Open-Source-Monitor

Survey report 2021

www.bitkom.org

bitkom

Publisher
Bitkom e.V.
Bundesverband Informationswirtschaft, Telekommunikation und neue Medien e.V.
Albrechtstraße 10 | 10117 Berlin

Responsible staff
Lukas Gentemann | Senior Research Consultant Bitkom Research
Dr. Frank Termer | Head of Software | T 030 27576 232 | f.termer@bitkom.org
Dr. Anja Weber | Head of Bitkom Research | T 030 27576 120 | a.weber@bitkom-service.de

Authors
Lukas Gentemann | Bitkom Research
Dr. Frank Termer | Bitkom
Dr. Anja Weber | Bitkom Research

Editors
Lukas Gentemann | Bitkom Research
Dr. Frank Termer | Bitkom
Dr. Anja Weber | Bitkom Research

Translation
Daniel Vandré

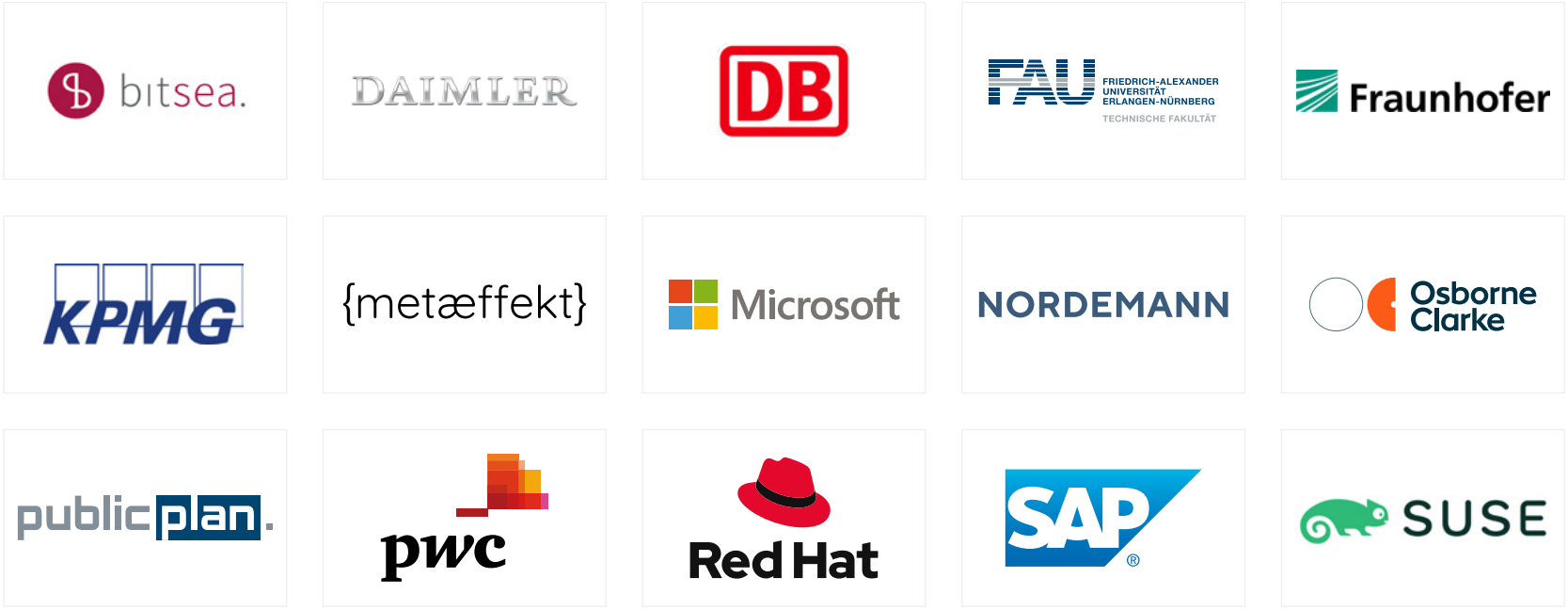
Design
Simon Wolff, translate.berlin

Image credits
Cover photo © giuseppe-mondi – unsplash.com

Table of contents

Table of figures

With the kind of support of



Preface

Let's do a little thought experiment: If we were to shut down all open-source software used worldwide even for a moment, what would happen? The internet would come to a standstill because pivotal infrastructures like webservers and data transmission protocols are open-source applications. Many of the large digital platforms, too, use open-source software at least in some core areas. Millions of smartphones would be turned off because their operating system is open source. Even software found on millions of devices such as graphics applications, video editing software, or word processors would stop working because all of them are developed and deployed by the open source community. Even if most people are not aware of it: Our everyday digital lives would be impossible without open-source software.

The German business community, too, relies on open source. Seven in ten companies with 20 or more employees deliberately use open-source solutions. This is but one of the results of a survey of more than 1,100 companies, which was commissioned by Germany's digital industry association, Bitkom, with the support of a group of 15 partners. The results have now been summarised in this »Open Source Monitor 2021«. In doing so two years after the first edition, our aim was to highlight the role of open-source software in Germany, where the development is heading, and the extent to which companies are committed to the open source community. For the first time ever, we have also surveyed the attitude of public agencies and other organisations of the public sector.

What is so special about open source? A prevailing preconception in this context is that, above all, it is »free of charge«. However, it is barely about that anymore. Software created under an open-source license can be used freely, its source code is open to analysis and modification, and, once modified, it can be shared with others. This means that many different developers can work on the same project. People from different companies, scientific institutions, the public sector but also interested and skilled private individuals. They can contribute their specific know-how – and, in turn, benefit from the ideas and solutions provided by others. Particularly new technologies like artificial intelligence and blockchain can be developed further at high speed through open source projects.

