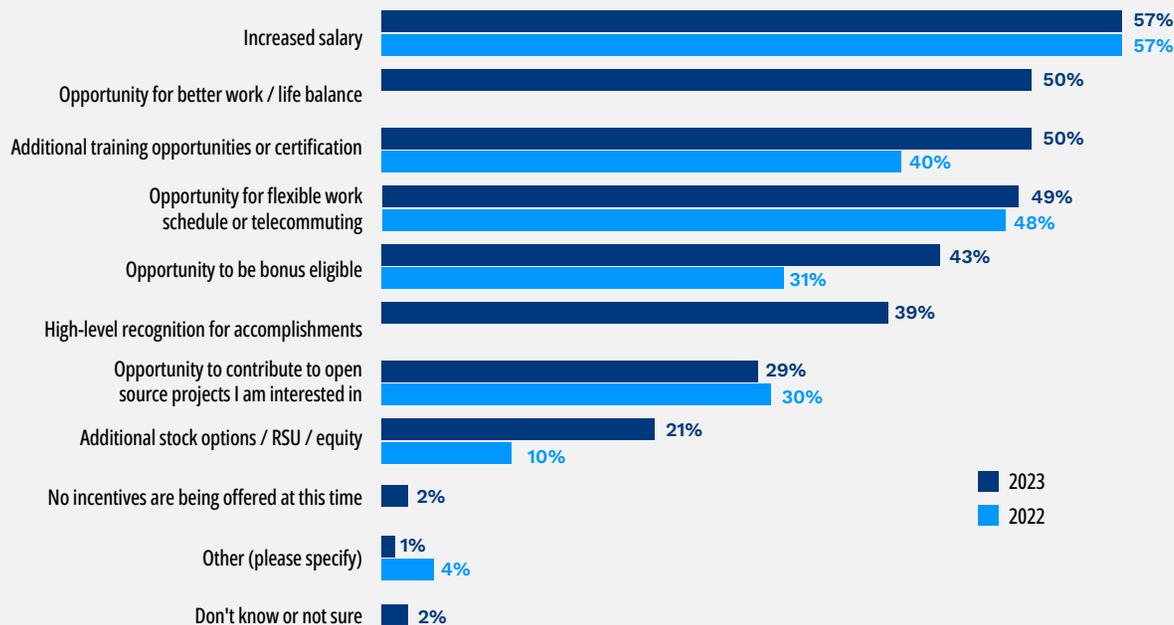


KEY TAKEAWAY

The 2023 State of Tech Talent Survey sheds light on the difficulties organizations encounter when hiring technical talent in a highly competitive labor market. It is evident that although there is a high demand for skilled technical professionals, the availability of labor remains severely limited, and there is no immediate solution in sight. Organizations cannot solely rely on hiring to solve the tech talent shortage. Alternative strategies, such as upskilling existing employees and offering better salaries, work / life balance, and opportunities to work on open-source projects, will be critical for organizations aiming to attract and retain top talent.

FIGURE 9 TRAINING / CERTIFICATION, BONUSES, AND EQUITY HAVE BECOME MORE PREVALENT AS EMPLOYEE RETENTION INCENTIVES

What incentives is your organization offering to deter your technical headcount from moving to another company?



2023 Tech Talent Survey, Q24, 2023 sample size = 418, valid cases = 418, total mentions = 1,529.

2022 sample size = 559. Both samples are of technology hiring managers, but in 2022, the question was focused on retaining open source talent.

PART 4

Recruitment and onboarding processes create challenges in 2023

Upskilling emerges as the best way to cope with a difficult situation

84% of those responsible for hiring tech talent agree (strongly agree and somewhat agree) that there is a need for a streamlined way to recruit new technical staff with proven skills, as shown in **FIGURE 10**. Additionally, 78% agree that hiring the wrong candidate

and onboarding again is an issue. In comparison, 64% agree that recruitment is costly and time-consuming and often does not lead to the right candidate. 64% agree that onboarding takes valuable internal resources away from other critical projects for too long.

Upskilling does have its challenges. While 55% of organizations agree that upskilling can help fill a new position, often the need to backfill remains. Fortunately, hiring a junior person is nearly always

easier than hiring a senior person. 47% of organizations state that upskilling takes too long or is ineffective at training for complex roles, but it is noteworthy that 39% of organizations disagree with this statement. Finally, 47% of organizations agree that upskilling is not well suited for teaching broad subject matter. 31% of organizations disagree with this last statement, and it is inappropriate to expect that upskilling is an alternative to college or advanced degrees.

FIGURE 10
UPSKILLING IS THE BEST WAY TO COPE WITH A DIFFICULT SITUATION

What are your perspectives on upskilling, recruiting, onboarding, and retaining technical staff?

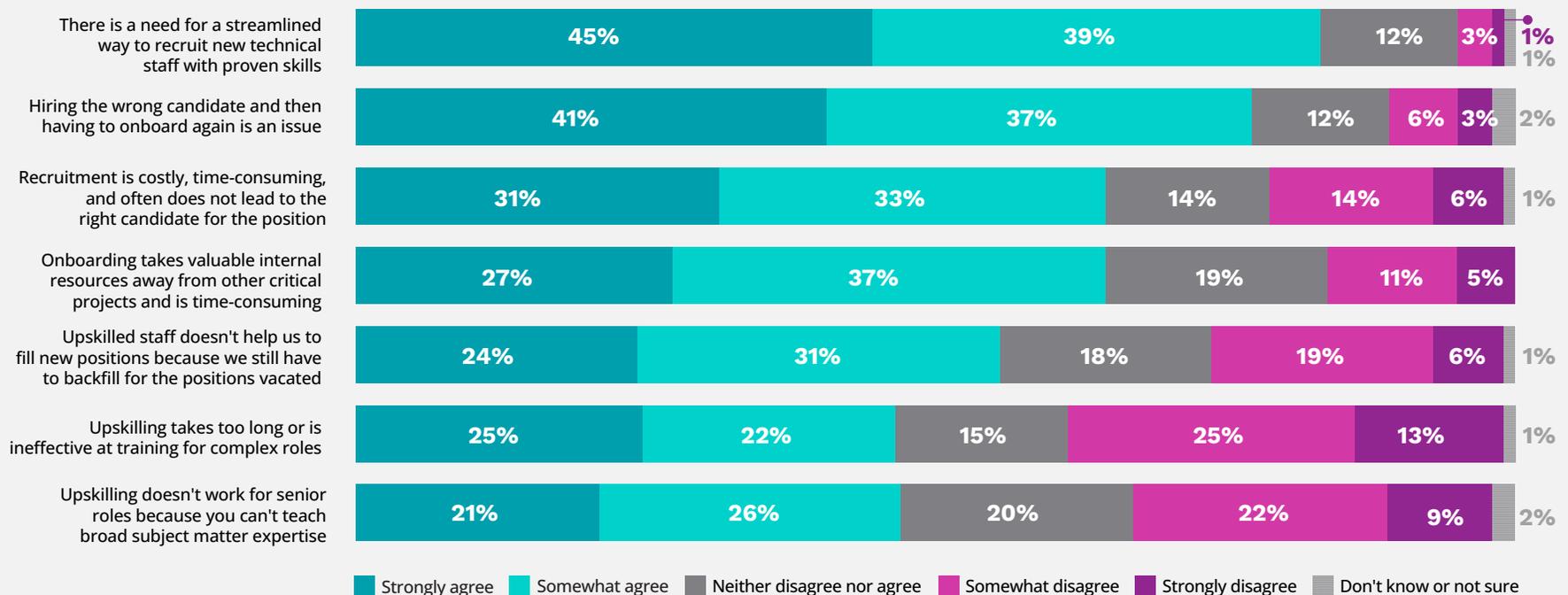
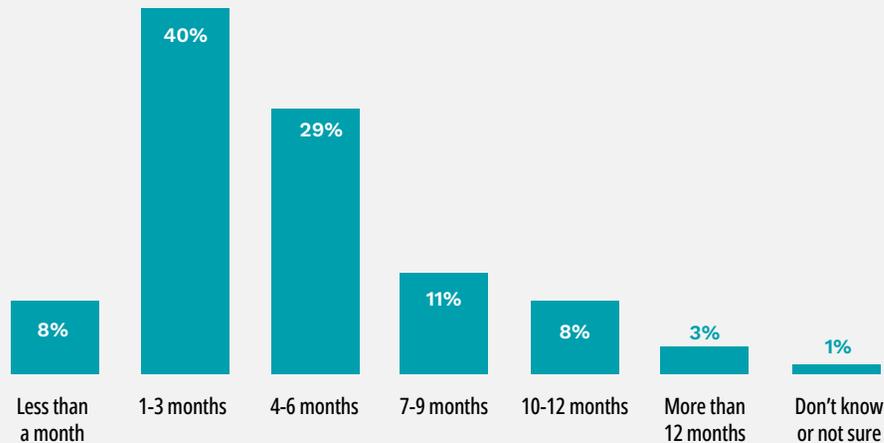


FIGURE 11

TIME TO FILL AN OPEN TECHNICAL POSITION

About how long does it take to fill an open technical position?



2023 Tech Talent Survey, Q29, sample size = 418.



KEY TAKEAWAY

Organizations should streamline their hiring and onboarding processes to reduce turnover rates and increase efficiency. Even with efficient processes in place, the survey data shows that recruitment and onboarding remain time-consuming. High turnover rates indicate that organizations may benefit more from upskilling their existing employees than solely relying on external recruitment efforts. The key is to use an “all of the above” strategy to address talent needs.

Recruitment and hiring are time-consuming in 2023

As shown in **FIGURE 11**, the time it takes to fill a technical position can vary significantly. Most respondents indicated that it takes 1 to 6 months to fill a technical position, with 40% reporting that it takes 1 to 3 months and 29% reporting that it takes 4 to 6 months.

According to the average of the survey data, a significant number of respondents, approximately 48%, or roughly half, indicated that it would take more than 3 months to fill a technical position. This highlights the potential challenges in finding and hiring qualified

candidates in a timely manner, which could potentially impact business operations and growth.

Respondents also reported longer wait times to fill technical positions, with 11% indicating that it takes 7 to 9 months and 8% indicating that it takes 10 to 12 months. A small percentage of respondents, 3%, reported that filling a technical position takes over 12 months.

On the other hand, only 8% of respondents indicated that it takes less than a month to fill a technical position, suggesting that finding qualified candidates quickly can be a challenge. This may be due to the demand for technical talent in the current

job market and the specialized skills and experience required for technical positions.

The average time to fill a technical position is 4.3 months.

Overall, the data suggests that filling a technical position can take several months, indicating the need for organizations to plan and take proactive steps to attract and retain technical talent. This may include offering competitive compensation and benefits packages, providing opportunities for professional development and growth, and promoting a positive workplace culture to attract and retain qualified candidates.



