



Japan Spotlight 2023

Open source trends, challenges, and opportunities in Japan

December 2023

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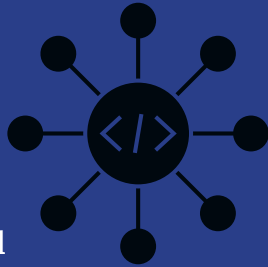
Foreword by Noriaki Fukuyasu, *The Linux Foundation*

In partnership with:



Japan Spotlight 2023

82% of organizations surveyed use open source at a moderate / significant / widespread level



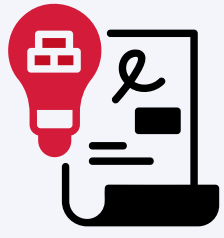
62% of respondents believe that OSS is **more secure** than closed software



Organizations with an OSS initiative are more likely to follow a rigorous approach to **OSS component evaluation**



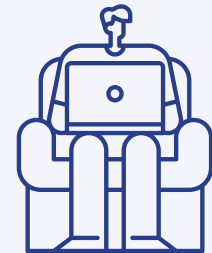
Licensing of intellectual property (IP) is the leading concern to organizational OSS use



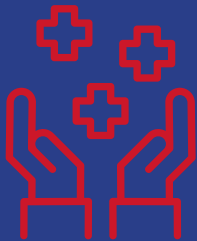
Top concerns about contributing include **legal and leaking IP issues**



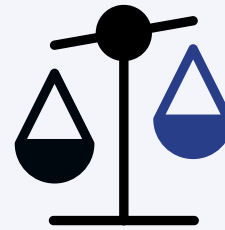
69% of respondents spend some time contributing to OSS in their **personal time**



Respondents contribute to OSS due to both **individual and collective** benefit



Benefits exceed the costs of OSS use in half of organizations surveyed



67% of respondents agree that OSS is valuable to their organization



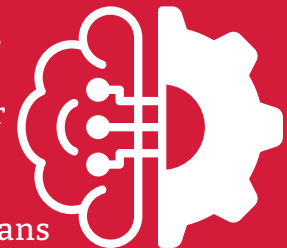
OSS contributions deliver multiple benefits including **improved security and software quality**



Funding for the commercial OSS startup ecosystem should be the leading investment area



OSS technologies in **Data science and AI / ML** factor prominently into future organizational plans



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Foreword

In 2009, when I became vice president of Japan operations at the Linux Foundation, it was a 10-person organization where we knew the faces of each staff member. The Linux kernel was the only open source project we hosted at that time. Open source software (OSS) itself was still a minor topic, and when visiting various companies in Japan, I remember often having to start with a basic explanation of “what OSS is.” At that point in time, I never imagined that OSS would become such a critical component of business success today or that the Linux Foundation would host so many projects across such a wide range of fields. Since then, with Linux kernel founder Linus Torvalds in the organization, the Linux Foundation has provided a safe and neutral space for OSS development. The organization has successfully managed hundreds of OSS projects with its expertise in open collaboration and open governance. As a person in charge of Japan operations, with a strong belief in OSS, I have participated in awareness campaigns to promote these core initiatives and have provided all kinds of support to Japanese companies for their participation in global OSS activities.

This report reveals that many Japanese companies use OSS to run their businesses while participating in OSS development as members of the global OSS development community. The formation of this community is a result of the tremendous support of Fujitsu, Hitachi, and NEC, which have been with us as Platinum Members, the highest level of membership, since the early days of the Linux Foundation. The strong traction of these three companies has nurtured the Japanese OSS industry, allowing a variety of Japan-originated activities to flourish on a global scale.

With Toyota Motor Corporation taking the lead, the formation of Automotive Grade Linux transformed software development in the automotive industry. In the information appliances industry, such as Sony and Panasonic, there was a need to learn about OSS license compliance and exchange information with the companies and developers in Asia who were upstream in the supply chain. To this end, the annual Open Compliance Summit began in Japan, leading to the formation of the OpenChain project. OpenChain has now become an ISO standard for software supply chain management. Toshiba, Renesas, and others have launched the Civil Infrastructure Platform, a project for the long-term maintenance of Linux used in civil infrastructures such as power plants and train operation systems. The Linux Foundation will continue supporting new opportunities and challenges so that Japanese companies and developers can be more active worldwide.

In 2023, Linux Foundation Research surveyed open source trends by region as part of its series, World of Open Source. The report has helped to expand our view of open source participation in different regions and provides valuable insight to better understand and support open source participation worldwide. This is the third report after the Europe and Global Spotlight reports, demonstrating the footprint of everyone involved in OSS activities in Japan. I am very pleased to see the publication of the 2023 Japan Spotlight report and would like to express my sincere gratitude to Linux Foundation Research and everyone who participated in the survey.

**Noriaki Fukuyasu,
Vice President of Japan Operations,
The Linux Foundation**

Executive summary

Open source adoption in Japan

The comparative analysis shows that Japan has an adoption rate of open source software (OSS) use of 82% compared with the global average of 90%. Open source policies show 63% of Japanese organizations encouraging OSS use, behind the global average of 73%. As for contributions, 54% of Japanese entities encourage them or leave the decision up to each development team, only 5% behind the global average. The establishment of open source program offices (OSPOs) is nearly identical, with Japan at 47% compared with the global 48%. This highlights Japan's solid embrace of open source practices and identifies potential growth opportunities in the region.

Open source use

Regarding OSS use, 82% of Japanese organizations utilize it at varying levels. Notably, 30% report widespread use. A significant 62% believe OSS is more secure than closed source software. Organizations with an OSPO are more likely to require secure software development training. Evaluation and implementation practices vary, with those having an OSS initiative more likely to ensure quality and safety. However, nearly half of all organizations use internal manuals, checklists, or guidelines.

Challenges in using OSS include regulatory compliance, lack of understanding, and concerns about quality, security, and intellectual property (IP). 63% cite licensing and IP concerns as limiting

factors, while 54% point to security concerns. 52% mention a lack of clear policies and training, and 45% acknowledge a lack of understanding of the non-technical value proposition.

To increase OSS use, 59% of organizations believe enhancing secure software development practices is crucial. Consistent policy implementation and improvement of training are equally important. Better legal, compliance, or security support, clear strategies, and understanding the technical and non-technical values of OSS are also identified as key investment areas.

Open source contributions

Contributions to OSS in Japan are diverse, extending beyond code submissions to include tasks such as issue reporting and documentation. Our findings reveal a wide variance in the time developers allocate to OSS projects. This underlines that even limited yet consistent contributions can accumulate into substantial impact over time.

However, the path to OSS contribution is not without its challenges. Prominent among these are fears of IP leakage, legal and licensing concerns, technology constraints, and a lack of policy or training materials. To foster increased OSS contributions, a multifaceted approach is needed. Key strategies preferred by respondents include open sourcing company products or internal tools, addressing security and licensing issues, and educating organizations on the value of OSS.

Providing clear policies for employee contributions also plays a critical role in increasing participation.

At the individual level, a large majority of developers contribute to OSS projects during their personal time, driven by a blend of personal and collective motivations. From fulfilling technology needs to experiencing the joy of community collaboration and supporting the open source movement, these factors also encompass career opportunities and personal development.

Value proposition of open source

The perceived value of OSS within Japanese organizations is positive, with a majority recognizing its pivotal role in strategic and operational dimensions. Using OSS is associated with multiple benefits including improved productivity, a better workplace environment, and reduced software ownership costs. Use of and contribution to OSS are seen as increasingly beneficial, indicating a positive trend in the value derived from these activities.

In terms of the future, respondents identify several priority areas for investment, notably in better funding for the commercial OSS startup ecosystem, advocating for global technology standards in OSS, and encouraging government adoption. The report also highlights the profound implications of AI, advanced analytics and cloud technologies in shaping future OSS contributions.

Introduction

In 2023, the Linux Foundation (LF) Research team set out to undertake research on the global landscape of open source following the success of the 2022 World of Open Source: Europe Spotlight survey and report. The Global Spotlight 2023 project greatly expanded our view of open source participation in different regions, providing valuable insight to better understand and support open source participation worldwide. The research is relevant to decision-makers from all functions and sectors, including managers, executives, policymakers, and others involved in open source initiatives. The 2023 survey contained enough data and information for us to create three reports. Two of them are already published. The [2023 Europe Spotlight report](#)¹ dives further into specific trends within Europe. The [2023 Global Spotlight report](#)² encompasses the globe, aiming to mentally cross borders while realizing the different needs and priorities of the studied regions. Finally, the 2023 Japan Spotlight report you are reading now gives special attention to the open source landscape in Japan and helps in identifying opportunities for OSS growth.

The main voices of the survey include open source contributors and developers who understand the role of OSS in their organization or within a given industry. The LF Research team would especially like to thank all participants in the survey who gave us their invaluable time. Your insights have been the backbone of this report and the potential critical discussions stemming from it.

Research overview

Data collection for the worldwide online survey took place between April and June 2023. We received 156 valid responses from Japan, which are the basis for the analysis presented in this report. The survey included questions in the following areas: demographics, the current state of open source consumption and contribution, benefits and challenges of open source usage and contribution, the value proposition of open source, and open source sustainability. For more information about the research approach and further demographics on participants and their organizations, see the Methodology section at the end of this report.

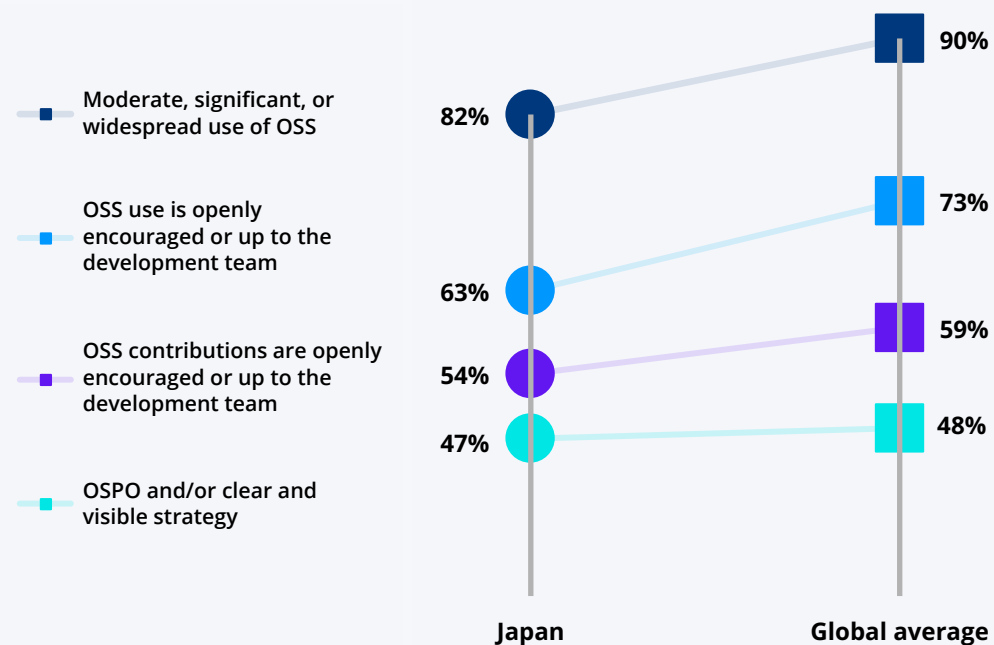
Open source adoption in Japan

The comparative analysis between Japan's adoption of OSS and the global average presents intriguing insights (FIGURE 1). A significant 82% of Japanese entities report moderate to widespread use of OSS, closely trailing the global average of 90%. When it comes to open source policies, 63% of Japanese organizations openly encourage the use of OSS or leave the decision to their development teams, compared with a 73% global average. The

disparity narrows further when considering OSS contributions, with 54% of Japanese entities actively promoting contributions or delegating the choice to their development teams, just a 5% difference from the global average of 59%. Lastly, Japan is at about the same level of the establishment of an OSPO and/or having a clear and visible OSS strategy, at 47% against the global average of 48%. Overall, it seems that Japan exhibits a commendable embrace of open source practices, closely mirroring the global trends, and underscores its commitment to fostering a collaborative and innovative technological ecosystem.

