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Europe Spotlight 2023

Exploring the State of European Open Source Innovation,
Opportunities, and Challenges

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Europe Spotlight 2023

Open source is a catalyst for social change, enabling low-cost access to infrastructure essential to solving some of the world's most pressing challenges, such as climate change and social inequality.



57% of respondents from organisations of all types indicate that the value of open source has increased over the last year, suggesting accelerating momentum.



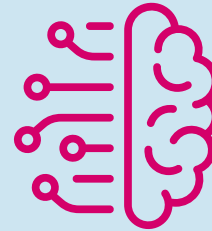
Open source is widely viewed to be vital to the future of industry sectors by 91% of survey respondents, 72% of which are outside of cross-industry IT vendors.



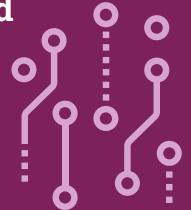
The most widely cited benefits of open source include improved productivity, innovation, and talent attraction.



Open source has played a significant role in generative artificial intelligence (AI), with open source equivalents to restrictive solutions emerging rapidly.



Open source communities optimised and extended AI models, significantly reducing the barrier to entry and allowing models to be trained and run on community hardware at minimal cost.



In the public sector, the perceived value derived from open source appears to have stagnated, with 53% indicating that it has stayed the same, compared with just 25% in other industries.



The gap between the value of open source use and contribution remains, with the greatest value being derived from lower cost of ownership, innovation, and reduced vendor lock-in.



The business value of using open source software (OSS) is well understood, and that value is increasing, according to 59% of respondents.



Open source is created by passionate developers. 62% of survey respondents make some form of weekly contribution in their personal time.



Improved security ranks lowest as a benefit of open source by survey respondents, and contribution as a way to improve security is least likely to be considered.



There is a lack of maturity when it comes to safely using OSS. Software bills of materials (SBOMs) are not well understood as a security best practice.



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Foreword

As we unveil the World of Open Source: Europe Spotlight 2023 report, our second edition, I'm filled with a sense of awe and responsibility.

I would be lying if I said that, when I started contributing to a small open source project over 15 years ago in Italy, I had any idea of the extent of the impact this movement would have in Europe, and globally. Nowadays, it is clear that open source is not just code, it's a unique and somewhat magical engine for collective and community-driven innovation. A community that thrives on collaboration, breaks down silos, and effectively pushes the boundaries of what's possible.

What makes this moment electrifying is the unprecedented convergence of technology, talent, and timing. Open source is no longer a "nice-to-have" but a "must-have". And, beyond its innovation potential, open source has the potential to be a catalyst for social change in Europe and beyond. It can democratise access to groundbreaking new technologies such as AI to foster inclusion and even contribute to solving some of the world's most pressing issues, including climate change and social inequality.

Take AI for example, which gained massive momentum in early 2023 with the advent of and mass access to large language models (LLMs). In just a few months, we went from a few large players dominating the market to a space that is already experiencing the open source disruption and innovation we have seen in so many other fields. The democratisation of such a powerful tool like AI through open source not only makes it that "there is no moat,"¹ but has the potential to revolutionise industries, from healthcare to finance, and address global challenges at a scale previously

unimaginable. It's not just about smart algorithms; it's about smarter, more ethical, and more inclusive solutions for society.

The data in this report speak volumes, but numbers alone can't capture the essence of open source. It's the stories behind these numbers – the stories of individual contributors, enterprises, and governments – that truly matter. And this community is what Europe, with its deep democratic roots and a clear vision for an open and human-centric technology future, has a unique opportunity to foster.

But with great power comes great responsibility, and so we must not overlook the challenges. The report highlights the age-old usage vs contribution gap, a crucial issue that we must address collectively. Open source is a two-way street, and as we leverage the growing value in open source, we must also contribute to its sustainability. This is not just an ethical imperative but a strategic one. The more we invest in open source, the more resilient and vibrant it becomes, benefitting us all.

Public sector organisations in Europe face unique challenges in unlocking the value of open source. It's not just about catching up; it's about understanding the economics and dynamics that govern this sector. We must create more inclusive communities that cater to the specific needs and constraints of the public sector. And let's not forget its potential to drive social impact. Open source can be a powerful tool in our arsenal to combat climate change, promote social inclusion, and create a more equitable world. Besides the findings of this report, our companion report on *Open Source in Europe's Public Sector*² delves deeper into this topic.

1 <https://techcrunch.com/2023/05/05/google-and-openai-are-walmarts-besieged-by-fruit-stands/>

2 <https://www.linuxfoundation.org/research/european-public-sector-opportunity>

Another significant development in this year's report is the regulation of software and open source. While regulation is a sign of maturity and recognition, it must be approached with caution. Poorly designed regulations could stifle innovation and undermine the very ethos of open source. We must work collaboratively with policymakers to ensure that regulations enhance, rather than hinder, the open source ecosystem.

Finally, open source security and sustainability is another area that demands our immediate attention. The report sheds light on the paradoxes that exist in open source security: the superior security of open source is widely recognised but does not translate into active participation in maintaining and securing the open source components we all depend on. It's time to move from perception to action: we must become mature consumers of open source, understanding its sustainability and security challenges and investing time and effort into solving these.

After almost a decade hosting open collaborations in as conservative and highly-regulated an industry as financial services, and now almost one year at the helm of Linux Foundation Europe, I have seen first-hand the transformative impact of open source in every industry undergoing digital transformation. The future is open, and it's up to us to shape it. Let's not just be passive consumers of this report; let's be active participants in this incredible journey. We hope this report can shine a light on where your contributions will matter the most.

So, as you flip through the pages of this report, I invite you to not just read but to reflect, to question, and to act. Let's take this report as a catalyst, a starting point for deeper conversations, contributions, and higher-impact open collaborations across the ecosystem.

The open source revolution is not just knocking on our doors; it's here, and it's unstoppable. Let's seize this moment to make open source more accessible, sustainable, and valuable – for ourselves, our organisations, Europe, and the global community.

Onward and open-ward!

Gabriele Columbro

*General Manager, Linux Foundation Europe & Executive Director,
FINOS*

Executive Summary

This report covers a wide range of themes, topics, and concerns relating to open source within Europe. In this section, we draw out some of the most compelling conclusions from our findings. It is our hope that these conclusions, backed with the data from our research, give individuals, organisations, and governments tangible advice that allows them to better unlock the growing value in Open Source Software (OSS).

The value of open source is growing, and momentum increasing

Our survey explored the value of open source from multiple perspectives, with highly positive sentiments expressed throughout. Most respondents (57%) indicated that the value they perceive from open source has increased over the last year, representing an accelerating momentum when compared with the results last year (47%). The vast majority of respondents consider open source to be valuable to the future of their sector (91%), and given that 72% of respondents are working in organisations that are not cross-industry IT vendors, this highlights just how widespread open source has become.

The tangible impact of open source is clear, with 77% indicating that benefits exceed the cost, compared with just 5% who felt costs exceed benefits. The most frequently cited benefits were diverse in nature, with improved productivity, innovation, and talent attraction coming out on top.

Notably, open source has played a significant role in one of the most talked-about technologies in 2023: generative AI. While this was initially a proprietary technology, with both models and weights hidden behind APIs and restrictive licences, open source equivalents have rapidly emerged. Within a matter of months, it was widely reported that open source AI innovation had all but caught up.

The public sector is not seeing the growing value perceived by others

Respondents from public sector organisations were just as positive that the benefits of open source exceed costs and reflected that it is valuable to the future of their sector. However, the value derived from open source appears to have stagnated in the public sector, with 53% indicating that it has stayed the same, compared with just 25% among other industries.

Reflecting on the results we found in last year's report, the public sector has a significantly different perspective on where value lies in open source. Those working in the public sector see a significant value in data technologies, whereas those in other sectors perceive a greater value in CI/CD and DevOps. Innovation is often cited as one of the most significant benefits of open source (61% for non-public sector organisations); however, those in the public sector are more likely to consider open source as a route to greater productivity and cost reduction.

New research from the Linux Foundation – [The European Public Sector Open Source Opportunity](#) – provides a set of recommendations for how governments can lead the way in leveraging open source to benefit citizens and society at large.

The value gap between open source use and contribution remains

The gap between use and contribution – or imbalance in ‘makers and takers’³ – remains, with relatively few respondents indicating a growth in the value they derived from open source contribution (44%) compared with the increased value derived from open source use (59%). The business value of using OSS needs very little explanation. However, the business value of spending time and resources giving back is much harder to articulate. This was reflected in our survey, with little agreement in responses when asked about factors that limit open source contribution.

When we explored how and when people contribute to open source, we found that many make some form of contribution to their employer’s open source project (49%) or third-party open source (47%) each week. Furthermore, 62% make some form of open source contribution in their personal time each week. It is clear that the open source code that we benefit from is created as a result of passion as well as through direct reward.

There is a paradox in the relationship between open source and security

Open source software provides transparency and the opportunity for greater scrutiny, which in turn theoretically contributes to more secure software. Our results found that three in every four respondents believe OSS is more secure than closed source software. However, when considering open source use, improved security is ranked lowest among the recognised benefits. Furthermore, respondents are least likely to consider contribution as a way of improving security. While open source is perceived as being more secure, the direct interactions (use and contribution) don’t necessarily reflect this.

There is also a lack of maturity when it comes to safely consuming OSS. While exploring the actions that organisations can take to increase open source usage, we found that Software bills of materials (SBOMs) are not well understood. Surprisingly, many organisations rely on little more than a simple check of the activity level ahead of using a new open source component. There is clearly much more work that needs to be done to improve understanding and create mature consumers.

³ <https://dri.es/balancing-makers-and-takers-to-scale-and-sustain-open-source>

Introduction

Open source has become something of a dominant force within the software industry, and as software continues to wade into almost every industry sector, OSS has followed. Open source is somewhat amorphous and can be used to describe a great many different things, from code to community, from commercial value to a common good.

This study explores the state of open source across Europe, building a comprehensive picture by examining the current levels of activity through use and contribution, inhibitors, motivators, and opportunities. It was conducted by Scott Logic and Linux Foundation Research via a combination of a survey (circulated in May 2023), which yielded 307 usable responses, and interviews with 15 individuals (conducted between May and July 2023) from a range of industries and countries. See the Methodology section for more details.

Given the importance of and our growing reliance on open source, it is imperative that we try to better understand it. We need to explore all aspects: usage, contribution, benefits, challenges, strengths, and weaknesses. Our research is predominantly focused on the relationship between organisations and open source (rather than individuals and open source). Survey questions were phrased to discover this; for example, 'What is the perceived value of open source to your organisation?' rather than simply 'What is the perceived value of open source?' Given an organisational focus, it is our hope that organisations can more directly use these results to make positive changes.

The value of open source

At its most basic level, open source is about creating software and then giving away both the product and code for free. Understandably, the business value of giving away your source code is not immediately apparent.

Despite this, the software industry has generally embraced open source, with multiple reports indicating that open source has become a dominant force. The Census II report from Linux Foundation Research and Harvard's Laboratory of Innovation Science estimated that OSS constitutes 70–90% of any given modern software solution.⁴

The growing value of open source, now and into the future

Our research indicates that the value that organisations derive from open source is continuing to grow. Most respondents (57%), from organisations of all types across Europe, indicated that the value they perceive from open source has increased over the last

“I believe that open source is now seen as essential for staying competitive and not falling behind”.

– COSMIN OPREA, ENTERPRISE ARCHITECT, LONDON STOCK EXCHANGE GROUP

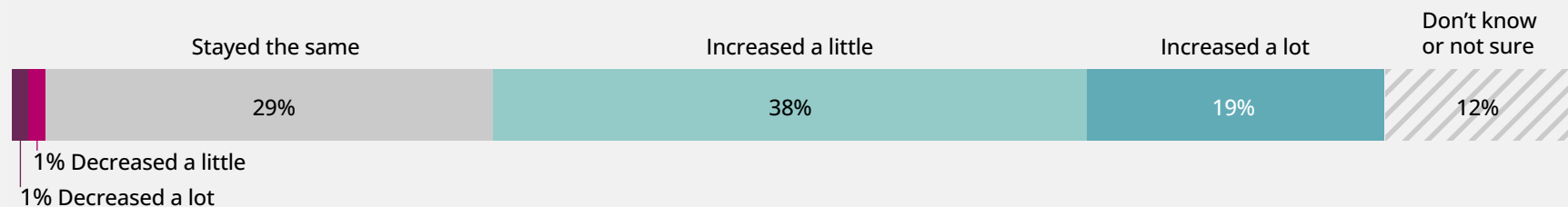
year (FIGURE 1). This suggests accelerating momentum, with the equivalent number from our previous iteration of the research 12 months ago standing at 47%.⁵ We also asked respondents to consider the value of open source in terms of costs vs benefits. The overwhelming majority (77%) indicated that the benefits exceed the costs, with 40% even stating that the benefits *greatly* exceed the costs (FIGURE 2).

4 <https://project.linuxfoundation.org/hubfs/LF%20Research/Harvard%20Census%20II%20of%20Free%20and%20Open%20Source%20Software%20-%20Report.pdf>

5 <https://www.linuxfoundation.org/research/world-of-open-source-europe-spotlight>

FIGURE 1

THE PERCEIVED CHANGE IN THE VALUE THAT ORGANISATIONS HAVE DERIVED FROM OPEN SOURCE OVER THE LAST YEAR



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q20, SAMPLE SIZE = 233

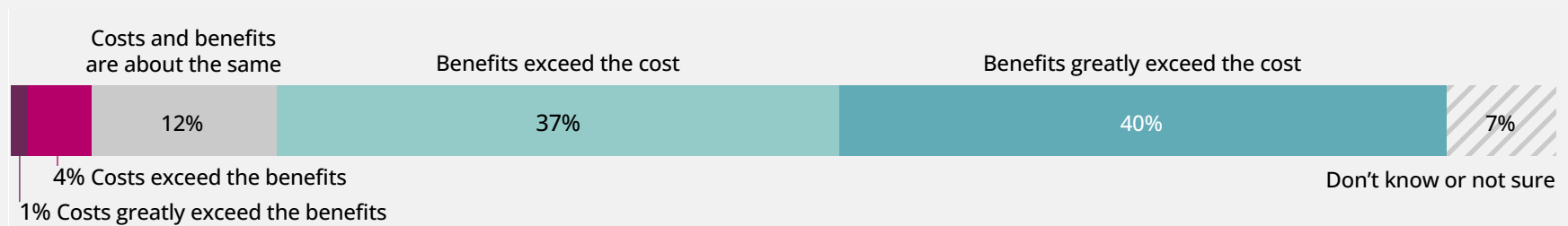
Research conducted by others further confirms the significant positive, proven impact of open source. A recent pulse survey by Stack Overflow asked developers in their community to share their sentiments about nascent trends in technology.⁶ OSS was felt to be the most proven of the technologies in the survey – even more so than cloud computing – and to have the most positive impact (by some margin!).

6 <https://stackoverflow.blog/2023/03/09/after-the-buzz-fades-what-our-data-tells-us-about-emerging-technology-sentiment/>

7 <https://www.linuxfoundation.org/research/world-of-open-source-europe-spotlight>

Our research highlighted the long-term future significance of OSS, with 89% of respondents indicating that open source is valuable to the future of their sector (FIGURE 3) – an almost identical proportion to those who responded last year (91%).⁷ Notably, 72% of respondents work in sectors other than IT, which demonstrates that the value of open source is apparent to individuals across a broad range of industry sectors.