KEY TAKEAWAY

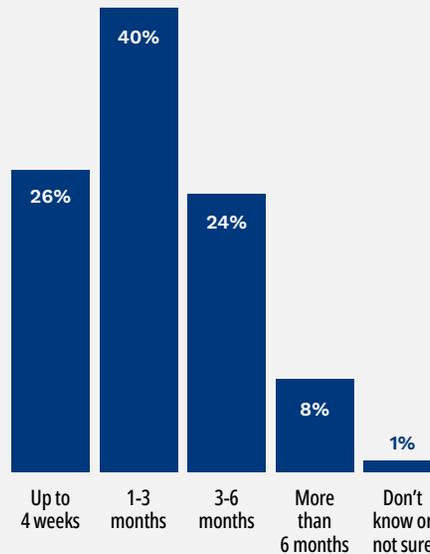
This year, the survey did not ask about the difficulty of finding professionals with open source-related skills because it has been consistently difficult for the past 10 years. However, the survey revealed the greater impact of onboarding and retaining new hires successfully. Strategic planning for technical staffing changes in 2023 is crucial, and organizations should consider the impact on business operations and growth. To remain competitive and relevant, prioritizing software development, technical support, and staff training is essential. Organizations can position themselves for success in the dynamic digital landscape by being proactive in staffing changes.

PHOTO FROM THE LINUX FOUNDATION / KUBECON EUROPE 2023

FIGURE 12

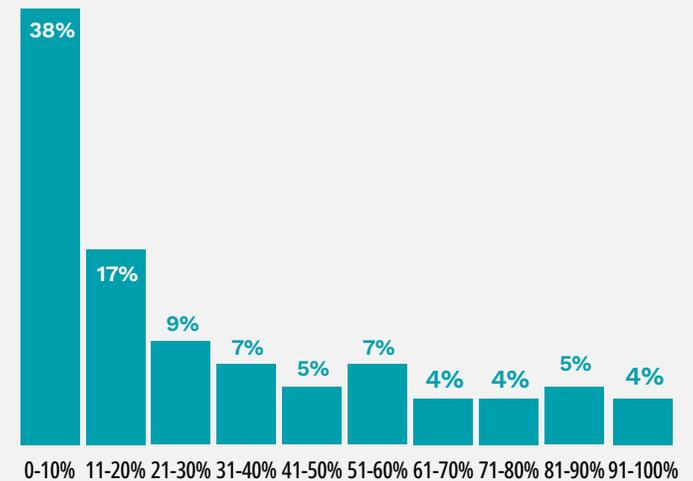
ONBOARDING IS TIME-CONSUMING, BUT TURNOVER REMAINS HIGH

How long does the onboarding process take for new technical headcount to reach normal productivity?



2023 Tech Talent Survey, Q30, sample size = 418.

On average, what percentage of new technical staff hires resign or were asked to leave within 6 months of being onboarded?



2023 Tech Talent Survey, Q31, sample size = 390.

Additionally, organizations may need to consider alternative approaches to recruitment, such as partnering with staffing agencies or leveraging online platforms to connect with potential candidates. By taking a proactive and strategic approach to recruitment and retention, organizations can better position themselves to succeed in the competitive landscape of technical talent acquisition.

Lengthy recruiting and onboarding times don't guarantee goodness of fit

The chart on the left in **FIGURE 12** shows that onboarding is time-consuming. For 40% of organizations, onboarding takes 1 to 3 months. Beyond that, 32% of organizations report it takes more than

3 months. The average across all organizations is an onboarding process that takes 2.6 months.

The chart on the right in **FIGURE 12** shows employee departures, be they voluntary or involuntary. 38% of organizations lose 0 to 10% of their new hires within 4 to 6 months. While these percentages trend down as departures grow, the overall average is somewhat high at 29%. Almost one out of three new hires departs within six months of being onboarded.

This is an astoundingly high metric and indicates that conventional approaches to recruiting and onboarding are not working. Considering that the average recruiting time is 4.3 months, and onboarding takes an average of 2.6 months, you will need to replace one out of three after an 8 to 13-month investment in each of your new hires.

Recruiting and hiring the right candidate has proven a costly, time-consuming, and often ineffective

process for many organizations. Therefore, organizations must ensure employees have the necessary skills to succeed in the rapidly changing technology landscape. Training and certifying existing staff are crucial to address the ever-increasing demand for technical expertise.



KEY TAKEAWAY

Successful recruiting and onboarding can be challenging, requiring significant resources and time. However, upskilling is a surprisingly effective solution to potential obstacles in the process. Upskilling and certification programs can address the technical talent shortage. These programs can verify technical skills developed by internal candidates through pre-placement testing and certification. Effective onboarding and upskilling are highly valued and essential for success. While smaller companies may be less likely to invest in these programs, it is crucial to recognize their value in ensuring that technical staff possess the necessary skills to thrive in an increasingly tech-driven business environment.

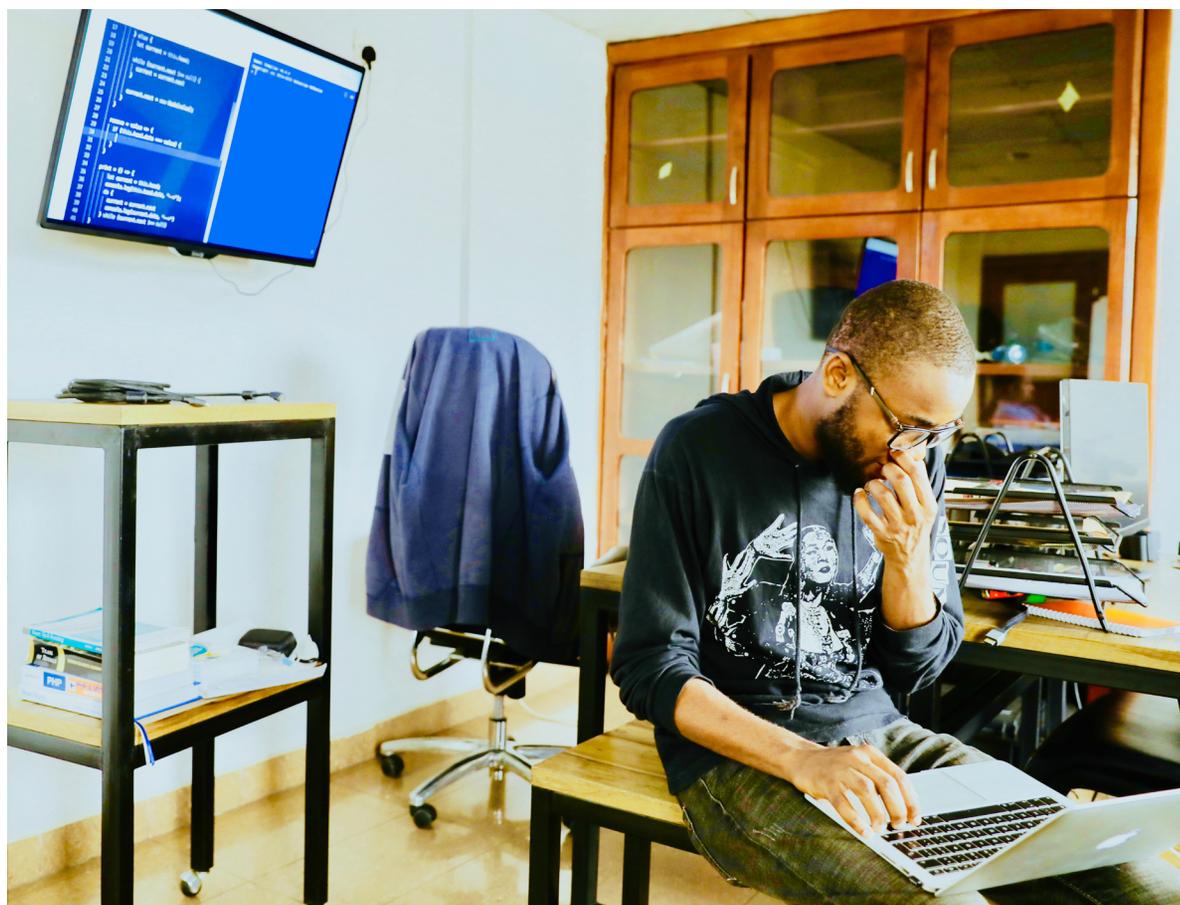


PHOTO BY DESOLA LANRE-OLOGUN ON UNSPLASH

PART 5

The increased need to train and certify existing staff in 2023





PHOTO FROM THE LINUX FOUNDATION / KUBECON EUROPE 2023

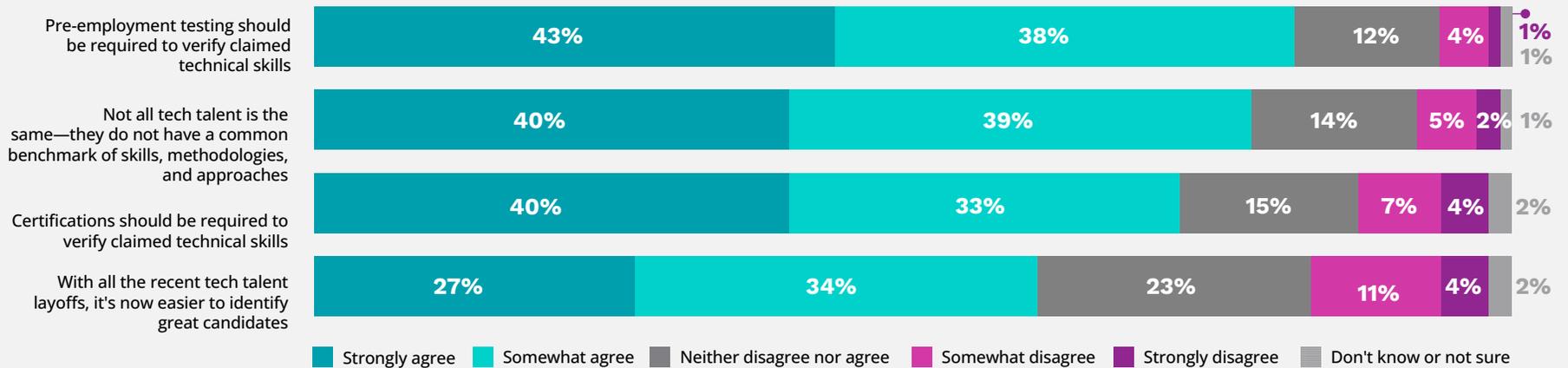
Certifications and technical skill verification will improve the hiring process

There is a strong desire among respondents for certification and pre-employment testing to verify technical skills, as shown in **FIGURE 13**. 81% agree (strongly agree and somewhat agree) that pre-employment testing should be a requirement. Pre-employment testing, especially scenario or case study testing, is an effective way to validate that the candidate has a portfolio of relevant skills for the role they are applying for.