FIGURE 1

OPEN SOURCE ADOPTION IN JAPAN COMPARED TO THE GLOBAL AVERAGE



Source:

2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q12, Q13, Q22, Q11, Sample Size = 117-156
 2023 World of OSS: Global Spotlight Survey, Q12, Q13, Q22, Q11, Sample Size = 705-916

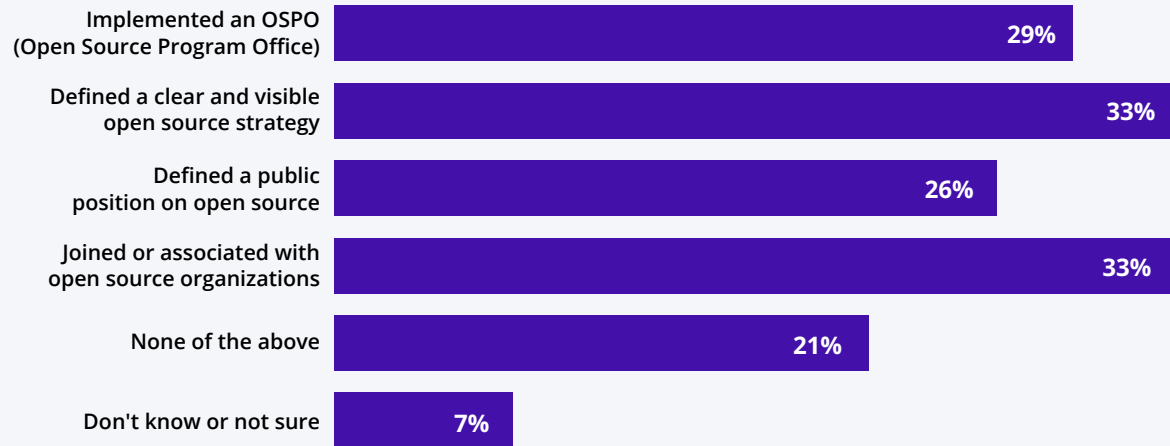
FIGURE 2 shows that 29% of organizations in our sample have implemented an OSPO, which indicates that almost one-third of organizations have established a dedicated office or team to manage their open source projects and strategies. This shows a recognition of the importance of open source in software development and innovation. 33% of respondents have defined a clear and visible open source strategy, indicating that about one-third of organizations have a well-defined approach to using OSS and contributing to open source projects. This suggests that these organizations are proactively embracing open source as part of their overall organizational strategy.

26% of respondents have defined a public position on open source, and 33% of respondents have joined or associated with open source organizations, such as foundations or communities. In addition to the 72% of organizations that have reported the actions above, 21% of respondents selected none of the options provided, indicating that their organizations have not yet taken any formal steps toward adopting or promoting open source technology. While 7% reported uncertainty on their open source journey; this could mean that these organizations are still evaluating their approach to open source or have not yet recognized its potential benefits for their business.

FIGURE 2

72% OF ORGANIZATIONS SURVEYED ENGAGE WITH OPEN SOURCE

Which of the following actions has your organization engaged in regarding OSS? (select all that apply)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q11, Sample Size = 156, Total Mentions = 233

Organizations are more likely to lean toward more permissive open source use policies than contribution policies

The descriptive statistics presented in **FIGURE 3** sheds light on the asymmetry in open source use and contribution policies within organizations. It is clear from the data that these policies can vary significantly, ranging from highly restrictive, where open source use and contribution are not permissible, to those that actively encourage both. Notably, 20% of the surveyed organizations have adopted a very permissive stance, allowing both open source use and contribution. Fortunately, only 3% of the organizations in our sample reported a complete prohibition of OSS usage and contribution, although it is essential to acknowledge that this figure could be higher outside our survey sample, as we did not include organizations that had no familiarity with OSS in our survey.

These findings underscore the nuanced landscape of open source adoption within organizations. While there is some symmetry in the policies, with a greater emphasis on permissive open source use policies compared with contribution policies, it is evident that there is room for improvement in aligning use and contribution

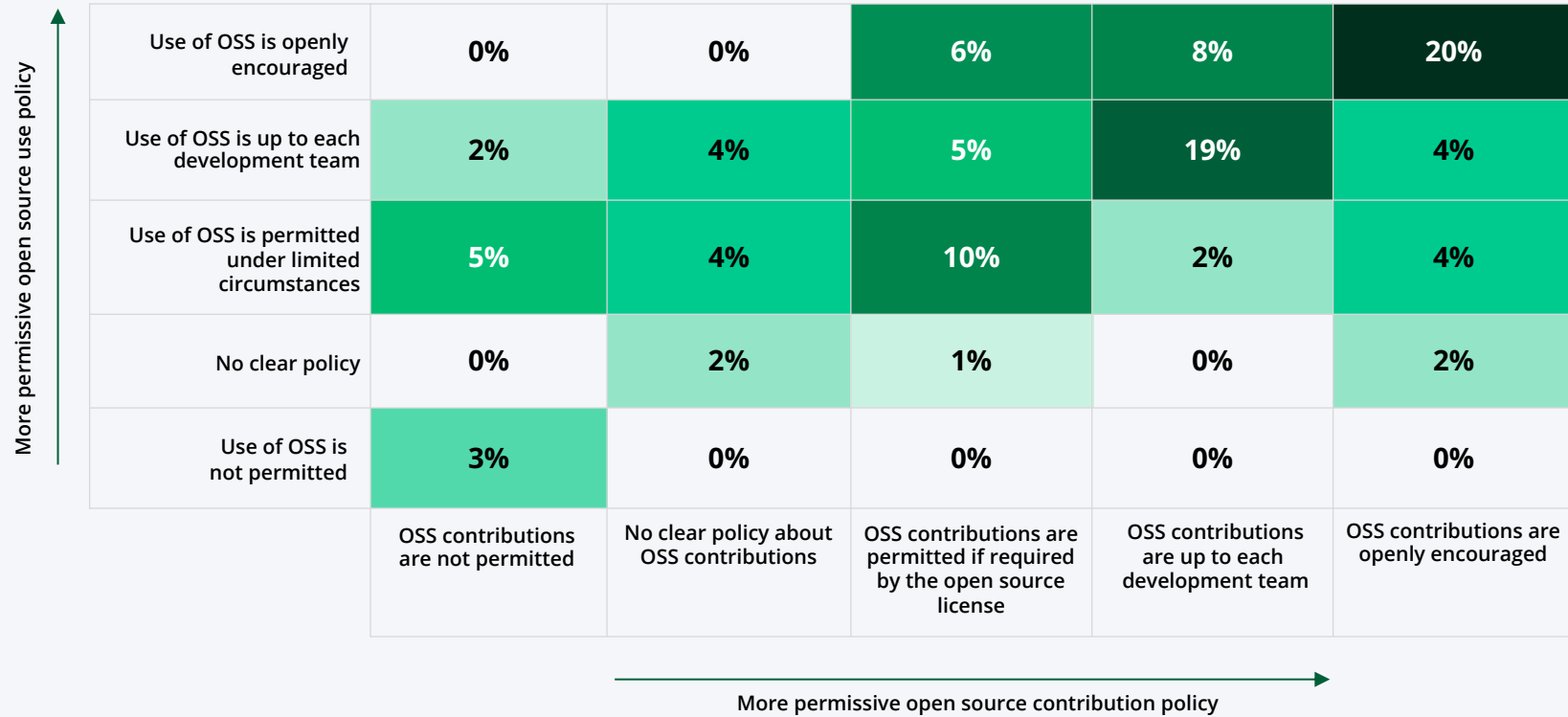
policies by making these policies more permissive. This asymmetry may reflect the differing attitudes and concerns organizations have regarding the consumption of OSS and contribution to open source projects. Addressing these disparities could lead to more consistent and effective open source strategies and increase the sustainability of the open source ecosystem.

Insights into the use of and contribution to different open source software technologies within organizations

FIGURE 4 compares the percentage of organizations using key OSS technologies with the percentage of organizations contributing to these same OSS technologies and shows the extent to which OSS technologies support business-critical activities. Open source software used by Japan parallels a pattern that we see worldwide. This pattern prioritizes technologies that enable cloud native computing, modern application development, and leading-edge technologies that are likely to have a significant impact on the competitive abilities of organizations. It is not surprising to see these technologies occupy the top seven use cases in **FIGURE 4**.

FIGURE 3

OPEN SOURCE IS ASYMMETRICAL WITH MORE PERMISSIVE OPEN SOURCE POLICIES AND STRICTER CONTRIBUTION POLICIES



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q13 and Q22, Sample size: 110 (DKNS excluded), cells add up to 100%

Cloud and container technologies, at 49% use and 40% contribution, is the leading use case and demonstrates the continuing importance of cloud native computing along with microservice-based architecture. Japan continues to experience growth in cloud computing because of the ease with which organizations can spin up distributed container-based environments through cloud service providers (CSPs). While the explicit focus on Kubernetes (20% use and 12% contribution) remains surprisingly low relative to other geographic regions, we would expect

this to change rapidly given the importance attached to cloud and container technologies. Linux also ranks seventh in **FIGURE 3** (34% use and 21% contribution), and this will also likely increase given its leadership status as a server operating system for cloud computing, supercomputing, embedded, and mobile operating environments.

Database and data management (38% use and 27% contribution) remains an important focal point for open source as it does

for the entire world. Data volumes are continuing to grow at exponential rates to facilitate a modern data-driven computing paradigm. This will correspondingly drive an increased focus on decisioning—which explains the importance of advanced analytics and data science (38% use and 42% contribution). Analytics and data science also represent a high point for OSS contribution in Japan.

Modern containerized application development, based on microservice architecture, is a leading use case (35% use and 22% contribution), and this is consistent with the emphasis on cloud computing, Linux, and data management. Service mesh and web assembly technologies continue to help mitigate the

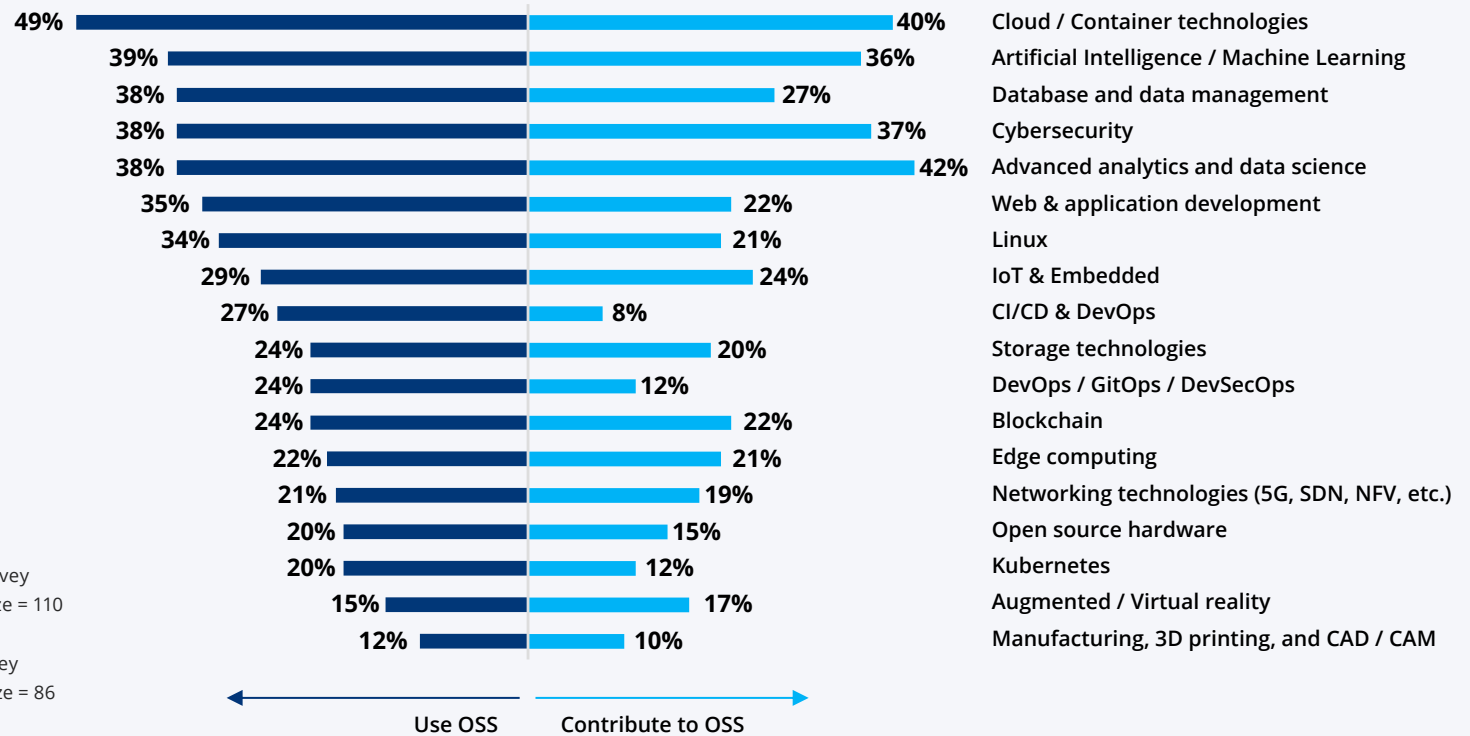
infrastructural complexity introduced by microservices. It is also reassuring to see a strong emphasis on cybersecurity (38% use and 37% contribution) given the mission-criticality of IT to most organizations.