FIGURE 2
THE PERCEIVED COST-VS-BENEFITS RELATIONSHIP IN ORGANISATIONS' USE OF OPEN SOURCE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q42, SAMPLE SIZE = 197

FIGURE 3
AGREEMENT OR DISAGREEMENT THAT OPEN SOURCE IS VALUABLE TO THE FUTURE OF THEIR INDUSTRY



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q37, SAMPLE SIZE = 197

The diverse benefits of open source

There is currently no broadly established quantitative approach to measuring the value of open source, so our research explored sentiment and perceptions in more detail. Overall, our findings further highlight the diversity of benefits derived from open source, deepening the related insights from our research last year.⁸

⁸ <https://www.linuxfoundation.org/research/world-of-open-source-europe-spotlight>

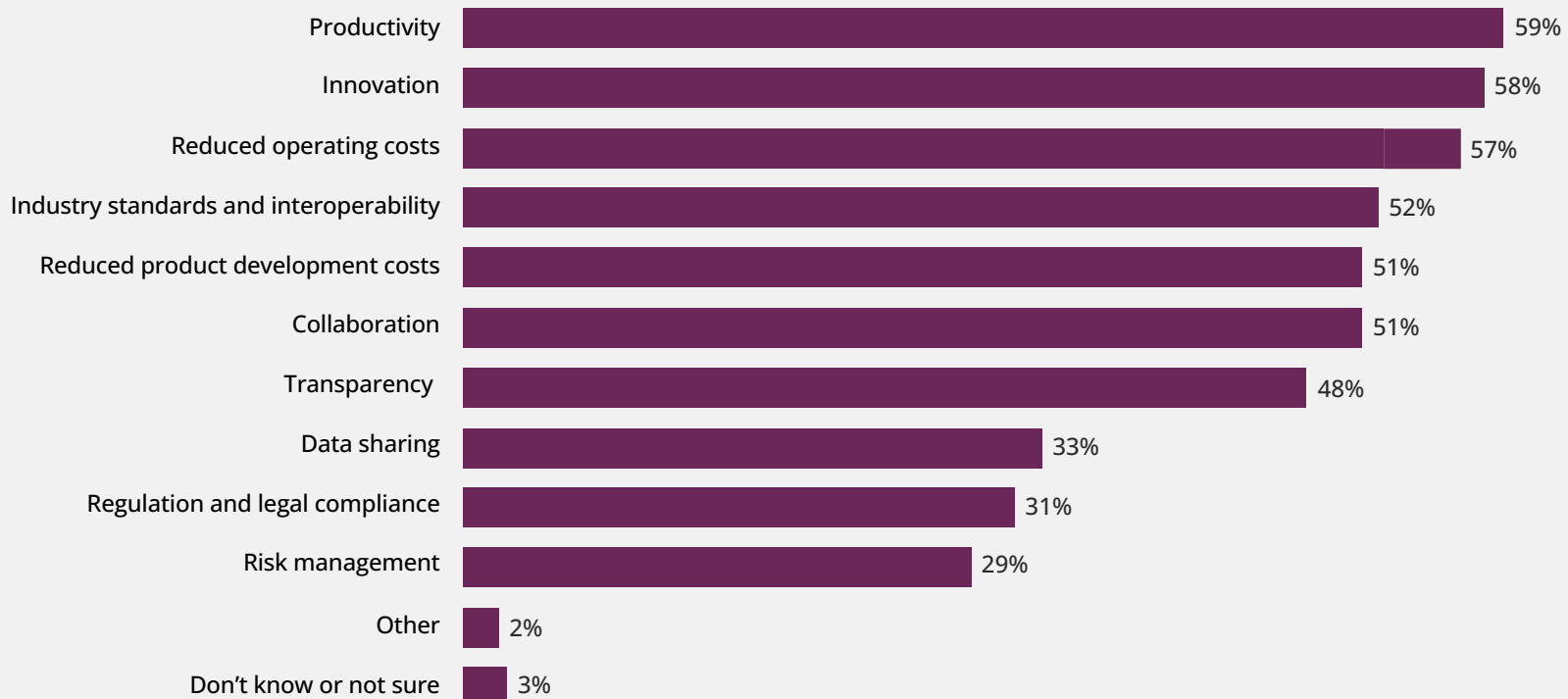
Three thematic areas stand out:

- 1. Improved productivity and reduced costs:** Among our respondents, 59% indicated that productivity in their industry would benefit from open source, and 51% felt that it would reduce product development costs (FIGURE 4). This was supported by 78% of respondents indicating that they always

“Many companies are looking to reduce their vendor spend and are considering open source solutions as a way to achieve this.”

– ERIC SCHABELL, DIRECTOR EVANGELISM, CHRONOSPHERE

FIGURE 4
ASPECTS WHERE INDUSTRIES MOST BENEFIT FROM OPEN SOURCE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q39, SAMPLE SIZE = 197, TOTAL MENTIONS = 937

or often perceived improved productivity, and 66% always or often saw less development time to market (FIGURE 5). Fifty-seven per cent of respondents believed that open source would benefit their industry by reducing operating costs (FIGURE 4), with 64% stating that open source always or often lowered the cost of IT operations in their organisation and 82% always or often seeing open source lowering the cost of software ownership (FIGURE 5).

2. Innovation, collaboration, and standards: Fifty-eight per cent of respondents felt open source would benefit innovation in their industry (FIGURE 4), with 74% indicating they always or often saw the use of open source facilitating innovation in their organisation (FIGURE 5) and 51% believing that contributing to open source always or often enables the IT to be more innovative (FIGURE 6). Industry standards

and interoperability (52%) and collaboration (51%) were also heavily cited as aspects of their industry that would most benefit from open source (FIGURE 4).

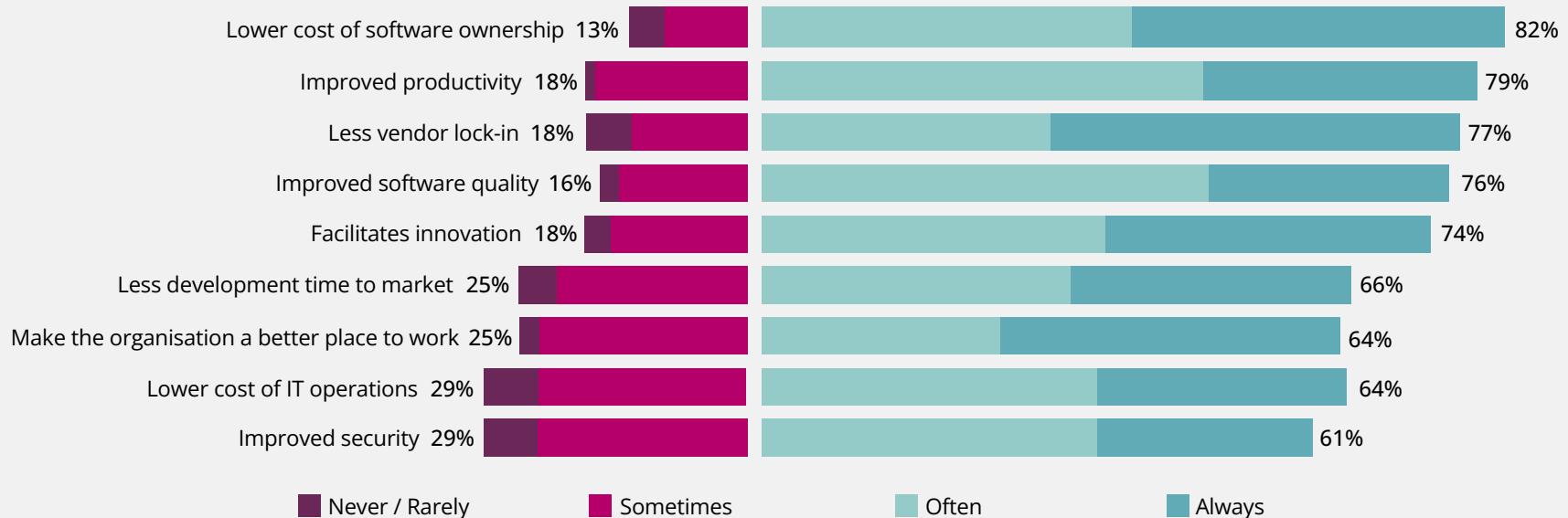
“Open source is critical for innovation... the pace of technology development is so high that even tech giants cannot define their own standards.”

– PHILLIPPE ENSARGUET, VP SOFTWARE ENGINEERING, ORANGE

3. Talent attraction, development, and retention: In our research, 64% of respondents cited the use of open source as always or often making the organisation a better place to work (FIGURE 5). In exploring what motivates individuals to contribute to open source projects in their personal time, 89% indicated *learning and personal development* and 71% *improving my career opportunities* as influential factors (FIGURE 18).

FIGURE 5

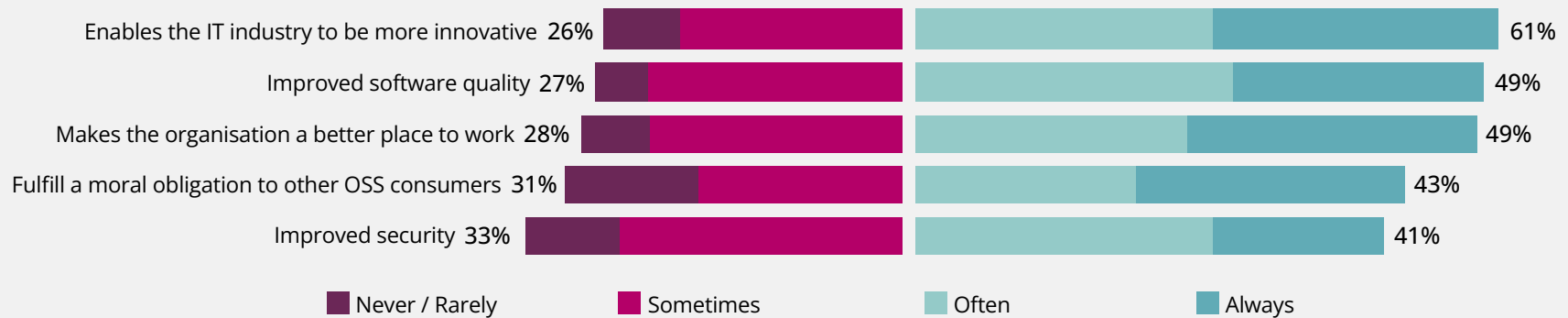
HOW OFTEN *USING* OPEN SOURCE DELIVERS DIFFERENT BENEFITS TO ORGANISATIONS



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q17, SAMPLE SIZE = 233

FIGURE 6

HOW OFTEN *CONTRIBUTING TO OPEN SOURCE* DELIVERS DIFFERENT BENEFITS TO ORGANISATIONS



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q26, SAMPLE SIZE = 202

“Open source offers a different perspective on software development and enables engineers to learn new technologies at a faster pace.”

– RHYDDIAN OLDS, HEAD OF UI & SERVICES AND THE OPEN SOURCE PROGRAM OFFICE LEAD AT CITI

Open source has touched all areas of software development. Regardless of which technology or domain you turn to, you’ll find a rich ecosystem of OSS. However, the value that organisations derive from it, and the level of usage, differs between technologies. From our survey responses, we found that the areas where people were most aware of open source being used within their organisation were Linux, cloud and containers, CI/CD, and DevOps. In other words, much of the ubiquitous, domain-agnostic infrastructure we use to build and run our software, whether at the operating system level or in the cloud, is open source because it is a layer of technology that does not create competitive advantage; rather, it is more akin to collective standards that are improved to the benefit of all.

Spotlight: Open source in an AI world

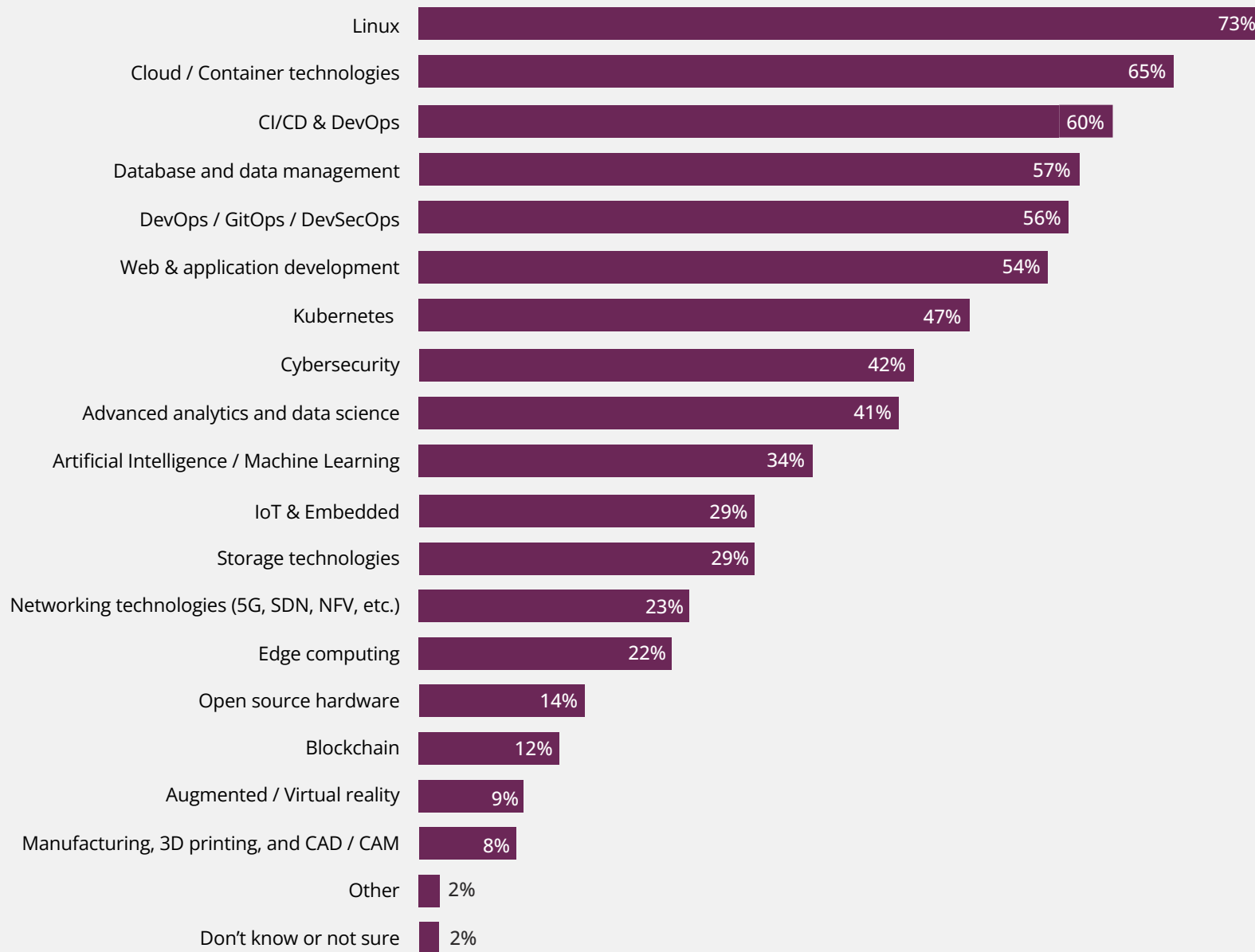
Usage of emerging technologies is understandably more limited, with organisations often trialling them rather than rolling them out more widely. Usage of open source AI was reported by 34% of our respondents, which is significantly higher than other emerging technologies, such as Blockchain and AR/VR (12% and 9%, respectively) (FIGURE 7).