73% of those hiring tech talent agree that certifications should be a requirement to verify claimed technical skills. Certifications are proof points of demonstrable validation of knowledge on specific subject areas, such as secure software development. Certifications provide a proactive way for candidates to demonstrate alignment with a role and can help mitigate the pressure and risks associated with pre-employment testing.

FIGURE 13
TESTING AND CERTIFICATION ARE WAYS TO VERIFY TECHNICAL SKILLS AND STREAMLINE HIRING

What is your perspective on recruiting, onboarding, and retaining technical staff?



2023 Tech Talent Survey, Q27, sample size = 418.



PHOTO FROM THE LINUX FOUNDATION / KUBECON EUROPE 2023

Upskilling is now the primary approach organizations use to expand and improve technology skills

Upskilling and certifications are highly valued, as shown in **FIGURE 14**. 91% of organizations believe that upskilling to expand or improve IT staff technical skills are either extremely important or very important. 77% of organizations indicate that certified skills are important, which follows because certification is a way to validate training. Surprisingly, 58% of organizations consider a college or university degree important. While college and university degrees are instrumental in helping individuals

develop critical thinking and decision-making skills, training and certification are unparalleled at teaching and validating domain-specific skills.

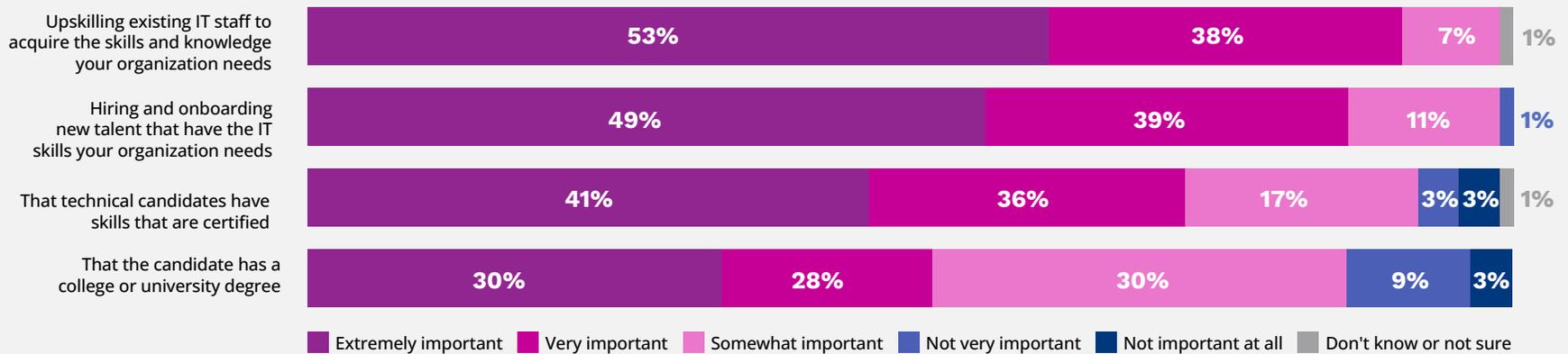
As covered in the earlier section on addressing tech talent shortages (**FIGURE 7**), investing in upskilling and certification opportunities can be cost-effective for small companies, helping to ensure that existing staff possess the necessary skills to thrive in a rapidly changing technology landscape.

FIGURE 14

UPSKILLING AND CERTIFICATIONS ARE HIGHLY VALUED AND MORE IMPORTANT THAN A TRADITIONAL UNIVERSITY EDUCATION

How important are the following approaches to addressing your organization’s technology needs?

2023 Tech Talent Survey, Q23, sample size = 418.

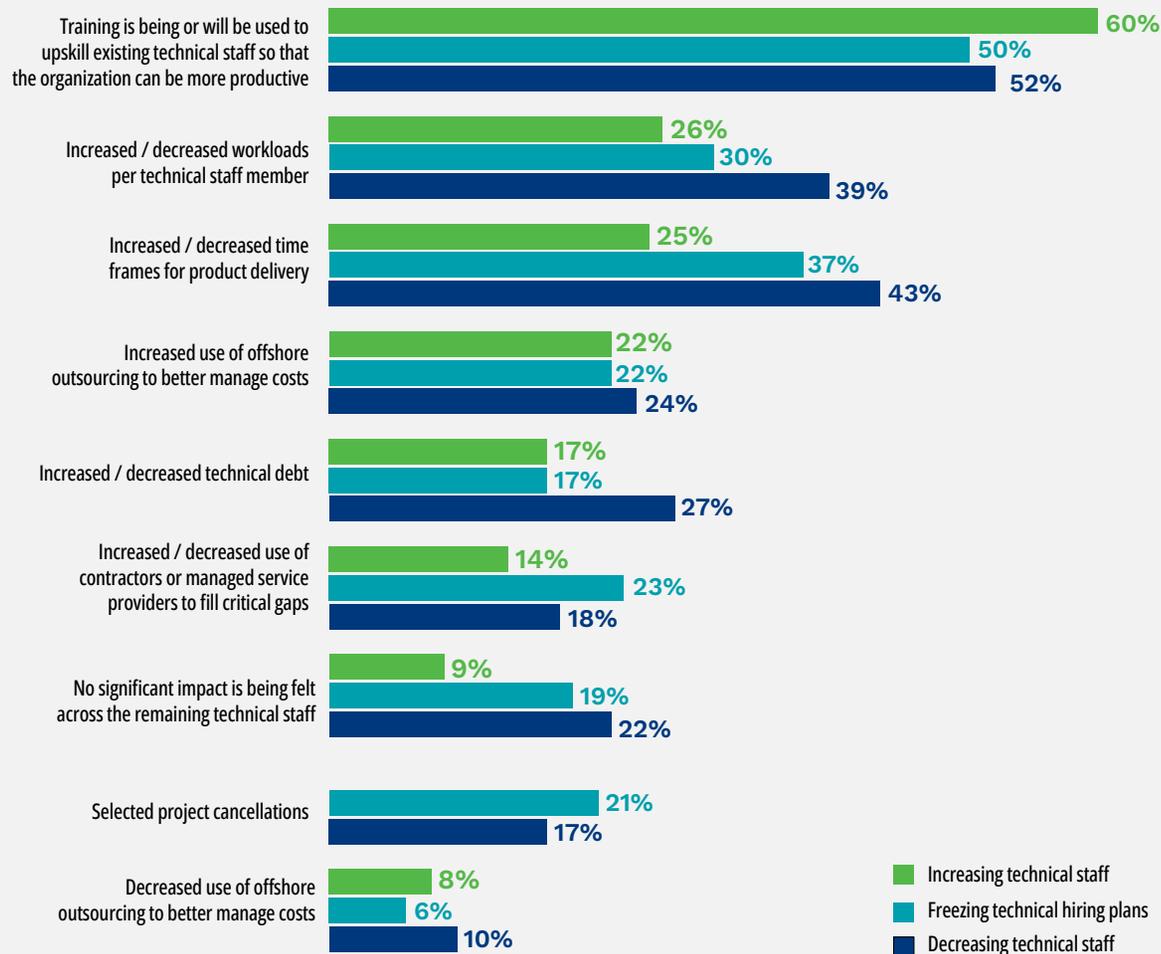


PART 6

The impact of increasing, pausing, or reducing technical staff in 2023



FIGURE 15
POSITIVE AND NEGATIVE IMPACTS OF CHANGES IN TECHNICAL STAFF HIRING PLANS
 What impacts have or are likely to occur in 2023 in technical staff hiring?
 [Answer choices differed slightly depending on the context]



2023 Tech Talent Survey, Q49 (increase), sample size = 235, valid cases = 235, total mentions = 571.
 2023 Tech Talent Survey, Q44 (freeze), sample size = 189, valid cases = 189, total mentions = 428.
 2023 Tech Talent Survey, Q49 (reduction), sample size = 82, valid cases = 82, total mentions = 208.

Increasing, pausing, or reducing technical staff all impact organizations positively and negatively. Organizations can address these changes in a variety of ways, such as:

- Using technical debt as a buffer
- Adjusting time frames
- Scaling contractor, managed service provider, or offshore resources (if permitted)
- Adjusting workloads
- Use of training to better align staff capabilities with project needs
- Adjusting technical staff workloads

Upskilling is the leading solution to align technical capabilities with product needs

The recognition of technical staff training within organizations is important regardless of how they need to adjust and align with market conditions, as shown in [FIGURE 15](#).

Upskilling is now the leading approach to ensure that new hires or existing staff can remain agile and adjust to organizational needs in response to increasing staff, pausing staff hires, or reallocation after staff departures.

[FIGURE 15](#) shows that 60% of organizations upskill their staff when increasing their technical headcount, presumably to provide existing staff with new opportunities while backfilling for them with new hires. 50% of organizations that have paused their technical staff hiring use training to reallocate resources based on changing business needs to remain flexible and optimize how they address changing workloads when

other alternatives are out of reach. 52% of organizations that are facing technical staff reductions rely on training to upskill staff much in the same manner as organizations that have had to pause their hiring.

FIGURE 15 also points out that negative outcomes, such as increased workloads and longer time frames for product delivery, are likely to occur

when organizations cut staff or pause hiring plans. Specifically, 43% of organizations that will be reducing staff and 37% that will freeze staffing plans are expecting longer time frames for product delivery. In contrast, only 25% of those increasing staffing believe that it will result in a quicker time to market.

Similarly, 39% of organizations that are reducing

staff and 30% of those that are freezing staffing plans expect to increase the workloads of their technical staff members. In contrast, only 26% of those increasing staffing believe that it will ease the workload of their technical staff members.

Strategies for what technical staff roles to add or reduce vary wildly

Organizations that have the opportunity to add technical staff have lots more flexibility within their budget constraints than organizations that must reduce technical headcount.

