



Fintech
Open Source
Foundation

The 2021 State of Open Source in Financial Services

Fintech Open Source Foundation (FINOS)
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Foreword

When we started FINOS in 2018, our vision was to provide an arena that would accelerate the financial services industry's journey towards open source along the same path that virtually every other industry had taken in the last two decades. This was not about "open source for open source's sake" but as a means to leverage this powerful, highly effective collaboration model.

Over the last three years, we have seen the industry take major leaps forward in using open source to tackle long-standing technology and business challenges in areas including interoperability, inefficient allocation and reuse of resources, poor customer experience, and ultimately, talent retention and development. We witnessed five major global financial institutions leaping into open source by contributing years of valuable intellectual property to our community and collaborating with their most fierce competitors. Intuitively, we knew the industry was progressing, but we needed data to understand the extent of that progress. After all, you can't improve what you can't measure.

So it became imperative to understand and clearly communicate the state of open source adoption, contribution, and maturity in the financial services industry. To that end, FINOS is pleased to publish this report, providing readers with a valuable quantitative and qualitative study of open source use in financial services.

We hope this document serves as a resource to inform and support business and technology leaders in their efforts to grow and strengthen participation in developing open source practices, software, and standards. Please take advantage of this report and use it to start a new conversation, engage stakeholders and counterparts, and increase support for our growing community of individuals and organizations delivering solutions through open source.

Finally, a big thank you to all of our research partners and those who participated in the survey and interviews; without your help, we wouldn't be able to conduct this valuable research.

We're thrilled that open source in financial services is now recognized as a strategic pillar, and we are honored to have played a role in accelerating its inevitable evolution. Let's keep the momentum going! Rest assured, open source is here to stay.

- Gabriele Columbro

Executive Director, *Fintech Open Source
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8% of study respondents have policies that always encourage upstream contribution, compared to 36% in other industry sectors

Only 35% of respondents are aware of their being an OSPO in their organization, and 26% could not identify or know who their FOSS leadership was



15% of employees in financial services organizations are unclear of FOSS contribution policies

The top 5 areas where respondents felt FOSS engagement could improve the Financial Services industry were **AI/ML, Common Workflows, Regulatory Compliance, Cloud, and DevOps**



45% of respondents reported that their employers heavily restrict or prohibit contributions to FOSS projects, whether private or work-related



56% of respondents had difficulty making good decisions about which FOSS components and versions to use



17% of employees in financial services organizations are unclear of FOSS consumption policies.

50% of respondents feel their employer should provide greater support around FOSS contribution policies



84% of respondents said Innovation was the top motivator for participating in FOSS projects

65% of respondents spend at least a few hours a month working on FOSS projects officially, and 40% spend a few hours of personal time on FOSS.



58% of respondents indicated that they or their colleagues contribute to work-related software projects that are open to their business unit or to their entire company (inner source)



69% of respondents feel consumption of FOSS improves work productivity



75% of respondents said they were not "open source first" organizations or were unaware if they were.

72% of respondents said they commit to looking for open source solutions before proprietary ones.



448 Contributors to FINOS Projects

LFX Data *All-Time Stats as of 31 August 2021

22.84M Lines of Code Changed in FINOS Projects



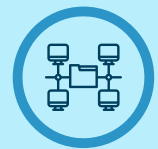
LFX Data *All-Time Stats as of 31 August 2021



19.50K Commits in FINOS Projects

LFX Data *All-Time Stats as of 31 August 2021

163 Repositories in FINOS Projects



LFX Data *All-Time Stats as of 31 August 2021

Executive Summary

The increased prevalence, importance, and value of open source is well understood and widely reported by many industry surveys and studies. However, the rate at which different industries acknowledge this shift and adapt their own business and technology practices to capitalize on open source opportunities differs considerably.

The financial services industry has been a long-time consumer of open source software. At the same time, open source software and standards development have not been activities at the core of financial services industry business models and technology strategies. Consequently, the levels of contribution to—and publishing of—open source, in software development, or in terms of allocating staff resources, are still in their infancy.

This report identifies the extent to which the financial services industry is active in open source, creating a baseline of understanding of governance, leadership, consumption, contribution, culture, and overall open source aspiration. Further, the report highlights the obstacles and challenges to improving industry-wide collaboration and concludes with a set of actionable insights for improving the state of open source in financial services. Here is a distillation of the key findings.

The Industry is Missing Out on Efficiency Gains and Innovation

Over 60% of respondents identified “Efficiency” and “Shared Innovation” as economic motivations for using open source. 81% of respondents agreed or strongly agreed that “Innovation” was one of the main reasons their company participates in open source with “Time to Market” and “Total Cost of Ownership,” following closely with over 80% identifying this as a reason. These figures reflect the great value that open source delivers.

Our respondents also indicate that they want to contribute to open source because “it’s fun” (53%) or they “learn to code” (54%). Although only some (40%) get to spend time at work contributing to open source projects, most (66%) spend some personal time on this activity.

So, what is stopping the industry from realizing all this potential value? Our research identified several areas: a lack of clear leadership and communication; the common divide between business and technology; an acknowledgment that open source must be part of the technology strategy; inadequate policies, processes, tooling, and training for open source consumption and contribution.

Our research also identified some bright spots, including areas where open source is widely used in financial services, such as DevOps tooling, infrastructure, and “line of business applications,” as well as areas ripe for collaboration like DevOps, cloud, AI/ML, standards, open data, and regulatory compliance.



KEY TAKEAWAY

If organizations wish to improve efficiency, drive innovation, and retain talent, they must develop the potential of open source and implement best practices.

Open Source Needs a Seat at the Top Table

In organizations where senior management has recognized open source as a strategic endeavor, it’s no surprise that there has been more focus on enabling employees to safely and efficiently consume and contribute open source code. However, there is a lack of open source leadership, consistent communication, and alignment in many financial institutions. Only 8% of respondents indicated that their company’s open source leadership was at the C-level, and 25% either didn’t know the seniority or indicated there was no leader. Without clear leadership at a level that can influence budget and strategy, it’s almost impossible to define and disseminate a clear message, influence culture, and implement the necessary governance and tooling.

Having established open source leadership in an influential position also helps address the common divide between ‘business’ and ‘technology’ in banks. More modern development practices are starting to bridge the gaps, but this chasm still runs deep within these organizations. The results of this research indicate that open source is very much perceived as a technology concern, with executives, contributors, and managers in technology functions having the most influence over the open source direction of their business. Of these, 80% of survey respondents agreed or strongly agreed that individual contributors in technology had significant

influence. Qualitative interviews indicated the sentiment that those on the business side still don't "get" open source and its value proposition. It is hard to see open source being truly strategic to a financial institution when this divide exists.

While financial institutions are still grappling with making open source strategic, it was heartening to see respondents identify "collaboration" (65%), "individual contribution" (51%), and "peer review" (47%), leading the table of open source behaviors championed in their organizations.

Open Source Governance is Hard But Necessary

A well-implemented governance model comprises policies, processes, tooling, and automation implemented to ensure open source is consumed, contributed to, created, and supported in a safe and compliant manner. This is not an easy task but is a worthwhile and essential foundation for achieving the benefits that open source can provide, which, according to survey respondents, include innovation (84%), reduced total cost of ownership (82%), and reduced time to market (83%).

Our research indicates that financial services is making progress but is still behind other industries. It's encouraging that 67% of respondents are aware of an open source policy as that's an important first step. 72% also know the policy on consumption; unfortunately, only 21% indicated that open source consumption is encouraged, with 51% responding that it is restricted or permitted under strict guidelines. Looking at contribution, we see a bigger challenge, with 15% of employees being unclear of their open source contribution policies compared to 5% in a similar survey, which spanned a broader range of industry sectors.¹ Additionally, A mere 8% of respondents in this study have policies that always encourage upstream contribution, compared to 36% in other industry sectors.² Looking at these results, it's no surprise that only 35% of respondents are aware of their organization having an Open Source Program Office (OSPO) or formal review board, whose responsibilities are to advise, build, implement, and evolve a governance program and associated policies.

KEY TAKEAWAY

A bottom-up approach to open source isn't enough; this needs to be coupled with a senior open source leader who can influence culture and strategy in the organization.

KEY TAKEAWAY

Unclear policies are an inhibitor to open source success, so it's important to focus on governance early in the process of establishing open source practices in an organization.

¹ Report on the 2020 FOSS contributor Survey, The Linux Foundation, December 10, 2020

² Report on the 2020 FOSS Contributor Survey, The Linux Foundation, December 10, 2020

Introduction

Financial services firms face unique obstacles to realizing the benefits of open source, including legal and regulatory, internal policies, cultural friction, and heavily restricted technology environments. The Fintech Open Source Foundation (FINOS) is a unique organization creating a path to working outside corporate boundaries with others in the industry trying to solve the same problems.

FINOS was established to accelerate collaboration and innovation in financial services by adopting open source software, standards, and best practices.

FINOS comprises over [45 member organizations](#), developing software and standards for data and data technologies, cloud services, financial desktop applications, and more. It is unique among open source foundations in that it is an open community for financial services and fintech firms to address industry challenges instead of being horizontal across industries.

In June of 2021, FINOS, in partnership with the Linux Foundation, GitHub, Scott Logic, and Wipro, launched a survey to understand the use of open source in financial services organizations, including banks, asset managers, and hedge funds. The survey was designed so that the findings would be a resource to be used by *all* financial services organizations to establish a benchmark against which future studies may be compared.

This report will explore motivations and challenges, successes and failures, the current state, and the direction of travel for open source in this sector. It will shed light on the strategic opportunities and organizational benefits created by open source and the challenges unique to the industry.

Scope of Open Source Financial Services Activity

A long-standing struggle for the financial services industry is how to accurately measure open source contribution (in any of its many forms) from its participants. We highlight some of the challenges in the report, but summarize the top issues with collecting the data, as follows:

1. Many contributions don't include the contributor's work email address (sometimes because corporate policy does not allow it).
2. In some cases, all contributions on behalf of an employer are released under a single corporate I.D.
3. There is no single, digitally accessible list of all email domains for financial services organizations in order to build the set of email domains to include for analysis.

Due to these challenges, this data will be imperfect, but we think it's important to establish a baseline that we can build on in coming years. The analysis in this section was provided by GitHub using a list of FINOS-supplied email domains of over 400 of the largest financial services institutions (by revenue and/or assets under management) as well as those financial services organizations known to this group to be active or interested in open source. Data was included for GitHub users who made commits to any public or open repo with an email (primary or other) that matched an email domain in a FINOS-provided list, or if the user was a member of an organization that had a billing email with a domain in that same list.

Public and OSS GitHub Repositories ³ with Financial Services (FinServ) Email Domain in User Profile ⁴ from July 1, 2020 through June 30, 2021		
Unique Repositories with FinServ Commits	Unique FinServ Users	Total Commits by FinServ Users
34,370	10,036	580,356

Drilling into the data, it's notable that the overwhelming majority of projects in the data set have contributors from only a single financial services institution. There were just over 15 exceptions, where there were 2 or 3 financial services institutions contributing to the same project, none of which were FINOS projects. These projects focus on governance, financial services specific technology, programming languages, and a mix of other areas. Turning then to look at the projects with the most individual committers identified as being from financial services, we see projects from several financial services organizations or fintechs, such as ANZ Bank, Capital One, Jane Street, Morgan Stanley, Starling Bank, Bloomberg, ConsenSys, and Wise (formerly TransferWise). While the total number of unique financial services committers ranges from 5 to 43 they come almost entirely from the same financial services organization for each project.

3 "Public repositories" are repos on GitHub that are shared publicly while "Open Source" repositories are public repositories with an explicit declaration of an OSS license.