We also asked respondents to consider which technologies they consider to be most important to the future of their sector. Here, we found AI rising to second place in the list (from 10th last year) (FIGURE 8). This year has seen significant progress in AI, with generative AI, as epitomised by ChatGPT, rising to the top of most organisations’ lists of disruptive technologies to watch. We’re still in the very early stages of understanding and quantifying the impact of AI. Early-stage research by McKinsey concludes that this technology could deliver value equal to an additional \$200 billion to \$340 billion annually in the banking industry, and \$400 billion to \$660 billion in the retail sector.⁹

9 <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-economic-potential-of-generative-ai-the-next-productivity-frontier>

FIGURE 7

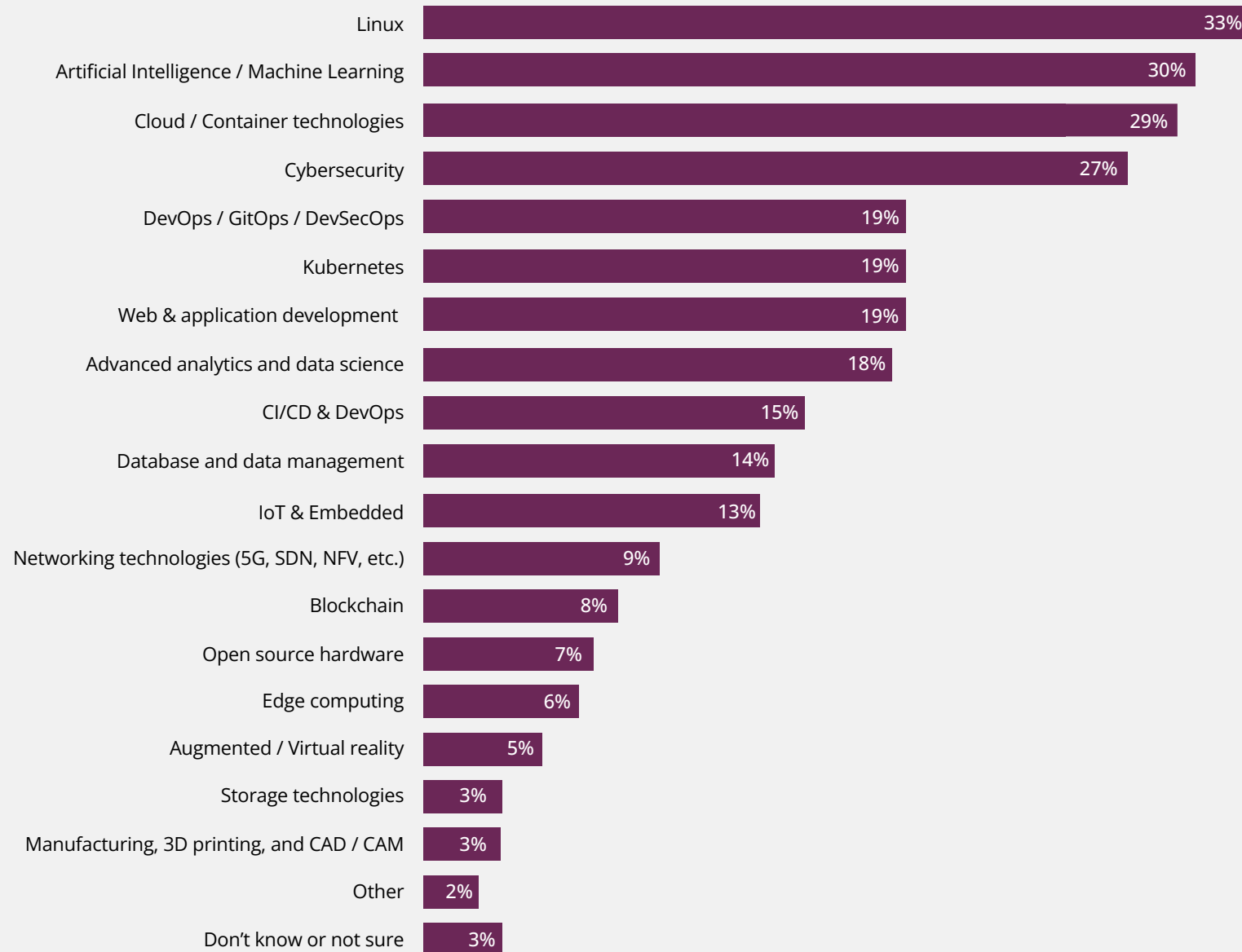
THE OPEN SOURCE TECHNOLOGIES THAT ORGANISATIONS ARE CURRENTLY USING



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q16, SAMPLE SIZE = 233, TOTAL MENTIONS = 1,580

FIGURE 8

THE OPEN SOURCE TECHNOLOGIES THAT ARE IMPORTANT TO THE FUTURE OF THE SURVEY RESPONDENT'S INDUSTRY



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q38, SAMPLE SIZE = 197, TOTAL MENTIONS = 553

Open source is an important component of most emerging technologies, but the role it is playing in the development of AI is central. Initial advances in generative AI were entirely proprietary; OpenAI, backed by a significant investment from Microsoft, created a market-leading solution (GPT) that dominated throughout 2022. The funds required to build and train the GPT models were the “moat” that OpenAI used to create its competitive advantage and propel its valuation.

However, the tables turned somewhat in early 2023 when model weights for a competing technology developed by Meta – Llama – were leaked onto the Internet. Within a matter of weeks, the open source community tuned, optimised, and extended these models. Their work significantly reduced the barrier to entry, allowing people to run these models on commodity hardware and train/ fine-tune models with minimal cost. This is very much a case study in the power of open source, with the community doing far more than some of the most highly funded technology organisations were able to (or incentivised to do). This culminated in a leaked Google internal memo that declared, ‘We have no moat, and neither does OpenAI’:

‘[...] the uncomfortable truth is, we aren’t positioned to win this arms race and neither is OpenAI. While we’ve been squabbling, a third faction has been quietly eating our lunch. I’m talking, of course, about open source. Plainly put, they are lapping us. Things we consider “major open problems” are solved and in people’s hands today’.¹⁰

“I believe that as AI becomes more important, and our reliance on it grows, the risks this poses become somewhat existential. Given this, it is crucial for the software to be open for inspection”.

– COSMIN OPREA, ENTERPRISE ARCHITECT, LONDON STOCK EXCHANGE GROUP

While this may have dented the value of these organisations, many within the industry see this as a very positive move. Although AI shows great promise and could genuinely enrich our lives, there is still a long list of unsolved problems relating to bias, alignment, non-determinism, data protection, ethics, and more. These are problems that are better solved in the open.

Meta has since gone on to embrace the value of open source in its AI efforts as a leading example, releasing the next generation of its LLM, Llama 2, for free and with source code available for both research and commercial use.¹¹ However, it should be noted that the means by which Meta and other organisations are making their AI models available is not technically open source – despite what some headlines may proclaim – but does embody some similar characteristics.¹²

Europe is likely to play an influential role in how open source AI evolves. On the one hand, European nations such as France are openly declaring significant support and investment in open source AI.¹³ On the other hand, the E.U. is currently finalising its Artificial Intelligence Act, which would ban some AI uses and create regulatory obligations that may restrict or suppress open source engagement.¹⁴

¹⁰ <https://www.semianalysis.com/p/google-we-have-no-moat-and-neither>

¹¹ <https://about.fb.com/news/2023/07/llama-2/>

¹² <https://www.alessiofanelli.com/blog/llama2-isnt-open-source>

¹³ <https://www.politico.eu/article/open-source-artificial-intelligence-france-bets-big/>

¹⁴ [https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0106\(COD\)&l=en](https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0106(COD)&l=en)

The ubiquity of open source use

This report is not the first, and is unlikely to be the last, piece of research to describe the use of open source within current software development lifecycles (SDLCs) as ubiquitous.¹⁵ Our findings clearly resonate with this view, with only 2% of organisations reporting no use of open source libraries as dependencies, as code directly copied into a codebase, or as tooling used for codebase creation or deployment (FIGURE 9).

As we explored the technology landscape with our interviewees, considering aspects of open source creation and curation, notions of cultivation gave rise to a useful analogy.

In the metaphorical gardens of software available today, closed source projects are the high-maintenance plants in need of close attention and supervision to thrive and survive. OSS is more akin to wild flora; where the environmental conditions are favourable, it will spread in abundance and create diverse value.

And it would seem that very few projects actively tend their borders to preclude the use of open source when we consider

those reporting minimal or no use of open source account for only 6% of respondents (FIGURE 9). On this basis, we could now consider SDLCs that do not make at least moderate use of open source to be exotic.

And while the simplest root-cause explanation for this prevalence is the core commercial value proposition for open source – the benefits of use outweigh associated costs (FIGURE 2) – our work has also sought to understand how policy and organisational governance have influenced this uptake, among other motivating factors.

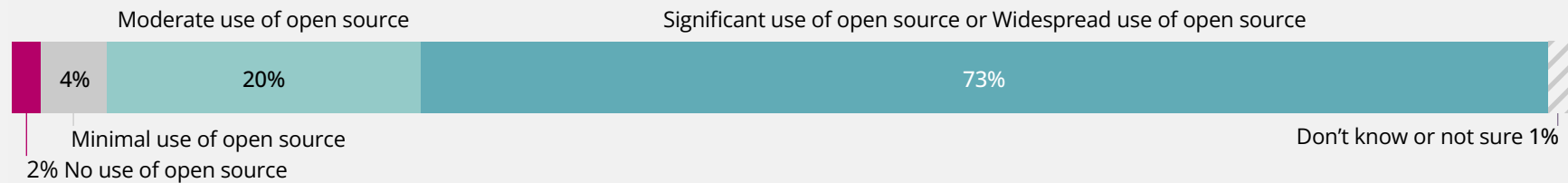
Perspectives on permissiveness and prevalence

Our research last year gathered data indicating that around half of all respondents worked for an organisation that encouraged open source use (FIGURE 10). This year, our survey posed the same question, with the addition of a new category for response – where the determination of open source use was decided on a per-team basis.¹⁶

¹⁵ Abstract, [Open Source Software in the Public Sector: 25 Years and Still in Its Infancy](#) | IEEE Journals & Magazine | IEEE Xplore

¹⁶ [[World of Open Source: Europe Spotlight 2022 \(linuxfoundation.org\)](#)]

FIGURE 9
EXTENT OF OSS USE IN ORGANISATIONS



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q12, SAMPLE SIZE = 300

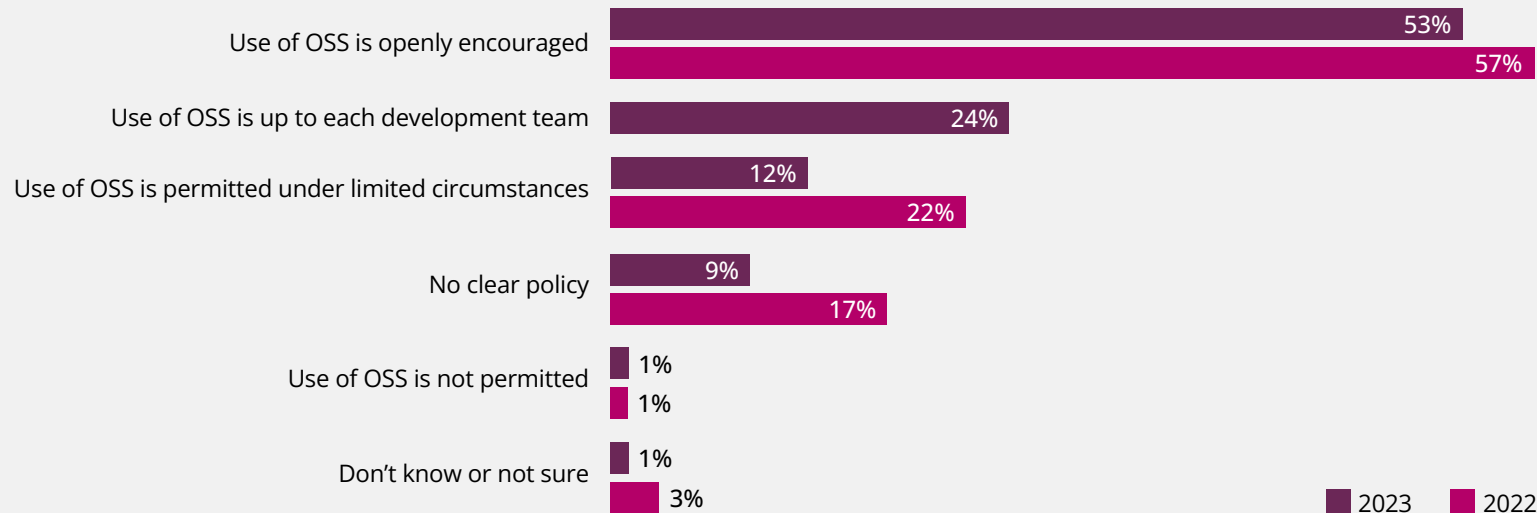
Making the broad assumption that patterns of use have not shifted significantly in the last 12 months, the notable differences in responses for 'No clear policy' and 'Under limited circumstances' suggest that these categories were previously selected in the context of a devolved policy of team-/project-/engagement-based determination of open source use – masking the true extent of our findings around the prevalence of policy and conditional use. With this category in place, we see permissive environments (including team-based decision-making) now reported by around four in five respondents (FIGURE 10).

Where prevalence and permission abound, it is perhaps a little surprising to find that governance of open source use is significantly less mature. Across all of our respondents, 56% reported neither having an organisational body regulating open source use – typically referred to as an open source program office (OSPO) – nor having a clear organisational strategy for this (FIGURE 11).

An interesting variation around this question is noted when we segment our respondents into vendor organisations and end-user organisations, where end users are defined as organisations primarily using IT products and services to support their business deliverables. When viewed through this lens, we see that end-user organisations are significantly less advanced in the regulation of their open source adoption, with only one in three organisations having these guiding principles and practices in place, compared with just over half of all the vendors responding to our survey.

These findings suggest that discreet drivers and inhibitors are associated with the governance of open source use, which may identify priority areas and specific audiences who could better understand the value proposition of organisational structures such as OSPOs.

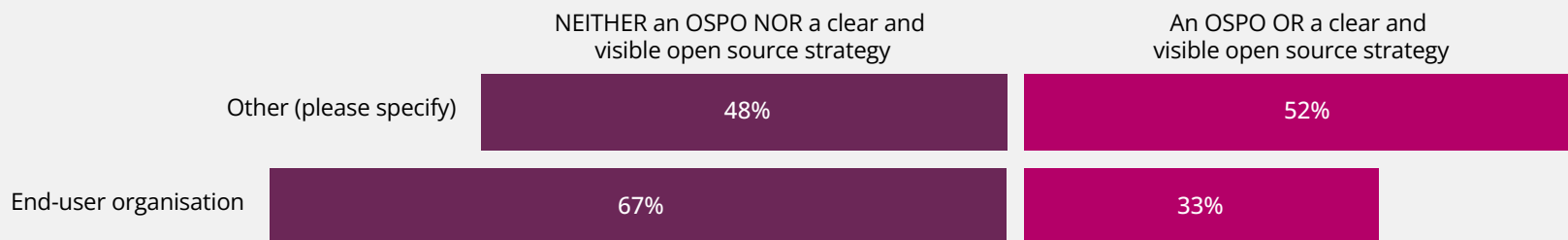
FIGURE 10
EXTENT TO WHICH OPEN SOURCE USE IS PERMITTED IN ORGANISATIONS (2022 VS. 2023)



SOURCE: WORLD OF OPEN SOURCE EUROPE SPOTLIGHT SURVEY 2022, Q13, SAMPLE SIZE = 779 | WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT SURVEY (EUROPE) 2023, Q13, SAMPLE SIZE = 300

FIGURE 11

PRESENCE OF OSPO OR A 'CLEAR AND VISIBLE' OSS STRATEGY, BY ORGANISATION TYPE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY, Q11 BY Q7, SAMPLE SIZE = 306

Open source contribution remains a conundrum

Open source thrives when it is a mutual exchange of value, with the consumer of (often free) software offsetting the benefit they enjoy by giving back to the open source community. This section explores the extent to which people are motivated, or permitted, to contribute.