In addition, open source can make an important contribution to bringing us closer to digital sovereignty. For good reason, a pivotal EU project like GAIA-X, which is creating a European cloud and data infrastructure, is based on the fundamental principles of open APIs, open standards, open documentation, and open source. Particularly in more widespread applications, open source can also create additional IT security because experts can scrutinise the source code and detect vulnerabilities before they can be exploited.

The »Open Source Monitor 2021« shows that two thirds of the surveyed companies are interested in open source and generally open-minded towards the subject. Barely seven percent state that they are fundamentally critical of open source or even oppose it. More than half of the companies support the open source community, mostly by purchasing fee-based ancillary services. As many as nine percent even make their modified source code available to others. However, only every fourth company has an open source strategy, meaning that three quarters do not have a strategic approach towards open source. This shows that we can do more to fully achieve the potential of open source and to quickly and successfully push Germany's digital transformation forward.

Achim Berg, president of Bitkom

Methodology

The question at the centre of the 2021 Open Source Monitor is to what extent German businesses deliberately opt for open-source software. For the second time since it launched in 2019, the Open Source Monitor aims at giving an overview of the use of open-source software by German businesses as well as answers to the following questions:

- What is the attitude of companies towards open-source software and which advantages or disadvantages do they see for themselves?
- To what extent do companies in Germany use open-source software and which resources do they deploy for managing open-source software?
- To what extent are companies actively involved in the development (or enhancement) of open-source software and which partners do they cooperate on open-source software projects with?
- How do companies deal with compliance regarding open-source software?

To answer these and additional questions, the project consortium decided to conduct a company survey to assess the strategic use of open-source software by German companies. Germany's digital industry association, Bitkom, and Bitkom Research have developed a survey design based on a company survey that is representative of German businesses. They have done so in cooperation with 15 survey sponsors, which include bitsea, Daimler, Deutsche Bahn, Friedrich Alexander University of Erlangen–Nuremberg, Fraunhofer, KPMG, metæffekt, Microsoft, Nordemann, Osborne Clarke, publicplan, PricewaterhouseCoopers, Red Hat, SAP, and SUS. The concept of the standardised questionnaire was drawn up using the expertise of the project consortium. The computer-aided telephone interviews, or CATIs, were conducted by specially trained telephone interviewers between late May and mid-July 2021.

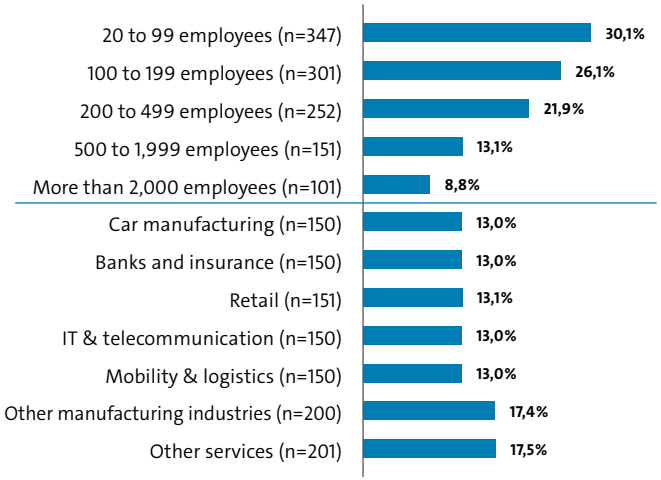


Figure 1 – Composition of the businesses sample by size classes and industries (unweighted)

Base: All companies with more than 20 employees (2021: n=1,152)
Source: Bitkom Research

For this survey, we interviewed 1,152 companies in Germany with at least 20 employees that were selected to represent different company sizes and industries. By stratifying this randomised sample, we made sure that companies from different size ranges and industries were represented in the number required for statistical analysis. During the analysis, the statements of the survey respondents were weighted in a way that created a representative picture of all companies with 20 or more employees in Germany in accordance with their size and industry.

This choice of sample structure made it possible to portray the specific characteristics of selected industries. They include car manufacturing, banking and insurance, retail, the ICT sector as well as the mobility and logistics sector, the results for which are shown in Section 2.

Unlike the 2019 Open Source Monitor, which used a population of companies with at least 100 employees, we now extended our reach to also include companies with at least 20 employees. Our aim here was to depict the use of open-source software in smaller companies with staff numbers between 20 and 99. This extension has been accounted for by increasing the total sample from previously ca. 800 companies to over 1,150 companies, maintaining direct comparability of the results for companies with at least 100 employees.

In addition to the representative company sample, we also interviewed a subsample of 100 public sector organisations to gain insights into the use of open-source software in the public sector (see Section 3). This includes many public sector organisations, incl. from the general public sector, and public services like healthcare, education, culture, social services, business promotion, economic order, and economic oversight. It does not include foreign affairs, defence, the legal system, public safety and public order, and social security. The resulting sample is distributed at 31 percent at the local government level, 54 percent at the state level, and 15 percent at the federal level (see Figure 2).

The standardised questionnaire from the company survey was adjusted to the public sector and then used to conduct more computer-aided telephone interviews (CATIs) from late June to late July 2021.

The results from the public sector were not weighted and are not included in the overall results of the representative company survey. This means that the sample is not representative of the use of open-source software in the public sector but nevertheless provides initial results and indications for the public sector.