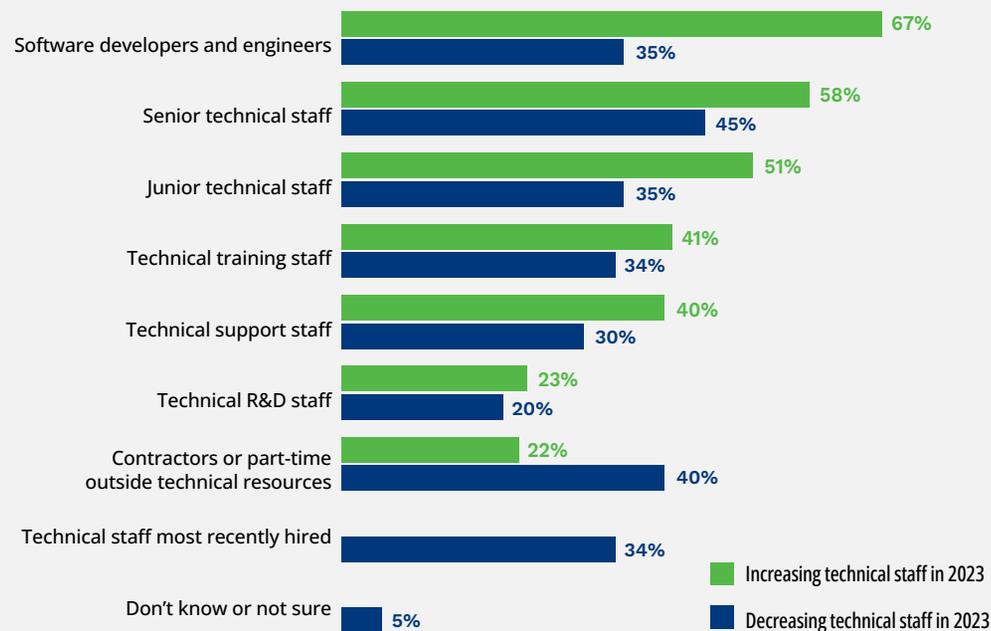
FIGURE 16 shows that when organizations add staff, they emphasize adding staff to either scale existing development teams or populate new ones. Developers are the primary focal point for 67% of organizations, followed by senior technical staff at 58% and junior technical staff at 51%. As a technical organization scales, there is always a need for additional training (41%) and support staff (40%). The addition of contractors (22%) addresses unique requirements or levels peak loads.

When organizations must reduce staff, there are different concerns to address. An obvious first move is to shed contractors, as identified by 40% of organizations, and lay off recently hired technical staff (34%) who have yet to amass significant experience and generate value add. While it is painful to consider laying off senior technical staff, their compensation can sometimes be significant compared to convention developers (35%) and especially junior staff (35%). In some cases, organizations can eliminate most of an entire team, and those

FIGURE 16 TYPES OF STAFF MOST IMPACTED BY CHANGES IN TECHNICAL STAFF INCREASES OR REDUCTIONS

What types of technical staff is your company adding or reducing?

[Asked if the organization is increasing or reducing its technical headcount in 2023]



2023 Tech Talent Survey, Q48 (increasing staff), sample size = 235, valid cases = 235, total mentions = 711.
2023 Tech Talent Survey, Q38 (reducing staff), sample size = 82, valid cases = 82, total mentions = 229.

team members can be reallocated to other teams. This creates a somewhat more equalized approach in which staff are subject to a reduction in force.

FIGURE 17 shows developers and IT management are the most commonly recruited roles. Specifically,

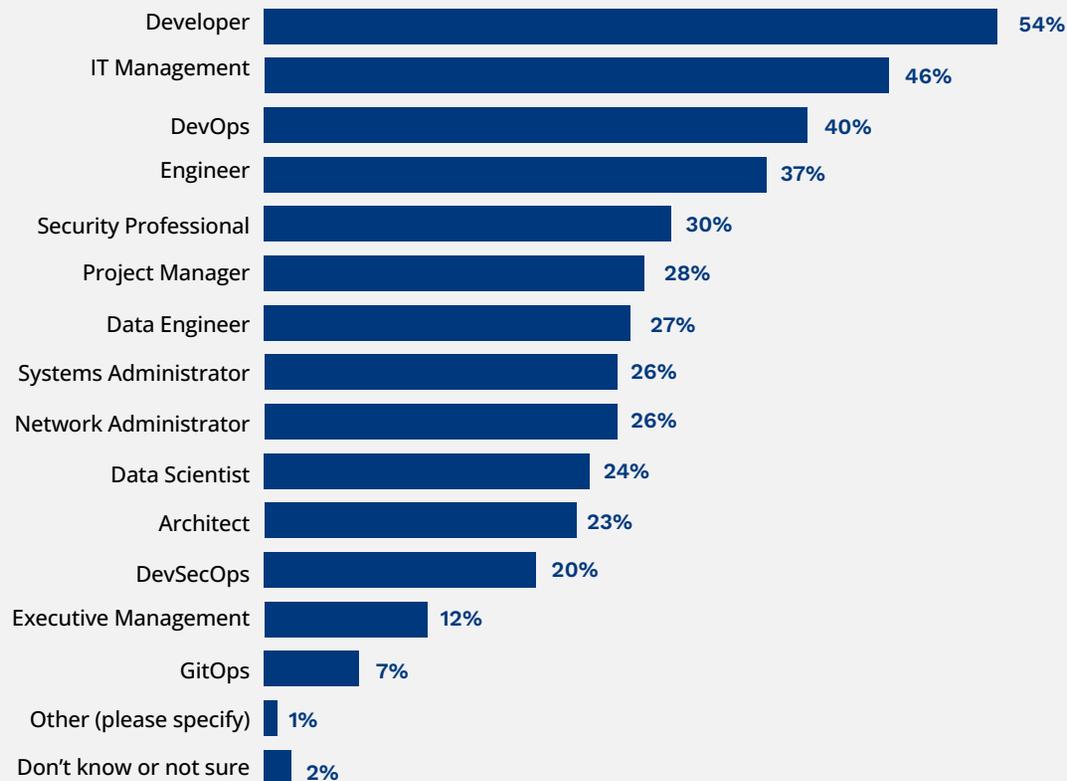
67% of organizations are increasing their technical staff target for developers and engineers. Moreover, when taking the type of engineer out of the equation, software developer is still the most likely job role being recruited, with 54% of organizations looking to staff up and target more developers

for their technical staff. At 46%, IT management is the second most commonly sought role.

The survey reveals an interesting trend: Organizations that believe recent tech talent layoffs facilitate the identification of exceptional candidates are more likely to hire IT management roles if they expand their technical workforce. These roles, which could be viewed as senior technical staff, are of greater interest to 56% of these organizations compared to the average respondent, where only 46% are looking to hire for IT management positions.

FIGURE 17 DEVELOPERS AND IT MANAGEMENT ARE THE MOST RECRUITED ROLES BY ORGANIZATIONS INCREASING THEIR HIRING

What kinds of positions are you looking to fill with technical staff?



KEY TAKEAWAY

The 2023 State of Tech Talent Survey reveals that training is essential for both increased and reduced hiring moves. Negative outcomes, such as increased workloads and longer time frames for product delivery, are likely to occur when organizations cut staff or pause hiring plans, and job cuts are blamed on revenue misses and economic caution. Furthermore, the types of staff most affected by staffing cuts are senior staff members, while developers and IT management are the most recruited roles.



Conclusions and actionable insights



A clear upskilling trend

Organizations need to focus on upskilling their workforce in emerging technology areas, such as cloud / containers, cybersecurity, and AI / ML. With technology constantly evolving, companies must invest in training and certification opportunities to ensure that they equip their employees with the necessary skills to remain competitive. The survey shows that organizations are taking different approaches to upskill their workforce, such as providing training opportunities and hiring new talent with experience in these areas.

Investing in upskilling is crucial for companies looking to keep up with emerging technologies and remain competitive in the market.

Today's hiring challenges require a multi-pronged approach

The survey results highlight the difficulties organizations face in hiring technical talent in today's tight labor market. While it is tempting for some companies to rely solely on external recruitment efforts to address the shortage, the data suggests this may not be enough. Instead, alternative approaches such as upskilling existing employees, offering increased salaries, improving work / life balance, and providing opportunities to work on open source projects can effectively attract and retain top talent.

Organizations need to be creative in their approach to hiring and consider alternative solutions to overcome the challenges posed by the current tech talent shortage.

Organizations need streamlined hiring and onboarding processes

The data reveals that organizations must streamline their hiring and onboarding processes to reduce turnover rates and increase efficiency. Even with efficient processes in place, recruitment and onboarding remain time-consuming. High turnover rates suggest it might be better to focus on upskilling existing employees rather than relying on external recruitment efforts.

Improving onboarding and training programs can help organizations reduce turnover rates and ensure that new hires effectively integrate into the company culture and team dynamics.

Comprehensive training and certification programs should supplement hiring

The results of this year's survey underscore the importance of investing in upskilling and certification opportunities to address the technical talent shortage. Certification and pre-employment testing can verify claimed technical skills while upskilling, effective onboarding, and certifications are highly valued and important for success.

While budgetary constraints are affecting both smaller and larger organizations in 2023, it is essential to recognize the value of training and certification in ensuring that technical staff possess the necessary skills to succeed in an increasingly tech-driven business environment.

Training and certification are important in an increased or reduced hiring environment

Training is crucial for increased or reduced hiring activity. The data also suggests that job cuts are to blame for revenue misses and economic caution, highlighting the importance of taking a strategic approach to hiring and staffing decisions. Organizations need to be aware of the types of staff most affected by staffing cuts, such as senior staff members, and be strategic in their hiring efforts by targeting roles such as developers and IT management that are commonly recruited for.

Organizations that are reducing staff or pausing hiring plans need to focus on upskilling their existing workforce to prevent negative outcomes such as increased workloads and longer time frames for product delivery.

Methodology

About this study

From a research perspective, it was important to eliminate any perception of sample bias and ensure high data quality. We eliminated sample bias by sourcing 80% of our usable sample from a 3rd party panel provider and the remaining 20% from Linux Foundation membership. We addressed data quality through extensive pre-screening and screening criteria to ensure that respondents had sufficient familiarity and professional experience to answer questions accurately on behalf of the organization they worked for.

The design of the worldwide survey conducted by Linux Foundation Training & Certification and Linux Foundation Research was to gather insights on the current trends and challenges related to technical talent hiring and management. We conducted the survey from February 23 through March 10, 2023, and we promoted it through various channels, including social media, the Linux Foundation and Linux.com websites, and the Linux Foundation Newsletter.

To ensure the accuracy and reliability of the survey data, we also utilized a third-party panel provider to obtain 80% of the respondents. These respondents received nominal compensation for their participation in the study. It is important to note that the screening of the survey participants was dependent on their employment status, and only

those who were employed full-time were part of the study. Individuals who were not affiliated with any organization or were unable to talk about their organization's hiring plans and practices were not part of the survey.

In total, the survey received 437 responses. We removed 19 responses, as they could not provide answers to questions about the 2023 hiring trends. The final sample size used in most of the report was 418 respondents. The margin of error for the survey data is $\pm 4.9\%$ at a 95% confidence level, indicating that the survey results are statistically significant and representative of the broader population.

For more details about the screening criteria used and access to the survey dataset, see <http://www.data.world/thelinuxfoundation>.