Our survey focused on the relationship between organisations and open source, through questioning their employees. When it comes to open source contributions, whether committing code, raising issues, or simply asking questions, an employee's activities are more directly influenced by company policy than personal preference. We asked respondents to describe their organisation's contribution policy, finding that 42% worked in an organisation that actively encouraged open source contribution, which is a relatively positive outcome. However, 24% responded that there was no clear policy – in this instance, it is likely that an employee will err on the side of caution and not contribute. Creating clearer policies is a real opportunity for many organisations.

Looking at the results across organisation size, we found that smaller organisations (<10 employees) are more permissive,

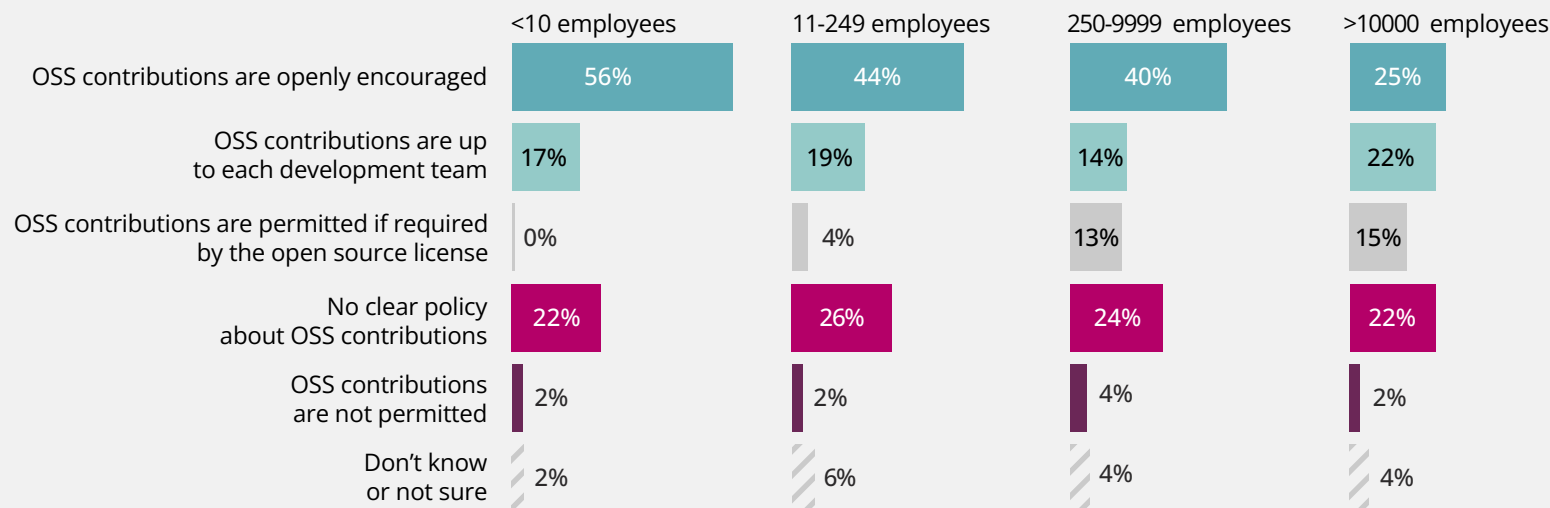
with 56% openly encouraging contribution compared with the more cautious approach found for larger organisations (>10,000 employees), where it drops to just 35% (FIGURE 12).

We explored the nature of these contributions, finding that the most frequent activity was opening an issue (23%), very closely followed by contributing code (22%) (FIGURE 13). We also found that a reasonable number of those who contribute are active in the wider community, with 19% answering questions on Stack Overflow and Reddit. Our survey findings reflect the sentiment we heard from our interviews; that open source contributions can be quite diverse in nature and that there is more to open source than just code – it is a community.

We explored the technology areas that organisations contribute to, finding that cloud and container technologies is the most active area, with 32% of organisations actively contributing. This has likely been fuelled by the Cloud Native Computing Foundation (CNCF), which was founded in 2015 and has experienced significant growth ever since.

FIGURE 12

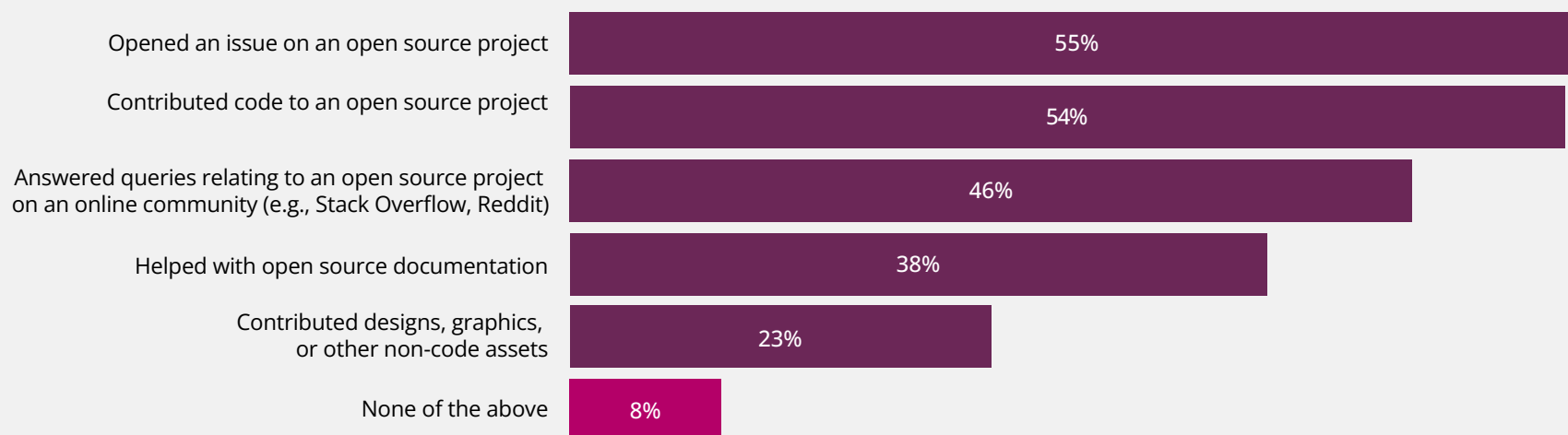
HOW WOULD YOU DESCRIBE YOUR ORGANISATION'S CONTRIBUTION TO OSS PROJECTS?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q22 BY Q10B, SAMPLE SIZE = 234

FIGURE 13

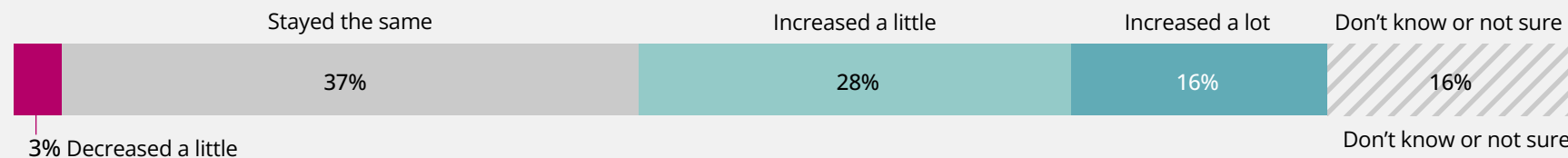
HAS YOUR ORGANISATION MADE ANY OF THE FOLLOWING OSS CONTRIBUTIONS?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q25, SAMPLE SIZE = 202

FIGURE 14

OVER THE LAST YEAR, HAS THE OVERALL BENEFIT YOUR ORGANISATION DERIVES FROM OSS CONTRIBUTIONS CHANGED?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q27, SAMPLE SIZE = 202

The value gap between use and contribution

While the value proposition of open source consumption, or use, is clear to most – at its most basic level, you get software for free – the benefit or business value of contribution is less obvious. This was reflected in our survey findings, where 59% of respondents indicated that the value they derive from open source use has increased either a little or a lot (FIGURE 1); there is a noticeable gap when compared with contribution, with just 44% indicating an increased value (FIGURE 14). Our interviews revealed some of the benefits of open source contribution but also touched on broader issues relating to open source funding and who is responsible for the open source ecosystem.

“You don’t get the full innovation benefit from open source technologies unless you also contribute back. These contributions allow companies to reduce risk and improve features but also give them a seat at the table in discussions about the project’s future direction”.

– DAWN FOSTER, CHAOSS DIRECTOR OF DATA SCIENCE AND CO-CHAIR FOR THE CNCF CONTRIBUTOR STRATEGY TECHNICAL ADVISORY GROUP

“I believe that any organisation that is developing using open source tooling and languages, benefitting from these in order to create their own proprietary solutions, should be paying some form of open source tax”.

– REBECCA RUMBUL, EXECUTIVE DIRECTOR AND CEO OF THE RUST FOUNDATION

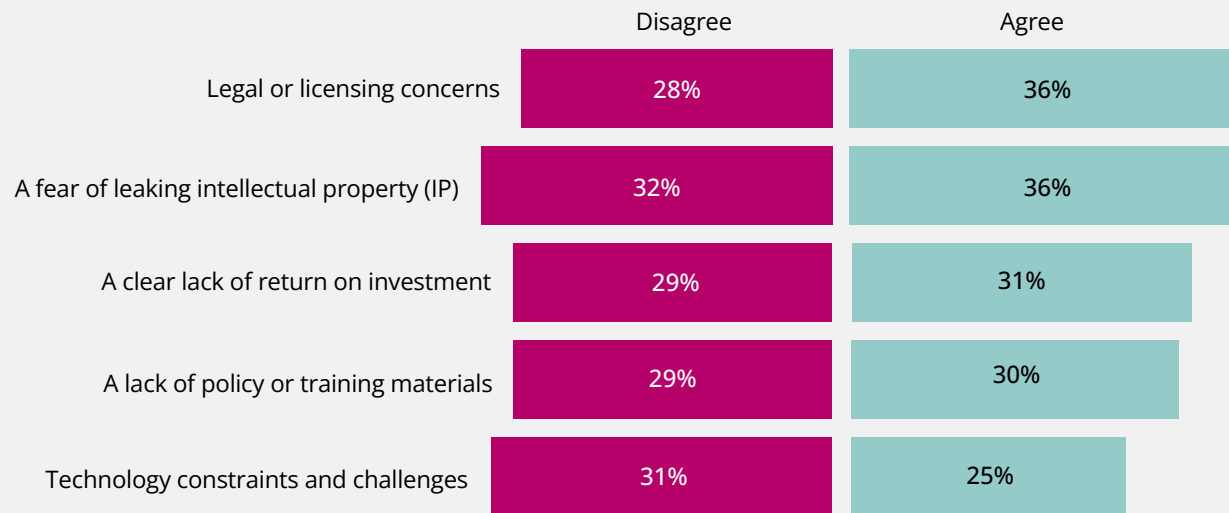
Our survey explored the factors that limit an organisation’s contribution to open source; however, the results didn’t find a single leading factor. On the contrary – for any given factor, the number of respondents who agreed that it limited their organisation’s OSS contributions was almost equal to the number who disagreed. That said, legal, licensing, and intellectual property concerns showed a modest skewing towards being ‘leading’ limiting factors (FIGURE 15). It seems fair to conclude that when considering open source contribution, organisations face a diverse range of challenges and limiting factors.

Contribution is equally a vocation and a personal endeavour

We explored the time individuals spend contributing to projects in work or personal time. When contributions occur at work, they might be to projects managed by other teams within their organisation (a practice known as inner source), company-founded or -adopted open source projects, or third-party open source projects. Among these, we found inner source activities to be the most prevalent, closely followed by time spent contributing to their organisation’s own projects and third-party open source projects. Close to half of respondents spend some time each week at work contributing to external projects, where no commercial relationship exists with their employer (FIGURE 16).

FIGURE 15

FACTORS THAT LIMIT AN ORGANISATION'S CONTRIBUTION TO OPEN SOURCE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q28, SAMPLE SIZE = 202

For engineers, getting into open source can be quite intimidating. Rather than diving in with a massive pull request, I encourage engineers to start small, find something you're interested in, open issues, join the conversation, get to know how the community works'.

– RHYDDIAN OLDS, HEAD OF UI & SERVICES AND THE OPEN SOURCE PROGRAM OFFICE LEAD AT CITI

Elsewhere in the survey, we asked respondents what actions their organisation could take to increase contribution, and we found that 'allocation of time' was the most impactful. Put simply, our survey responses indicated that people would like to see open source contributions being acknowledged as a formal part of their job. Given our findings, it clearly is for many.

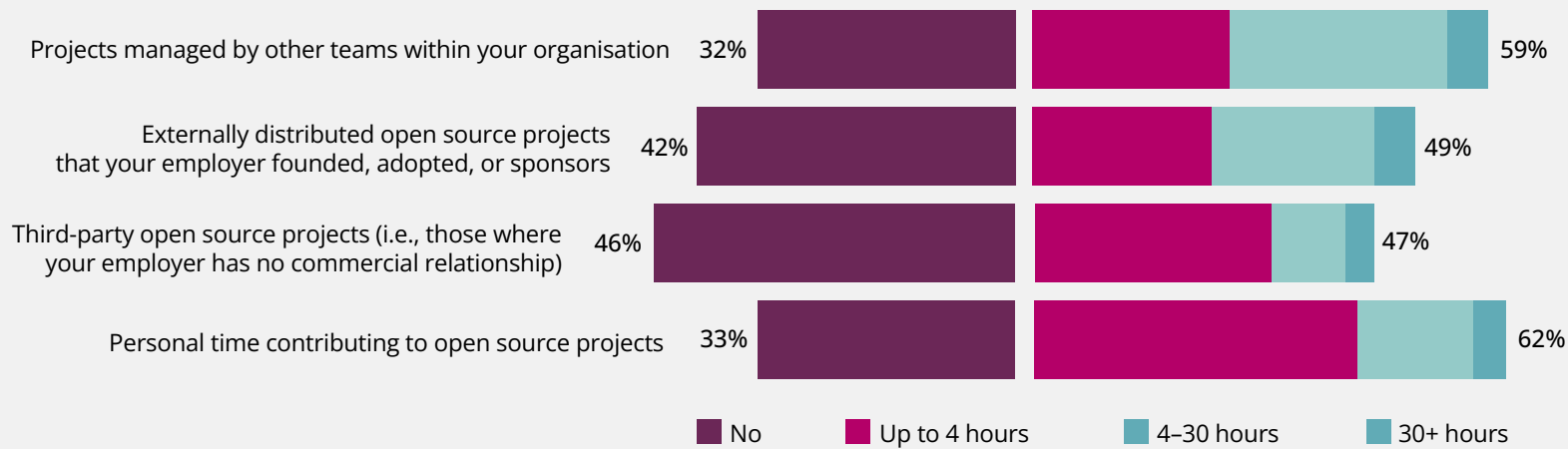
We also explored whether respondents spend any of their personal time on open source, finding that many (62%) consider this a weekly activity (FIGURE 16). While we didn't explore the specific types of projects people undertake in their personal time, we did explore the motivating factors. Learning and development was a clear leader (FIGURE 17); however, all the factors we proposed in the survey were met with a strong positive response. By making open source contribution part of the day job, these factors will likely yield a better employee experience.