The interviews were conducted with those company executives responsible for open source. A slim majority of companies (54 percent) has formally or informally assigned the responsibility to one person. Typically, one person is informally responsible

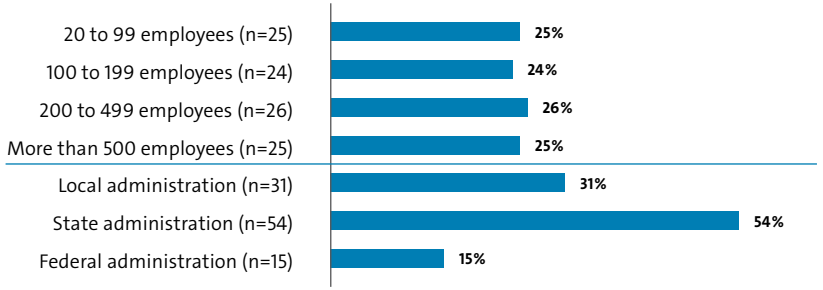


Figure 2 – Composition of the businesses sample by size ranges and industries (unweighted)

Base: All organisation with more than 20 employees (2021: n=100) | Source: Bitkom Research

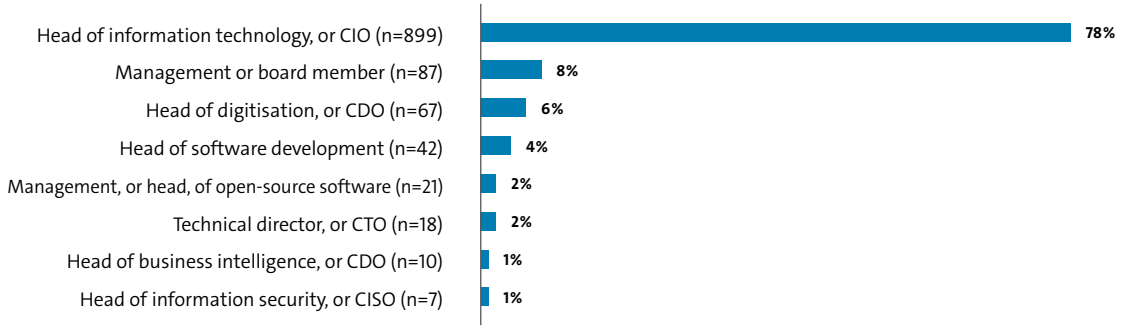


Figure 3 – Composition of the businesses sample by the position of the respondent in the company (unweighted)

Base: All companies with more than 20 employees (2021: n=1,152)
The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

such as the head of information technology or the chief digital officer. Only two of all the surveyed companies have created a formal position responsible for handling open-source software (0.2 percent). In those companies where responsibility for matters open source is not formally assigned to one person (44 percent), we interviewed the executives who are responsible for the use or development of software within their company.

Figure 3 depicts the composition of the sample by the surveyed responsible person. In eight out of ten companies (78 percent), the interview was conducted with the executive responsible for the information technology department. In the public sector, too, seventy percent of the interviews were conducted with the head of information technology (see Figure 4).

Each of the two surveys started off by creating a common understanding of what open-source software is. The agreed-upon definition, which this survey report is based on, is as follows:

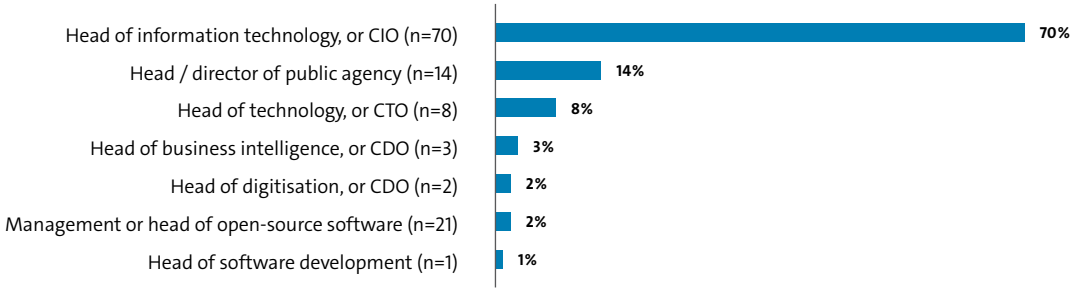


Figure 4 – Composition of the public sector sample by the position of the respondent in the organisation (unweighted)

Base: All organisation with more than 20 employees (2021: n=100) | Source: Bitkom Research

»We understand open-source software as software, including programme modules, developer tools, or libraries, whose source code is disclosed and whose license allows licensees to use, analyse, adjust it to own requirements, and share it freely and in unmodified or modified form. The prerequisites for this include the open access to source code and the absence of licensing fees.«

The following report will abbreviate open-source software to OSS – as was done during the survey that preceded it.

1 Use of open-source software in companies

1.1 Attitudes towards open-source software

Two thirds of all companies with 20 or more employees (67 percent) are interested in open-source software and open-minded towards the subject as a whole (see Figure 5). In comparison, only seven percent of the companies are critical of open-source software, or somewhat opposed to it. Between these two positions is a quarter of the companies (25 percent) that are undecided when it comes to open-source software.