How missing data is handled

Although the requirement is for respondents to answer nearly all questions in the survey (the only exceptions are the open-ended questions), there are times when a respondent is unable to answer a question because it is outside the scope of their role or experience. For this reason, we frequently add a DKNS response to the list of responses for a question. However, this creates a conundrum regarding what to do with DKNS responses.

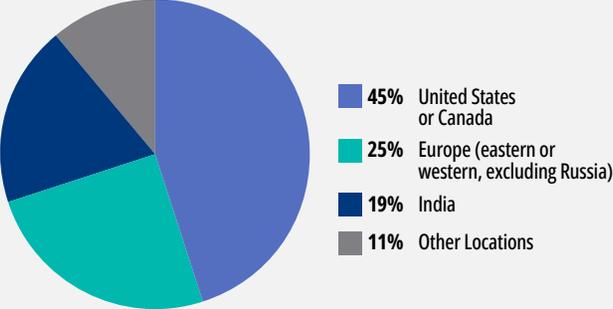
One approach is to treat it just like any other response. In this way, report readers can see the percentage of respondents that answered DKNS. The advantage of this approach is that it reports back the exact distribution of the data collected. The challenge with this approach is that it distorts the distribution of valid responses—those responses where respondents could answer the question.

Some of the analyses in this report excluded the DKNS. This can occur when the data missing can either be classified as missing at random (MAR) or missing completely at random (MCAR). Excluding DKNS data from a question does not change the distribution of data (counts) for the other responses, but it does change the size of the denominator used to calculate the percentage of responses across the remaining responses. This has the effect of proportionally increasing the percent values of the remaining responses relative to the number of DKNS responses. The number of valid cases is adjusted accordingly. Where we have elected to exclude DKNS data, a careful examination of the footnote for the figure will enable the reader to determine the number of DKNS responses based on the difference between the sample size (DKNS inclusive) and valid cases (DKNS excluded).

Finally, percentage values in this report may not add up to exactly 100% due to rounding.

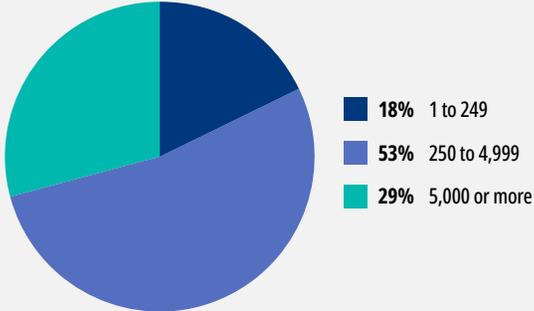
FIGURE 18
SELECTED DEMOGRAPHICS OF THE 2023 STATE OF TECH TALENT SURVEY

Region of organization's headquarters



2023 Tech Talent Survey, Q8, sample size = 418.

Organization's # of employees



2023 Tech Talent Survey, Q14, sample size = 417.

Type of organization



2023 Tech Talent Survey, Q10, sample size = 418.

Role in hiring process



2023 Tech Talent Survey, Q2, sample size = 418.

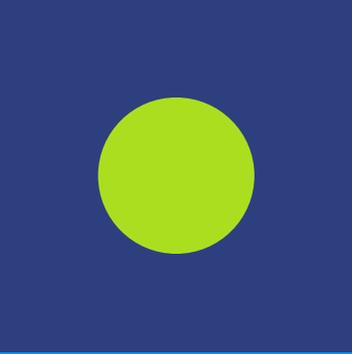
Demographics

FIGURE 18 presents a combination of employee and organizational demographics. This was a worldwide study, with 45% of organization headquarters located in North America, 25% in Europe, 19% in India, and 10% in other Asia-Pacific countries.

We originally collected company size data (number of employees) in the 2nd panel across seven size categories. We aggregated and then recoded this data into three categories: 1 to 249 employees (18%), 250 to 4,999 employees (53%), and 5,000 or more employees (29%).

The 3rd panel in **FIGURE 18** shows the distribution of organization types. 35% of our sample was classified as end-user organizations that primarily use (consume) IT products and services to support their business activities. This contrasts with vendors and service providers (55%), whose primary activity is creating horizontal and vertical IT products and services for sale to end users. This leaves 10% of organizations that are in academia, research, government, nonprofits, foundations, or other areas.

The 4th panel classified the role of the respondent. 72% of respondents were hiring managers, 17% were in talent management, 6% were learning and development professionals, 3% were internal recruiters, and 1% were in other fields related to the named fields.



Appendix A

The contents of Appendix A include a frequency for every question and selected crosstabs referenced in the report. Free text questions are not included in this Appendix. For a complete PDF of the survey instrument, see www.data.world/thelinuxfoundation. Appendix A includes 71 tables (A1 to A71).



TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A1	Q1: Are you someone who hires or recruits information technology (IT) professionals? (select one)		
	Yes	418	100%
	No	0	0%
	Total	418	
A2	Q2: What type of hiring or sourcing person are you? (select one)		
	I hire technical staff to work for my team or department	302	72%
	Internal human resource or talent manager	72	17%
	Internal learning and development professional	27	6%
	Internal recruiter	13	3%
	Other (please specify)	4	1%
	Total	418	
A3	Q3: Please indicate what best describes who you are. (select one)		
	I am a real person	419	100%
	I'm just lines of code	0	0%
	I am a bot	0	0%
	I just want to mess with the researchers	0	0%
	Don't know or not sure	0	0%
	Total	418	
A4	Q4: When talking about your organization's hiring plans and practices, what perspective will you speak for in this survey? (select one)		
	I can speak for the entire company or enterprise that I work for	264	63%
	I can only speak for the department or group that I work with	122	29%
	I work for multiple entities and can speak for what I see in the industry	32	8%
	I can speak only for myself	0	0%
	Don't know or not sure	0	0%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A5	Q5: What is your current employment status? (select one)		
	Employed, full time	399	95%
	Self-employed; full- or part-time	13	3%
	Employed; part-time	6	1%
	Student; full- or part-time	0	0%
	Unemployed but previously employed and looking for work	0	0%
	Unemployed, and not currently looking for work	0	0%
	Retired	0	0%
	Total	418	
A6	Q7: How many technical headcounts report to you? (select one)		
	0	8	3%
	1	4	1%
	2-4	35	12%
	5-9	78	26%
	10-19	87	29%
	20 or more	88	29%
	Don't know or not sure	2	1%
	Total	302	
A7	Q8: In what country or region does your organization have its headquarters? (select one)		
	United States or Canada	188	45%
	Europe (Eastern or Western, excluding Russia)	104	25%
	India	79	19%
	Asia (except China, India, Japan, Russia, and Oceania)	7	2%
	Oceania (including Australia and New Zealand)	6	1%
	South America	5	1%
	Middle East	4	1%
	West and Central Africa	4	1%
	Japan	3	1%
	Mexico, Central America, and the Caribbean	2	0%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Eastern and Southern Africa	2	0%
	North Africa	1	0%
	China	1	0%
	Russia	1	0%
	Other country / region (please specify)	11	3%
	Total	418	
A8	Q9: Professionally, which role or field do you most closely identify with? (select one)		
	IT development—Director or Vice President	99	24%
	Talent management and recruiting	71	17%
	Software development—developer, engineer, architect	60	14%
	IT operations—Director or Vice President	59	14%
	C-level (CEO, CFO, CTO, CIO, CISO, CSO)	44	11%
	Systems operations, administration, SRE, or ITSM	24	6%
	Product or project management	15	4%
	Software delivery (testing, packaging, release)	9	2%
	Technical training	6	1%
	Security team	5	1%
	Data scientist or machine learning	4	1%
	Sales and marketing	3	1%
	Open source program office (OSPO) team	2	0%
	Business analyst	1	0%
	Legal counsel	1	0%
	Academic or educator	1	0%
	Other (please specify)	14	3%
	Total	418	
A9	Q10: Which response best describes the organization you work for? (select one)		
	“End-user” organization that primarily uses IT products / services to support its business activities	146	35%
	System integrator or IT consulting firm	100	24%
	Cloud service provider or managed service provider	49	12%
	Hardware and / or software vendor	42	10%
	Hardware and / or software supplier	25	6%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Software reseller or distributor	10	2%
	Academic or research institution	10	2%
	Nonprofit association or foundation	8	2%
	Embedded systems vendor	4	1%
	Government entity or agency	3	1%
	Other entity (please specify)	21	5%
	Total	418	
A10	Q11: Which of the following best describes your organization's primary industry? (select one) [end-user organizations only]		
	Manufacturing (discrete or process)	25	17.1%
	Telecommunications / Internet service provider (ISP) / web hosting	24	16.4%
	Healthcare	18	12.3%
	Financial services (banking, insurance, securities, etc.)	14	9.6%
	Retail, wholesale, & e-commerce	13	8.9%
	Business services (accounting, management consulting, legal, etc.)	10	4.8%
	Construction / engineering	7	3.4%
	Media (broadcast communications, entertainment, publishing, website, social networking, etc.)	5	2.1%
	Automotive	3	2.1%
	Education (college, university)	3	2.1%
	Transportation & logistics (other than automotive)	3	2.1%
	Mining, oil, and gas	2	1.4%
	Life sciences (biotech, pharmaceuticals, etc.)	2	1.4%
	Real estate, rental, and leasing	1	0.7%
	Government (state, local)	1	0.7%
	Education (K-12, primary, secondary)	1	0.7%
	Consumer packaged goods	1	0.7%
	Agriculture	1	0.7%
	Hospitality & travel	1	0.7%
	Government (federal, national)	0	0.0%
	Utilities / energy	0	0.0%
	Other (please specify)	11	6.8%
	Total	146	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A11	Q12: Which of the following best describes your organization's primary industry? (select one) [vendor and service provider organizations only]		
	Cross-industry information technology (IT vendor, service provider, or manufacturer)	108	39.7%
	Telecommunications / Internet service provider (ISP) / web hosting	25	9.2%
	Healthcare	23	8.5%
	Financial services (banking, insurance, securities, etc.)	14	5.1%
	Retail, wholesale, & e-commerce	12	4.4%
	Manufacturing (discrete or process)	11	4.0%
	Business services (accounting, management consulting, legal, etc.)	10	3.7%
	Education (college, university)	9	3.3%
	Automotive	7	2.6%
	Construction / engineering	7	2.6%
	Government (federal, national)	6	2.2%
	Education (K-12, primary, secondary)	5	1.8%
	Media (broadcast communications, entertainment, publishing, website, social networking, etc.)	4	1.5%
	Consumer packaged goods	4	1.5%
	Transportation & logistics (other than automotive)	4	1.5%
	Government (state, local)	2	0.7%
	Utilities / energy	2	0.7%
	Life sciences (biotech, pharmaceuticals, etc.)	1	0.4%
	Mining, oil, & gas	1	0.4%
	Real estate, rental, and leasing	1	0.4%
	Hospitality & travel	1	0.4%
	Agriculture	0	0.0%
	Other (please specify)	15	5.5%
	Total	272	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A12	Q11 + Q12: Which of the following best describes your organization's primary industry? (select one) [all organizations]		
	Cross-industry information technology (IT vendor, service provider, or manufacturer)	108	25.8%
	Telecommunications / Internet service provider (ISP) / web hosting	49	11.7%
	Healthcare	41	9.8%
	Manufacturing (discrete or process)	36	8.6%
	Financial services (banking, insurance, securities, etc.)	28	6.7%
	Retail, wholesale, & eCommerce	25	6.0%
	Business services (accounting, management consulting, legal, etc.)	20	4.8%
	Construction / engineering	14	3.3%
	Education (college, university)	12	2.9%
	Automotive	10	2.4%
	Media (broadcast communications, entertainment, publishing, website, social networking, etc.)	9	2.2%
	Transportation & logistics (other than automotive)	7	1.7%
	Education (K-12, primary, secondary)	6	1.4%
	Government (federal, national)	6	1.4%
	Consumer packaged goods	5	1.2%
	Government (state, local)	3	0.7%
	Life sciences (biotech, pharmaceuticals, etc.)	3	0.7%
	Mining, oil, & gas	3	0.7%
	Hospitality & travel	2	0.5%
	Utilities / energy	2	0.5%
	Real estate, rental, and leasing	2	0.5%
	Agriculture	1	0.2%
	Other (please specify)	26	6.2%
	Total	418	
A13	Q13: What percent of your IT workload runs in the public cloud? (select a percent value between 0% and 100%)		
	1-20%	29	7%
	21-40%	60	15%
	41-60%	104	27%
	61-80%	118	30%
	81-100%	81	21%
	Total	392	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A14	Q14: Please estimate how many total employees are in your organization. (select one)		
	1-49	28	7%
	50-249	48	11%
	250-999	103	25%
	1,000-4,999	119	28%
	5,000-9,999	50	12%
	10,000-19,999	16	4%
	20,000 or more	53	13%
	Don't know or not sure	1	0%
	Total	418	
A15	Q15: Please identify what changes y made to your technical headcount during 2022. (select one)		
	We didn't make any changes to our technical headcount in 2022	77	18%
	We reduced our technical headcount in 2022	81	19%
	We increased our technical headcount in 2022	254	61%
	Don't know or not sure	6	1%
	Total	418	
A16	Q16: Approximately what percent of the organization's technical headcount did you lay off or resigned in 2022? (select a percent value between 0% and 100%) [Asked if the respondent's organization reduced technical headcount in 2022.]		
	0%	1	1%
	1-20%	40	50%
	21-40%	12	15%
	41-60%	11	14%
	61-80%	9	11%
	81-100%	7	9%
	Total	80	
A17	Q16: Approximately what percent of the organization's technical headcount did you lay off or resigned in 2022? segmented by Q14: Please estimate how many total employees are in your organization.		
		1-249 employees	250-4,999 employees
			5,000 or more employees
	0%	0%	2%
	1-20%	36%	43%
	21-40%	43%	10%
			8%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT		COLUMN %
	41-60%	21%	21%	13%
	61-80%	0%	19%	4%
	81-100%	0%	14%	4%
	Total	80		
A18	Q17: Approximately what percent of the organization's technical headcount did you add in 2022? (select a percent value between 0% and 100) [Asked if the respondents increased technical headcount in 2022.]			
	0%	0		0%
	1-20%	113		46%
	21-40%	53		22%
	41-60%	31		13%
	61-80%	29		12%
	81-100%	18		7%
	Total	244		
A19	Q18: Please estimate how many technical staff were in your organization at the beginning of 2023. (select one)			
	1-9	23		6%
	10-24	36		9%
	25-49	39		9%
	50-99	29		7%
	100-249	47		11%
	250-499	46		11%
	500-999	57		14%
	1,000-2,499	41		10%
	2,500-4,999	31		7%
	5,000-9,999	28		7%
	10,000-14,999	5		1%
	15,000-19,999	6		1%
	20,000 or more	27		6%
	Don't know or not sure	3		1%
	Total	418		