"I see my contributions as a way to help others and improve the lives of people".

– IVAYLO PETROV, MAINTAINER OF RUST LORAWAN LIBRARY

FIGURE 16

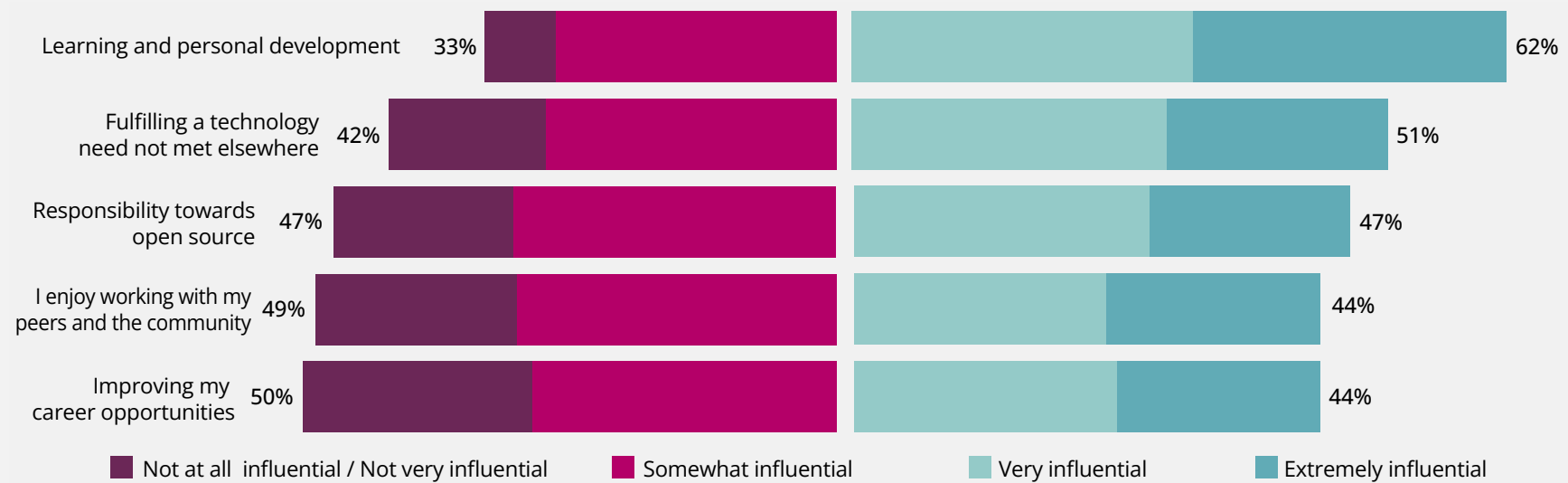
HOW MUCH TIME DO SURVEY RESPONDENTS SPEND CONTRIBUTING TO VARIOUS PROJECTS, EITHER IN WORK OR PERSONAL TIME?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q30, Q31, Q32, Q33, SAMPLE SIZE = 202

FIGURE 17

MOTIVATING FACTORS FOR PERSONAL CONTRIBUTIONS



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q34, SAMPLE SIZE = 209

The paradoxical relationship between open source and security

OSS has been considered more secure than closed source software almost since its inception; hence Linus's Law: 'Given enough eyeballs, all bugs are shallow'.¹⁷ The perception of open source within SDLCs has moved on significantly since the time when coding in the open was considered less secure due to decreased obfuscation. The value of this form of transparency remains as vital now as it was then and readily emerges as a theme across our qualitative research:

“Open source software provides transparency and collaboration, which translates to confidence in the technology”.

– CSILLA ZIGRI, CHIEF STRATEGY OFFICER, BTP

“Open source provides the opportunity for inspection and collaboration needed for transparency and trust in software”.

– COSMIN OPREA, ENTERPRISE ARCHITECT, LONDON STOCK EXCHANGE GROUP

Our results substantiate this view, with around three in every four respondents believing OSS is more secure than closed source software (FIGURE 18).

We also have good reason to suggest that security has never been a more important topic among open source advocates. Ricardo Sueiras (Principal Advocate in Open Source, AWS) highlighted the results of a recent survey he had conducted, identifying security as a top pain point for OSS developers, and almost all of those we interviewed wanted to share insights on this topic.

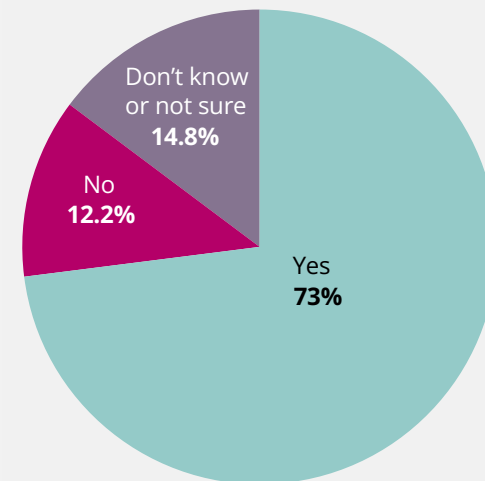
¹⁷ Raymond, Eric S. (1999). *The Cathedral and the Bazaar*

Why is realising open source's value for security a challenge?

In this context of heightened interest, our findings point to a paradox: while our respondents consider OSS inherently more secure, their experience of realising this benefit in the delivery of OSS attracts more scepticism than most other categories we enquired about (FIGURE 5).

FIGURE 18

IS OPEN SOURCE SOFTWARE MORE SECURE THAN CLOSED SOURCE SOFTWARE?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q21, SAMPLE SIZE = 237

Our research shows clear support for the well-understood commercial value proposition offered by open source adoption. By contrast, improved security is ranked lowest of these recognised benefits, along with operational support costs (FIGURE 5). When the case for increased security is as plain to our respondents as the commercial value that OSS offers, why do we find them at opposite ends of this spectrum? To add to the conundrum, our findings around areas of contribution showed that respondents are least likely to consider contribution as a way of improving security.

Clearly, a challenge exists around realising the inherent value open source has for security, and despite recognition of its importance, many respondents felt less empowered to deal with this directly.

Why do the benefits of SBOMs seem poorly understood?

It is logical to consider this challenge within the complex context of interdependencies that form any modern software development project. And the concept of bringing transparency to the software supply chain through an inventory of assets – an SBOM¹⁸ – has been in existence for over a decade.¹⁹

There is wide recognition not only of the importance of securing software supply chains but also that the use of SBOMs represents a vital control in addressing this challenge. The 8th Annual State of the Software Supply Chain report by Sonatype describes the current state of affairs in clear and urgent terms: “Development teams must address software supply chain attacks and select better open source projects”.²⁰

18 [NTIA.gov/SBOM](https://www.ntia.gov/sbom).

19 <https://spdx.dev/about/>

20 <https://www.sonatype.com/state-of-the-software-supply-chain/introduction>

21 [Establishment and Expansion of Software Supply Chain Regulation and Standards \(sonatype.com\)](https://www.sonatype.com/establishment-and-expansion-of-software-supply-chain-regulation-and-standards)

Use of SBOMs has been mandated by the U.S. government, and Sonatype’s report highlights how such regulation and standards are gaining traction across the world.²¹

With all this focused attention, it again seems paradoxical that the impact of SBOMs was the least well understood when considering forms of investment in responsible open source use; one in five respondents to our survey answered ‘Don’t know or not sure’ (DKNS) when asked what they would expect the impact to be of increased investment in using SBOMs to improve component trust (FIGURE 19). Interestingly, there were almost the same level of DKNS responses regarding OSPOs (FIGURE 19).

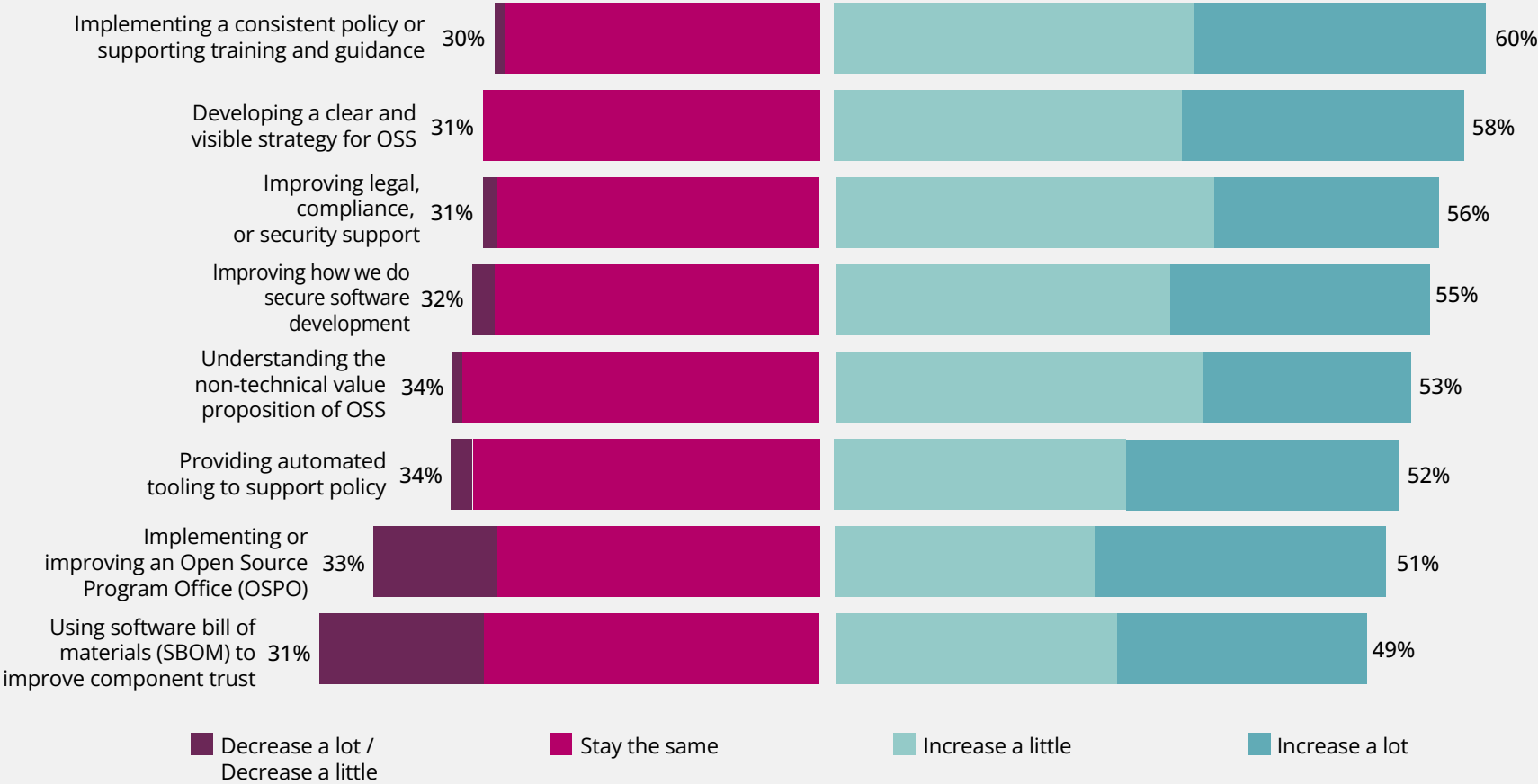
Good practices seem less prevalent than is touted

It is hard not to draw a parallel between these seeming paradoxes and the results of our questions concerning the practices and actions that organisations adopt and enact when making use of OSS:

- One in five respondents don’t have any of the risk management approaches we listed in place to manage OSS (FIGURE 20).
- When asked about the actions their organisation takes before incorporating a new OSS component, the overwhelming focus is on the level of activity in the community itself (FIGURE 21).

FIGURE 19

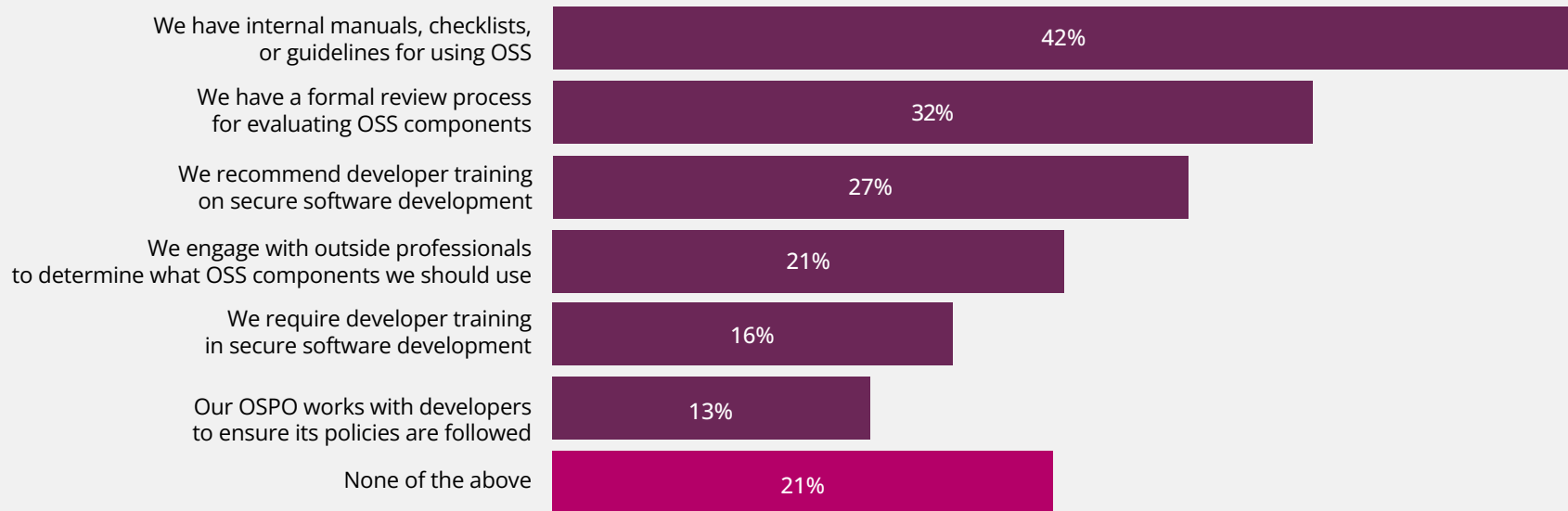
EXPECTED IMPACT ON OSS USE WITH INCREASED INVESTMENT



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q19, SAMPLE SIZE = 237

FIGURE 20

REPORTED USE OF RISK MANAGEMENT PRACTICES IN ASSOCIATION WITH OSS USE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q14, SAMPLE SIZE = 233, TOTAL MENTIONS = 421