Finally, AI and ML (39% use and 36% contribution) is the second most important OSS technology area for Japan. This is also consistent with how other regions view AI and ML and will benefit from the strong focus that Japan has on advanced analytics and data science. GenAI can provide immense value to organizations and can be transformative in how an organization communicates with its customers and addresses data-driven strategic and tactical needs.

FIGURE 4

OPEN SOURCE TECHNOLOGIES ARE USED FOR A WIDE VARIETY OF BUSINESS CRITICAL ACTIVITIES

In which of the following areas does your organization use / contribute to OSS? (select all that apply)



Source:

2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q16, Sample Size = 110 (DKNS excluded)

2023 World of OS: Global Spotlight Survey (data filtered for Japan), Q24, Sample Size = 86 (DKNS excluded)

Open source use

Trends in open source software use

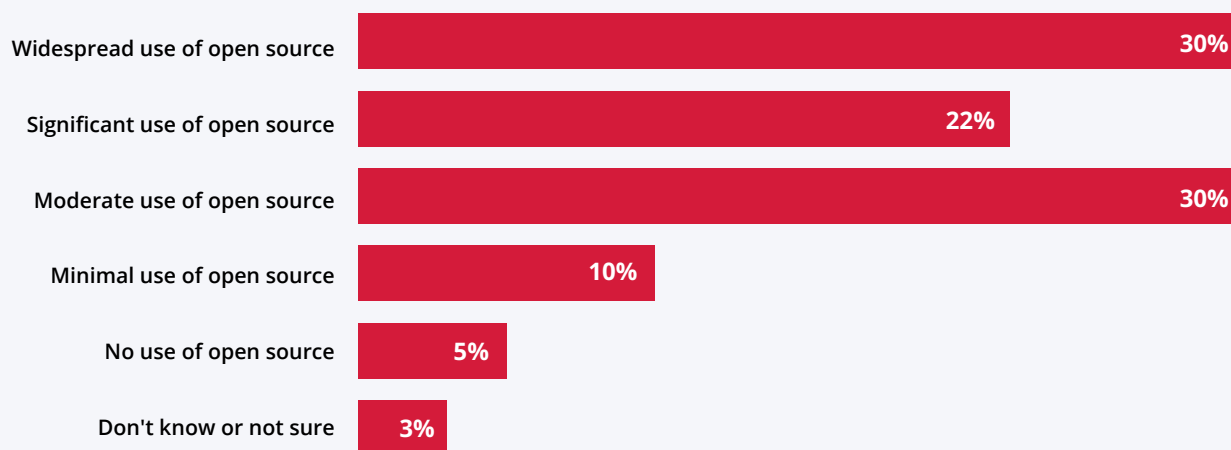
According to our sample in **FIGURE 5**, 82% of Japanese organizations surveyed utilize OSS at either a moderate, significant, or widespread level. Specifically, 30% report widespread use, 22% indicate significant use, and another 30% state moderate use. A minority, at 10%, report minimal use, with 5% not using OSS at all. This data underscores the profound influence and adoption rate of open source solutions within the Japanese business ecosystem, suggesting a strong inclination toward open innovation, cost-effective solutions, and collaborative software development in the region.

FIGURE 6 shows that a significant 62% of the Japanese respondents believe that OSS is more secure than its closed source counterpart. Meanwhile, 26% of the respondents do not share the same belief and think that OSS is not more secure than closed software. The picture is further nuanced by the results shown in **FIGURE 7**, where 31% of organizations with an OSPO require secure software development training. This penetration rate drops to 13% for those without an OSS initiative. While neither of these penetration rates is very high, formal training in secure software development should be required for most developers. The LF Training and Certification provides a comprehensive free online course and exam on exactly this topic.

FIGURE 5

82% OF ORGANIZATIONS USE OPEN SOURCE AT A MODERATE / SIGNIFICANT / WIDESPREAD LEVEL

How much does your organization use OSS? (select one)

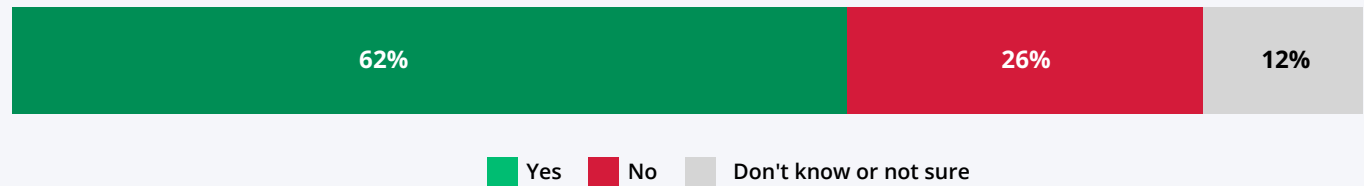


Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q12, Sample Size = 130

FIGURE 6

62% OF RESPONDENTS BELIEVE THAT OSS IS MORE SECURE THAN CLOSED SOFTWARE

Do you believe that OSS is more secure than closed source software? (select one)

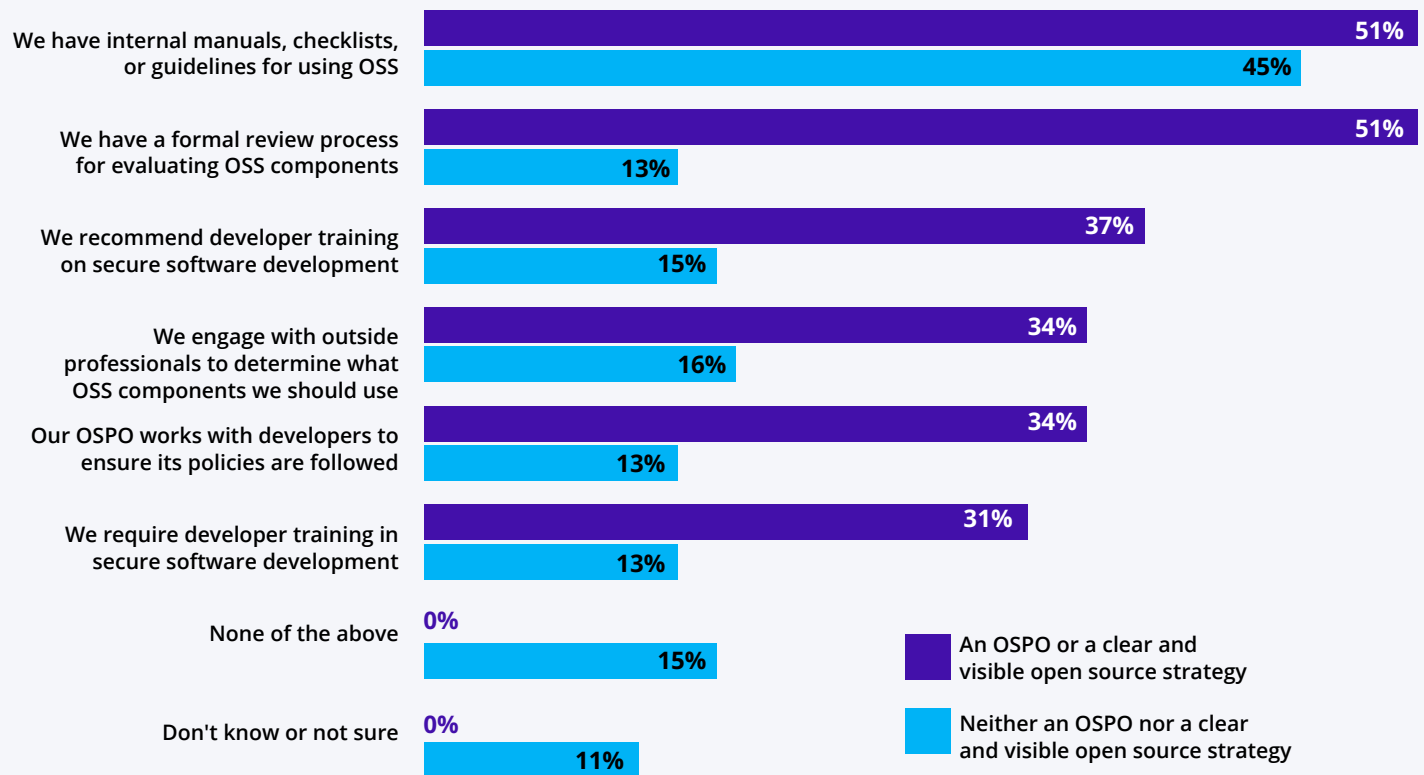


Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q21, Sample Size = 118

FIGURE 7

ORGANIZATIONS WITH AN OSS INITIATIVE ARE MORE LIKELY TO FOLLOW A RIGOROUS APPROACH TO OSS COMPONENT EVALUATION

What practices does your organization follow regarding the use of OSS? (select all that apply) by Which of the following actions has your organization engaged in regarding OSS? (select all that apply)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q14 by Q11, Sample Size = 114, Valid Cases = 114, Total Mentions = 217

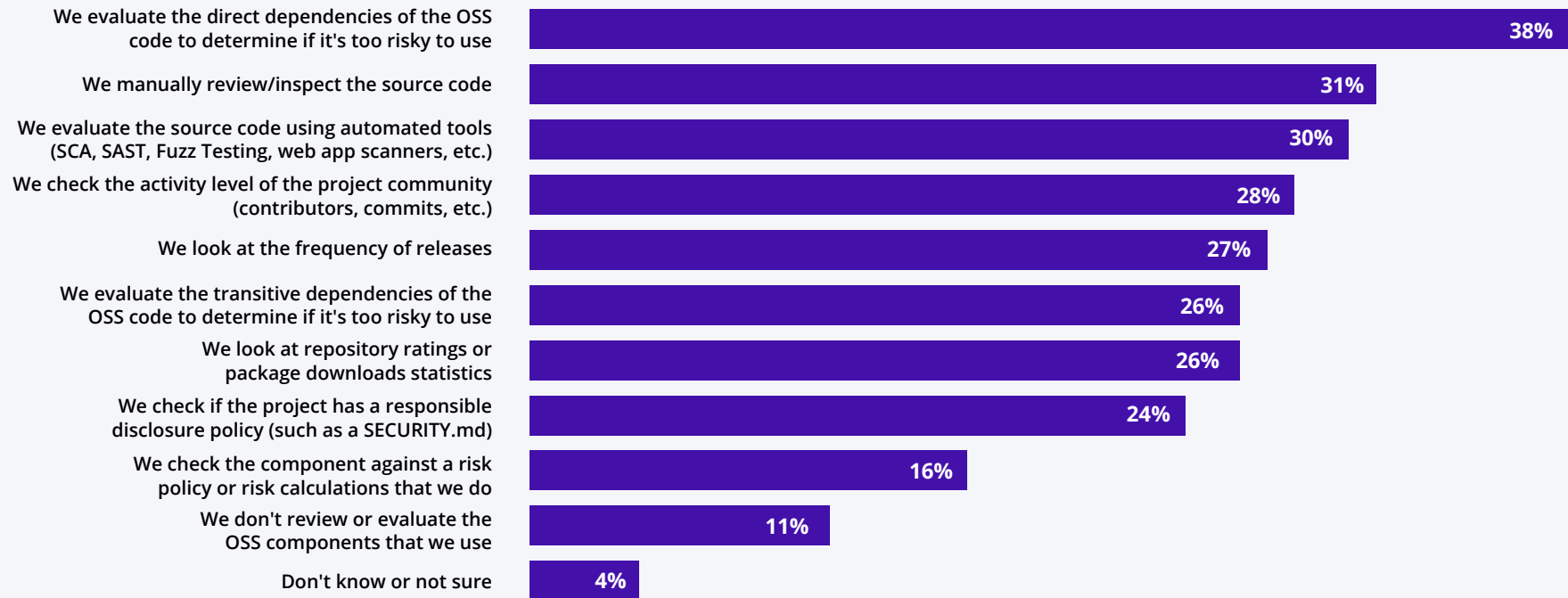
FIGURE 7 also delves into the practices of organizations in Japan when it comes to the evaluation and implementation of OSS components. This data is contrasted between organizations with a distinct OSPO or a clear open source strategy versus those without. The difference between the two groups is stark across the practices, where those with an OSS initiative are more likely to have actions in place to ensure OSS quality and safety for organizational use. However, there is not much difference between the most popular practice—having internal manuals, checklists, or guidelines—as almost half of the organizations report using these.