4 Defined as users committing to public and OSS GitHub repositories with an email address (primary or other) ending in a domain in the financial institution list supplied by FINOS.

If we briefly compare this analysis to data provided by LFX Insights, a Linux Foundation tool used to provide visibility into project performance and ecosystem trends for Linux Foundation projects only, we do see some discrepancies for the same time period. For example, LFX shows that Cloud Service Certification has commits from two banks however this does not show up in the GitHub data set. This reinforces the introductory premise that this data is very hard to collect comprehensively, consistently, and reliably. We know that contribution can come in many forms, including issues, comments, and pull requests, and while there is certainly value in measuring these efforts as well, we believe that evaluating commits over time is the best way to measure progress in the industry as institutions overcome existing barriers and challenges to open source contribution.

While we know that these numbers under-represent the true contribution of individuals in the financial services industry, it is a useful baseline to have and one we expect to see grow year on year.

Thank you to GitHub for providing the data for this analysis.

Leadership

To ensure that an organization is aligned and moving forward together, consistent open source leadership must come from multiple stakeholders and through multiple internal channels.

From executive sponsorship to operational support from an OSPO to developer evangelism, it is essential to operate in unison and communicate the same messages. And, supporting individuals to become leaders through their actions and contributions is a core tenet of open source and an important indicator of success for open source programs.

However, conveying the value of open source to and from senior management is a challenge for many in the industry. As per one OSPO director;

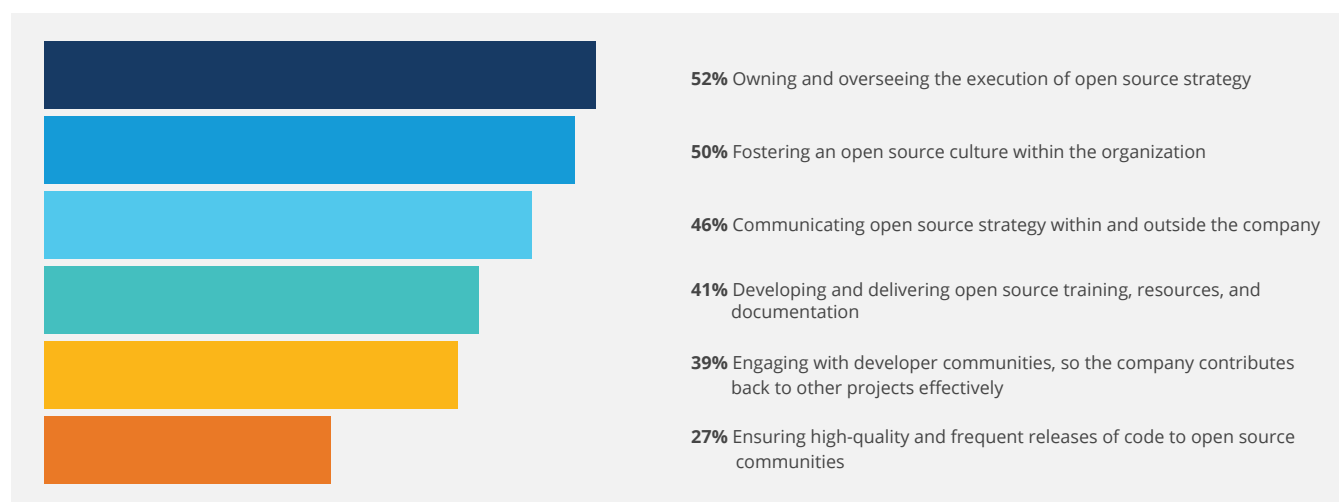
“Management continues to be the hardest problem because we’re teaching them something that’s completely new. People hanging out in ivory towers don’t realize that 99% of what’s inside really isn’t unique or differentiated. That creates a disconnect that can cause them to bristle at the idea of upstream contribution, releasing an open source work, or participating in a working group or user group, or presenting at an event.”⁵

Evidence suggests that consistency of communication and messaging can be quite a struggle for many organizations. Nevertheless, clear, consistent communication is critical to reaping the full benefits of open source activities.

Figure 1: Open Source Leadership

Is there a single leader responsible and accountable for any of the following?

Multiple Response Variable Sample Size = 111, Valid Cases = 111, Total Mentions = 283



Source: FINOS 2021 Survey, July 2021.

⁵ Interview with financial services OSPO leader, July 19, 2021.

All of the leadership activities outlined are important for the success of an open source program. They should involve multiple stakeholders, but as we see, the responses vary from a high of 52% to a low of 27%. This leaves wide room for improvement in leadership and communication in these organizations and represents a real opportunity to reach and impact more individuals.

In response to the questions, “*Is open source strategically important for your organization?*” and “*Has this changed in the last 2-3 years?*” one CTO at a large investment bank told us that “*changes in management definitely helped shift this. The company overall has become more engineering-centric.*”⁶ That same individual shared that the focus can be different for open source and inner source where “*open source participation is still more bottom up while for inner source it’s become top-down and a key part of the strategy.*”

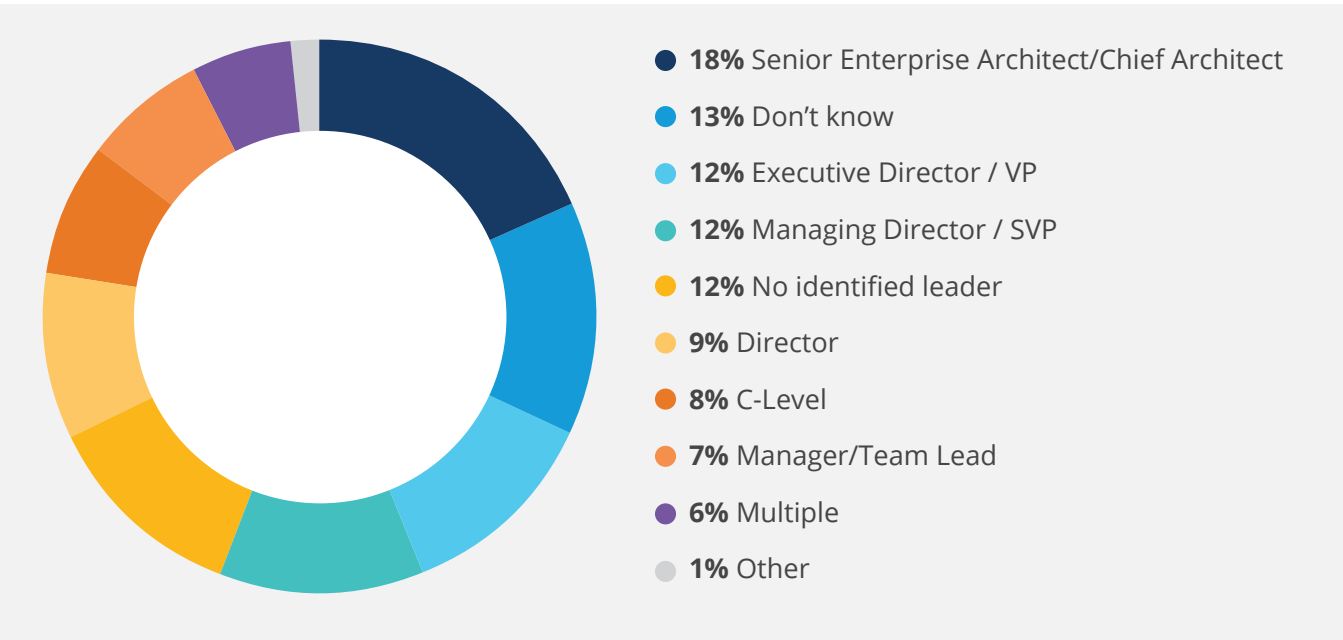
The head of another OSPO shared that his role wouldn’t even exist if it weren’t for the CIO publicly stating the importance of open source at an internal all-hands meeting.

The opportunity for growth in financial services of the leadership role around open source is quite evident in the responses to the question, “*What seniority is your open source leadership?*”.

Figure 2: Seniority Levels Among Open Source Leaders

What seniority is your open source leadership?

Sample Size = 145



Source: FINOS 2021 Survey, July 2021.

6 Interview with a CTO for a global bank, July 7, 2021

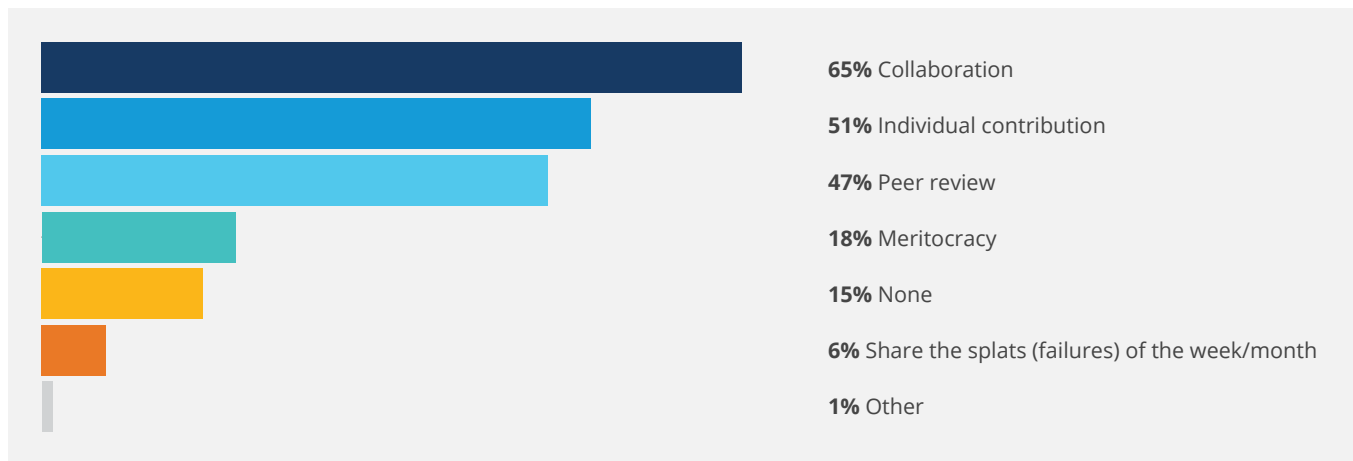
When there are ten different categories of response and two of the top five are: “No identified leader” and “Don’t know,” it is clear that there is work to be done in this area.

Of those organizations with active leaders, it is good to see the following activities championed the most: individual contribution and collaboration. This clearly indicates a correlation between the focus on collaboration and contribution and the *need* for more collaboration and contribution.

Figure 3: Collaborative Behaviors

What open source behaviors are championed in your organization to establish trust and transparency to drive increased open source/inner source collaboration?

Multiple Response Variable Sample Size = 139, Valid Cases = 139, Total Mentions = 283



Source: FINOS 2021 Survey, July 2021.

Companies need to realize that open source leadership doesn’t need to correlate to organizational leadership. Executive leadership and community leadership are both important but not the same. As with other meritocracies found in the technology industry and elsewhere, in the open source world, leadership is established by behavior and actions and is therefore *merited*; and these are key aspects of open source to understand and mirror within financial organizations.

One of the important aspects of leadership for many executives is the notion of *industry* leadership. Frequent comments in the press and at conferences concern the use of open source as a transformation lever and how organizations can become “open source first” companies. But when asked about whether organizations were “open source first” in the survey, 75% said “no” or “they didn’t know.” We can infer two things from this. First, being open source first is a nice sound bite. Second, in some instances, there is an intent to be an open source first organization, but people don’t know what that means or how to become one. This was evident in one bank when the procurement department, doing their best to be an open source first organization, sent an email to a generic address for an open source project, asking for a Service Level Agreement (SLA) and couldn’t understand why they never received a response.