This view was supported anecdotally by Eric Schabell (Director Evangelism, Chronosphere), who acknowledged the challenges of OSS use and dependency management:

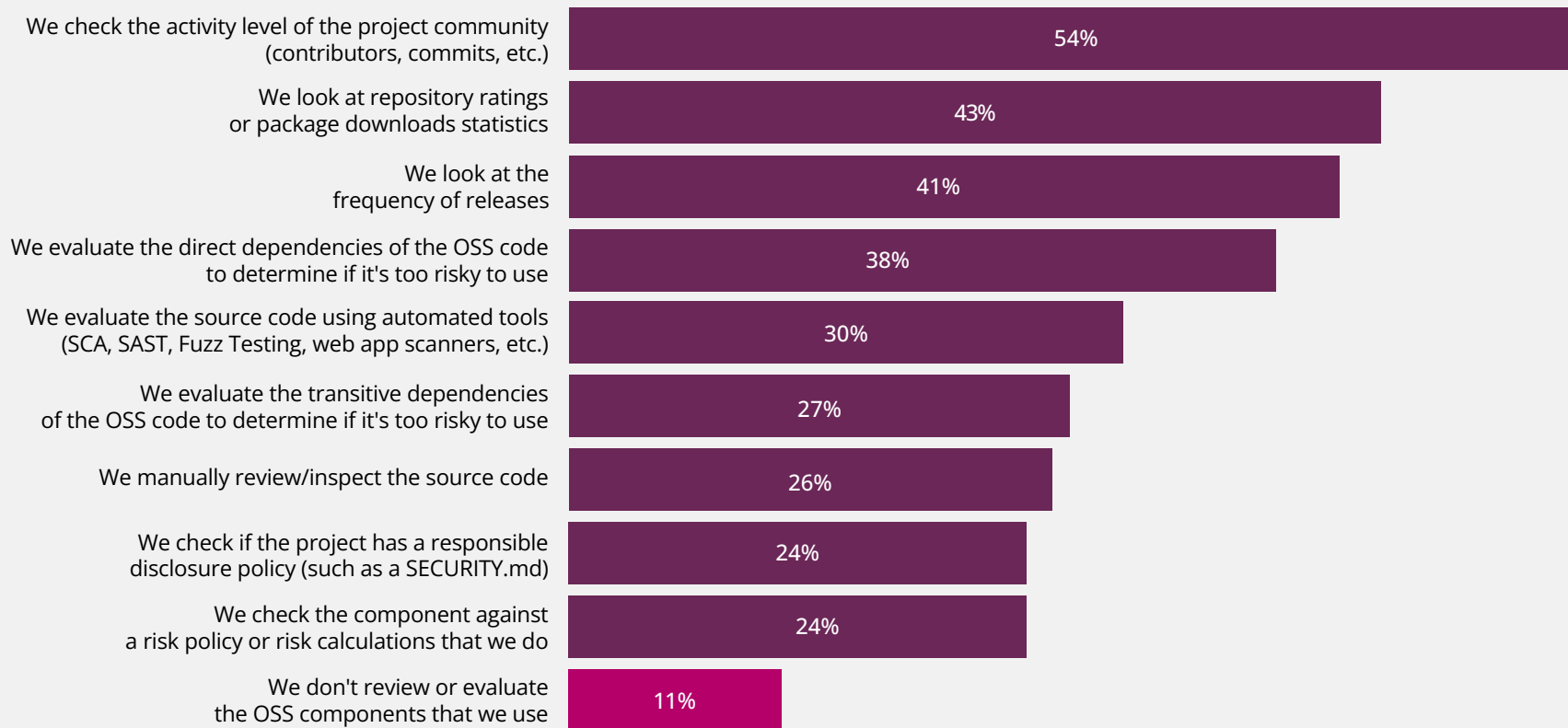
“There’s a lot of developers that are grabbing [open source software components] to make their lives easier, and the next thing you know... it’s in your production environment. Usually [developers are] looking to see if a component is actively maintained, but that just means checking if there’s been a commit in the last month or so – that’s not an in-depth analysis”.

The many other good practices shared with us have been far from confined to the disciplines of observable asset management and due diligence. Ralf Wildenhues (Software Engineer, Site Reliability

Engineering, Google) shared his insights on the complexity of taking a considered view of the OSS you consume, including: not only considering the supply chain through dependencies but also the maturity of a project and its ecosystem through its history and approach to change management and addressing vulnerabilities; and how readily the software can be tested.

FIGURE 21

ACTIONS TAKEN BEFORE USING A NEW OSS COMPONENT



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q15, SAMPLE SIZE = 233, TOTAL MENTIONS = 767

Interviewees in our research this year and last year were rightly proud of the contributions they made to communities to address vulnerabilities and other challenges. They recognised these as investments both in their own engineering capability and in the foundational components themselves.

Given the paradox our research has uncovered around security, there is a clear imperative to do

more to promote the virtues and benefits of this kind of responsible open source consumption and contribution. This promotion cannot be one-size-fits-all; it must take into account the scale, context, and characteristics of different kinds of open source projects and the needs of the volunteers supporting them.

Open source's sustainability challenge

Our research last year highlighted the growing sustainability challenges from which open source is suffering, pointing to the research's evidence that organisations tend to take significantly more than they give.²² This puts significant pressure on the open source ecosystem, and the resultant unease in the community is becoming increasingly pronounced. Open source project maintainers are becoming more vocal and public about their plight, bemoaning the relentlessly high expectations placed on those who are effectively volunteers²³, including the case of a library that is used by over 13 million developers and that has been downloaded over 9 billion times and yet does not financially support its sole maintainer.²⁴

“The current funding model for open source software is broken... The free rider problem is a significant issue, with many people using open source software without contributing to its development or maintenance”.

– REBECCA RUMBUL, CEO, RUST FOUNDATION

“Contributing to open source should be a viable career path, where you can earn a normal living, rather than maintainers struggling to scrape together the necessary funding”.

– FELIX FAASSEN, OPEN SOURCE PROGRAM LEAD, TOMTOM

New E.U. regulations that are being finalised – the Cyber Resilience Act²⁵ and the Artificial Intelligence Act²⁶ – may inadvertently introduce additional burdens on open source projects. So pronounced is the concern that the leaders of significant open source organisations across Europe – including Linux Foundation Europe – sent an open letter to Members of the European Parliament to highlight that if the Cyber Resilience Act is implemented as written, ‘it will have a chilling effect on open source software development as a global endeavour, with the net effect of undermining the EU’s own expressed goals for innovation, digital sovereignty, and future prosperity’.²⁷

Our survey explored how respondents felt open source project sustainability could be improved. The top responses suggested a lean towards time and effort contributions rather than financial. Specifically, 63% of respondents felt open source project sustainability could be improved by organisations allowing time during working hours for employees to make meaningful contributions, while 54% felt organisations using open source should accept that they have a responsibility to give back through contributions to open source standards and projects (FIGURE 22). Regarding financial contributions, European organisations might start joining an increasing number of large American organisations that are experimenting with FOSS contributor funds, first piloted by Indeed in 2019²⁸ “to directly and democratically support the open source projects they are using”.²⁹

22 <https://www.linuxfoundation.org/research/world-of-open-source-europe-spotlight>

23 <https://nolanlawson.com/2017/03/05/what-it-feels-like-to-be-an-open-source-maintainer/>

24 <https://www.thestack.technology/core-js-maintainer-denis-pusharev-license-broke-angry/>

25 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52022PC0454>

26 [https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0106\(COD\)&l=e](https://oeil.secure.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2021/0106(COD)&l=e)

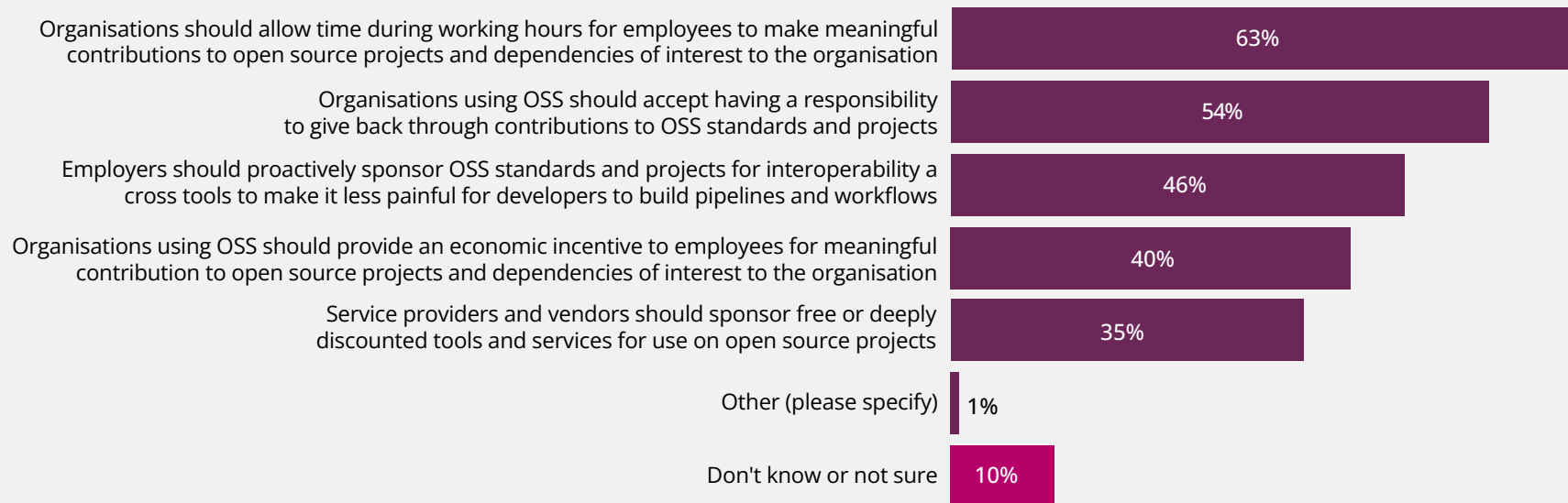
27 <https://newsroom.eclipse.org/news/announcements/open-letter-european-commission-cyber-resilience-act>

28 <https://medium.com/indeed-engineering/the-foss-contributor-fund-at-indeed-f164125c1ca0>

29 <https://www.bloomberg.com/company/stories/bloomberg-ospo-launches-foss-contributor-fund/>

FIGURE 22

HOW OSS PROJECT SUSTAINABILITY SHOULD BE IMPROVED



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q43, SAMPLE SIZE = 197, TOTAL MENTIONS = 490

“Open source foundations and industry bodies should have mechanisms in place to ensure that organisations are not only leveraging OSS but are also contributing back”.

– CSILLA ZIGRI, CHIEF STRATEGY OFFICER, BT

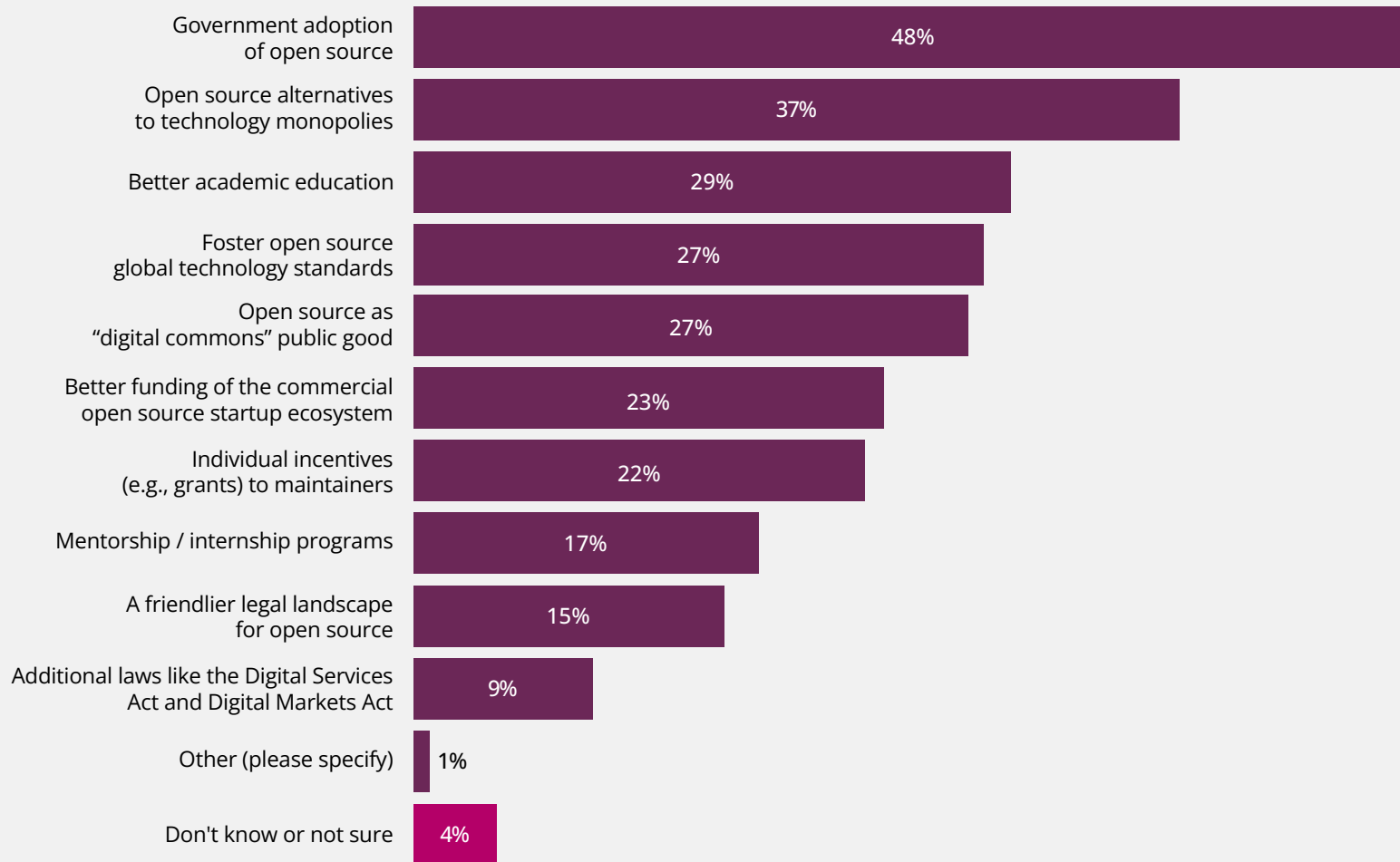
“My survey over the last year of approximately 1,200 open source developers suggested that beyond direct code contributions, a key way AWS supports open source is to provide managed services running those projects”.

– RICARDO SUEIRAS, PRINCIPAL ADVOCATE IN OPEN SOURCE, AWS

Our research also explored the areas in which there should be further investment in open source. The top selection was government adoption of open source (48%), followed by open source alternatives to technology monopolies (37%) (FIGURE 23). More generally, the responses highlighted the diversity of areas for investment in open source that were felt to be worthwhile.

FIGURE 23

WHERE THERE SHOULD BE FURTHER INVESTMENT IN OPEN SOURCE



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q41, SAMPLE SIZE = 197, TOTAL MENTIONS = 510

Missed opportunities in the public sector

Last year’s iteration of this research highlighted indicators that the public sector is failing to fully capitalise on open source.³⁰ Unfortunately, this year’s survey further reinforces this notion and points to a significant gap in sentiment and direction between the public sector and all other sectors.