FIGURE 8 underscores the multifaceted approach Japanese organizations adopt when considering the integration of a new OSS component. The emphasis on both manual and automated code reviews, along with the consideration of community activity and software dependencies, demonstrates a balanced and thorough approach to ensuring the reliability, security, and compatibility of OSS components. However, the segment of organizations that do not review or evaluate their OSS components represents a potential vulnerability and highlights the importance of comprehensive OSS adoption practices.

FIGURE 8

THOROUGH CODE INSPECTION IS A LEADING ACTION WHEN USING A NEW OSS COMPONENT

What actions does your organization usually take before using a new OSS component? (select all that apply)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q15, Sample Size = 114, Valid Cases = 114, Total Mentions = 298

Factors limiting open source software use

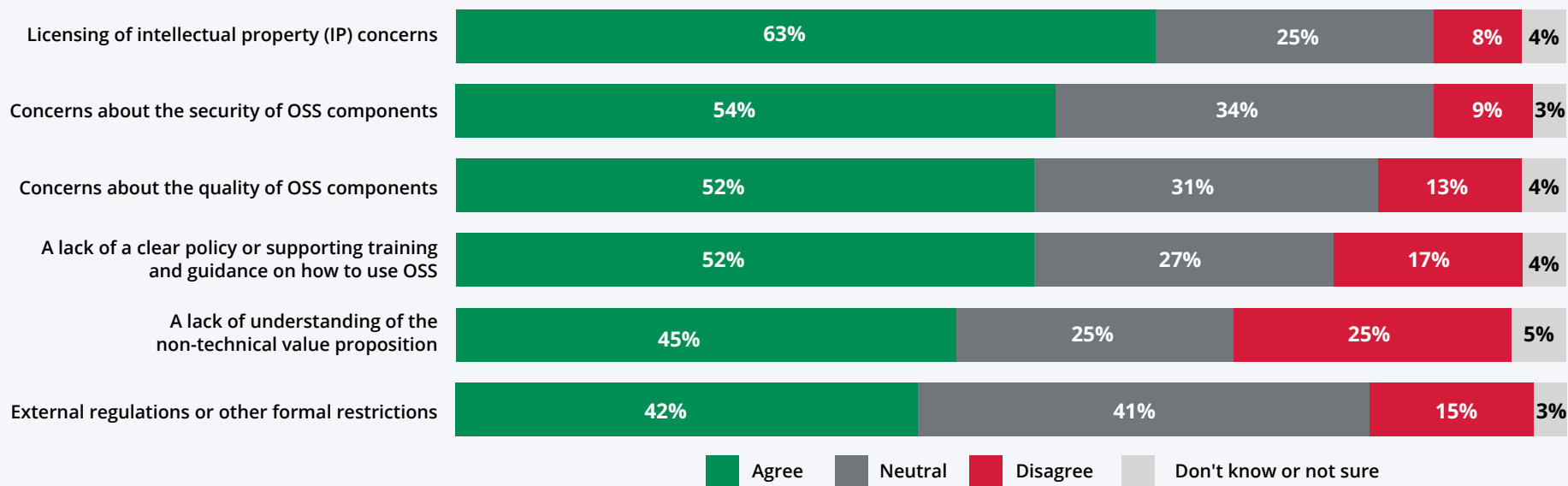
FIGURE 9 shows that organizations face various challenges when using OSS, ranging from regulatory compliance and lack of understanding to quality, security, and IP concerns. 63% of respondents agreed that licensing IP concerns limit their use of OSS. This suggests that organizations may be hesitant to adopt OSS due to concerns about protecting their IP or being exposed to potential legal liabilities. 54% of respondents agreed that concerns about the security of OSS components limit their use of OSS. This underscores the importance of ensuring that OSS components are secure and up to date, as well as addressing any vulnerabilities promptly.

52% of respondents agreed that a lack of clear policies and training limits their use of OSS. This suggests that organizations may need to establish clearer guidelines and provide training for employees on how to effectively utilize. 45% of respondents agreed that a lack of understanding of the non-technical value proposition limits their use of OSS. This indicates that decision-makers may not fully appreciate the benefits of OSS beyond technical aspects, such as cost savings, flexibility, improved organizational culture, and community involvement. However, many do realize the benefits, with 25% disagreeing with this point as an issue. Other concerns include a lack of clear policies and training, as well as external regulations. Addressing these challenges can help organizations overcome their limitations and fully leverage the benefits of OSS.

FIGURE 9

LICENSING OF IP IS THE LEADING LIMITATION TO ORGANIZATIONAL OSS USE

Do you agree or disagree that OSS use in your organization limited by:



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q18, Sample Size = 118

Solution paths to increase open source software use

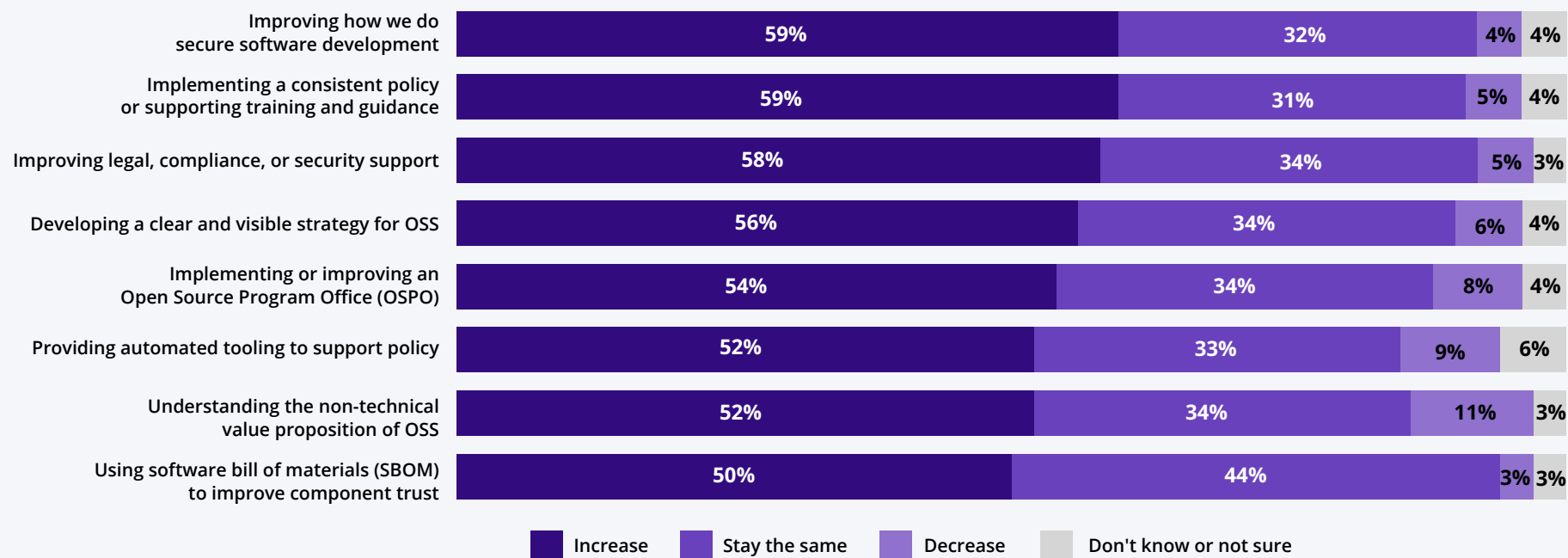
FIGURE 10 shows that Japanese organizations recognize multiple investment areas pivotal for elevating the use of OSS. The emphasis on secure software development, consistent policies, and training underscores the prioritization of security and standardized approaches. A significant 59% of respondents believe that enhancing secure software development practices would increase OSS use in their organizations. Equally ranked at 59%, consistent policy implementation and bolstering training

and guidance are perceived as influential in augmenting OSS use. Also just as important was the finding that 58% of organizations predict that bettering legal, compliance, or security support would drive OSS adoption. The data also highlights the importance of having clear strategies and understanding both the technical and non-technical values of OSS. While a majority see these investments as positive catalysts for OSS adoption, a considerable portion believes it might maintain the current usage level, indicating that these investments are also vital for retaining existing OSS practices.

FIGURE 10

MULTIPLE INVESTMENT AREAS WOULD INCREASE OSS USE

How much would OSS use change if your organization invested in the following:



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q19, Sample Size = 118

Open source contributions

Trends in open source software contributions

Contributions to OSS encompass a wide range of activities. Contribution is not limited solely to code submissions; it also encompasses actions such as opening issues and answering queries, contributing to documentation, and providing non-code assets, such as design elements (FIGURE 11).

FIGURE 12 sheds light on the meticulous steps Japanese organizations adopt when contributing to OSS, underscoring the balance between ensuring code quality and navigating legal and compliance landscapes. The emphasis on security and functional testing is commendable. However, there's room for improvement in areas such as documentation and SBOM development, which can elevate the overall quality, transparency, and security of contributions.

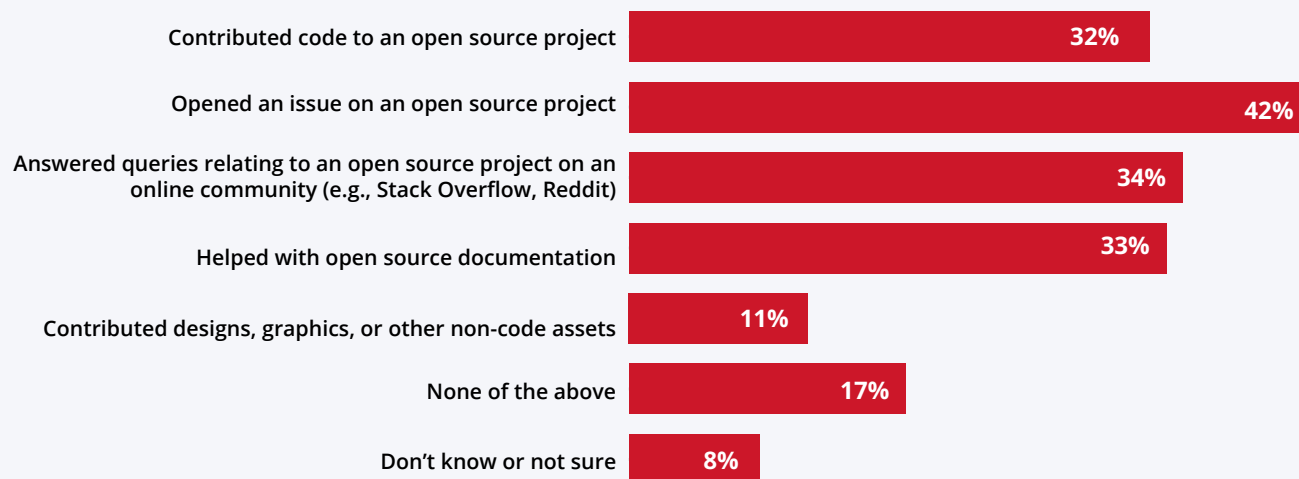
FIGURE 13 provides valuable insight into the allocation of developer time across different types of projects and their contributions. Our goal was to understand the time developers spend contributing at work to inner source projects, employer-supported projects, and third-party projects.

It is essential to highlight the diversity in the time commitment across the board. Developers' contributions can range widely, from devoting just one to four hours per week to contributing more than 40 hours per week. The line in FIGURE 13 shows the total hours contributed across the three project types for each hour range category. This implies that even developers with limited time can make a meaningful impact through consistent contributions. This shows that open source talent is being leveraged in various types of job functions and is not limited to full-time assignments.