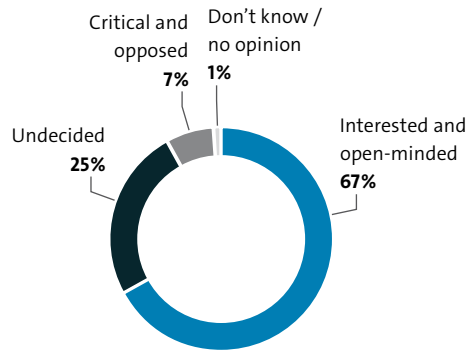


Figure 5 – Attitudes towards open-source software
What is your company's general position on OSS?
Base: All companies with more than 20 employees (2021: n=1,152)
Source: Bitkom Research

Taking business size into account, we see that attitudes towards OSS are initially linear to the size of the company (see Figure 6). Larger companies with 500 or more employees are also the most interested in OSS (79 percent), while only two thirds of the smaller companies with less than 100 employees are interested in or open-minded towards OSS (66 percent). In medium-sized companies, seven out of ten companies are interested in OSS (100 to 199 employees: 70 percent; 200 to 499 employees: 71 percent). The level of interest in large corporations with 2,000 and more employees is on par with that in medium-sized companies; seven out of ten companies (69 percent) of this size are open-minded towards OSS.

The predominantly positive attitude of companies towards OSS continues when asked about its advantages. Eight out of ten companies (82 percent) with 20 or more employees state that the use of OSS has advantages for them (see Figure 7). A mere 14 percent of companies are of the opinion that the use of OSS will not yield any advantages for their company. Among those companies that have no stakes in OSS, the share of companies that did not name any advantages of OSS rises to one third (33 percent). Among the users of OSS (companies that use, integrate, develop or enhance, or in any other way participate in OSS), only eight percent do not see any advantages of using OSS.

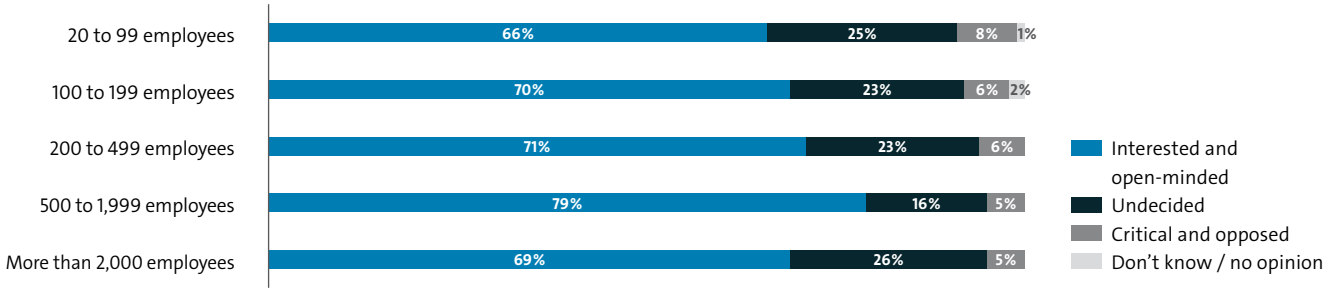


Figure 6 – Attitudes towards open-source software by business size
What is your company's general position on OSS?
Base: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

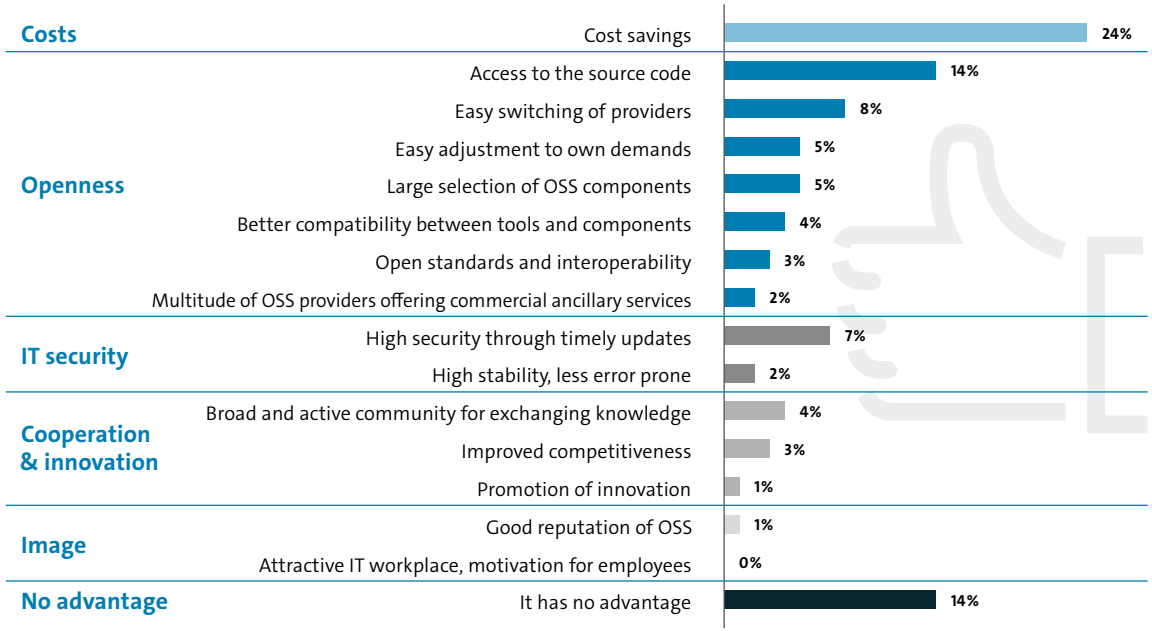


Figure 7 – Advantages of open-source software

In your view, what is the biggest advantage that OSS holds for your company?

Base: All companies with more than 20 employees (2021: n=1,152) | Open-ended question, only one possible response | Source: Bitkom Research

By far the most frequently mentioned advantage of OSS is the saving of costs as there are no licensing fees. A quarter of companies (24 percent) state this as the biggest advantage. By some distance, it is followed by numerous other reasons that differ only by a few percent. It must be noted that the benefits of OSS were surveyed using an open-ended question and free text entry. The surveyed companies were asked to focus on the biggest advantage. With this in mind, the following results demonstrate how diverse the arguments for using OSS are from the companies' point of view, and that costs are only one of many aspects.