The public sector is not seeing the growing value perceived by others

Our research suggests that the benefits of open source are perceived to exceed the costs as frequently in the public sector (81%) as elsewhere (77%). Similarly, there appears to be equally strong agreement that open source is valuable to the future of the respondents’ organisation and industry in public sector responses (85% and 96%, respectively) as in all other responses (89% and 87%, respectively).

However, the value derived from open source appears to have stagnated in the public sector, with 53% indicating it has stayed the same, compared with 25% among other industries (FIGURE 24). Arguably, this may be due to greater maturity than in other sectors, but other research and anecdotal evidence strongly suggest otherwise. The IEEE recently published a special issue, *Open Source Software in the Public Sector: 25 Years and Still in Its Infancy*, as a call to action ‘to enable the public sector to fully harness the potential benefits open source has to offer’.³¹

“In the public sector, both awareness and adoption of open source software is still in its infancy due to a number of obstacles including regulatory, cultural, and capacity-related challenges”

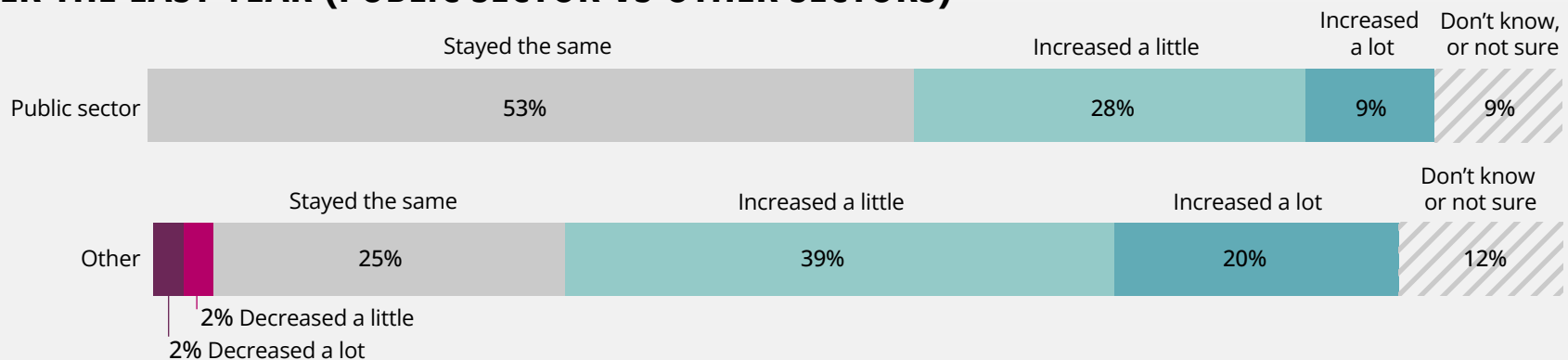
– IEEE SOFTWARE (VOLUME: 40, ISSUE: 4, JULY–AUGUST 2023)

³⁰ <https://www.linuxfoundation.org/research/world-of-open-source-europe-spotlight>

³¹ <https://ieeexplore.ieee.org/document/10176156>

FIGURE 24

THE PERCEIVED CHANGE IN THE VALUE THAT ORGANISATIONS HAVE DERIVED FROM OPEN SOURCE OVER THE LAST YEAR (PUBLIC SECTOR VS OTHER SECTORS)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q26, SAMPLE SIZE = 202

Our survey data point to the public sector having significantly different perspectives of where value lies in open source. For example, when indicating which open source technologies were most valuable to the future of their industry, public sector sentiment towards data technologies was significantly stronger than other sectors (31% vs 16% for advanced analytics and data science and 27% vs 12% for database and data management), while sentiment towards CI/CD and DevOps was significantly weaker (4% vs 16%) (FIGURE 25). Similarly, only 42% of public sector respondents felt open source would benefit their industry in terms of innovation compared with 61% of respondents from other sectors, while 35% of public sector respondents saw industry standards and interoperability as an area of benefit compared with 55% of respondents from other sectors (FIGURE 26).

Others see a role for the public sector that it does not

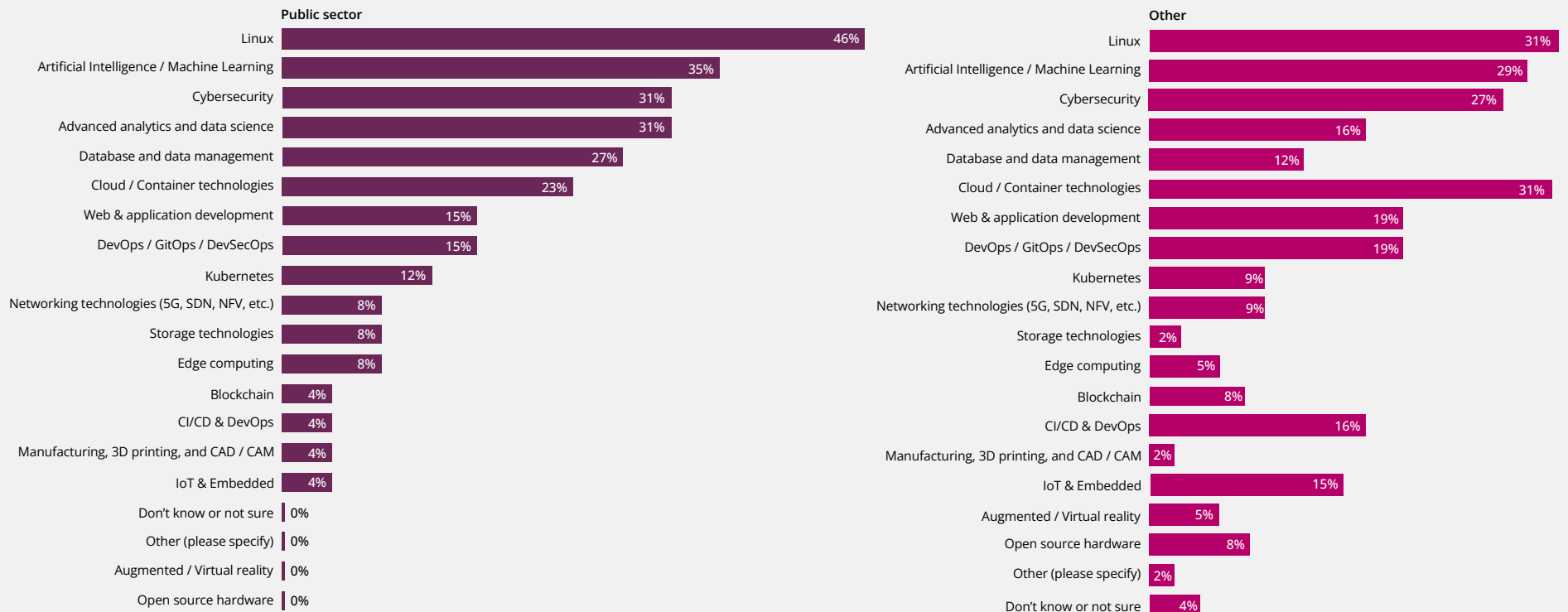
When asked which industries would most benefit from investing in open source, the public sector (35%), IT (31%), and education (29%) came out top, with no significant variation in the responses from different sectors (FIGURE 27).

In exploring sentiment towards where there should be further investment in open source, significant differences arise (FIGURE 28). There is strong consensus that government adoption of open source warrants further investment, with particularly strong sentiment towards this among public sector responses (62%). However, beyond that, public sector responses point to better academic education (54%) and mentorship/internship programmes (27%), the sentiment for which is much lower in other industries (25% and 15%, respectively). Furthermore, where other responses show warmth towards fostering open source global tech standards (29%) and recognising open source as a 'digital commons' public good (29%), the public sector responses are significantly cooler (12% and 12%, respectively).

When considered thematically, it appears that those outside the public sector believe the public sector could, and should, play a more central role in the adoption, promotion, and support of OSS. However, the public sector either actively disagrees or does not recognise the opportunity.

FIGURE 25

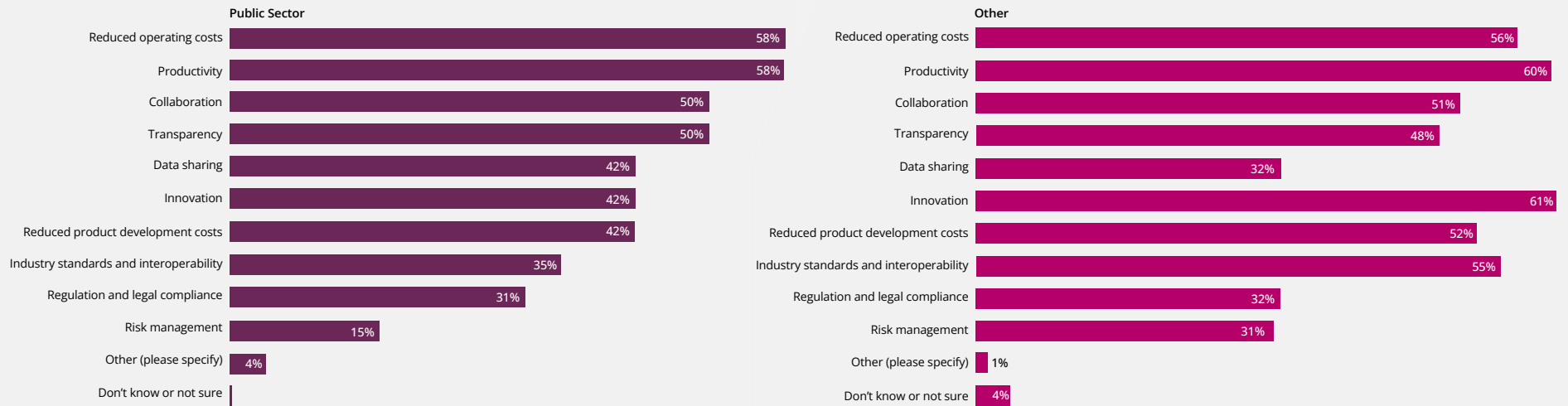
THE OPEN SOURCE TECH THAT IS MOST VALUABLE TO THE FUTURE OF THEIR INDUSTRY (PUBLIC SECTOR VS OTHER SECTORS)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q38 BY Q8/9, SAMPLE SIZE = 197, TOTAL MENTIONS = 553

FIGURE 26

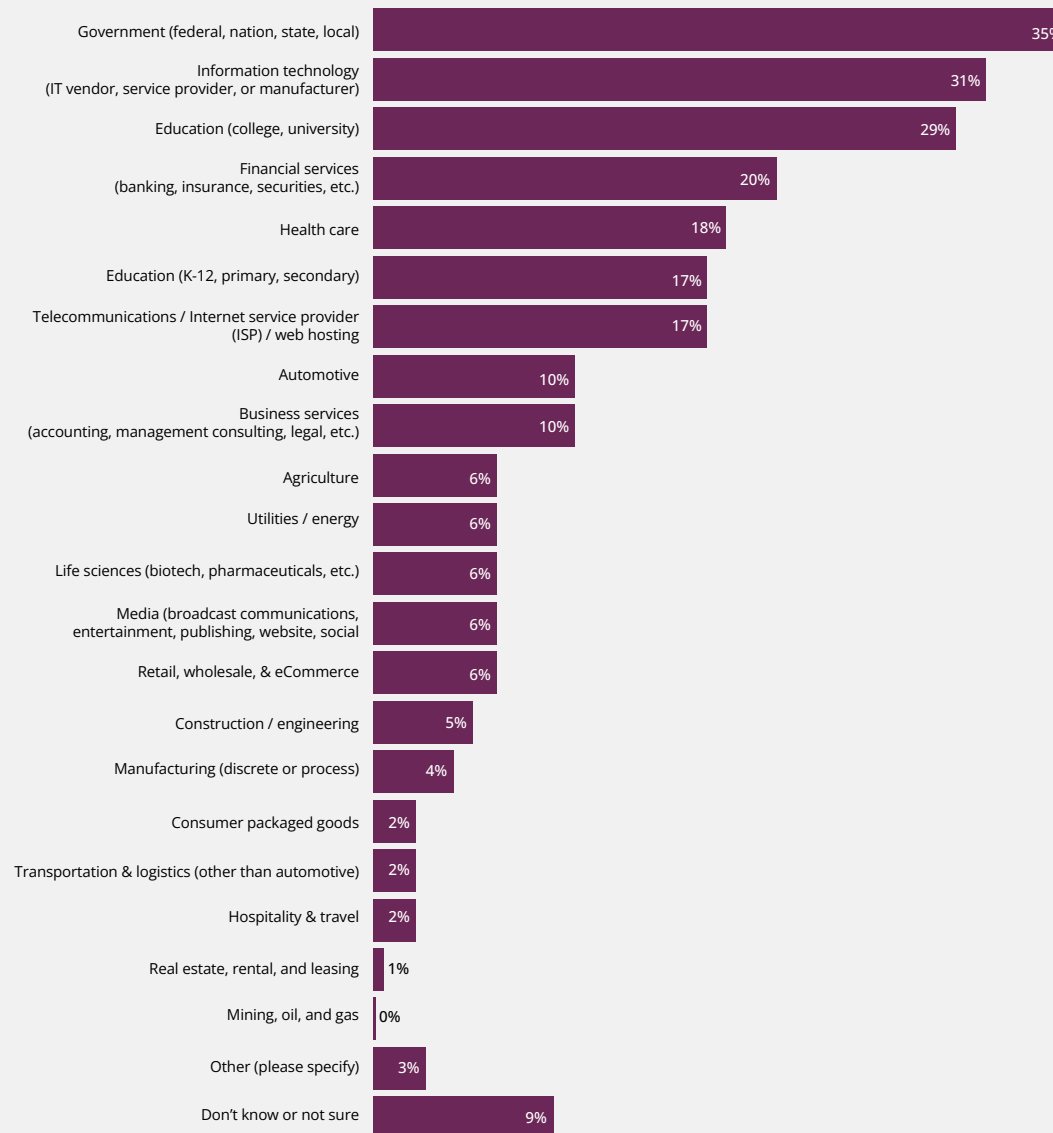
THE ASPECTS OF INDUSTRY THAT WOULD MOST BENEFIT FROM OPEN SOURCE (PUBLIC SECTOR VS OTHER SECTORS)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q39 BY Q8/9, SAMPLE SIZE = 197, TOTAL MENTIONS = 937

FIGURE 27

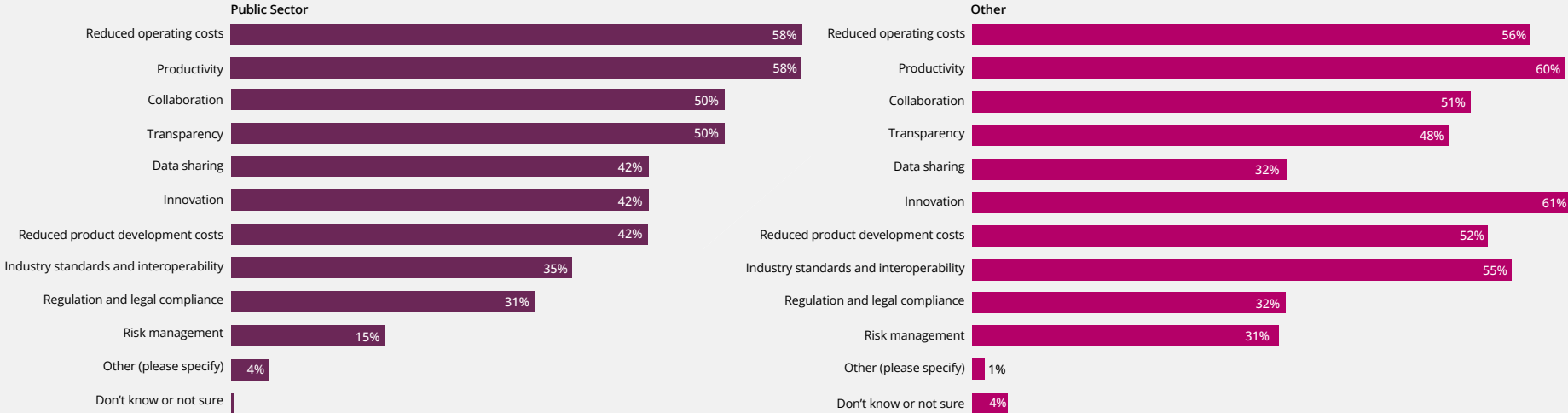
THE INDUSTRIES THAT WOULD MOST BENEFIT FROM INVESTING IN OPEN SOURCE (PUBLIC SECTOR VS OTHER SECTORS)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q40, SAMPLE SIZE = 197, TOTAL MENTIONS = 503

FIGURE 28

WHERE THERE SHOULD BE FURTHER INVESTMENT IN OPEN SOURCE (PUBLIC SECTOR VS OTHER SECTORS)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q41 BY Q8/9, SAMPLE SIZE = 197, TOTAL MENTIONS = 510

Conclusions

This report is the culmination of many hours of research work; time spent crafting the survey, fielding and analysing the results, interviewing subject matter experts, researching other publications, and exploring datasets. As the report authors, we're very happy with the results and are pleased that they didn't just reinforce the findings of last year's report. We found new avenues to explore and drew fresh conclusions.