FIGURE 11

OSS CONTRIBUTIONS ARE NOT LIMITED TO CODE CONTRIBUTION

Has your organization made any of the following OSS contributions? (select all that apply)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q25, Sample Size = 100, Total Mentions = 177

FIGURE 12

SECURITY AND QUALITY TESTING ARE COMMON IN OSS CONTRIBUTIONS BUT COMPONENT DOCUMENTATION HAPPEN ONLY IN 31% OF ORGANIZATIONS

What steps are followed for contributing OSS code in your organization? (select all that apply)

Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q23, Sample Size = 100, Total Mentions = 230

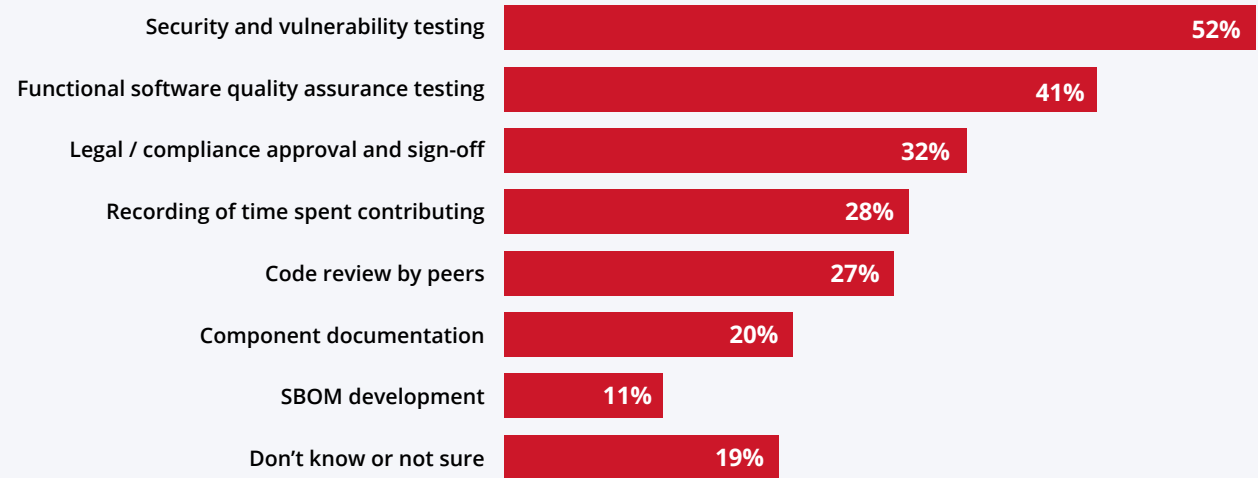


FIGURE 13

TIME SPENT ON CONTRIBUTIONS CAN RANGE FROM 0 TO MORE THAN 40 HOURS PER WEEK



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q30-32, Sample Size = 100

Factors limiting open source software contributions

In **FIGURE 14**, it appears that several factors limit organizations' ability to contribute to OSS. According to the survey results, fear of leaking IP (53%), legal or licensing concerns (54%), technology constraints and challenges (46%), and a lack of policy or training materials (47%) hinder their organization's OSS contributions. These findings suggest that Japanese organizations may prioritize protecting their IP and ensuring regulatory compliance over contributing to OSS projects. Additionally, they may require more resources, infrastructure, and knowledge to effectively participate in OSS development. While 45% of respondents consider a clear lack of monetary return on investment a barrier, 15% disagree with this statement. This suggests that a significant number of organizations

do not view the absence of direct financial gains as an important obstacle to their contributions. Addressing these diverse concerns will likely require a concerted effort from both within individual organizations and the broader Japanese tech industry to promote a culture of collaboration and sharing in software development.

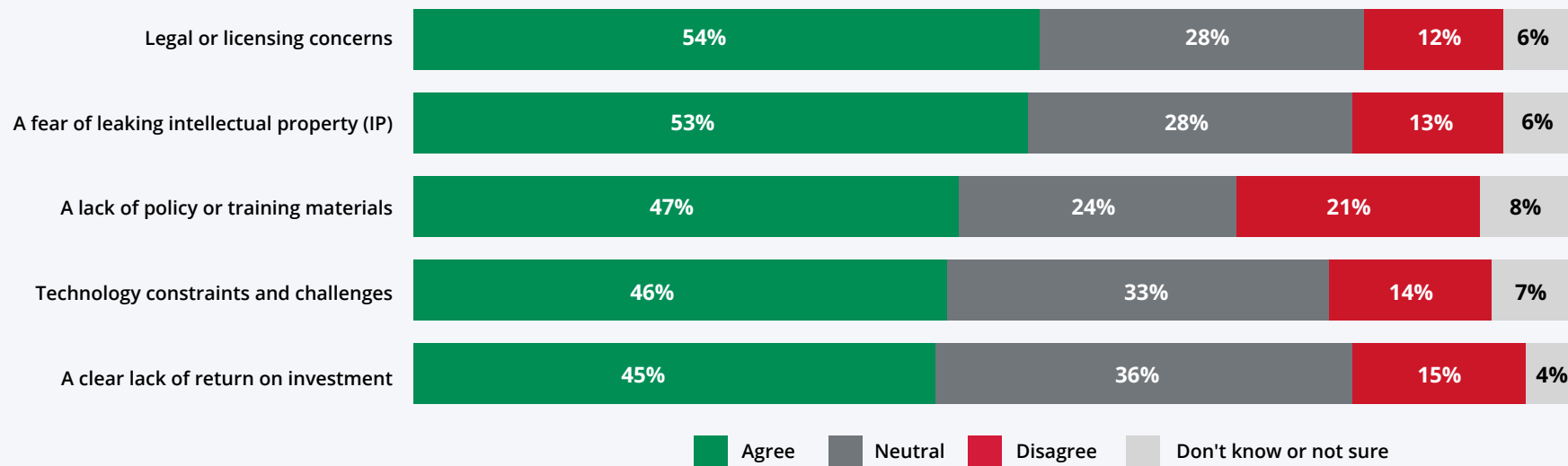
Solution paths to increase open source software contributions

When we shift the perspective and inquire about the areas deserving of resources or investment to foster increased open source contributions, several clear solution paths emerge (**FIGURE 15**). Foremost among these is open sourcing company products or internal tools, which ranks as the top priority at 64%. Addressing security concerns would be another critical avenue.

FIGURE 14

TOP CONCERNS ABOUT CONTRIBUTING INCLUDE LEGAL AND LEAKING IP ISSUES

Does your organization agree or disagree that its OSS contributions are limited by:



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q28, Sample Size = 111

Building on the earlier discussion of legal and licensing concerns, addressing these issues is crucial. A significant 57% of respondents agree that tackling licensing concerns would significantly increase contributions. This underscores the importance of legal clarity in encouraging organizations to engage more actively in open source initiatives. Additionally, providing clearer and more accessible policies for employees regarding open source contributions is essential. Many organizations currently lack well-defined open source contribution policies (FIGURE 3), which can act as a deterrent.

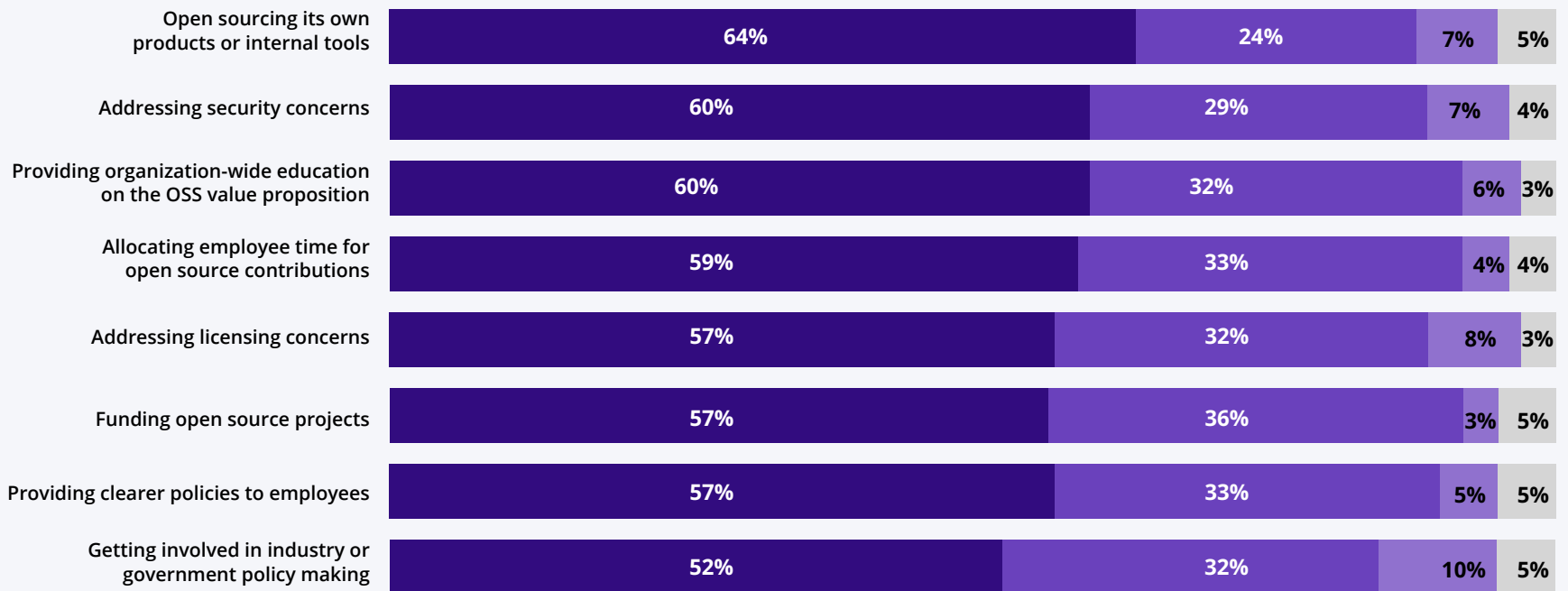
Clarity in this area empowers employees to participate confidently.

Educating the organization on the value of OSS is important (60%). While survey respondents recognize the high value associated with open source, it's essential to ensure that this understanding permeates throughout the organization. When management and other stakeholders grasp the significance of open source contributions, they are more likely to support and invest in these initiatives, preserving the roles of open source contributors within the company.

FIGURE 15

LEADING INVESTMENT AREA CONCERNS OPEN SOURCING AN ORGANIZATION'S OWN PRODUCTS AND TOOLS

How much would OSS contributions change if your organization invested in the following actions:



■ Increase ■ Stay the same ■ Decrease ■ Don't know or not sure

Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q29, Sample Size = 111

Individual contributions

Although our survey focused on organizations, the dedication of developers who willingly contribute to open source projects during their personal time, often without any financial compensation, may also provide important insight. **FIGURE 16** shows that 69% of respondents contribute to OSS in their personal time.

FIGURE 17 displays the various factors that motivate these individuals when deciding whether to engage in open source contributions in their personal time. Among these factors, the most significant is the fulfillment of a technology need, as it holds great influence for 52% of respondents and is somewhat influential for 30%. Other collective factors also play a role; 46% of respondents indicated that the enjoyment they derive from collaborating with their peers and actively participating in the community is a very influential motivator. Additionally, respondents feel a sense of responsibility toward the open source movement itself, viewing their contributions as a

way to give back and support the broader community.

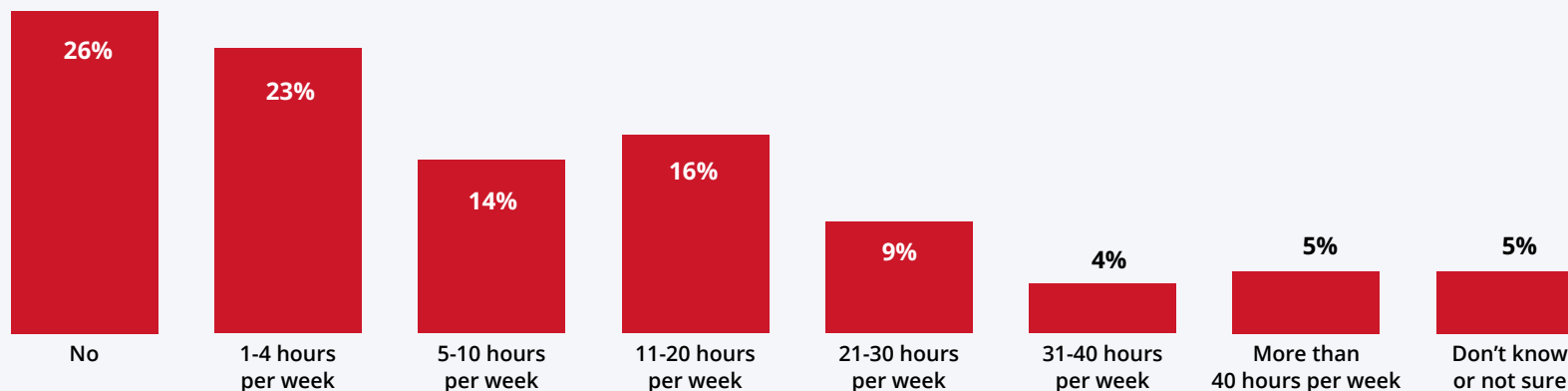
Individual factors are also strong motivators; 81% of respondents contribute in their personal time to improve their career opportunities, and 79% see it as an opportunity for learning and personal development. This blend of individual and collective motivations illustrates the diverse reasons why developers choose to contribute their personal time and expertise to open source initiatives.