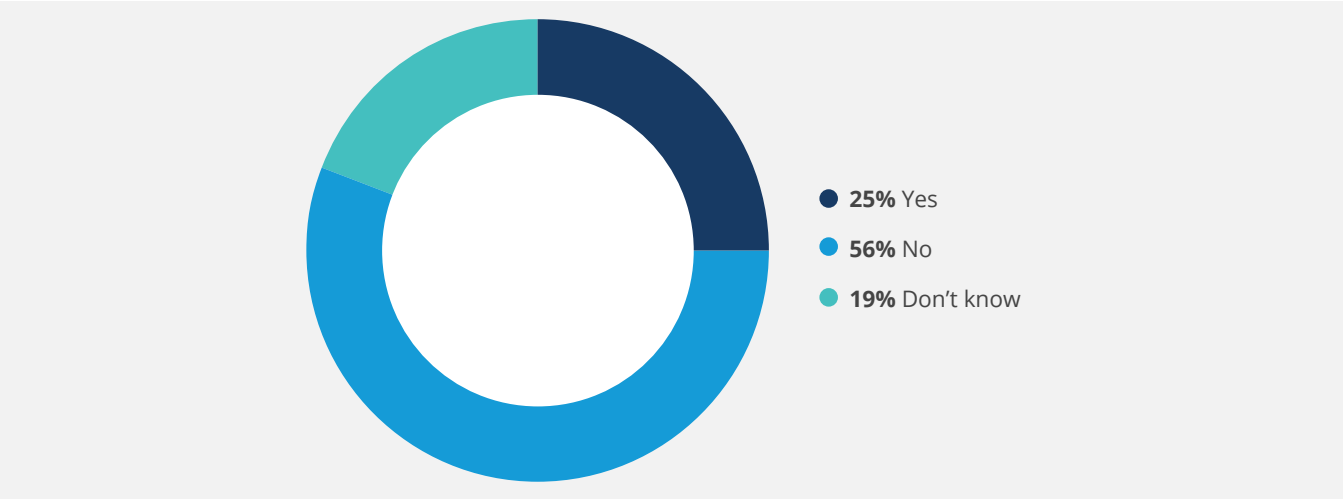
For organizations with an open source first policy, we see one common trait: a common desire to lead with open source. Almost 72% of respondents said they commit to looking for open source solutions before proprietary. This commitment helps developers understand the open source ecosystem better as they research solutions. For procurement, they understand the unique nature of open source and how to incorporate it into their acquisition models.

One common misconception is that being an “open source first” organization means that only open source is to be used. This misconception can be seen as an obstacle until it is understood that the use of open source is a preference, one that only adds an initial research step in the procurement process. It doesn’t necessarily prevent the use of proprietary software if there is no good open source option.

Figure 4: Open Source First Organizations

Are you an open source first organization?

Sample Size = 141

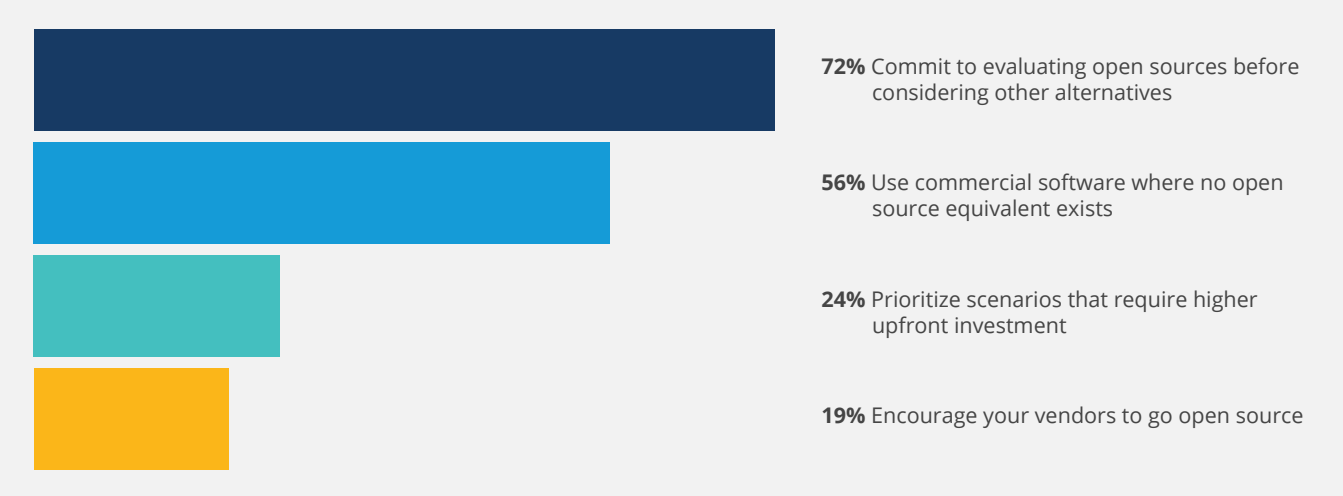


Source: FINOS 2021 Survey, July 2021.

Figure 5: Approaches to Open Source

If your organization has an open source first strategy, does it do any of the following?

Multiple Response Variable Sample Size = 85, Valid Cases = 85, Total Mentions = 145



Source: FINOS 2021 Survey, July 2021.

Consumption

Engaging with open source code has three distinct elements:

- **Consumption:** Identifying, selecting, and ingesting it into the organization
- **Contribution:** Making modifications, such as bug fixes or adding new features to the code, or providing documentation and test results, essentially giving back to the community in some way, shape, or form
- **Publishing:** Taking internally developed code and making it open source

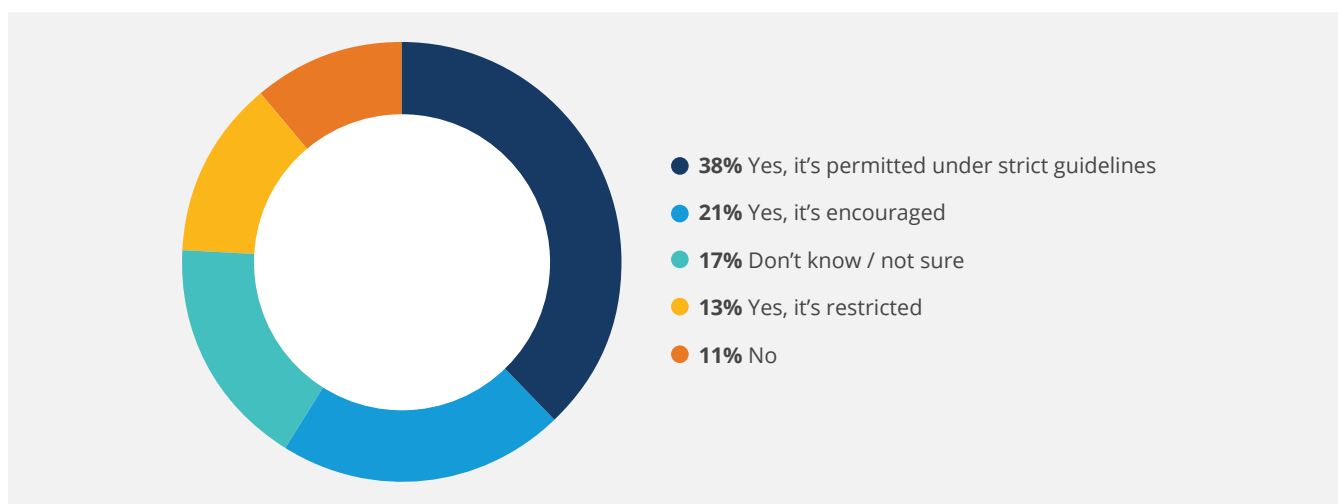
Financial services organizations have been consuming open source code for almost 20 years, starting with the operating system, moving to infrastructure components, databases, languages, frameworks, etc. Today, we see evidence of consumption up and down the stack.

Fully 59% of respondents to the survey attested that they have a policy around consumption that allows it to *some degree*. Of the 17% who responded that they don't know, some likely have a consumption policy but just aren't aware of it. These are quite heartening numbers to see, as having a consumption policy is the first step for companies on the journey to realizing the full benefits of open source.

Figure 6: Open Source Consumption Policy

Do you have a policy on consumption?

Multiple Response Variable Sample Size = 132, Valid Cases = 132, Total Mentions = 435



Source: FINOS 2021 Survey, July 2021.

One of the more interesting and varied responses was to the question, “What are the most common challenges when using open source?”. The eight responses can be put into two categories: governance (security, license compliance, process, and component management); and complexity, in the form of selecting the right open source and getting unbiased information. Difficulty in choosing the right components and getting unbiased information has essentially the same root cause: not understanding how to evaluate the information readily at hand.

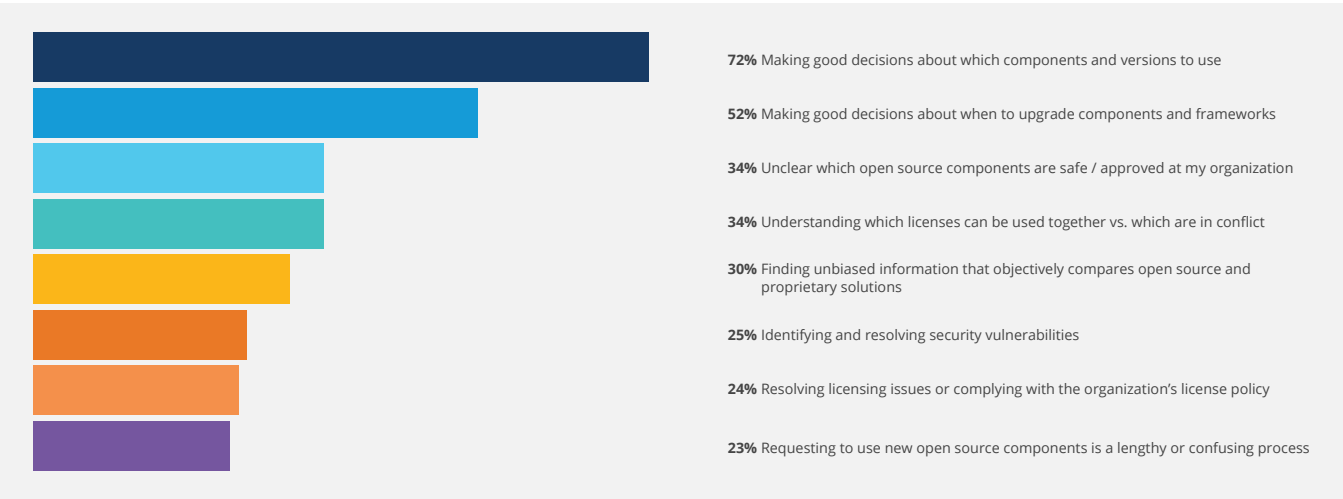
Everything a company needs to decide on open source is publicly available. However, if an organization has not previously engaged in the open source ecosystem, it might not be aware of that. For example, if an organization is looking for a new database, decision-makers hopefully know what meets their requirements, whether SQL, graph, relational, etc. It is harder to know typical metrics on which to evaluate an open source project beyond the purely technical aspects. For example, understanding whether the community is viable or responds to contact from other users are important questions to be answered. Existing toolsets for understanding these types of community health metrics include the CHAOSS Project and LFX Insights.⁷

Simple Google searches will narrow the search to the top 3 to 5 open source alternatives in each category. This is the same process used for proprietary software. From there, organizations can begin to evaluate the maturity, velocity, and vitality of an open source project by digging into the communities themselves. GitHub and GitLab provide some nice tools, as does the Linux Foundation now, to see the project’s history from code growth, contributor growth, and even security view. There are numerous metrics and dimensions with which to identify the right solution for each organization. And, one of the benefits often heard from IT leaders about open source is the ability to “fail fast” and move on with comparatively little to no lost time or financial commitment, thanks to the simplified procurement model of open source.