In addition to these, the advantages that were named can be divided into four categories: openness, IT security, cooperation & innovation, and image advantages.

A total of 41 percent of companies mention openness and flexibility of OSS as the biggest advantages. This includes access to the source code (14 percent) and easy switching of providers (8 percent). Every twentieth company mentions the ease with which software can be adjusted to own demands and the large selection of OSS components (5 percent each) as the main advantage of OSS. Compatibility between tools and components (4 percent), support of open standards and interoperability (3 percent), and the diverse selection of OSS providers offering commercial ancillary services (2 percent) are also seen as beneficial.

A total of nine percent mention advantages relating to security. Seven percent of companies value the high security through regular and frequent updates, another two percent mention OSS' high stability and its low error-proneness.

An additional eight percent see the improved chances for cooperation and innovation through OSS as the main advantage. This includes exchanging knowledge with the OSS community (4 percent), improved competitiveness (3 percent), and the promotion of innovation (1 percent). Few also mentioned open-source software's good reputation, increased attractiveness of the workplace due to using open source, and the motivation of employees as the main advantage.

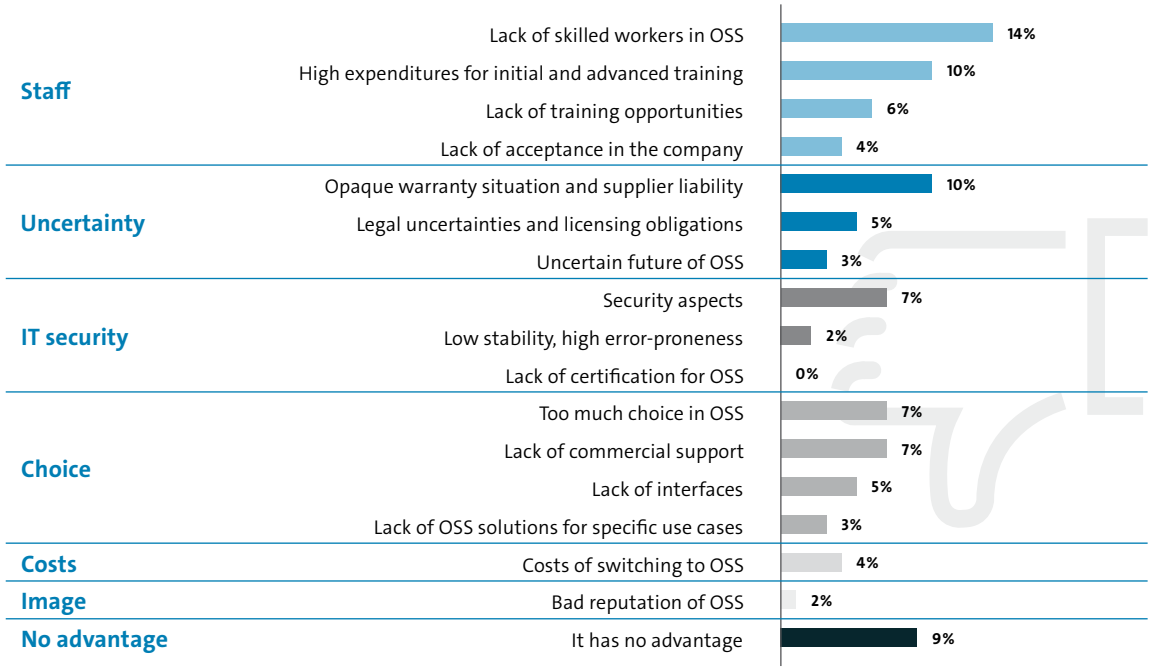


Figure 8 – Disadvantages of open-source software

In your view, what is the biggest disadvantage that speaks against using OSS in your company?

Base: All companies with more than 20 employees (2021: n=1,152) | Open-ended question, only one possible response | Source: Bitkom Research

From where the companies stand, numerous disadvantages are pitted against the advantages. These can be subdivided into the six categories staff, uncertainty, IT security, choice, costs, and image (see Figure 8). Like the advantages, the disadvantages were surveyed using open-ended questions.

One third of the companies (34 percent) see the greatest disadvantage of OSS at the staff level. Fourteen percent cite a lack of skilled staff as the biggest disadvantage, i. e., a lack of experts within the company able to adjust and develop software to meet their individual needs. In this context, the high expenditures for initial and advanced training (10 percent) as well as a lack of training opportunities (6 percent) for relevant skilled workers are also seen as disadvantages. Four percent bemoan the lack of acceptance of OSS in their companies.

For a just under a fifth of companies (18 percent), the deployment and use of OSS yields diverse uncertainties. Ten percent see the warranty situation and supplier liability as opaque; five percent cite legal uncertainties regarding licensing; three percent see the future of OSS as uncertain.

Regarding the issue of IT security, the results show the ambivalence with which the use of OSS is viewed. While nine percent cite security-related aspects as advantages of OSS, also nine percent see them as disadvantages. Of those, seven percent pointed towards general security aspects, and two percent bemoaned error-proneness. A small group (0.2 percent) is critical of the lack of certification.

The ambivalence in the way OSS is discussed can also be seen in the choice category. Not all companies see the large choice of OSS components and suppliers as an advantage: Seven percent tend to see it as a disadvantage. Another seven percent bemoan the lack of commercial ancillary services as well as interfaces (5 percent) as well as the lack of OSS solutions for their specific use case (3 percent).