FIGURE 18 reveals a notable disparity in the sense of belonging among Japanese contributors to third-party OSS projects compared with a broader group of contributors. While a majority in both groups feel a part of the projects they contribute to (60% and 63%), a significant portion of Japanese contributors feels excluded (28%). This sentiment might stem from various factors, such as cultural differences, communication barriers, or the nature of their contributions, and underscores the importance of fostering inclusive and welcoming communities in the OSS ecosystem.

FIGURE 16

69% OF RESPONDENTS SPEND SOME TIME CONTRIBUTING IN THEIR PERSONAL TIME

Do you spend any of your personal time contributing to open source projects? (select one)

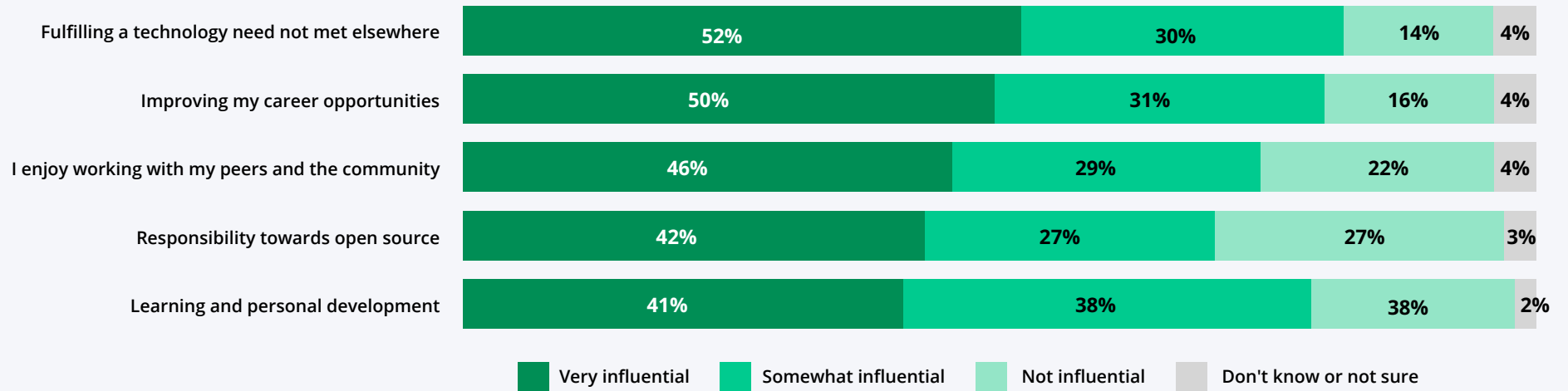


Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q33, Sample Size = 111

FIGURE 17

RESPONDENTS CONTRIBUTE DUE TO BOTH INDIVIDUAL AND COLLECTIVE BENEFIT

How influential are the following factors when considering whether or not to contribute your personal time to open source projects?



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q34, Sample Size = 111

FIGURE 18

MAJORITY OF RESPONDENTS FEEL PART OF THE PROJECTS BUT A SIGNIFICANT PORTION OF JAPANESE RESPONDENTS FEEL EXCLUDED

How do you feel about the third-party OSS projects you contribute to? (select one)

Source: 2023 World of OSS: Global Spotlight Survey, Q35, Sample Size = 83 (for data filtered for Japan, DKNS excluded) and 482 (DKNS excluded)

Japan



I feel part of the project | I neither feel nor not feel part of the project | I do not feel part of the project

Global Average



Value proposition of open source

FIGURE 19 illuminates the overwhelmingly positive sentiment toward the value of OSS in organizations within Japan. With more than two-thirds of respondents acknowledging its significance, it is evident that OSS plays a pivotal role in the strategic and operational facets of many organizations. While a minority remains neutral or unsure, it is clear that the open source movement has established itself as a key driver in the technology landscape of Japan.

Benefits of open source software use

The findings in **FIGURE 20** suggest that using OSS can bring various benefits to an organization. Improving productivity (66%), making the organization a better place to work (62%), and lowering the cost of software ownership (60%) are the top three benefits that are always or often achieved through OSS use. Additionally, less development time to market, lower cost of IT operations, improved software quality, improved security, and facilitating innovation are significant advantages of using OSS. Overall, the findings suggest that OSS can help Japanese organizations achieve

their goals by providing cost-effective, high-quality solutions that promote innovation and improve productivity.

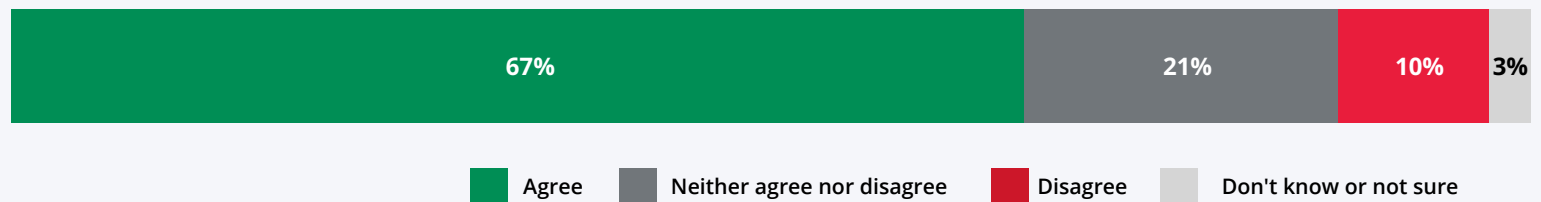
FIGURE 21 portrays a largely positive outlook on the utility of OSS in organizations within Japan, with a dominant 50% seeing more benefits than costs. However, a not-insignificant percentage sees it the other way around or believes the two to be balanced. This emphasizes the importance of a well-informed strategy when adopting and implementing OSS to ensure maximum benefits and minimize potential costs.

FIGURE 22 paints a favorable picture of the growing importance and perceived value of both using and contributing to OSS in organizations in Japan. The majority recognize an upward trend in the benefits they accrue from both of these aspects. While the use of OSS shows a slightly higher increase in value compared with contributions, the figures for both are notably positive. Organizations are not just passive users but are actively engaging in and benefiting from the open source ecosystem.

FIGURE 19

67% OF RESPONDENTS AGREE THAT OSS IS VALUABLE TO THEIR ORGANIZATION

To what extent do you agree or disagree that OSS is valuable to the future of your organization? (select one)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q36, Sample Size = 111

FIGURE 20

OSS USE DELIVERS IMPROVED PRODUCTIVITY TO ORGANIZATIONS

How often does using OSS deliver the following benefits in your organization?

Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q17, Sample Size = 114

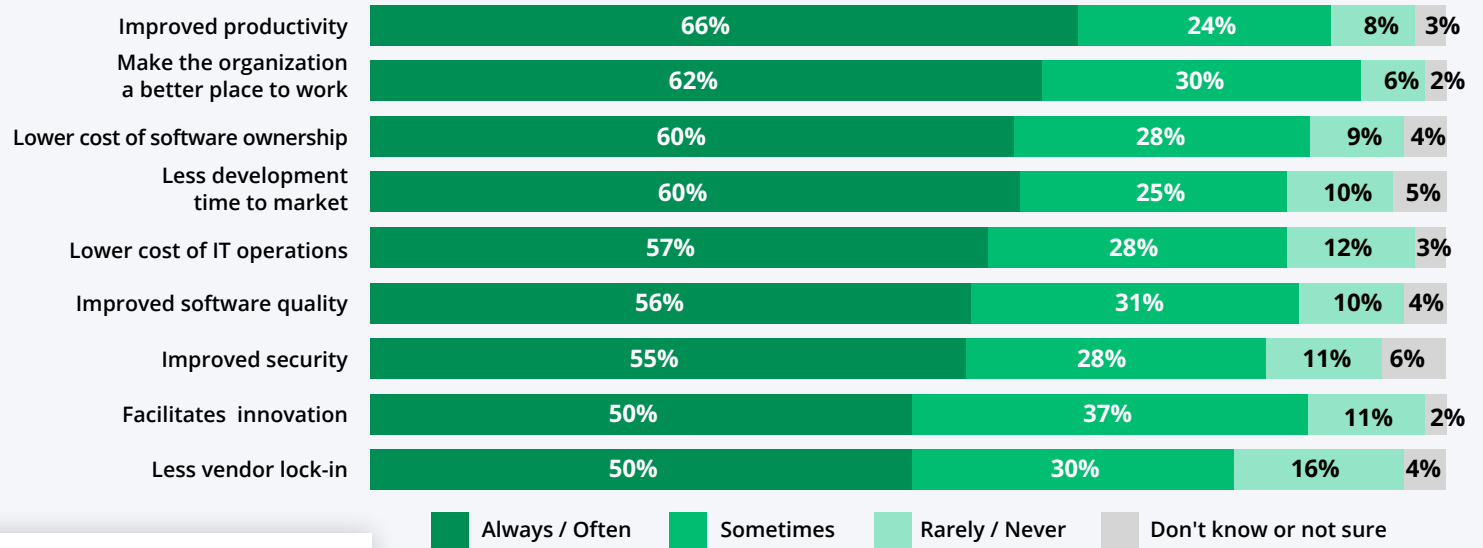
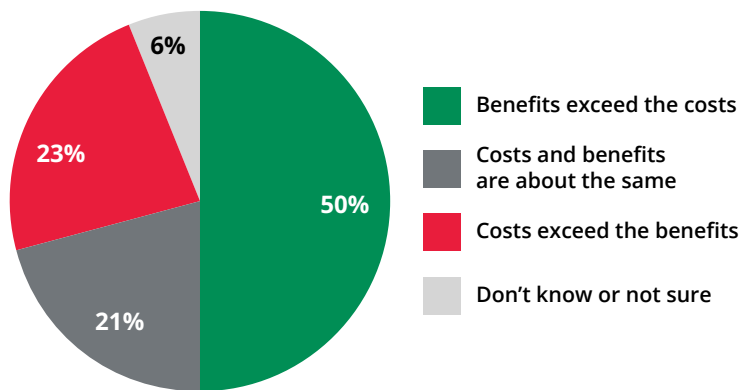


FIGURE 21

BENEFITS EXCEED THE COSTS OF OSS USE IN HALF OF ORGANIZATIONS SURVEYED

Which of the following statements best characterizes your organization's use of OSS? (select one)



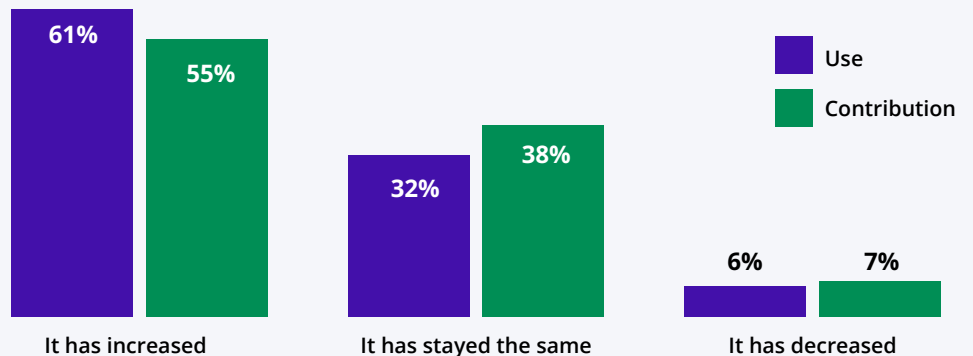
Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q42, Sample Size = 114

FIGURE 22

INCREASING VALUE IS ASSOCIATED WITH OSS USE AND CONTRIBUTIONS

Over the last year, how has the business value your organization derives from OSS use changed? (select one)

Over the last year, has the overall benefits your organization derives from OSS contributions changed? (select one)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q20, Sample Size = 109 (DKNS excluded)
2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q27, Sample Size = 91 (DKNS excluded)

Benefits of open source software contributions

The rationale behind contributing to open source projects may not always be immediately apparent to organizations, but there are numerous tangible benefits that such contributions can bring. These advantages encompass not only monetary gains but also improvements to an organization's work environment and the broader industry landscape.