Figure 7: Challenges Using Open Source

What are your most common challenges when using open source? Check all that apply.

Multiple Response Variable Sample Size = 132, Valid Cases = 132, Total Mentions = 435



Source: FINOS 2021 Survey, July 2021.

7 “Measuring the Health of Open Source Projects”, Isabella Ferriera and Mark Shan, Linux.com, July 2021.

Contribution

Many financial institutions have policies and processes in place to ensure that they are safe consumers of open source software. However, these processes can become overly complicated when it comes to contribution and are often quite prohibitive.

An open source policy is vital as it establishes how to minimize legal, compliance, and IP concerns. However, an effective policy should also act as an enabler, providing awareness, outlining training resources and requirements, and processes that automate and simplify adherence to the policy.

We wanted to explore how the policies of respondents to this survey compared to those of the wider open source community. We asked about the contribution policy of their employer, comparing our results to the Linux Foundation's 2020 FOSS Contributor Survey (where only 7% of respondents are from finance or insurance sectors).⁸

The survey results show some stark differences. A mere 8% of our respondents indicated that their companies have policies that always encourage upstream contribution, compared to 36% in other industry sectors.⁹ In the cases where open source licensing terms mandate that all changes to source must be contributed back to the project, the upstream contribution is greater.

Just as notable is the 18% of our respondents who are simply unsure of what the policy dictates, compared to 5% in other sectors.¹⁰

Open source contributions create opportunities to develop new code, documentation, infrastructure, user experience, and more. And, this is done while channeling the expertise outside of the walls of their organizations. In the words of one OSPO leader,

*"It's also about hearing other people's opinions. If you narrow the scope, then there's no opportunity for alternative opinions [to emerge]. It can lead you to a lot more bad decisions down the road. So having discipline around external feedback, aka needing to collaborate with other people for a shared outcome, helps to hold that in check constantly."*¹¹

⁸ Report on the 2020 FOSS Contributor Survey, The Linux Foundation, Dec 10, 2020

⁹ Report on the 2020 FOSS Contributor Survey, The Linux Foundation, Dec 10, 2020

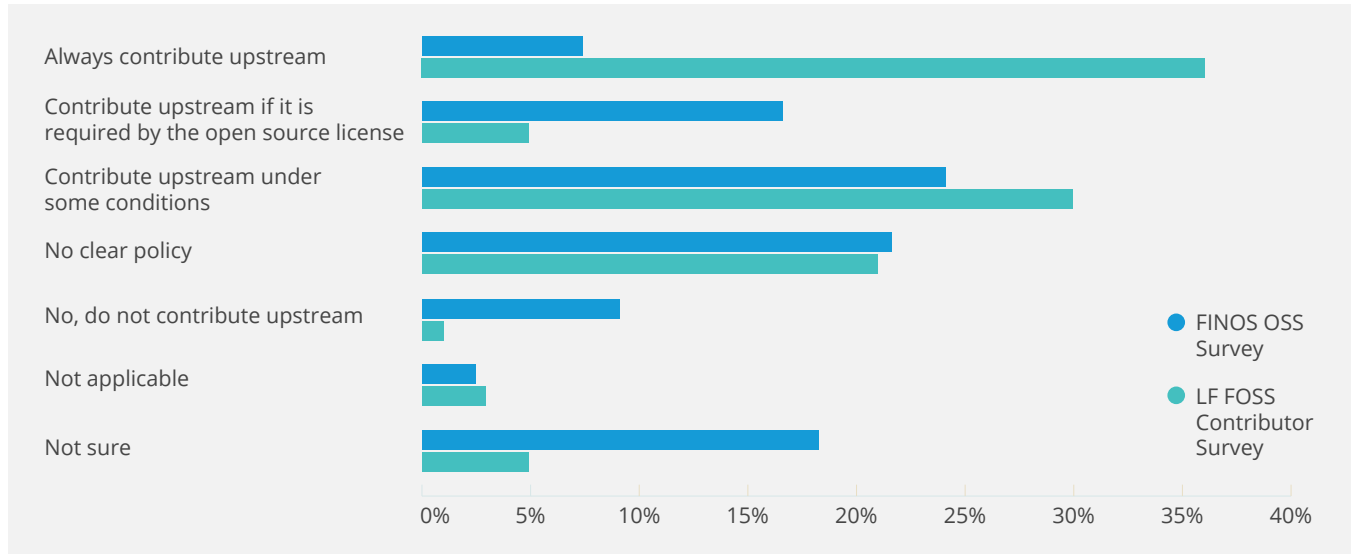
¹⁰ Report on the 2020 FOSS Contributor Survey, The Linux Foundation, Dec 10, 2020

¹¹ Interview with financial services OSPO leader, July 19, 2021.

Figure 8: Upstream Contribution Policy

Please select the statement closest to your current employer's policy on contributing upstream.

FINOS OSS Survey N = 120, LF FOSS Contributor Survey N = 433



Source: FINOS 2021 Survey, July 2021 & FOSS Contributor Survey, December 2020.

We often hear about the complexity that large, highly regulated organizations face in providing mechanisms for upstream contribution. According to one OSPO director:

*"So for anything done officially, we don't allow associates to contribute via their GitHub owner space. If they're making open source contributions on behalf of our organization, for example, everything essentially transits through our public organization's account under our policy."*¹²

In many organizations, upstream contribution is either prohibited, the process is restrictive, or employees simply don't know the process. According to one interviewee,

*"I'm not entirely sure what the process is for contributing back, I've not experienced this. I think the code goes to a central enterprise team, they will check for proprietary code, and will contribute upstream on your behalf if the checks pass."*¹³

One of the challenges mentioned related to consumption, that is equally valid for contribution, is how to adequately train staff as *"licensing gets very complicated and difficult for an engineer to understand the nuance in different scenarios."*¹⁴

¹² Interview with financial services OSPO leader, July 19, 2021.

¹³ Interview with a Global Head of e-Trading, July 5, 2021

¹⁴ Interview with a distinguished engineer leading inner source efforts at a global bank, July 8, 2021

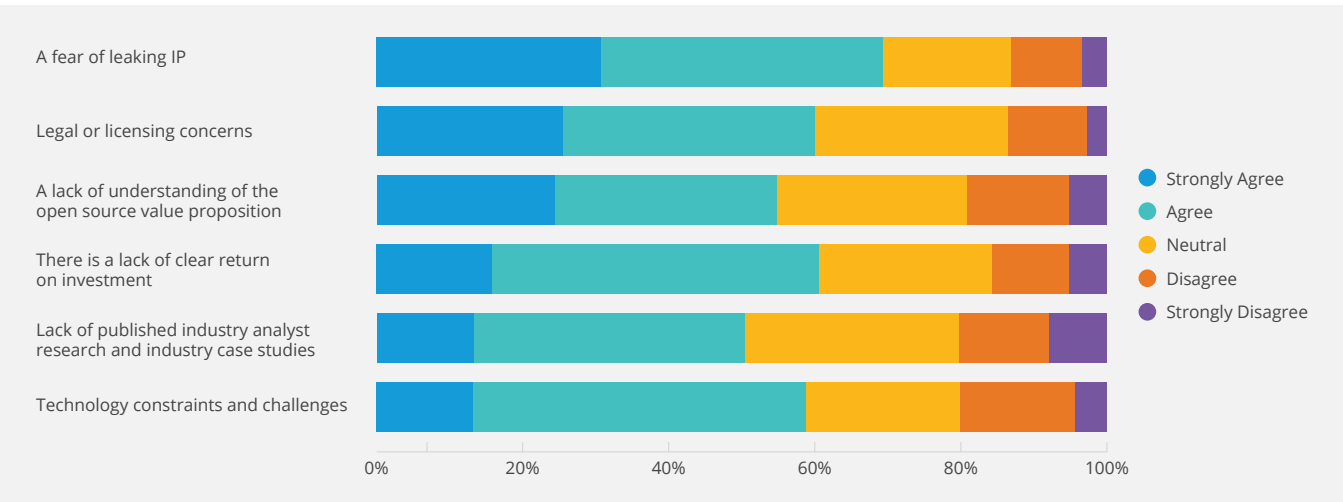
Beyond understanding levels of uncertainty around upstream contribution, we wanted to explore some of the factors that people feel inhibit open source contribution. Survey results showed that fears of IP leakage, and legal or licensing issues were the most significant limiting factors. Additionally, 59% of respondents agree, or strongly agree, that technology is a limiting factor.

One technology challenge to contribution in a heavily regulated industry, which encompasses several factors respondents identified, is around “*automating the interface between internal and external. This is one of the main blockers to contribution and has to address things like data leakage of identifiable information like internal server details. Ideally these checks all have to be pre-commit and not post-commit, to avoid data leaking in commit histories too.*”¹⁵

Figure 9: Limiting Factors of Open Source Investment

What do you think limits your employer’s open source investment and/or discourages contributions?

Sample Size = 118



Source: FINOS 2021 Survey, July 2021.

We also heard about how a bank’s original approach to contribution, specifically the goal of contributing an in-house project to open source, has influenced the progression of its policies and subsequent implementations. “*If you look at contributing a new project to open source versus contributing to an existing project, this changes the risk appetite, individual controls, and the level of scrutiny required.*”¹⁶

One approach we heard about from multiple firms concerning streamlining contributions and applying appropriate levels of scrutiny is quite simple; illustrate the process via a number of different practical examples

15 Interview with a distinguished engineer leading inner source efforts at a global bank, Jul 8, 2021

16 Interview with VP of Architecture and OSPO member at a global bank, July 8, 2021.

which can be used as a reference for engineers, legal, IP, and compliance teams. This is about getting the right balance of appropriate scrutiny, review, and control, with the time it takes to approve a contribution.

While we see banks making progress in open source contribution, as evidenced by the increase in contributors to FINOS projects over the last two years, it is clear that they lag behind other industries and face numerous challenges to close that gap.¹⁷

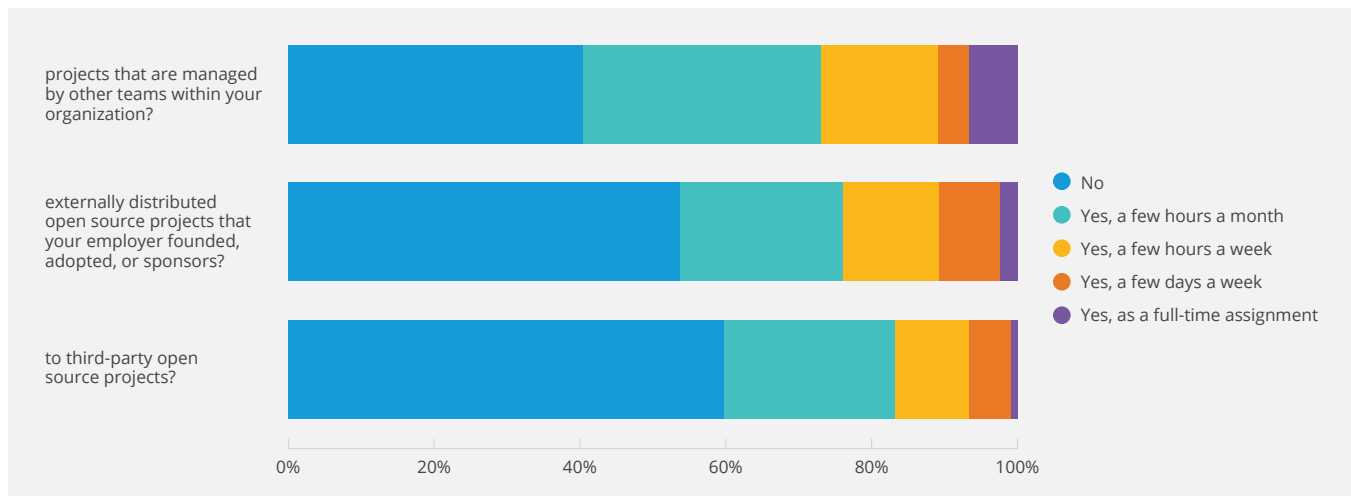
Next, we wanted to explore how much contribution really happens. The survey asked respondents to describe how much time they spent on inner source projects, employer open source, and third-party open source projects.