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A20	Q19: What is the average total compensation (salary + bonus) per person in USD for technical staff in your organization? (select one)		
	\$0-\$24,999	28	7%
	\$21,000-\$49,999	55	13%
	\$50,000-\$74,999	90	22%
	\$75,000-\$99,999	77	18%
	\$100,000-\$124,999	57	14%
	\$121,000-\$149,999	14	3%
	\$150,000-\$174,999	31	7%
	\$171,000-\$199,999	16	4%
	\$200,000-\$224,999	13	3%
	\$225,000-\$249,999	8	2%
	\$250,000 or more	16	4%
	Don't know or not sure	13	3%
	Total	418	
A21	Q20: Did economic concerns beginning in 2022 cause your organization to change or revise your 2023 technical headcount hiring plans? (select one)		
	Yes	247	59%
	No	154	37%
	Don't know or not sure	17	4%
	Total	418	
A22	Q21: Which of the following technology areas are staffed by technical headcount? (select all that apply)		
	Cloud / Container technologies	248	59%
	Cybersecurity	242	58%
	Database and data management	226	54%
	Advanced analytics and data science	200	48%
	Web & application development	181	43%
	Artificial intelligence / Machine learning	173	41%
	DevOps / GitOps / DevSecOps	173	41%
	Networking technologies (5G, SDN, NFV, etc.)	156	37%
	Storage technologies	149	36%
	Linux	127	30%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %	
	CI / CD & DevOps	121	29%	
	Edge computing	102	24%	
	Kubernetes	93	22%	
	IoT & Embedded	92	22%	
	Open source hardware	84	20%	
	Blockchain	82	20%	
	Manufacturing, 3D printing, and CAD / CAM	57	14%	
	Augmented / Virtual reality	57	14%	
	Other (please specify)	6	1%	
	Don't know or not sure	0	0%	
	Total	418		
A23	Q22: As new technology comes into use at your organization, what steps are you taking to ensure your technical staff have the right skills? (select all that apply)			
	Hiring new IT professionals with experience in the new technology	297	71%	
	Providing training opportunities for existing technical staff	291	70%	
	Hiring consultants to support projects and train existing technical staff	174	42%	
	Requiring additional training for existing technical staff	159	38%	
	Don't know or not sure	1	0%	
	Total	418		
A24	Q22: As new technology comes into use at your organization, what steps are you taking to ensure your technical staff have the right skills? segmented by Q10: Which response best describes the organization you work for?			
		"End-user" organization that primarily uses IT products / services to support its business activities	Tech vendor, supplier, or service provider	Other, including government, NGO, and academic institution
	Hiring new IT professionals with experience in the new technology	47%	35%	26%
	Providing training opportunities for existing technical staff	43%	40%	45%
	Hiring consultants to support projects and train existing technical staff	77%	67%	57%
	Requiring additional training for existing technical staff	78%	66%	74%
	Don't know or not sure	0%	.4%	0%
	Total	418		