We want this report to be more than just a story. There are clear opportunities in front of us and tangible problems to be solved. Here are some actions that you can take to make open source more accessible, sustainable, and valuable for yourself, your organisation, Europe, and the global community.

Leverage the growing value of open source

The value and significance of open source need very little explaining, and in some ways, our research simply adds numbers to something that is well understood. But data and numbers are both useful and empowering. We should be arming ourselves with this information and leveraging it to tackle some of the challenges that still persist, most notably the usage vs contribution gap. Given the value of open source, we should all be looking to protect it, both for ourselves and for others.

Be conscious of the sector-specific challenges that exist in the public sector

Public sector organisations are struggling to unlock the value of open source. Our findings revealed that it isn't simply a matter of waiting for this sector to catch up. The economics of the public sector and the resultant dynamic are very different from those of private sector organisations. As a result, they have a different relationship with open source. Through a better understanding of this relationship and the sector-specific challenges, we can create a more inclusive community.

Take a more responsible approach to open source use and security

We found a number of interesting paradoxes when considering open source security. Many of these stem from there being a gap between the perceived state of the industry and what is happening "on the ground". The most important thing any organisation can do is become a more mature consumer of open source. It is incumbent on all of us to better understand the myriad sustainability and security challenges and for organisations to put time and effort into solving these.

About this study

This study is based on a web survey conducted by the Linux Foundation and its partners from April to June 2023. The survey was intended to provide a global perspective on the state of open source, but for this specific report, responses have been filtered to only include organisations headquartered in Europe. In the following, we present the study methodology and the demographics of the respondents. From a research perspective, it was important to eliminate any perception of sample bias and also ensure high data quality. Sample bias was addressed by sourcing our usable sample from the Linux Foundation membership, partner communities, social media, and a third-party panel provider. Data quality was addressed 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 organisations they worked for.

Survey data were collected from end-user organisations, IT vendors and service providers, and non-profit/academic/government organisations. Respondents spanned many vertical industries and companies of all sizes, and data were collected from geographies including the Americas, Europe, and Asia-Pacific. However, in this specific report, we only included data from Europe to explore trends and patterns specific to the continent.

Methodology

Survey screening involved the use of four variables to validate the respondent. The respondent was required to answer all of the demographic questions.

- The respondent had to be at least somewhat familiar with how their organisation 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 not only for themselves but for the department, organisation, or industry they work 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 global survey, 1,249 were disqualified due to our screening criteria, and 916 answered a significant number of survey questions or 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 Europe and included in this report, 307 qualified respondents started the survey, and 197 respondents made it to the end. The margin of error for the European data is at most $\pm 5.8\%$ at the 90% confidence level. Data collection was stratified by company size and organisation type. The stratification was designed to allow segmentation by these variables, and other variables correlated with these.

Although respondents were required to answer nearly all questions in the survey, there were times when the respondent was unable to answer a question because it was outside the scope of their role or experience. For this reason, we added a 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 respondents that answered the DKNS 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 done because the data missing can be classified 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 included 43 questions on 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 29 illustrate the geographic distribution of the global survey, the company size of the organisations, and the role of respondents. The left-hand chart in

FIGURE 29 identifies the region where the respondent's corporate headquarters is located. For the global survey, responses for Asia-Pacific were primarily populated by respondents from Japan. Likewise, respondents for the Americas primarily came from North America, and responses from Europe generally originated from Western European countries.

The chart in the bottom left of FIGURE 29 shows company size as measured by number of employees. The seven categories originally presented in this question have been aggregated into the four categories shown here. The intention was to ensure that each of these four categories had enough responses so that, when cross-tabbed, the results would be reliable.

The right-hand chart shows the role that best describes the respondent. Approximately 66% of the respondents were in IT roles.

The type of organisation is shown in the left-hand chart of FIGURE 30 and contains a cross-section of IT vendors and service providers, end-user organisations, and other organisations, including non-profits, foundations, academic institutions, and government agencies.

In the right-hand chart, respondents were able to report the industry their organisations are part of. Most respondents work for cross-industry IT vendors, but a variety of industries are represented in the sample.

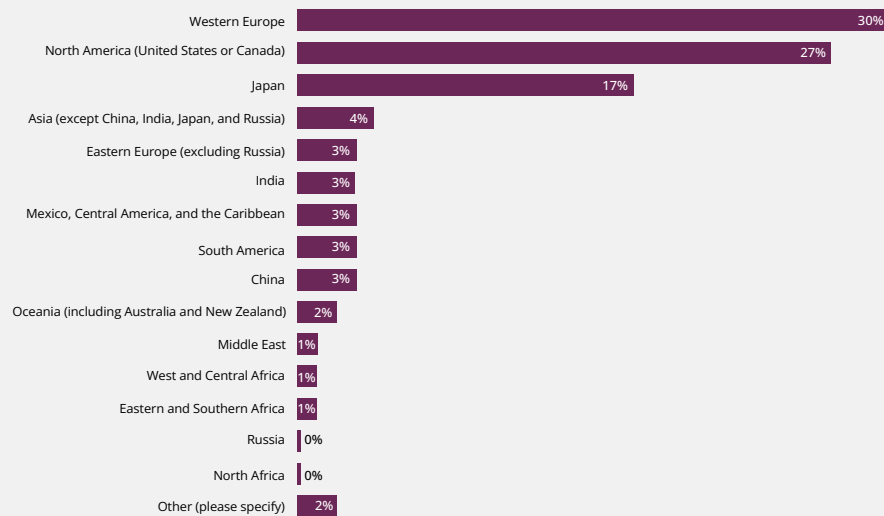
Survey data: Data.World

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 29

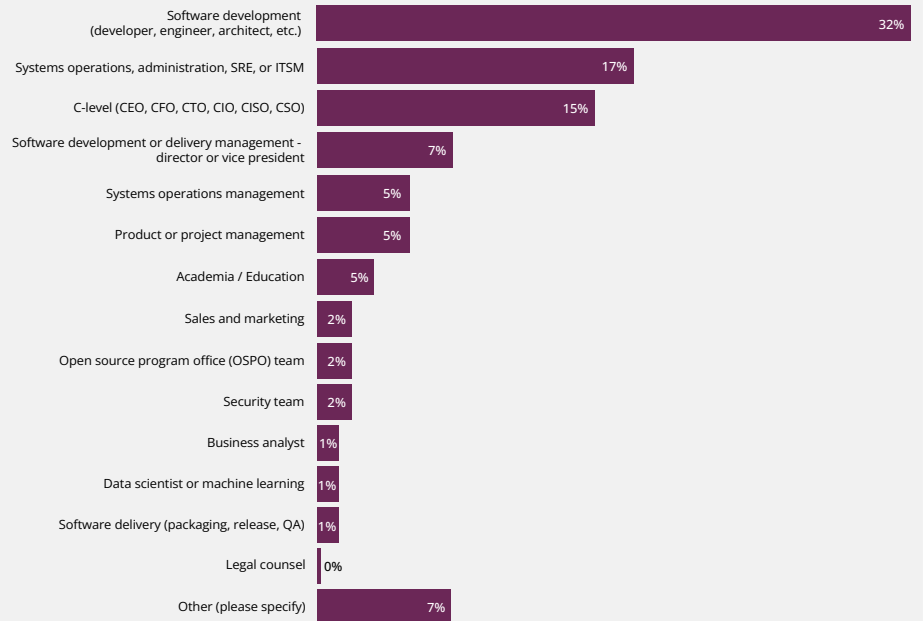
REGIONAL DISTRIBUTION AND SELECTED DEMOGRAPHICS FROM THE 2023 WORLD OF OPEN SOURCE SOURCE: GLOBAL SPOTLIGHT SURVEY (FILTERED FOR EUROPE)

In what country or region does your organisation have its headquarters?



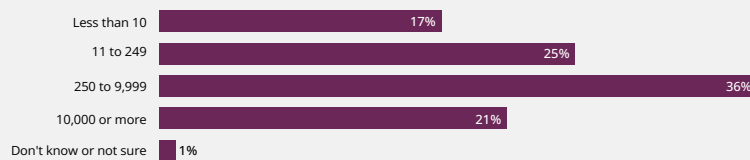
SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q5, SAMPLE SIZE = 916

Professionally, which role do you most closely identify with?



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q6, SAMPLE SIZE = 307

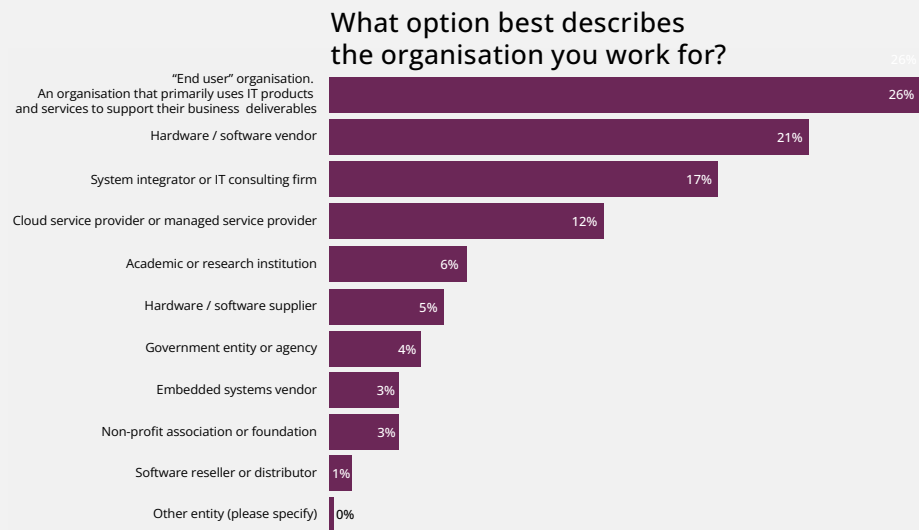
Please estimate how many employees your organisation has worldwide.



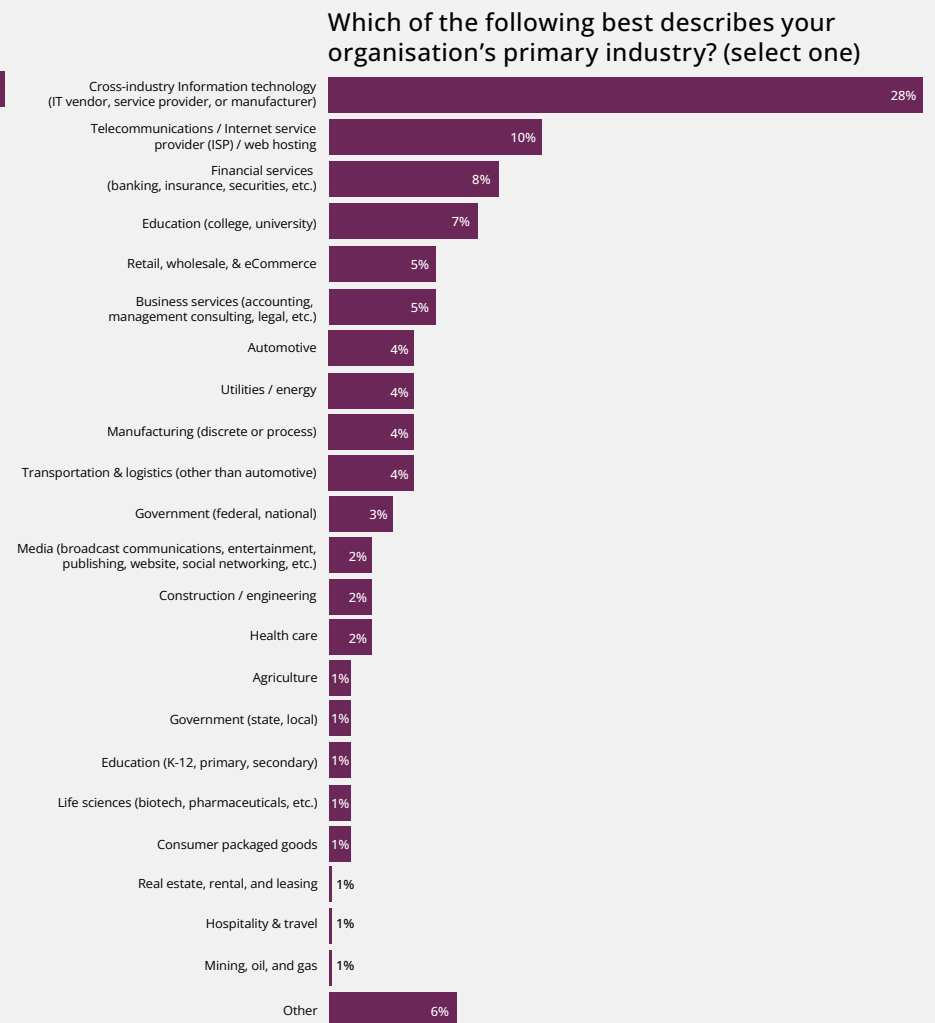
SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q10, SAMPLE SIZE = 307

FIGURE 30

SELECTED DEMOGRAPHICS FROM THE 2023 WORLD OF OPEN SOURCE: GLOBAL SPOTLIGHT SURVEY (FILTERED FOR EUROPE)



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q7 BY Q8/9, SAMPLE SIZE = 307



SOURCE: WORLD OF OPEN SOURCE GLOBAL SPOTLIGHT 2023 SURVEY (EUROPE), Q8/Q9, SAMPLE SIZE = 306

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Graham is the Chief Strategy Officer at Scott Logic, a U.K.-based software consultancy creating bespoke digital technology solutions for

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Matt is a Delivery Principal at Scott Logic, where he helps ensure high-performing teams have what they need to meet and exceed

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About the Linux Foundation and Linux Foundation Research

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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