As seen earlier, inner source is a growing trend, with 27% contributing at least weekly to projects managed by other teams within their organization. This drops to 23% for weekly contributions to open source projects founded by their employers, then just 17% for external projects.

Figure 10: Employee Contributions to Open Source Projects

Do you spend any time at work contributing to...

Sample Size = 119



Source: FINOS 2021 Survey, July 2021.

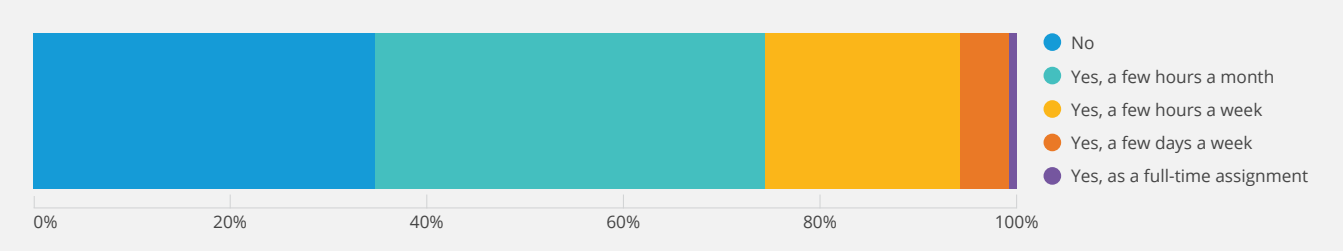
Finally, we wanted to see whether respondents spent their own time working on open source projects. The results show that 65% contributed at least a few hours each month. Interestingly, 13% of this group are unsure of their employer's policies concerning contributing to open source projects, policies which may restrict open source activities conducted in their own time.

¹⁷ LFX Insights, <https://insights.lfx.linuxfoundation.org/projects/finos-f/dashboard>, time range 2 years, accessed Sep 8, 2021.

Figure 11: Personal Contributions to Open Source Projects

Do you spend any of your personal time contributing to open source projects?

Sample Size = 121



Source: FINOS 2021 Survey, July 2021.

Governance

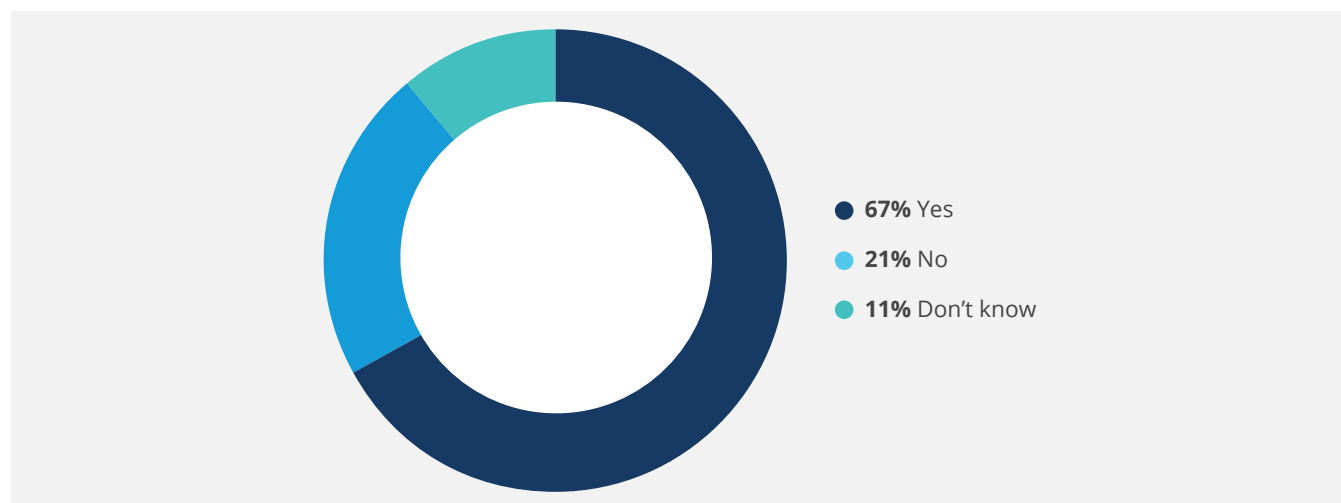
A well-implemented governance model comprises policies, processes, tooling, and automation implemented to ensure open source is consumed, contributed to, created, and supported in a safe and compliant manner. Establishing a governance model that meets the requirements of legal, risk, and security departments while not being so burdensome on the developers that they give up on using open source or work hard to circumvent the program is a challenging endeavor.

Although open source itself is becoming recognized as a strategic asset and driver of transformation, governance programs have yet to reach a level of standardization, maturity, and enterprise pervasiveness that most other risk mitigation and compliance programs have.

Figure 12: Open Source Policies

Do you have an open source policy?

Sample Size = 168

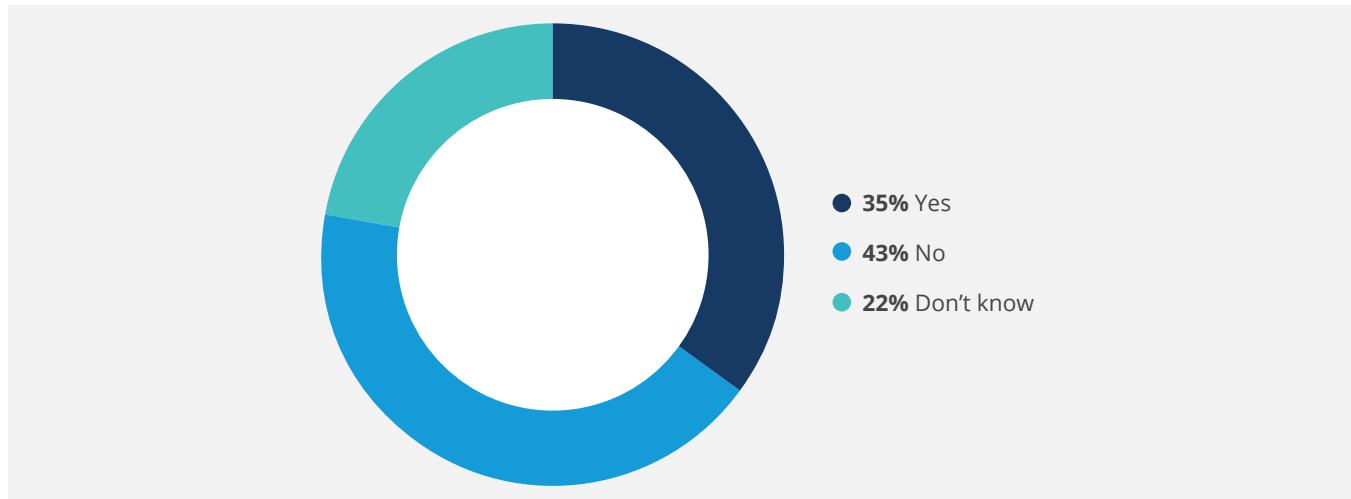


Source: FINOS 2021 Survey, July 2021.

The fundamental element of a governance program is a policy that broadly lays out the guidelines for how open source is used in an organization and having a group of individuals assigned to manage compliance with the policy. Governance most often takes the form of a review board or Open Source Program Office whose responsibilities are to advise, build, implement, and evolve a governance program and address exception cases to the policy. We see that 32% of the respondents either don't know if their organization has a policy or assert that it does not have a policy. As indicated in Figure 13, 65% don't think their company has a review board or aren't aware of the existence of one.

Figure 13: Prevalence of the Open Source Program Office**Do you have an Open Source Program Office (OSPO) or formal review board?**

Sample Size = 168



Source: FINOS 2021 Survey, July 2021, Q12.

Most financial services organizations use tens of thousands of open source components. One bank technologist indicated they were using around 45,000 libraries when he checked a couple of years ago and expected that to be higher now, and another said, *“I think we’re using around 30,000 components, but I don’t know”*. The potential risk of not having an enterprise-wide governance program can be significant with all that open source in use.

Open source governance program staffing and competency building is not about training on an open source policy alone. It is about having people staffed in OSPOs with the requisite background and cross-functional skills: legal, security, compliance and assurance, and even procurement, to work with developers to help them navigate open source issues. *And*, program staffing needs to be broader than simply appointing people to manage open source.

Organizations should recognize that they need to employ full-time open source staff, not assign part-time responsibilities. According to one OSPO director, *“Previously, we had an open source review board. Volunteer firefighters are great, and volunteer firefighters are necessary. But they also have a day job that requires them to pay their mortgage.”*¹⁸ In essence, there’s only so much a volunteer open source contributor can do. It therefore becomes important that open source governance is not adjunct to a staff member’s day-to-day responsibilities but is the full-time job of multiple individuals or, ideally, an entire department. According to one OSPO director, the question becomes, *“How do you scale a policy? And then how do you make that policy actionable to the associate in ways that matter?”*¹⁹

¹⁸ Interview with financial services OSPO leader, July 19, 2021.

¹⁹ Interview with financial services OSPO leader, July 19, 2021.

With the growing recognition that open source is becoming more strategic, an employee from a large investment bank noted that IT staff are receiving increased support with management buy-in to ensure that consumption and contribution are made safely. *“When the Open Source Review Council started, they communicated the direction and set of principles. The Council has representatives from legal, risk and control, CSO, SDLC, technology infrastructure, procurement, etc. so we have good coverage as well as senior interest and commitment.”*²⁰ This is not yet common across the industry but a good example of the desired outcome.

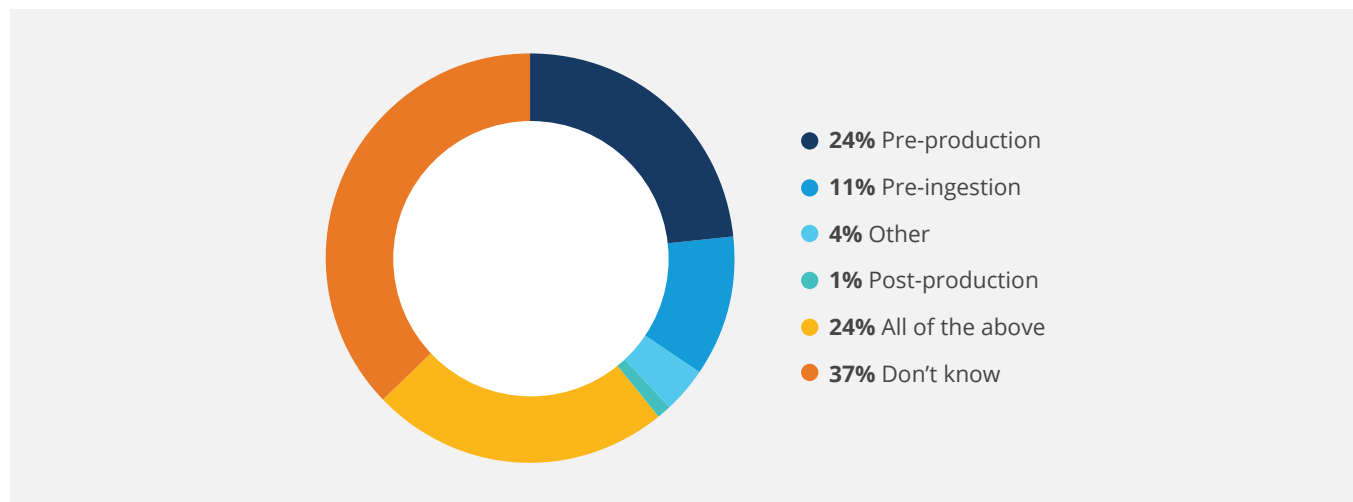
Perhaps the most challenging aspect of building a governance program is developing the set of processes to instantiate and automate the policy, with the least disruption and increased overhead to the developers and within a bank’s ever-evolving development environment. Given the highly distributed and often autonomous nature of the different lines of business within financial institutions, and the sometimes minimal shared IT services, it can be highly challenging to implement a common set of processes, tooling, and automation.