We can see the results in **FIGURE 23**. Almost half (49%) think that contributions always or often make their organizations a better place to work, fostering teamwork, skill development, and a sense of community among employees. Many organizations also see contributing to open source as a moral obligation, reflecting a commitment to the principles of transparency, collaboration,

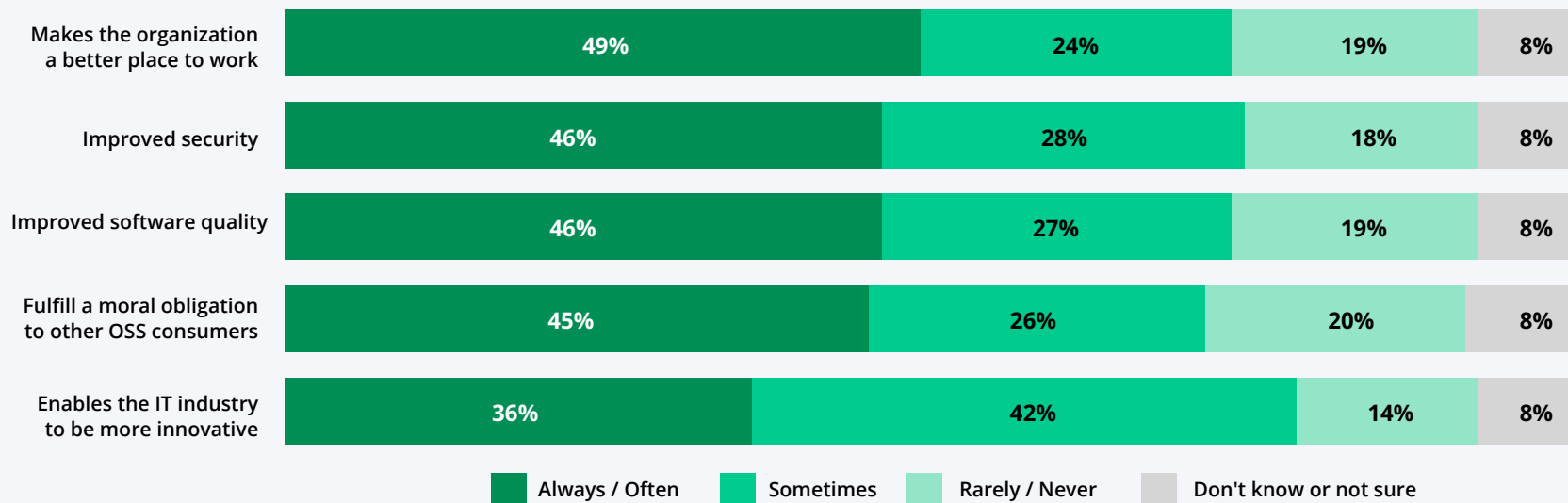
and giving back to the community. Additionally, improved software quality resulting from contributions can be directly tied to economic value for organizations. High-quality software reduces maintenance costs and enhances user satisfaction and can lead to increased revenue.

Lastly, contributions aimed at enhancing the security of open source projects are crucial for the long-term health of these projects, protecting an organization's digital assets and reinforcing overall trust in open source solutions. These diverse benefits underscore the multifaceted advantages of open source contribution, appealing to the economic interests and the broader values of organizations, ultimately adding to the collective progress and vitality of the open source ecosystem and the technology industry as a whole.

FIGURE 23

OSS CONTRIBUTIONS DELIVER MULTIPLE BENEFITS INCLUDING IMPROVED SECURITY AND SOFTWARE QUALITY

How often do OSS contributions in your organization deliver the following benefits:



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q26, Sample Size = 100

Priorities for the future

Priorities in investment area

FIGURE 24 highlights a diverse set of areas where stakeholders believe investments in open source should be directed in Japan. The top priorities include bolstering the commercial open source startup ecosystem, pushing for global technology standards in OSS, and encouraging government adoption. These insights can be instrumental for policymakers, investors, and the OSS community in strategizing future growth paths.

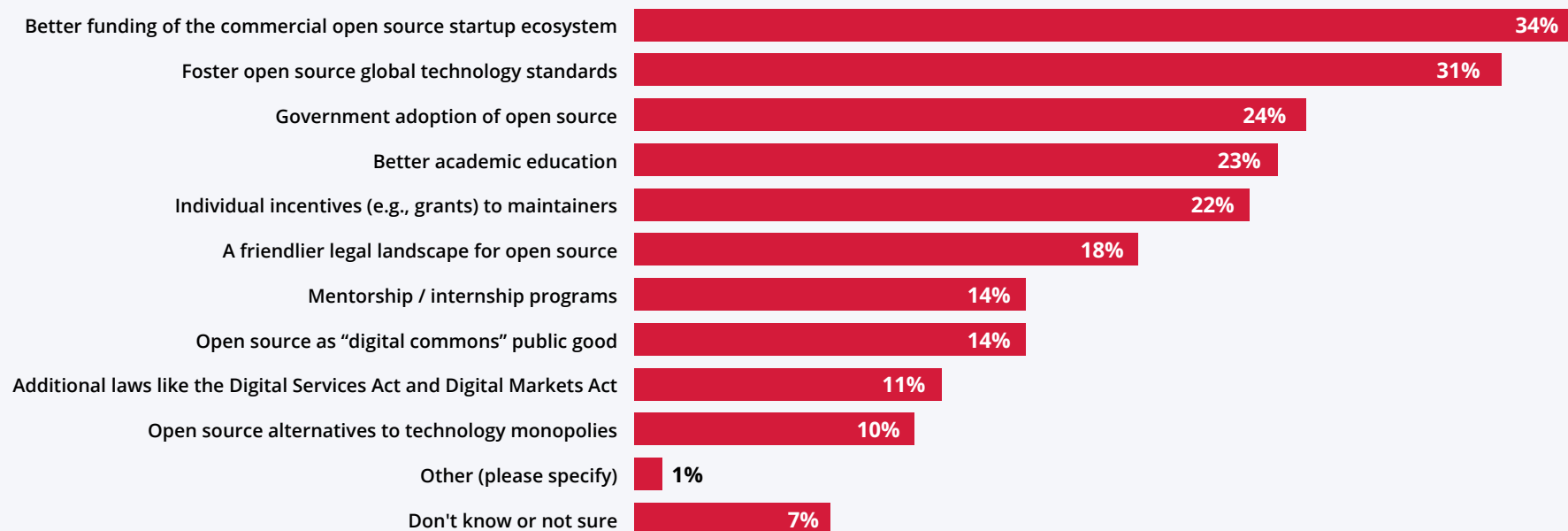
Technologies that factor into future open source software use and contributions

We asked organizations which open source technologies are most valuable to the future of their industry. The intent was to identify and initiate discussions on how best to support these technology areas. **FIGURE 25** indicates that three technology areas warrant discussion: advanced analytics (AA) and data science (31%), artificial intelligence / machine learning (AI / ML) (30%), and cloud / container technologies (29%).

FIGURE 23

FUNDING FOR THE COMMERCIAL OSS STARTUP ECOSYSTEM SHOULD BE THE LEADING INVESTMENT AREA

In which areas do you think there should be further investment in open source across your geographic region? (select between one and three responses)



Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q41, Sample Size = 111, Total Mentions = 231

In the context of Japan, it seems advanced analytics receive a similar amount of attention as AI / ML. This is important because of the complex AA technology involving neural networks that makes GenAI work. While GenAI is truly remarkable in what it enables, the real advances will come from the intersection of GenAI and AA. This is because AA has significant experience in forecasting, decisioning, and closed-loop systems that learn. Therefore, the combination of GenAI and AA will enable far more reliable data-driven decisions that represent a game-changing approach to supporting customers and competitive decision-making. The data shows that Japanese respondents are likely aware of this and can secure a competitive advantage in the space.

AI / ML is now showing up frequently as a key technology in LF

Research surveys. AI / ML factors heavily in to organizational hiring plans, is a high-growth technology area, and is an area targeted by organizations for OSS development.³ The challenge with AI / ML is determining exactly how the community can add value. An upcoming research report on the state of open source in GenAI will be published in 2023 Q4.

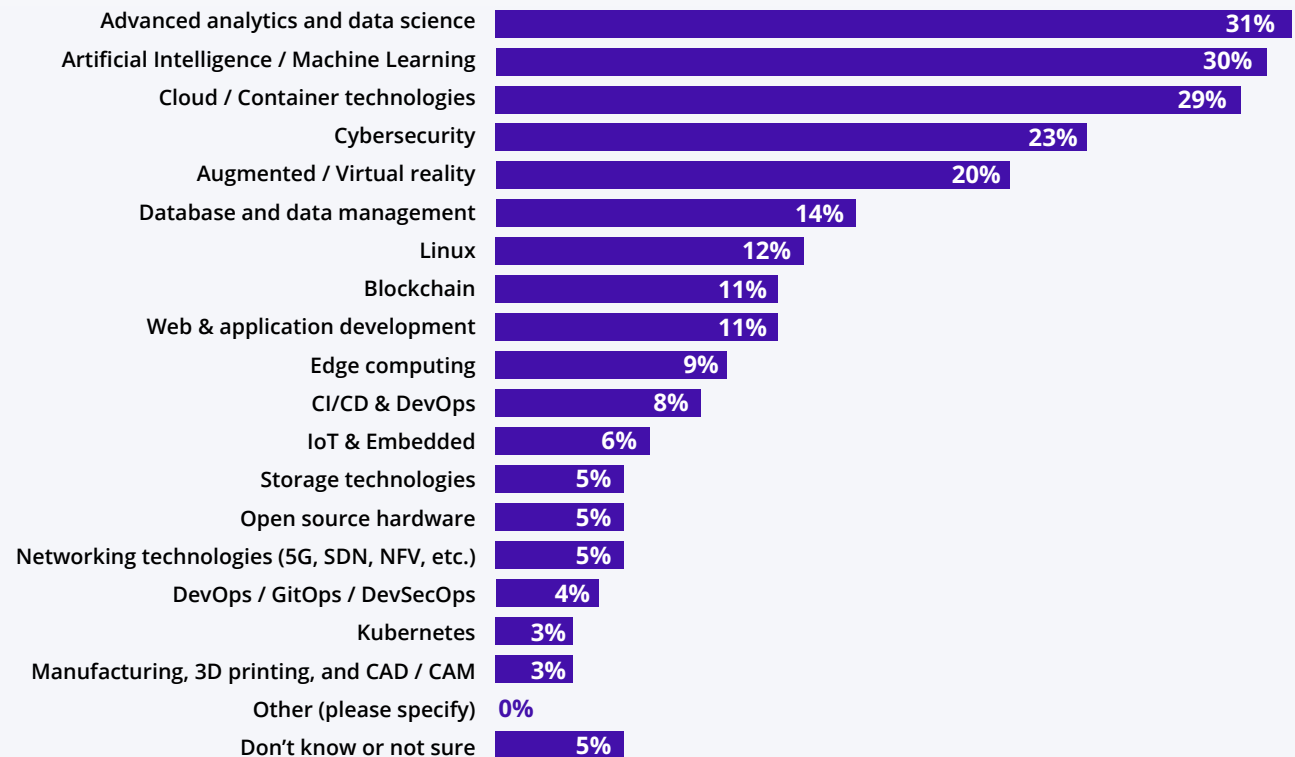
Cloud and container technologies continue to be a strong focal point for open source, judging by the lengthy list of CNCF incubating and graduated projects and the high levels of interest and participation in these projects. The success of cloud service providers in bringing cost-effective modern full-stack cloud native capabilities to organizations of all sizes is also proof that this is the path forward.