Four percent of the companies see the biggest disadvantage in the costs incurred by switching to OSS. An additional two percent are critical of the reputation of OSS.

A total nine out of ten companies (88 percent) stated at least one disadvantage of OSS. However, nine percent of all companies with 20 or more employees see no disadvantage that speaks against the use of OSS in their company. Among OSS users, meaning companies that use, integrate, develop or enhance, or in any other way participate in OSS, 13 percent see no disadvantages in using OSS. Among the companies that do not use OSS in any form, less than 1 percent mention no disadvantages of OSS.

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
TECHNISCHE FAKULTÄT

Expert statement

Prof. Dr. Dirk Riehle
Open Source Research (and Teaching) Group at the Friedrich-Alexander-University Erlangen-Nuremberg

Which of the following statements is accurate?

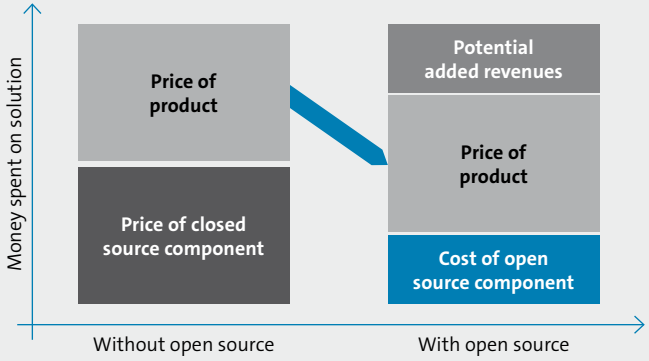
1. Open source helps to save costs
2. Open source keeps the competition at bay
3. Open source helps to generate sales

All these statements are accurate if you know how.
So how?

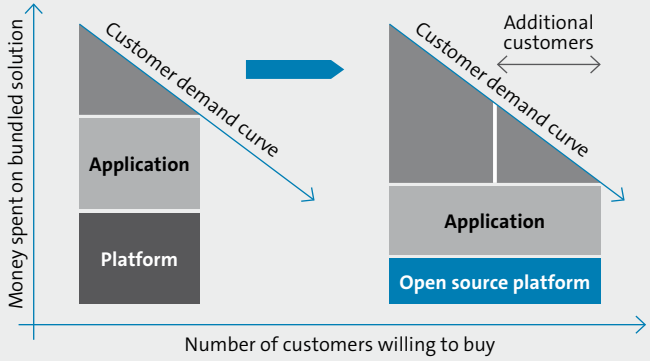
1. Use open-source software or create it with others to save costs. In my research group, for example, we regularly conduct agile software development projects in which teams of students develop open-source software for and together with our partners. Maybe with you, too?
2. When doing so, it is important to understand which components are not essential to the way you set yourself apart from the competition and can thus be developed as open-source software.
3. Gaining a competitive edge is also a reason to develop open-source software. In industry, for example, a joint Linux development is an alternative to Windows. Likewise, the car industry, the movie industry, and many others develop open-source software as an alternative to traditional providers. Having open-source software as an alternative to possible monopolies also means to prevent the erosion of one's own profit margin.
4. To increase sales, you must apply a commercial open source strategy. In doing so, you get a foot in the door of your customers by offering them parts of your product as a free open-source software. Later, however, turn users into customers by providing them with supplementary, non-open add-ons or services for the free product that the user has learned to love.

Silicon Valley has shown the world how this is done, and our research has been investigating it for many years.

I am happy to answer your questions.
↗dirk.riehle@fau.de | ↗https://oss.cs.fau.de



Growing your share of the customer's wallet



Reaching more price sensitive customers

Expert statement: Digital transformation with openness and sovereignty

Dr. Gerald Pfeifer
Chief Technology Officer, SUSE,
and Chair of the Board, openSUSE

The digital transformation is driven by the many modern technologies that are making new business models and processes in companies and government agencies possible in the first place. Most of these technologies – from the cloud to container technology and Kubernetes to the DevOps methods – are based on open-source developments.

According to Bitkom's 2021 Open Source Monitor, open-source software is being used by a majority of companies in Germany (71 percent). Open-source software is popular: no licensing fees, open code, say the respondents. But open-source software offers more. Above all, it creates openness in addition to its large potential for innovation. An openness that has provided thousands of customers with access to cutting-edge innovation. One that has given them the flexibility they need to use the best-possible solutions for them and to be in control of the speed of their transformation. The basis of this is an open, flexible software infrastructure on which to run applications that are critical to their business – from electronic banking systems and business management solutions to software for autonomous vehicles, satellite control centres, or life-saving medical devices.

Bitkom's Open Source Monitor shows that companies are well-advised to address and develop their strategies, policies, and compliance requirements for using open-source solutions. In an age of highly developed hacker attacks and service disruption, the Federal Office for Information Security has set important standards, for example, with the ISO and common criteria certification. When opting for a Linux infrastructure solution, it is imperative to look out for the Common Criteria EAL4+ certification. It encompasses the entire software supply chain: secure production, deployment of updates, and effective protection of important digital resources. The certification guarantees adherence to the most demanding security requirements of the highest international standard for critical business infrastructures.

Digital and sovereign

Digital sovereignty is an issue that is high up on the political agendas in the EU and Germany. Open-source software is an important component for strengthening Europe's sovereign and diverse technology position: It doesn't belong to anybody, the developer community is not tied to one country, and its code is open. This transparency enables the community to quickly identify and close possible security gaps. Developing new syllabi for schools and universities and getting more people excited about technology are also issues that are related to this subject. Open source can make a valuable contribution here.