One bank explained the challenge by noting they had more than 100 software development teams and functional groups from legal, risk, compliance, assurance, security, IT standards, and architecture. Having such a disparate group trying to agree on just a single aspect of governance, such as when to scan code for open source components, explains the variety of responses in the survey.

Figure 14: Compliance Practices

When do you scan your code (SCA/binary) specifically for open source licensing, IP, compliance, and security issues using tools like Black Duck, Nexus, Whitesource, FOSSA, etc.?

Sample Size = 168



Source: FINOS 2021 Survey, July 2021.

²⁰ Interview with VP of Architecture and OSPO member at a global bank, July 8, 2021.

One area of consumption that is attracting more attention than it had previously is understanding the extent to which third-party-supplied software used within financial institutions contains or is definitively open source. As an individual at one bank told us, *“there is now a requirement for vendors to make sure that all vendor software is OSS compliant and they have set several related clauses in the contracts.”*²¹ These types of requirements will continue to grow in importance, especially given the recent executive orders issued by the White House, for example, regarding security in the software supply chain, where open source was mentioned eight times. Fortunately, there are a number of advanced efforts and groups attempting to address these issues, such as OpenChain, and a nascent standard; ISO 5230.²²

Although creating, implementing, and maintaining a governance program can be quite an endeavor, with the general recognition that open source is inevitably going to be more important to financial institutions, it is an imperative to get it right.

²¹ Interview with VP of Architecture and OSPO member at a global bank, July 8, 2021.

²² [ISO/IEC 5230:2020](#), International Standards Organization.

Culture

There has always been a strong cultural element to open source, which can be traced back to its very beginnings when it was very much a grassroots movement, with members campaigning for software freedom. While the move away from 'free' to 'open source' has softened some of these early ideas, the cultural element of open source remains strong.

Culture is a very broad term, and in practice, people and organizations participate and engage with open source for a wide range of reasons. We asked respondents about the cultural motivations for their company's participation in open source, and innovation came out top (84% agreed or strongly agreed that this was a motivation).

The open source community is known for its innovation, driven for a good part by the technological heterogeneity that is a recurring trait within communities, with many new technologies (AI, containerization, cloud computing, blockchain) being created in the open. However, the adoption of new technologies can present a significant challenge for banks with large and complex IT estates, which have grown organically over several decades to support an ever-increasing array of business lines.

According to a Global Head of e-Trading:

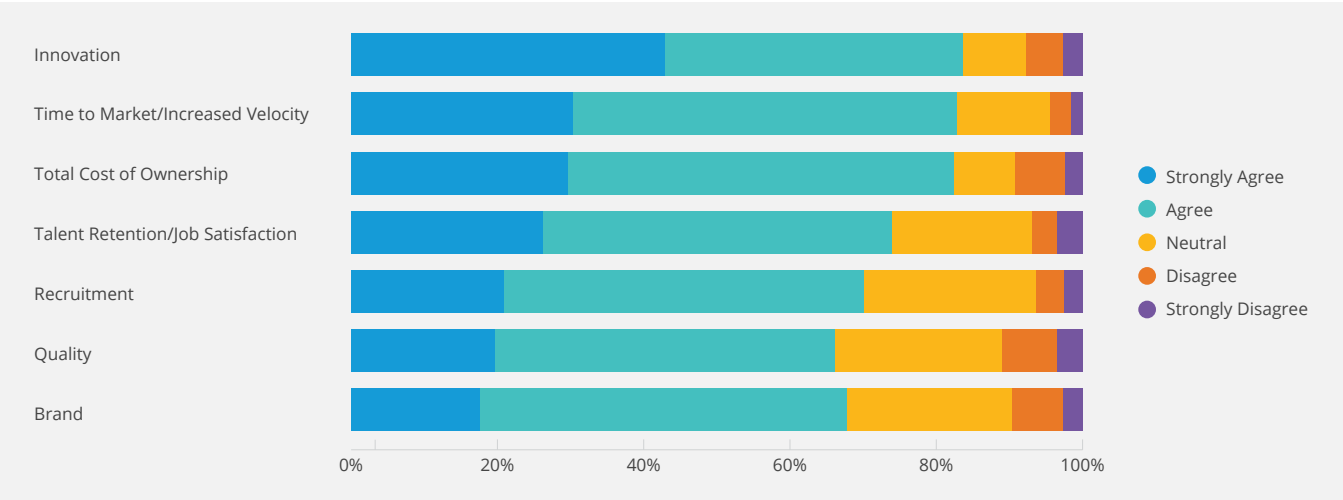
*"For a big bank, open source is not always good; there are projects that look novel and innovative yet lack any form of support. This is a significant inhibiting factor when considering adoption—which might feel counterintuitive to smaller organizations"*²³

²³ Interview with a Global Head of e-Trading, July 5, 2021

Figure 15: Innovation as Motivation for Open Source Participation

What do you feel are the main reasons your company participates in open source from the culture point of view: Innovation?

Sample Size = 117



Source: FINOS 2021 Survey, July 2021.

Looking beyond innovation, “Time to Market” and “Total Cost of Ownership” are both considered significant motivating factors. Considering that the framing of this question is ‘culture,’ we might infer from this that culturally, people feel it is right to adopt solutions built by others rather than ‘reinventing the wheel.’ This might be a good example of where culture and business motivation align!

As one engineer at a global investment bank said:

“As part of a focus on building a strong engineering culture within the bank they want to recognize contributions to open source and also support the value that external recognition brings, knowing that your change is good enough to be merged in by another community.”²⁴

An individual from a buy-side firm noted, *“It would be advantageous to hire people who know your tools already because they used them in their college projects or at other jobs; think of the improved onboarding velocity.”* He added, *“An organization can do the same things but you gain greater credibility if other organizations and individuals can see and are aware of what you have done.”²⁵* This touches on several of the reasons to participate in open source identified by survey respondents.

Finally, it is comforting to see that ‘brand’ is at the bottom of the list, which might indicate a genuine authenticity around motivations. The wish to join a community to improve an organization’s brand is not likely to sit well with other community members!

24 Interview with a distinguished engineer leading inner source efforts at a global bank, July 8, 2021

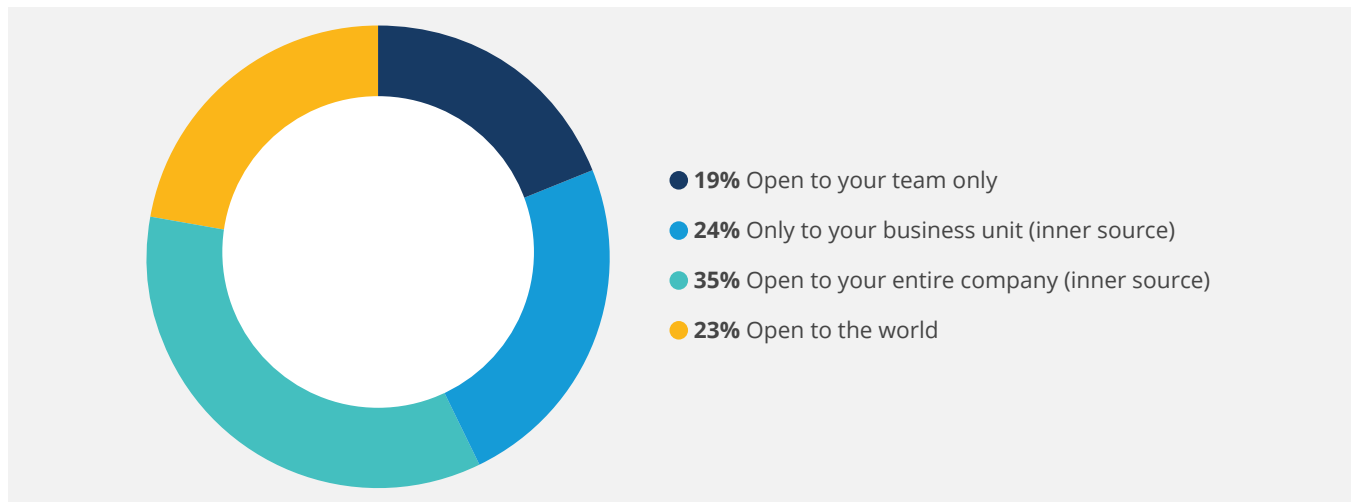
25 Interview with Head of Infrastructure Engineering and open source lead at a hedge fund, June 30, 2021

Next, we explored how these motivations influence the way people work and the projects to which they contribute.

Figure 16: Types of Open Source Contributions

At work, you or your colleagues contribute to work-related software projects that are:

Sample Size = 123



Source: FINOS 2021 Survey, July 2021.

Only 19% of respondents focus their energies exclusively on the work of their own team. All other respondents contribute to open projects within their business or ‘the world.’

Multinational banks are often siloed by design, with different business units isolated from each other due to compliance, regulatory requirements, function, or even as the result of multiple mergers and acquisitions. While the focus of each business unit has its own needs, there is often a lot of common ground in the technology they are adopting and building. In the past, the siloed nature of these banks has made it all but impossible to share common infrastructure and code.

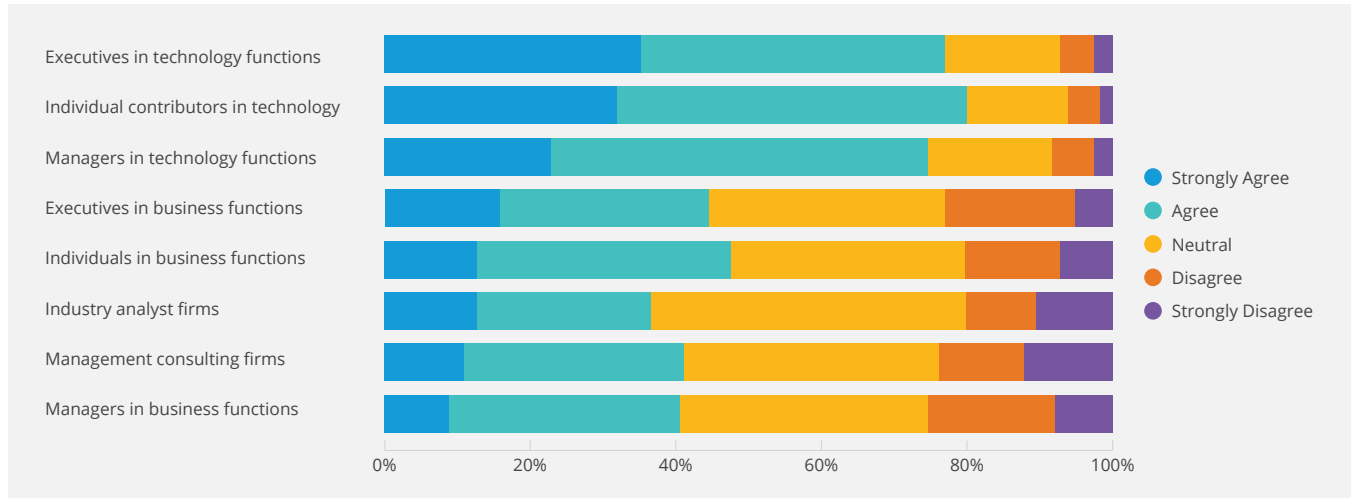
However, as we see through the results of this survey, collaboration within a business unit, or wider company, is a growing trend. This practice has been given the title ‘inner source’, enabling large organizations to realize some of the cultural benefits of open source simply by improving collaboration within their own organizations.