FIGURE 25

DATA SCIENCE AND AI / ML FACTOR PROMINENTLY INTO FUTURE ORGANIZATIONAL PLANS

Which open source technologies do you feel are the most valuable to the future of your industry? (select between one and three responses)

Source: 2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q38, Sample Size = 111, Total Mentions = 257



Conclusions and actionable insights

The current state of open source software use and contribution

To conclude, the open source landscape both globally and in Japan is marked by the persistence of asymmetrical use and contribution policies, which reflect the various attitudes and strategies of organizations. Additionally, disparities exist in the gaps between open source technology use and contribution, underscoring the need for more comprehensive strategies. Regarding open source use, some organizations may lag in implementing best practices for safe usage. While it's evident that organizations perceive value in contributions, it's noteworthy that this value encompasses both non-monetary benefits and those tied to economic gains. This multifaceted value proposition underscores the diverse motivations for contributing to open source projects. However, contributing to open source is not without its challenges. These barriers extend beyond a simple lack of monetary return and encompass a range of factors, including legal and IP concerns, organizational policies, and resource constraints. The open source ecosystem is dynamic and diverse, characterized by a complex interplay of policies, practices, motivations, and challenges.

Open source program offices can help organizations navigate the open source landscape

Establishing an OSPO is an excellent way to formalize and structure an organization's open source efforts. OSPOs can provide clear policies and guidelines to employees, fostering a culture of responsible open source engagement. They can also address legal and licensing concerns, ensuring compliance with open source licenses. OSPOs can play a pivotal role in increasing

an organization's contributions to open source projects. By providing clear policies, resources, and support, OSPOs empower employees to contribute confidently. Organizations need not navigate the open source landscape alone. Resources such as those offered by the [TODO Group](#) may be invaluable. They provide guidance on setting up and managing OSPOs, including best practices and case studies. Such a strategy ensures that organizations follow the necessary steps and fosters a culture of collaboration, compliance, and contribution, ultimately benefiting both the organization and the broader open source community.

Better funding for the open source startup ecosystem should be prioritized

In conclusion, the insights drawn from our research paint a comprehensive picture of the pathways and priorities essential for fostering increased open source contributions, specifically in Japan. Our data underscored the importance of directing investments in Japan toward strengthening the commercial open source startup ecosystem, advocating for global technology standards in OSS, and promoting government adoption. These priorities are instrumental for policymakers, investors, and the OSS community in charting strategic paths for future growth.

While acknowledging that economic headwinds are at play that divert attention from these efforts, we hope this report serves as evidence that the open source ecosystem is deserving of a special focus in resources and investment. If you are interested in further discussions around open source innovation as a potential lever for economic recovery, read our [report⁴](#) on the key takeaways on the topic. Thank you for reading through and being part of the conversation.

About this study

This study is based on a web survey conducted by the LF and its partners in 2023 from April to June. The survey's goal was to provide a global perspective on the state of open source. In the following, we present the study methodology and the demographics of the respondents. From a research perspective, it was important to reduce any perception of sample bias and ensure high data quality. We handled the reduction of sample bias by sourcing our usable sample from the LF membership, partner communities, social media, and a third-party panel provider. We addressed data quality through extensive pre-screening, screening criteria, and data quality checks to ensure that

respondents had sufficient open source familiarity and professional experience to answer questions accurately on behalf of the organization they worked for.

We collected survey data from end-user organizations, IT vendors and service providers, and nonprofit, academic, or government organizations. Respondents spanned many vertical industries and companies of all sizes, and we collected data from geographies including the Americas, Europe, and Asia Pacific. In this specific report, we filtered our data to only include responses from Japan.

Methodology

Survey screening involves the use of four variables to validate the respondent. The respondent needed to answer all the demographic questions.

- The respondent had to be at least somewhat familiar with how their organization uses and contributes to OSS.
- The respondent needed to self-identify as a real person willing to share their OSS experience and perceptions.
- The respondent needed to be able to speak for themselves and the department, organization, or industry they are working for.
- The respondent could not be “unemployed and not currently looking for work,” a full-time student, or retired.

A total of 2,165 candidates started the survey. There were 1,249 candidates that we disqualified due to the screening criteria outlined above, and 916 answered a significant number of survey

questions or completed all of them. The margin of error for this sample size was $\pm 2.7\%$ at a 90% confidence level. Regarding the data filtered for Japan and included in this report, 156 qualified respondents started the survey and 111 respondents made it to the end. The margin of error for the Japanese data is at most $\pm 7.8\%$ at the 90% confidence level. To geographically filter the data, we used Question 5: “In which country or region does your organization have its headquarters?” We only included respondents in this report who answered “Japan” for this question. Please see the Demographics section for the geographical distribution of the worldwide survey.

Although respondents needed to answer nearly all questions in the survey, there were times when the respondent was unable to answer one because it was outside the scope of their role or experience. For this reason, we added a “Don't know or not sure” (DKNS) response to the list of responses for nearly all questions. However, this creates a variety of analytical challenges.

One approach was to treat a DKNS just like any other response so that the percentage of DKNS responses is known. The advantage of this approach is that it reports the exact distribution of data collected. The challenge with this approach is that it can distort the distribution of valid responses, i.e., responses where respondents could answer the question.

Some of the analyses in this report exclude DKNS responses. This is because we can classify the missing data as either missing at random or missing completely at random. 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 percentage values of the remaining responses. Where we have elected to exclude DKNS data, the footnote for the figure includes the phrase “DKNS responses excluded.”

The percentage values in this report may not total exactly 100% due to rounding.

Survey design

The 2023 World of Open Source: Global Spotlight Survey comprised 43 questions, including the themes of open source use, contribution, value, and sustainability. For information about access to the 2023 World of Open Source: Global Spotlight project and survey instrument, see the Data.World access heading at the end of this section.

Demographics

The demographic data in **FIGURE 26** illustrates the composition of the Japan sample and the geographic distribution of the worldwide survey. The first chart shows that 17% of the sample came from organizations headquartered in Japan.

The type of organization, shown in the second chart, contains the distribution of IT vendors / service providers and end-user organizations. End-user organizations are companies that use IT products and services to support their business deliverables. We also included nonprofits, foundations, academic institutions, and government agencies in the end-user category.

The third chart in **FIGURE 26** shows company size as measured by the number of employees. We aggregated the seven categories originally presented in this question into the three categories shown here. The intention was to ensure that each of these three categories had enough responses so that, when cross-tabbed, the results would be reliable.

The fourth chart shows the role that best describes the respondent. Approximately 68% of the respondents were in technical roles.

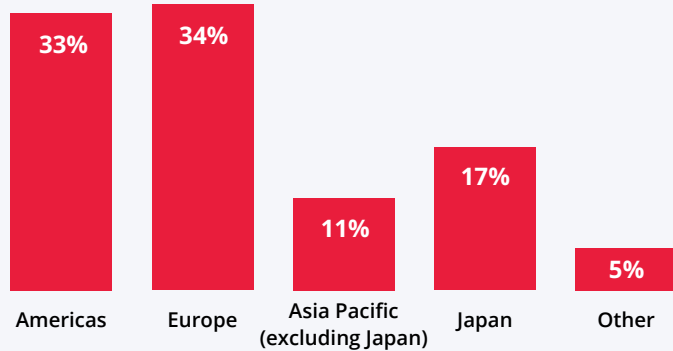
Data.World access

Linux Foundation Research makes each of its empirical project datasets available on Data.World. Included in this dataset are the survey instrument, raw survey data, screening and filtering criteria, and frequency charts for each question in the survey. Linux Foundation Research datasets, including this project, can be found at data.world/thelinuxfoundation.

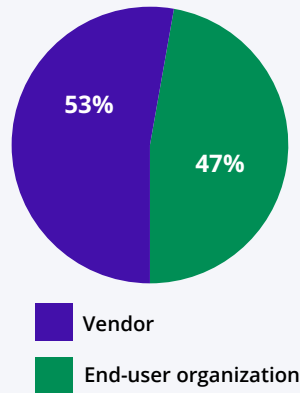
FIGURE 25

SELECTED DEMOGRAPHICS FROM THE 2023 WORLD OF OS: GLOBAL SPOTLIGHT SURVEY

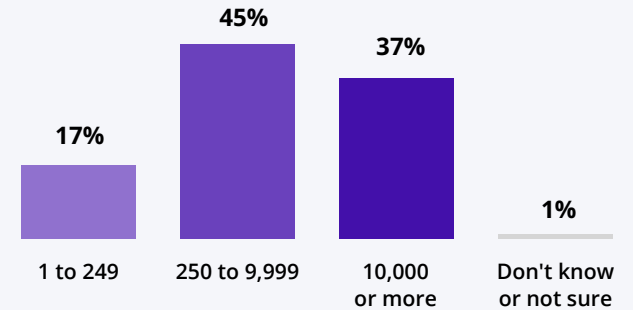
In what country or region does your organization have its headquarters? (select one)



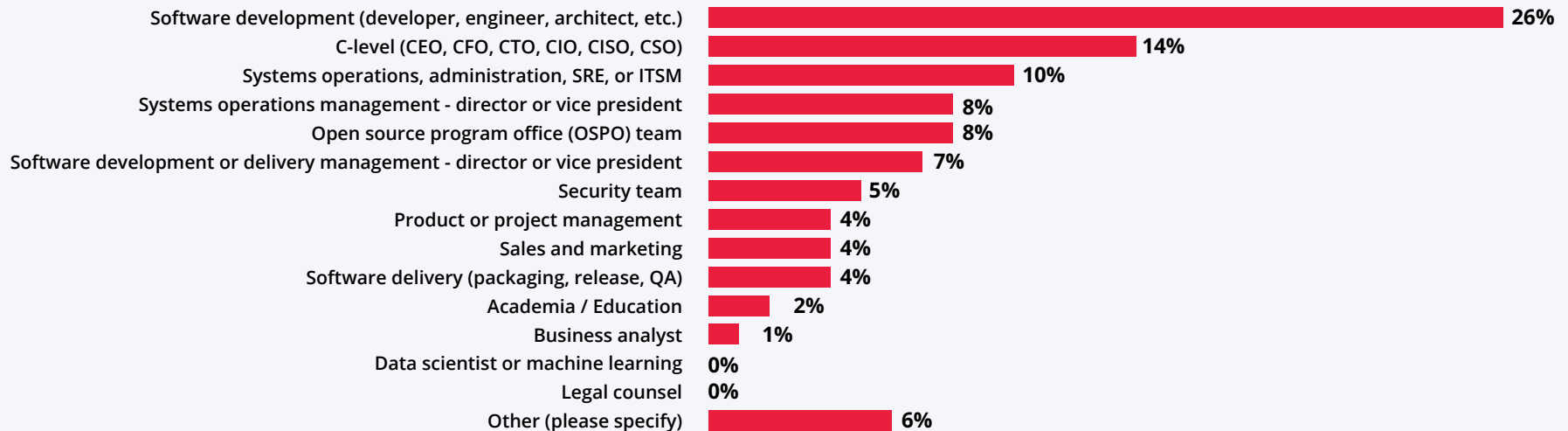
What option best describes the organization you work for? (select one)



Please estimate how many employees your organization has worldwide. (select one)



Professionally, which role do you most closely identify with? (select one)



Source:

2023 World of OSS: Global Spotlight Survey, Q5, Sample Size = 916

2023 World of OSS: Global Spotlight Survey (data filtered for Japan), Q7, Q10, Q6, Sample Size = 156

Acknowledgments

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Endnotes


- 1 Colin Eberhardt, Graham Odds, and Matthew Dunderdale, "Europe Spotlight 2023: Exploring the State of European Open Source Innovation, Opportunities, and Challenges," foreword by Gabriele Columbro, The Linux Foundation, September 2023.
- 2 Adrienn Lawson and Stephen Hendrick, "Global Spotlight 2023: Survey-based insights into the global landscape of open source trends, sustainability challenges, and growth opportunities", foreword by Sachiko Muto, the Linux Foundation, October 2023.
- 3 Jason Perlow and Stephen Hendrick, "2023 State of Tech Talent Report," foreword by Clyde Seepersad, The Linux Foundation, May 2023.
- 4 Cailean Osborne, "Open Source Innovation as a Potential Lever for Economic Recovery: Insights from a Linux Foundation Challenge Session at the 9th World Open Innovation Conference," foreword by Henry Chesbrough, The Linux Foundation, March 2023.

Founded in 2021, [Linux Foundation Research](#) explores the growing scale of open source collaboration, providing insight into emerging technology trends, best practices, and the global impact of open source projects. Through leveraging project databases and networks, and a commitment to best practices in quantitative and qualitative methodologies, Linux Foundation Research is creating the go-to library for open source insights for the benefit of organizations the world over.

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December 2023



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