The banking and finance sector as well as car manufacturers show how it's done: Over 70 percent of the respondents from these high-innovation sectors are relying on open source. However, at 72 percent across all industries, an open source strategy is lacking.

Innovative business models require modern, flexible IT structures – from data centres to clouds, edge computing, and beyond. The unique innovative capacity of the open source community opens up new opportunities for companies – whether in Linux, the cloud, Kubernetes, or edge technologies. A solid open source strategy should therefore be a part of every IT strategy.

1.2 Open-source software strategy

In the methodology chapter, we have already given some initial indication of the strategic focus of companies regarding OSS. According to the survey, a good half of the companies with 20 or more employees (54 percent) in Germany have assigned a formal or informal position to be in charge of OSS. However, the share of companies that have a formal position in place, for example, a head of open-source software, is less than one percent.

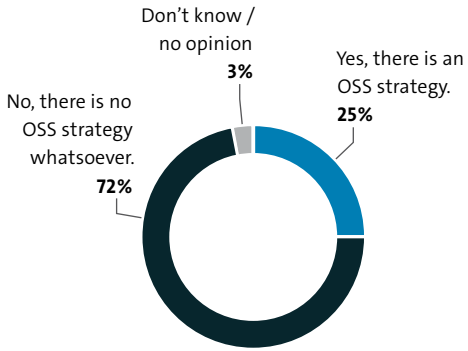


Figure 9 – Open-source software strategy
Does your company have a strategy for using or participating in OSS?

Base: All companies with more than 20 employees (1.152: n=1,152)
Source: Bitkom Research

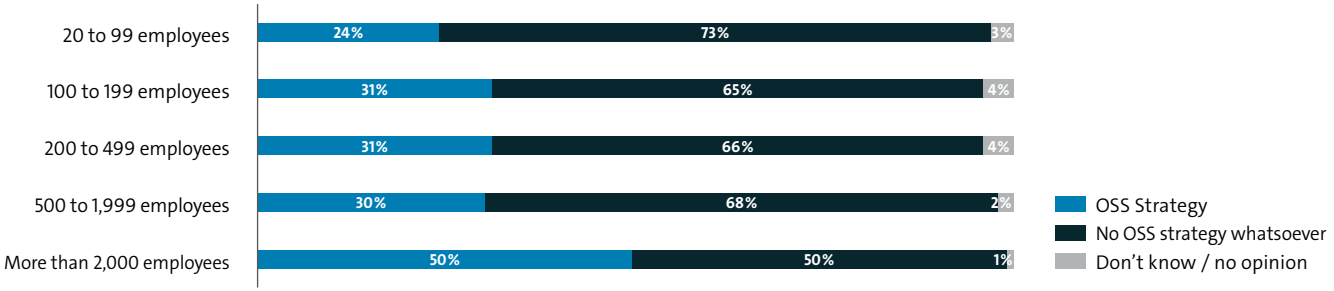


Figure 10 – Attitudes towards open-source software by business size
Does your company have a strategy for using and participating in OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

When asked about an existing OSS strategy, the share of companies that have a strategic approach to OSS is significantly reduced. Every fourth company (25 percent) has an OSS strategy, but almost three quarters of companies (72 percent) has no OSS strategy at all (see Figure 9).

Where large companies with 2,000 or more employees are a little less open-minded to OSS than large companies with 500 or more employees (compare ↗ Chapter 1.1), they certainly have a more strategic approach to it (see Figure 10).

Half of the large companies have developed an OSS strategy (50 percent in those with more than 2,000 employees). Among the medium to large companies, it's about one third of the surveyed companies (30 percent in those with 500 to 1,999 employees, and 31 percent with 100 to 499 employees).

Additionally, there are differences in companies that have an OSS strategy regarding the scope and extent of their respective strategy. At 14 percent, the strategy focuses on the use of OSS (see Figure 11). A comparable amount of the companies state that they have a strategy on how to participate in OSS (14 percent). In most cases, these are cross-sector strategies (21 percent), while only seven percent report having strategies for individual company departments.

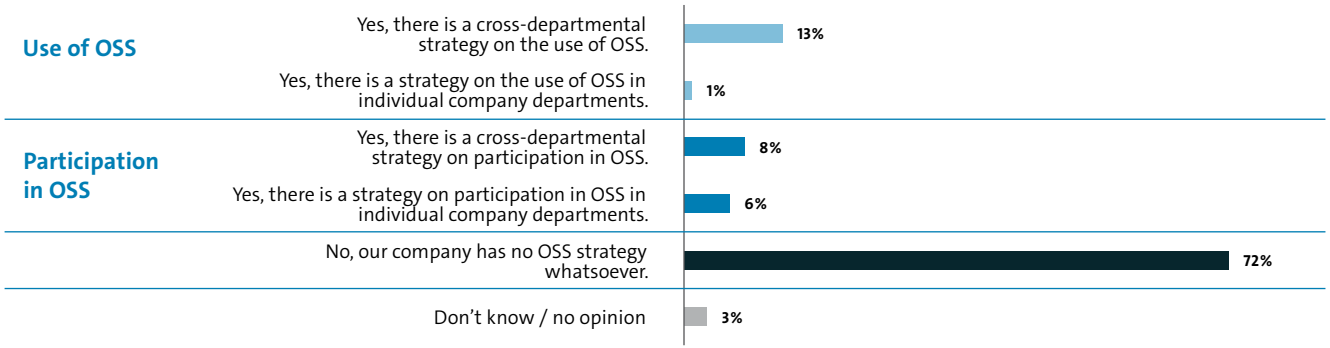


Figure 11 – Open-source software strategy by type

Does your company have a strategy for using or participating in OSS?