“I’ve recently kicked off an inner source working group, and the first thing we are tackling is a shared component library. Demonstrating the ROI on inner source is a lot easier [than demonstrating ROI for open source], you can clearly see how it builds the firm’s IP and reduces TCO.”²⁶

²⁶ Interview with VP (leading an Inner Source initiative) at a global bank, 13 July 2021

Figure 17: Influence of Individual Contributors Over Open Source Engagement**Who do you think has significant influence over the direction of open source engagement within your organization: Individual contributors in technology?**

Sample Size = 116



Source: FINOS 2021 Survey, July 2021.

In addition to dealing with siloes, there is often a clear divide within banks between ‘business’ and ‘technology,’ a divide that more modern development practices are starting to bridge but still runs deep. The results indicate that open source is very much a technology concern, with executives, contributors, and managers in technology functions having the most influence over the open source direction of their business.

However, the value proposition of open source collaboration is difficult to describe, as is the collaborative nature of open source and the benefits it yields. For example, a leading financial services OSPO director explained why they need to do more than just fund or contribute code and how they need to get closer to the ‘beating heart’ of the project to help influence its future direction.

“We base our business around things like Linux, and we base our business around platforms like Kubernetes, these kinds of large efforts. And we help finance foundations—and that’s great. But these projects won’t just live on their own. So not only should we be supporting them through our knowledge and experience, aka opening pull requests [contributing code directly], but also being able to exert our own opinion in those spaces.”²⁸

“Consumption of open source is strategic to the organization, at least within the IT teams. Business doesn’t really understand this area, if it can reduce ROI, speed to market etc., they are happy!”²⁷

²⁷ Interview with VP (leading an Inner Source initiative) at a Global Bank, 13 July 2021

²⁸ Interview with financial services OSPO leader, July 19, 2021.

Aspirations

Historically, financial services organizations delivered impressive technical innovations, being among the first companies to run thousands of scenarios across hundreds of portfolios of data. They developed and continue to advance quantitative models for managing risk, pump out market prices at a rate measured in microseconds, settle millions of trades a day, and handle massive amounts of complex data, to name a few areas of technical prowess.

It's arguable that in the last decade, "big tech" has surpassed most of the financial services industry in technical innovation, and they have certainly surpassed financial services in contributing open source projects. As one CTO at a large investment bank pointed out,

"The financial services industry has pioneered things that later became popular in open source, like efficient messaging protocols, microservices, and event streaming, but the technologies were kept proprietary in banks and only became mainstream when other companies open sourced them. It would be beneficial to contribute more."²⁹

So, where does that leave financial services? What can employers do to support and promote open source in their own organizations and what are some key areas where open collaboration can make a difference in financial services?

As we've discussed, financial services are big consumers of open source, so it's not surprising that most respondents, 69%, identified consumption of open source software as a primary method for increasing productivity at work. As one technical architect and OSPO member noted, part of their open source practice is to *"try to focus their developers on the business and help them find and use off-the-shelf software for commodity functions."*³⁰

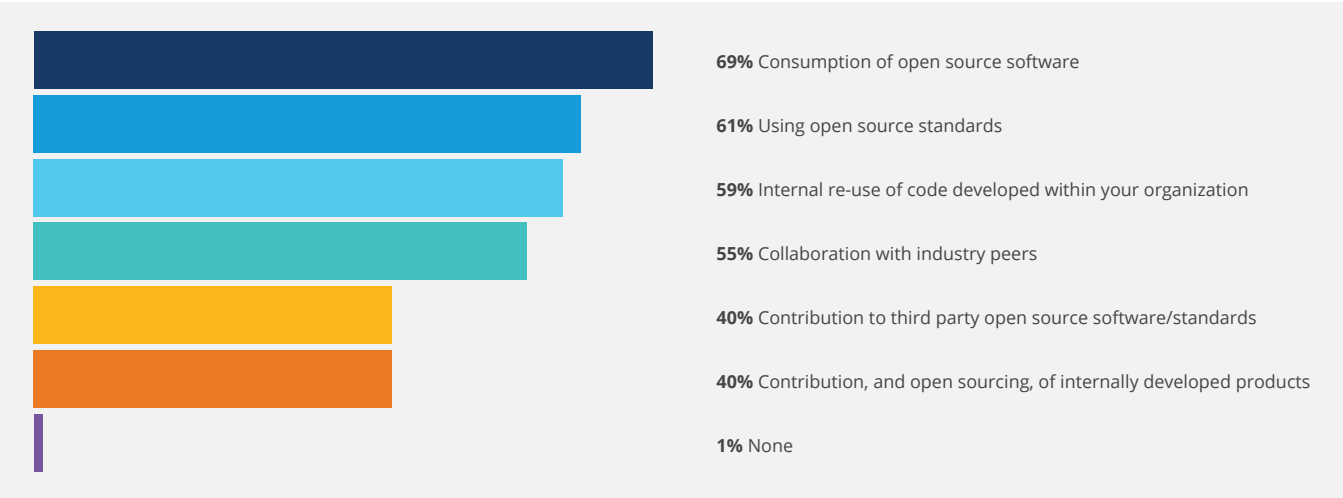
29 Interview with a CTO for a global bank, July 7, 2021

30 Interview with Technical Architect and OSPO member of a global bank, Aug 10, 2021

Figure 18: Top Contributors to Open Source Developer Productivity

Which of the following do you think can/does increase your productivity at work?
Check all that apply.

Multiple Response Variable Sample Size = 115, Valid Cases = 115, Total Mentions = 373



Source: FINOS 2021 Survey, July 2021.

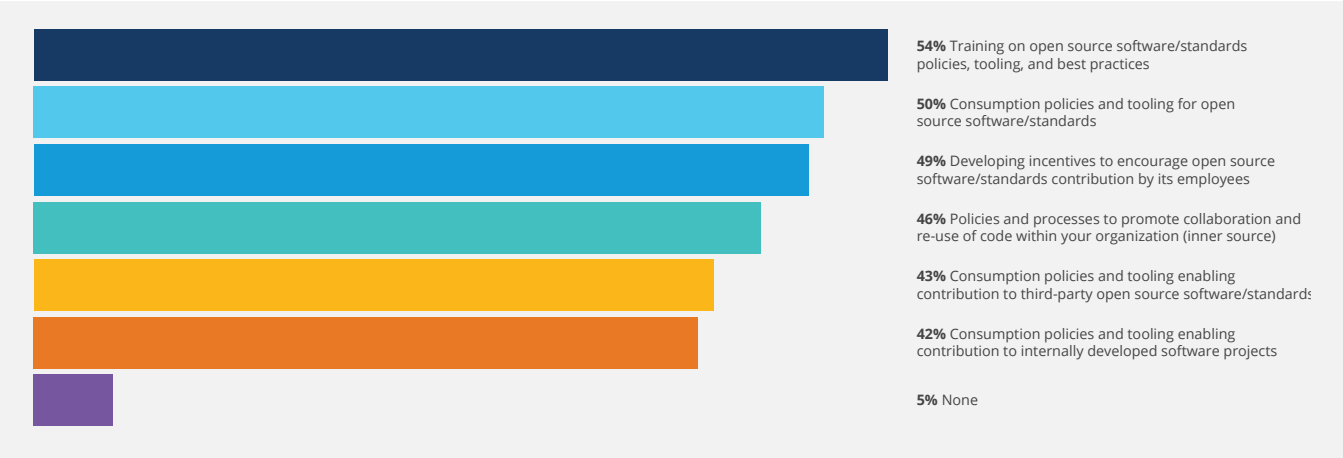
Two other top contributors to productivity are “using open source standards” and “internal re-use of code developed within your organization” (often referred to as inner source). Standards are not new to financial services: FIX, FpML, FTP, ISO, ISDA CDM, SWIFT, LEI, etc. help improve efficiency and reduce costs and errors. However, fully open source standards are newer to the industry and are also one of the largest growth areas within FINOS. And, inner source is sometimes a controversial topic, but as mentioned earlier, its use is growing, and most agree that reducing duplicative development is good.

Turning to what employers can do to support the use of open source in their organizations, 54% of respondents agreed that “training on open source software/standards policies, tooling, and best practices” should be a focus area. This aligns with the feedback we heard during interviews with many organizations noting that they are working on enhancing their existing training, rolling out new training, and determining how best to ensure that the right individuals get (and know about) the appropriate training.

Figure 19: Desired Prioritization of Investments in Open Source

Where do you think your employer should provide greater support or make additional investment to improve the use of open source in your organization? Check all that apply.

Multiple Response Variable Sample Size = 111, Valid Cases = 111, Total Mentions = 320



Source: FINOS 2021 Survey, July 2021.

The second highest response to where employers can improve open source in their organizations was “consumption policies and tooling for open source software/standards,” with 50% recognizing this as important. This aligns with the consumption of open source being one of the top items that can increase productivity at work.

Having looked at many aspects of open source in financial services (leadership, consumption, contribution, governance, and culture), we wanted to see where respondents thought open source engagement could bring value to the industry. While we didn’t provide an exhaustive list, the top three areas identified were DevOps, Cloud, and AI/ML, with more than half of respondents identifying these as areas where open source could be beneficial. FINOS has community-led open source initiatives and projects in two of these three areas (DevOps³¹ and Cloud³²), supporting the data that these are promising areas of collaboration. Regulatory compliance and common workflows were also high on the list and are also both areas where the FINOS community has established projects or initiatives ([Financial Objects](#), [Open Regulation Innovation](#)).

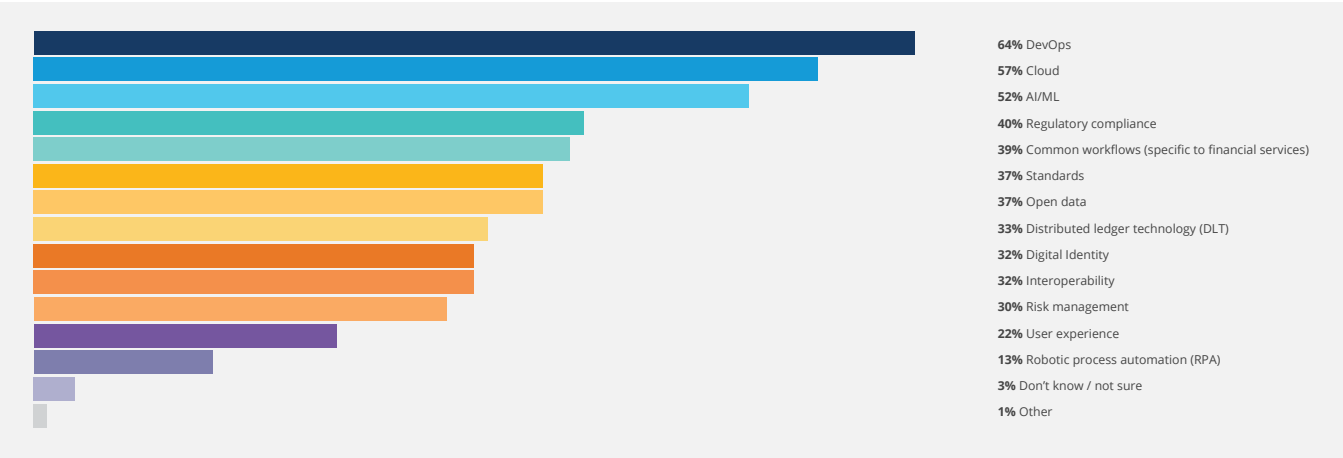
31 FINOS DevOps Mutualization Special Interest Group (<https://github.com/finos/devops-mutualization>)

32 FINOS Cloud Service Certification (<https://github.com/finos/cloud-service-certification>)

Figure 20: Desired Prioritization of Open Source Engagement

In which of the following areas do you think open source engagement could bring the most benefit to the financial services industry (including through improvement of existing processes/technology or delivering innovative new approaches)? Select three.