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A25	Q23.1: How important are the following approaches to addressing your organization's technology needs? (select one)— Hiring and onboarding new talent that have the IT skills your organization needs		
	Not important at all	0	0%
	Not very important	5	1%
	Somewhat important	46	11%
	Very important	162	39%
	Extremely important	204	49%
	Don't know or not sure	1	0%
	Total	418	
A26	Q23.2: How important are the following approaches to addressing your organization's technology needs? (select one)— Upskilling existing IT staff to acquire the skills and knowledge your organization needs		
	Not important at all	0	0%
	Not very important	2	0%
	Somewhat important	31	7%
	Very important	159	38%
	Extremely important	221	53%
	Not important at all	5	1%
	Total	418	
A27	Q23.3: How important are the following approaches to addressing your organization's technology needs? (select one)—That the candidate has a college or university degree		
	Not important at all	13	3%
	Not very important	39	9%
	Somewhat important	125	30%
	Very important	115	28%
	Extremely important	124	30%
	Total	418	
A28	Q23.4: How important are the following approaches to addressing your organization's technology needs? (select one)—That technical candidates have skills that are certified		
	Not important at all	11	3%
	Not very important	14	3%
	Somewhat important	71	17%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Very important	149	36%
	Extremely important	170	41%
	Total	418	
A29	Q24: What incentives is your organization offering to deter your technical headcount from moving to another company? (select all that apply)		
	Increased salary	237	57%
	Opportunity for better work / life balance	211	50%
	Additional training opportunities or certification	210	50%
	Opportunity for flexible work schedule or telecommuting	204	49%
	Opportunity to be bonus eligible	179	43%
	High-level recognition for accomplishments	164	39%
	Opportunity to contribute to open source projects I am interested in	120	29%
	Additional stock options / RSU/ equity	86	21%
	No incentives are being offered at this time	10	2%
	Other (please specify)	6	1%
	Don't know or not sure	8	2%
	Total	418	
A30	Q25: If unable to find technical candidates with the skills you need, which of the following best describes how you have met your organization's requirements? (select all that apply)		
	Sought training for existing employees	223	53%
	Continued to look until we found a close fit	210	50%
	Hired a consultant	148	35%
	Delayed technology projects and/or deployments	112	27%
	Other (please specify)	5	1%
	Don't know or we've been able to find tech talent, so this is not an issue	33	8%
	Total	418	
A31	Q26.1: What is your perspective on upskilling technical staff? (select one)—Upskilling rather than hiring new employees is a more cost-effective way to increase technical expertise		
	Strongly disagree	3	1%
	Somewhat disagree	10	2%
	Neither disagree nor agree	46	11%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Somewhat agree	139	33%
	Strongly agree	218	52%
	Don't know or not sure	2	0%
	Total	418	
A32	Q26.2: What is your perspective on upskilling technical staff? (select one)—Upskilling is the preferred way to fill senior positions where we can't find a technical headcount		
	Strongly disagree	3	1%
	Somewhat disagree	14	3%
	Neither disagree nor agree	49	12%
	Somewhat agree	170	41%
	Strongly agree	179	43%
	Don't know or not sure	3	1%
	Total	418	
A33	Q26.3: What is your perspective on upskilling technical staff? (select one)—Upskilling doesn't work for senior roles because you can't teach broad subject matter expertise		
	Strongly disagree	38	9%
	Somewhat disagree	94	22%
	Neither disagree nor agree	84	20%
	Somewhat agree	107	26%
	Strongly agree	88	21%
	Don't know or not sure	7	2%
	Total	418	
A34	Q26.4: What is your perspective on upskilling technical staff? (select one)—Upskilled staff doesn't help us to fill new positions because we still have to backfill for the positions vacated		
	Strongly disagree	27	6%
	Somewhat disagree	81	19%
	Neither disagree nor agree	76	18%
	Somewhat agree	129	31%
	Strongly agree	102	24%
	Don't know or not sure	3	1%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A35	Q26.5: What is your perspective on upskilling technical staff? (select one)—Upskilling is an ideal way to help junior technical staff expand their capabilities		
	Strongly disagree	2	0%
	Somewhat disagree	4	1%
	Neither disagree nor agree	35	8%
	Somewhat agree	147	35%
	Strongly agree	228	55%
	Don't know or not sure	2	0%
	Total	418	
A36	Q26.6: What is your perspective on upskilling technical staff? (select one)—Upskilling works best for learning narrowly focused skills		
	Strongly disagree	3	1%
	Somewhat disagree	27	6%
	Neither disagree nor agree	69	17%
	Somewhat agree	150	36%
	Strongly agree	161	39%
	Don't know or not sure	8	2%
	Total	418	
A37	Q26.7: What is your perspective on upskilling technical staff? (select one)—Upskilling takes too long or is ineffective at training for complex roles		
	Strongly disagree	53	13%
	Somewhat disagree	103	25%
	Neither disagree nor agree	61	15%
	Somewhat agree	94	22%
	Strongly agree	103	25%
	Don't know or not sure	4	1%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A38	Q26.8: What is your perspective on upskilling technical staff? (select one)—Upskilling, training, and certifications are more important than having a relevant college degree		
	Strongly disagree	10	2%
	Somewhat disagree	18	4%
	Neither disagree nor agree	71	17%
	Somewhat agree	138	33%
	Strongly agree	175	42%
	Don't know or not sure	6	1%
	Total	418	
A39	Q27.1: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Recruitment is costly, time-consuming, and rarely leads to the right candidate for the position		
	Strongly disagree	26	6%
	Somewhat disagree	60	14%
	Neither disagree nor agree	60	14%
	Somewhat agree	140	33%
	Strongly agree	131	31%
	Don't know or not sure	1	0%
	Total	418	
A40	Q27.2: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Onboarding takes valuable internal resources away from other critical projects and is time-consuming		
	Strongly disagree	21	5%
	Somewhat disagree	47	11%
	Neither disagree nor agree	79	19%
	Somewhat agree	156	37%
	Strongly agree	113	27%
	Don't know or not sure	2	0%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A41	Q27.3: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)— There is a need for a streamlined way to recruit new technical staff with proven skills		
	Strongly disagree	5	1%
	Somewhat disagree	12	3%
	Neither disagree nor agree	49	12%
	Somewhat agree	161	39%
	Strongly agree	188	45%
	Don't know or not sure	3	1%
	Total	418	
A42	Q27.4: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Not all tech talent is the same—it's challenging that they do not have a common benchmark of skills, methodologies, approaches		
	Strongly disagree	6	1%
	Somewhat disagree	19	5%
	Neither disagree nor agree	59	14%
	Somewhat agree	158	38%
	Strongly agree	172	41%
	Don't know or not sure	4	1%
	Total	418	
A43	Q27.5: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—With all the recent tech talent layoffs, it's now easier to identify great candidates		
	Strongly disagree	14	3%
	Somewhat disagree	45	11%
	Neither disagree nor agree	98	23%
	Somewhat agree	139	33%
	Strongly agree	115	28%
	Don't know or not sure	7	2%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A44	Q27.6: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Hiring the wrong candidate and then having to onboard again is an issue		
	Strongly disagree	13	3%
	Somewhat disagree	24	6%
	Neither disagree nor agree	49	12%
	Somewhat agree	153	37%
	Strongly agree	172	41%
	Don't know or not sure	7	2%
	Total	418	
A45	Q27.7: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Certifications should be required to verify claimed technical skills		
	Strongly disagree	14	3%
	Somewhat disagree	25	6%
	Neither disagree nor agree	59	14%
	Somewhat agree	142	34%
	Strongly agree	169	40%
	Don't know or not sure	9	2%
	Total	418	
A46	Q27.8: What is your perspective on recruiting, onboarding, and retaining technical staff? (select one)—Pre-employment testing should be required to verify claimed technical skills		
	Strongly disagree	6	1%
	Somewhat disagree	18	4%
	Neither disagree nor agree	49	12%
	Somewhat agree	158	38%
	Strongly agree	181	43%
	Don't know or not sure	6	1%
	Total	418	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A47	Q28: Which of the following training or professional development opportunities does your organization use to train and certify technical staff? (select all that apply)		
	Employer-paid training and certifications	265	63%
	Online / virtual courses	260	62%
	We send employees to technical conferences	201	48%
	Corporate onsite training	199	48%
	Self-directed learning	190	45%
	Mentoring programs	189	45%
	Books and manuals	135	32%
	Tuition assistance toward pursuing a degree	86	21%
	Other (please specify)	2	0%
	Don't know or not sure	2	0%
	Total	418	
A48	Q29: About how long does it take to fill an open technical position? (select one)		
	Less than a month	32	8%
	1-3 months	166	40%
	4-6 months	120	29%
	7-9 months	47	11%
	10-12 months	34	8%
	More than 12 months	14	3%
	Don't know or not sure	5	1%
	Total	418	
A49	Q30: How long does the onboarding process take for new technical headcount to reach normal productivity? (select one)		
	Up to 2 weeks	30	7%
	3-4 weeks	80	19%
	1-2 months	78	19%
	2-3 months	89	21%
	3-4 months	47	11%
	5-6 months	54	13%
	7-9 months	13	3%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	10-12 months	13	3%
	More than 12 months	9	2%
	Don't know or not sure	5	1%
	Total	418	
A50	Q31: On average, what percentage of new technical staff hires resigned or did you ask to leave within six months of being onboarded? (select a percent value between 0% and 100%)		
	0%	26	7%
	1-10%	125	32%
	11-20%	68	17%
	21-30%	35	9%
	31-40%	28	7%
	41-50%	19	5%
	51-60%	26	7%
	61-70%	14	4%
	71-80%	16	4%
	81-90%	19	5%
	91-100%	14	4%
	Total	390	
A51	Q32: What is the status of an Open Source Program Office (OSPO) at your organization? (select one)		
	We are evaluating if we need an OSPO	85	22%
	We have a partially staffed OSPO	68	18%
	We don't have an OSPO	63	16%
	We are implementing an OSPO	63	16%
	We have a fully staffed OSPO	55	14%
	We don't have a need for an OSPO	36	9%
	Don't know or not sure	17	4%
	Total	387	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A52	Q33: Where or who does this OSPO report to in your organization? (select one)		
	IT Operations or ITSM	78	42%
	CTO	45	24%
	Software engineering or development	35	19%
	CIO	12	6%
	CISO, security, compliance, or risk management	11	6%
	Legal	2	1%
	Don't know or not sure	3	2%
	Total	186	
A53	Q34: How did concerns about the economy change your 2023 technical staff hiring plans? (select all that apply) [Asked if concerns about the economy caused a change in technical hiring plans]		
	Our current plan is to put new technical staff positions on hold	128	52%
	Our current plan is to increase the size of our technical staff	117	47%
	Our current plan is to reduce the size of our technical staff	66	27%
	Don't know or not sure	2	1%
	Total	247	
A54	Q35: What is your 2023 technical staff hiring plan? (select all that apply) [Asked if the respondent did not say the economy had an impact on technical hiring plans]		
	Our current plan is to put new technical staff positions on hold	118	68%
	Our current plan is to increase the size of our technical staff	16	9%
	Our current plan is to reduce the size of our technical staff	61	35%
	Don't know or not sure	0	0%
	Total	173	
A55	Q36: What are the reasons behind reducing your technical staff in 2023? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Revenue and profits are trending lower than planned	51	62%
	The organization is exercising caution due to concerns over economic uncertainty in 2023	46	56%
	Use of cloud or managed service providers has eliminated some roles	35	43%
	The organization hired too many technical staff in anticipation of growth	25	30%
	Increased reliance on more outsourcing or offshoring has eliminated some roles	23	28%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Technical staff were involved in projects that would not deliver value soon enough	20	24%
	Upskilling can address our near-term need for new skill sets	15	18%
	Other (please specify)	1	1%
	Don't know or not sure	0	0%
	Total	82	
A56	Q37: About what percent of the organization's technical staff have you or do you expect to lay off in 2023? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	0%	1	1%
	1-20%	28	39%
	21-40%	6	8%
	41-60%	11	15%
	61-80%	11	15%
	81-100%	14	20%
	Total	71	
A57	Q38: What types of technical staff resigned or have / will you lay off in 2023? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Senior technical staff	37	45%
	Contractors or part-time outside technical resources	33	40%
	Junior technical staff	29	35%
	Software developers and engineers	29	35%
	Technical staff most recently hired	28	34%
	Technical training staff	28	34%
	Technical support staff	25	30%
	Technical R&D staff	16	20%
	Don't know or not sure	4	5%
	Total	82	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A58	Q39: What impacts have or are likely to occur in 2023 from this reduction in technical staff? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Training is or will be used to upskill existing technical staff	43	52%
	Increased time frames for product delivery	35	43%
	Increased workloads per technical staff member	32	39%
	Technical debt will increase	22	27%
	Increased use of offshore outsourcing to better manage costs	20	24%
	No significant impact is anticipated on the remaining technical staff	18	22%
	Increased use of contractors or managed service providers to fill critical gaps	15	18%
	Selected project cancelations	14	17%
	Decreased use of offshore outsourcing to better manage costs	8	10%
	Don't know or not sure	1	1%
	Total	82	
A59	Q40: To your knowledge, have you or are you planning any of the following actions to avoid reductions in technical staff in 2023? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Upskilling technical staff	45	55%
	Merit increases being put on hold	42	51%
	Bonuses being put on hold	39	48%
	Base compensation being temporarily scaled back	19	23%
	Other (please specify)	0	0%
	Don't know or not sure	4	5%
	Total	82	
A60	Q41: What are your long-term technical staffing plans? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Based on the economy, we may see more technical staff reductions in 2023 or 2024	46	56%
	Based on the economy, we don't anticipate any more staff reductions in 2023 or 2024	29	35%
	We may be able to hire technical staff later this year	27	33%
	We are not anticipating any changes to staffing later in 2023 or 2024	17	21%
	We are planning to hire technical staff in 2024	16	20%
	Don't know or not sure	3	4%
	Total	82	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A61	Q42: In which technology areas are / will you be reducing technical staff in 2023? (select all that apply) [Asked if the respondent's organization is reducing technical headcount in 2023]		
	Cloud / Container technologies	33	40%
	Artificial intelligence / Machine learning	27	33%
	DevOps / GitOps / DevSecOps	23	28%
	Advanced analytics and data science	22	27%
	Cybersecurity	20	24%
	Database and data management	20	24%
	CI / CD & DevOps	20	24%
	Blockchain	19	23%
	Networking technologies (5G, SDN, NFV, etc.)	16	20%
	Web & application development	14	17%
	Linux	13	16%
	Manufacturing, 3D printing, and CAD / CAM	12	15%
	Augmented / Virtual reality	11	13%
	Edge computing	11	13%
	Storage technologies	11	13%
	IoT & Embedded	9	11%
	Open source hardware	8	10%
	Kubernetes	6	7%
	Other (please specify)	0	0%
	Don't know or not sure	7	9%
	Total	82	
A62	Q43: What are the reasons behind freezing technical staff hiring in 2023? (select all that apply) [Asked if the respondent's organization is putting a pause on technical headcount in 2023]		
	The organization is exercising caution due to concerns about economic uncertainty in 2023	108	57%
	Revenue and profits are trending lower than planned	74	39%
	The organization hired too many technical staff in anticipation of growth	59	31%
	Use of cloud or managed service providers is more cost-effective than hiring additional staff	57	30%
	Upskilling technical staff is being done to expand capabilities without hiring	46	24%
	Established outsourcing or offshoring is more cost-effective than hiring additional staff	43	23%
	Reducing technical R&D spending has allowed us to better address operations and technical debt	31	16%
	Other (please specify)	0	0%
	Don't know or not sure	3	2%
	Total		