Multiple Response Variable Sample Size = 115, Valid Cases = 115, Total Mentions = 568



Source: FINOS 2021 Survey, July 2021, Q49.

Interestingly, only 37% of respondents recognized standards as an area of open source engagement that could benefit the industry, while 61% of respondents also indicated that the use of standards increased their productivity. This is one area that warrants more investigation, and one explanation for the discrepancy is that while standards are valuable, they are hard to develop. Another possible explanation is that individuals assume that standards development is done by standards organizations rather than by open source contributors.

While open data did not top the list (it was tied with standards, with 37% of respondents indicating this as an area of opportunity), at least two individuals we interviewed recognized this as a potential area for collaboration.

One industry professional noted that “*Opportunities to collaborate are going to typically be around tooling and that subset of data, e.g., reference data, that is non-differentiating.*”³³ This was confirmed by another industry professional, stating that, “*In some areas of data and data validation, there isn’t a competitive advantage; it’s a recognized huge inefficiency across the industry.*”³⁴

The two made additional comments, highlighting the complexity of collaborating on open data projects or standards. First, many data projects require significant time and commitment, so “*you have to get senior buy-in, understanding the business benefit of collaboration and the reduced technical debt, in order to get the*

33 Interview with Head of Infrastructure Engineering and open source lead at a hedge fund, June 30, 2021

34 Interview with Technical Architect and OSPO member of a global bank, August 10, 2021

right commitment to a project.”³⁵ Second, “some types of data, like good historic trade data and training data for AI, can still be a competitive advantage”³⁶ so are less likely to garner the needed collaboration for a successful project.

The data tells us that there are many different areas of potential collaboration that can provide value to the industry and that a diverse community of individuals with different jobs and different areas of interest can create an ecosystem of open source projects and standards that touch many aspects of financial services.

³⁵ Interview with Technical Architect and OSPO member of a global bank, August 10, 2021

³⁶ Interview with Head of Infrastructure Engineering and open source lead at a hedge fund, June 30, 2021

Demographics

Among the survey's objectives was to increase understanding of the levels of diversity of the different respondent groups at the intersection of the financial services industry and open source. The long-term goal is to be able to compare data over time on how these demographics may shift.

Of the 331 total survey respondents, data was derived from 208 people who answered that they were either employed by the financial services sector or were a supplier to it.

We have a high level of confidence that survey respondents and their respective organizations understand open source. Most respondents stated that their organizations were familiar with their approach to open source, with 30% stating "Very Familiar," 29% "Familiar," 16% with "Some Familiarity," and only 2.4% that were "Not at all" familiar with open source.

Most respondents (36%) came from organizations with 30,000 employees worldwide, followed by 100-4999 employees (26%), 1-99 employees (14%), 15,000-29,999 employees (9%), and 5,000-9,999 employees (7%). These results show that smaller challenger banks and fintechs are active in the space. Still, we expected to see more from SMBs such as regional financial institutions.

The most popular titles in the respondent pool were Architect (22%), Technician/Engineer/Tester (16%), Executive Director/VP (14%), Programmer/Developer (11%), Analyst (8%), and Director (8%).

IT professionals comprised 52% of the respondents, which did not come as a surprise. Of those from other lines of business, the largest group was Engineering (15.5%), followed by Product Management (7%).

A majority of respondents came from North America (30%), Western Europe (25%), India (13%), and Asia, excluding China, Japan, and India (11%).

Whites/Caucasians represented approximately 38% of respondents, with an equal number of Asians included in the pool (38%). Only 9% identified as Hispanic/Latinx, whereas only 6% identified as Black. A statistically significant minority (11%) preferred not to answer.

In terms of gender, 84 percent of respondents said they were men, whereas 7 percent said they were women. A single respondent was non-binary, and 8% preferred not to answer. As with other open source research, there remains the concern that responses are heavily skewed toward men's perspectives. However, representation of non-men in this report was higher than our [2020 FOSS Contributor Survey](#)³⁷ conducted with the Laboratory for Innovation Sciences at Harvard (approximately 3 percent), which indicates that women are more represented in the Financial Services industry overall.

As is true for other industries, the financial services industry has work to do to increase the diversity of its participants. The benefits of doing so have proven to generate better products and services that more effectively meet the needs of end-users, regardless of how they identify, their levels of seniority, their respective functions, and the regions in which they live.

³⁷ [Report on the 2020 FOSS Contributor Survey, The Linux Foundation, Dec 10, 2020](#)

Conclusions & Actionable Insights

So, what exactly is the state of open source in financial services in 2021? From the survey data and interviews, we draw the following insights and provide suggested steps and sample resources for those who are interested in increasing open source community engagement, best practices, education, and more in the financial services industry.

Financial institutions need to make open source part of their strategy and culture with clear leadership and communication

The report indicates respondents were often unclear about who is responsible for leading open source efforts as well the policies around open source within their firms. Without clearly identified leadership it is extremely difficult to address many of the challenges raised in this report and reap the benefits that fully engaging (consumption, contribution, and publishing) in open source can yield.

Establish your open source leadership and strategy:

- Appoint an open source leader and communicate this widely.
- Establish an Open Source Program Office that encompasses individuals from across the organization, including technology, architecture, business, legal, compliance, procurement, security, etc.
- Dedicate full-time staff who can steward open source and best practices within their organizations.
- Define an initial open source strategy for your organization that sets out near, medium, and long-term goals and targets.

Communicate the importance of open source within (and outside of) your organization:

- Initiate conversations between business line executives and IT departments, ensuring that both are on the same page.
- Use communication to break silos, raising the topic of open source in a variety of scenarios and with professionals in varying roles across the organization, e.g. technologists, project managers, business analysts, COOs, procurement, risk, legal, and compliance professionals, as they all play a role in open source.
- Engage in marketing (blogs, press releases, case studies, podcasts, conferences, meetups, etc.) to promote your open source and inner source successes both internally and externally.
- Recognize individuals for their contributions to open source.

Resources

- [This is Why Your Organization Needs a Chief Open Source Officer](#) (Blog)
- [How to Create an Open Source Program](#) (Documents)
- [Open Source Program Office 101](#) (Free Training)
- [Marketing Open Source Code](#) (Guide)
- [Why Open Source Software Matters to Your Enterprise](#) (Report)
- [Fostering An Open Environment For Developers In A Regulated Industry](#) (Webinar)
- [A Guide to Open Source Software for Procurement Professionals](#) (Report)

Financial institutions need to continue developing open source governance, policies, processes, tools, and training

It is clear from the survey that there is an appetite to both consume and contribute to open source but that there are currently numerous hurdles preventing this from happening on a wide scale, including lack of clarity on policies and a desire for more training.

Develop open source policies:

- If you don't already have an open source policy, write one.
- Create a single location (intranet site, internal repository, shared drive, etc.) where all information related to open source for the organization is stored. Promote this widely so that even if individuals aren't interested now they know where to look in the future.

Work on tooling to make both consumption and contribution controlled and efficient:

- Continue to improve processes that make open source consumption easy since this is recognized as a top way to increase productivity.
- Continue to improve processes for making contributions to open source easier to unlock collaboration and innovation potential.

Provide training on the many aspects of open source:

- Make more training available on open source software/standards policies, tooling, and best practices.
- Leverage the significant training that already exists in the marketplace.
- Provide different types of training for individuals working on different elements of open source.

Resources

- [Reference FOSS Policy for Financial Services Institutions](#) (Document)
- [FINOS Open Source Readiness](#) (Special Interest Group)
- [Tools for Managing Open Source Programs](#) (Guide)
- [A Beginner's Guide to Open Source Software Development](#) (Free Training)
- [Using Open Source Code](#) (Guide)

Financial organizations need to encourage identifying and engaging in collaborative activities

There are many different areas of potential collaboration that can provide value to the industry. A diverse community of individuals with varying areas of interest and focus can create an ecosystem of open source projects and standards that touch many aspects of financial services. This includes an overall desire to improve innovation, consume more open source software to take the place of commodity functions, improve standards adoption, and increase the use of emerging but important information technology disciplines such as DevOps, AI/ML, and Cloud.

Promote open source collaboration across many types of job functions:

- Help individuals understand that contributions to open source projects and standards can take many forms beyond developing and submitting code, for example, working on documentation, use cases, infrastructure, and helping to improve the user experience by providing feedback are all helpful ways to support the open source community.
- Establish collaborative working processes more widely within financial services organizations through inner source and open source efforts.

Explore different areas of collaboration:

- Explore collaborative ways to solve the technical challenges of open source contribution in a highly regulated environment, through open source initiatives like FINOS DevOps Mutualization and Open Source Readiness Special Interest Groups and peer networking.
- Set specific personal or corporate (potentially through an OSPO) targets related to open source collaboration, i.e. join a working group, start a conversation about a potential new project or standard, attend an event, raise an issue or submit a pull request on a project you haven't worked on before.

Resources

- [FINOS DevOps Mutualization](#) (Special Interest Group)
- [FINOS Inner Source](#) (Special interest Group) and [InnerSource Commons](#) (website)
- [13 ways to get involved with your favorite open source project](#) (Article)
- Open Source Project Catalogs ([FINOS](#), [Linux Foundation](#), [Apache Foundation](#), [Eclipse Foundation](#))

Methodology

From June 1 to July 26, 2021, FINOS and its research partners fielded a worldwide survey of individuals within (or providing services to) the financial services industry on various questions related to trends and concerns, usage, and governance about their open source environments.

The quantitative survey was designed to engage key stakeholders at the intersection of open source and finance, including developers, IT leaders, executive management, security, legal, procurement, and HR. This was combined with distillation and benchmarking of previous work conducted by the Linux Foundation. The survey was distributed and promoted across research partner social media channels, websites, newsletters, and via direct email campaigns.

This research report draws on survey data, industry data, and insights culminating from a series of qualitative interviews. Senior leaders fluent in open source technologies, communities, and challenges, were invited to share their insights on subjects in the following areas:

Engagement in Open Source

- Consumption and governance
- Open Source Program Offices
- How open source is used within these organizations
- Contribution policy
- Use of repositories

Culture

- How the organization compares to peers
- How financial services compares to other industries in terms of open source collaboration
- Inner source programs
- How do firms' open source efforts fit into recruiting and retaining IT talent
- On "giving back"

Drivers/Challenges

- The strategic importance of open source and key benefits
- The key stakeholders for OSS in these organizations
- Decisions to open source internally developed software and metrics used
- The biggest challenges to greater open source adoption

Industry opportunities

- Understanding which business units benefit from open source collaboration
- Open source industry initiatives
- Regulatory issues

Interviews were recorded so that transcripts could be produced. Such transcripts were strictly controlled and used only for purposes of this report. If a recording was not permitted, then detailed notes were taken. Questions were also shared for completion via email. Unless quotes were given explicit approval by the named individuals and/or their organizations, sources were anonymized.

Acknowledgments

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