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A63	Q44: What impacts will occur from this pause in hiring technical staff in 2023? (select all that apply) [Asked if the respondent's organization is putting a pause on technical headcount in 2023]		
	Training is being used to upskill existing technical staff so that the organization can be more productive	95	50%
	Increased time frames for product delivery	69	37%
	Increased workloads per technical staff member	57	30%
	Increased use of contractors or managed service providers to fill critical gaps	43	23%
	Increased use of offshore outsourcing to better manage costs	42	22%
	Selected project cancelations	40	21%
	No significant impact is being felt across the remaining technical staff	35	19%
	Increased technical debt	32	17%
	Decreased use of offshore outsourcing to better manage costs	11	6%
	Don't know or not sure	4	2%
	Total	189	
A64	Q45: What are your future technical staffing plans? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Based on the economy, we don't anticipate any more staff reductions in 2023 or 2024	78	41%
	We may be able to hire technical staff later this year	73	39%
	Based on the economy, we may see more technical staff reductions in 2023 or 2024	47	25%
	We are not anticipating any changes to staffing later in 2023 or 2024	42	22%
	We are planning to hire technical staff in 2024	31	16%
	Don't know or not sure	5	3%
Total	189		
A65	Q46: What are the reasons behind increasing your technical headcount in 2023? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	New skill sets are needed to address cloud native computing and other new technologies	144	61%
	Technological innovation is accelerating and creating new opportunities for us	143	61%
	Revenue and profits are trending higher than planned	108	46%
	Difficulty in retaining technical staff is creating openings that we need to fill	60	26%
	Outsourcing and offshoring are not effective at addressing some of our needs	44	19%
	Upskilling is not able to address our near-term need for new skill sets	36	15%
	Other (please specify)	4	2%
	Don't know or not sure	3	1%
	Total	235	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A66	Q47: Approximately what percent will you be able to increase the size of your technical headcount in 2023? [Asked if the respondent's organization is increasing technical headcount in 2023]		
	0%	1	0%
	1-20%	110	49%
	21-40%	48	22%
	41-60%	27	12%
	61-80%	20	9%
	81-100%	17	8%
	Total	223	
A67	Q48: What types of technical staff is your company adding? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Software developers and engineers	157	67%
	Senior technical staff	136	58%
	Junior technical staff	121	51%
	Technical training staff	97	41%
	Technical support staff	93	40%
	Technical R&D staff	53	23%
	Contractors or part-time outside technical resources	52	22%
	Technical staff most recently hired	0	0%
	Other (please specify)	2	1%
	Don't know or not sure	0	0%
	Total	235	
A68	Q49: What impacts will occur from this increase in technical headcount in 2023? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Ability to address new development opportunities	141	60%
	Training will be used to upskill technical staff so that the organization can be more productive	140	60%
	Decreased workloads per technical staff member	61	26%
	Decreased time frames for product or service delivery	59	25%
	Increased use of offshore outsourcing to better manage costs	52	22%
	The amount of technical debt will decrease	40	17%
	Decreased use of contractors or managed service providers to fill critical gaps	34	14%
	No significant impact will be felt across the existing technical staff	21	9%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Decreased use of offshore outsourcing to better manage costs	19	8%
	Don't know or not sure	4	2%
	Total	235	
A69	Q50: What are your future technical staffing plans? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	We may be able to hire more technical staff later this year	108	46%
	We are planning to hire more technical staff in 2024	90	38%
	Based on the economy, we don't anticipate any staff reductions 2023 or 2024	76	32%
	We are not anticipating any additional changes to staffing later in 2023 or 2024	51	22%
	Based on the economy, we may see technical staff reductions in 2023 or 2024	37	16%
	Don't know or not sure	7	3%
	Total	235	
A70	Q51: In which technology areas are / will you be hiring technical staff in 2023? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Cybersecurity	118	50%
	Cloud / Container technologies	118	50%
	Artificial intelligence / Machine learning	107	46%
	Database and data management	87	37%
	Advanced analytics and data science	86	37%
	Web & application development	78	33%
	DevOps / GitOps / DevSecOps	74	31%
	Networking technologies (5G, SDN, NFV, etc.)	71	30%
	CI / CD & DevOps	62	26%
	Linux	54	23%
	Kubernetes	47	20%
	Blockchain	45	19%
	Edge computing	45	19%
	Augmented / Virtual reality	44	19%
	IoT & Embedded	44	19%
	Storage technologies	43	18%
	Open source hardware	39	17%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	Manufacturing, 3D printing, and CAD / CAM	24	10%
	Other (please specify)	2	1%
	Don't know or not sure	7	3%
	Total	235	
A71	Q51: In which technology areas are /will you be hiring technical staff in 2023? minus Q42: In which technology areas are / will you be reducing technical staff in 2023?		
	Cybersecurity	118	31%
	Cloud / Container technologies	118	27%
	Artificial intelligence / Machine learning	107	25%
	Database and data management	87	21%
	Advanced analytics and data science	86	20%
	Web & application development	78	20%
	Networking technologies (5G, SDN, NFV, etc.)	71	17%
	DevOps / GitOps / DevSecOps	74	16%
	CI / CD & DevOps	62	13%
	Kubernetes	47	13%
	Linux	54	13%
	IoT & Embedded	44	11%
	Edge computing	45	11%
	Augmented / Virtual reality	44	10%
	Storage technologies	43	10%
	Open source hardware	39	10%
	Blockchain	45	8%
	Manufacturing, 3D printing, and CAD / CAM	24	4%
	Total	226	
A72	Q52: What are the top three technical areas that you are seeking technical staff for? (select up to three areas) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Cybersecurity	83	36%
	Cloud / Container technologies	83	36%
	Artificial intelligence / Machine learning	62	27%
	Advanced analytics and data science	56	25%
	Web & application development	43	19%
	Database and data management	39	17%

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
	DevOps / GitOps / DevSecOps	36	16%
	C I/ CD & DevOps	32	14%
	Linux	22	10%
	Networking technologies (5G, SDN, NFV, etc.)	21	9%
	Blockchain	18	8%
	Augmented / Virtual reality	17	7%
	Kubernetes	16	7%
	IoT & Embedded	13	6%
	Storage technologies	9	4%
	Edge computing	9	4%
	Open source hardware	9	4%
	Manufacturing, 3D printing, and CAD / CAM	5	2%
	[Insert text from Other]	2	1%
	Total	228	
A73	Q53: What kinds of positions are you looking to fill with technical staff? (select all that apply) [Asked if the respondent's organization is increasing technical headcount in 2023]		
	Developer	128	54%
	IT Management	109	46%
	DevOps	94	40%
	Engineer	87	37%
	Security Professional	70	30%
	Project Manager	66	28%
	Data Engineer	64	27%
	Systems Administrator	62	26%
	Network Administrator	62	26%
	Data Scientist	56	24%
	Architect	54	23%
	DevSecOps	47	20%
	Executive Management	29	12%
	GitOps	16	7%
	Other (please specify)	2	1%
	Don't know or not sure	4	2%
	Total	235	

TABLE	QUESTIONS AND ANSWER CHOICES	COUNT	COLUMN %
A74	Q53: Breakout of respondents that agree that with all the recent tech talent layoffs, it's now easier to identify great candidates		
	IT Management	79	56%
	Developer	74	52%
	DevOps	59	42%
	Engineer	51	36%
	Data Engineer	44	31%
	Security Professional	43	30%
	Project Manager	42	30%
	Data Scientist	37	26%
	DevSecOps	35	25%
	Network Administrator	34	24%
	Systems Administrator	32	23%
	Architect	25	18%
	Executive Management	24	17%
	GitOps	11	8%
	Other (please specify)	1	1%
	Don't know or not sure	2	1%
	Total	142	

About the authors

With over 25 years of experience in the information technology industry, Jason Perlow is a seasoned systems architect, technology strategist, and technical writer and has worked with leading companies such as IBM, Microsoft, Unisys, and NTT Data. He serves as Editorial Director at the Linux Foundation, leading content writing and external communications for Linux Foundation Projects and Research. Jason has authored several Linux Foundation Research reports, including the 8th, 9th, and 10th annual Linux Foundation Jobs Reports and the 2022 Mentorship in Open Source Report. Additionally, Jason was the founding Sr. Technology Editor of Linux Magazine, covering the formation of the Linux Foundation, and had an op-ed technology column on ZDNET for 15 years, from 2008 to 2023.

Stephen Hendrick is Vice President of Research at the Linux Foundation, where he is the principal investigator on a variety of research projects core to the Linux Foundation's understanding of how open source software is an engine of innovation for producers and consumers of information technology. Steve specializes in primary research techniques developed over 30 years as a software industry analyst. Steve is a subject matter expert in application development and deployment topics, including DevOps, application management, and decision analytics. Steve brings experience in a variety of quantitative and qualitative research techniques that enable deep insight into market dynamics and has pioneered research across many application development and deployment domains. Steve has authored over 1,000 publications and provided market guidance through syndicated research and custom consulting to the world's leading software vendors and high-profile startups.

Acknowledgments

Special thanks to Linux Foundation colleagues Hilary Carter, Lawrence Hecht, Stephen Hendrick, Anna Hermansen, Christina Oliviero, Scott Punk, Melissa Schmidt, Mary Simpkins, and Clyde Seepersad for your contributions to and in support of this research project.

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May 2023



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To reference the work, please cite as follows: Jason Perlow and Stephen Hendrick, "2023 State of Tech Talent Report," foreword by Clyde Seepersad, The Linux Foundation, May 2023.



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