Base: All companies with more than 20 employees (1.152: n=1,152) | Multiple responses possible | Source: Bitkom Research

Microsoft

Expert statement: Promoting the responsible use of OSS

Thomas Langkabel
National Technology Officer at Microsoft Deutschland

The 30th anniversary of Linux is a clear sign of how far open-source software (OSS) has penetrated the world of IT. In doing so, previously existing boundaries between software development methods, software architectures, or business models will continue to become increasingly blurred and, in the future, will likely disappear completely. OSS has brought together people across national borders that work together on the realization of ideas in realization areas of concerning business and society, or to just have fun developing together. It is network effects like these that have facilitated the strong growth, the wide dissemination, and the broad acceptance of OSS.

This year's Open Source Monitor by Bitkom shows how much potential OSS holds and how open source has been a driving force for innovation in the IT sector. However, with this growing influence comes a new responsibility for everyone involved.

There has been a sea change, especially regarding technical digital standards. Earlier digital standards in technology used to be put forward in government committees and were then codified by them. This has not been happening in the past few years. Today, technical interoperability is achieved through OSS repositories like GitHub, where a new component is made available to anyone who is interested and swiftly adjusted to meet new demands. This is done at a much higher speed than via classic standardization committees, who are increasingly focusing on process-oriented standards with longer stability cycles.

An interesting interaction can be observed between new concepts of digital sovereignty and the basic principles of OSS. On the one hand, some view OSS as playing an important role in establishing a country's digital sovereignty. On the other hand, its true capacity for innovation is unlocked only when digital country borders do not conflict with a society's other requirements.

Furthermore, the 2020 SolarWind cyberattack has made business customers and the media more wary of the need to secure software supply chains. Due to a very dynamic environment and the participation of many independent actors, however, this is a generally new challenge faced by the IT sector, including OSS. Every organization, every developer that uses pieces of OSS from other repositories must secure the OSS supply chain by integrating new quality assurance processes into their own software development process and by defining an internal re-build process to minimize their dependency on precompiled runtime modules.

Additionally, there are issues such as maintenance statuses, robust roadmaps, and the trustworthiness of projects that are driven by smaller communities with only few active members.

Due to ever-new attack vectors, the development of secure software has been a constant challenge in the past and will require significantly more attention in the future due to the newest attack vector, the supply chain. This affects all manufacturers of software and platforms equally, independent of their development or business models. The right response to this is to intensify cooperation and the exchange of experiences.

1.3 Using open-source software

The majority of companies in Germany with 20 or more employees is interested in open-source software and open-minded towards the subject as a whole (compare ↗ Chapter 1.1). However, this initially positive picture is somewhat put into perspective by the way with which the issue is strategically embedded into business practice (compare ↗ Chapter 1.2). But what about the actual use of OSS in companies? The following section will focus on OSS use and, at the same time, answer the following questions:

- How do companies use OSS?
- Which human resources do companies deploy for OSS management?
- How do companies go about security checking OSS components?
- Which criteria are decisive for choosing OSS projects?

Seven out of ten companies with 20 or more employees (71 percent) state that they deliberately use OSS in their companies (see Figure 12). They are contrasted by a quarter of companies (26 percent) that state that they do not use any OSS solutions.

The use of OSS increases proportionally from smaller to larger companies (see Figure 13). Seven out of ten companies with less than 200 employees use OSS (70 percent in companies

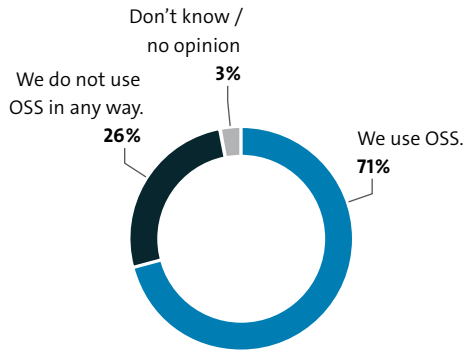


Figure 12 – Use of open-source software

Which of the following statements apply to your company's use of OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

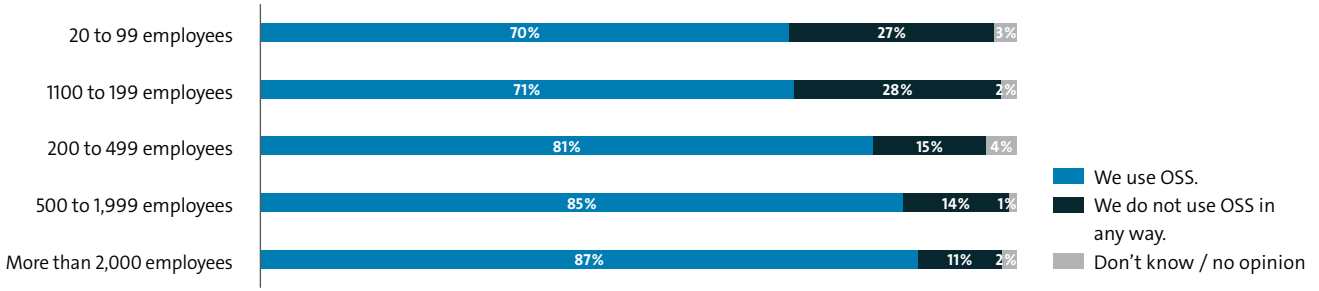


Figure 13 – Use of open-source software by business size

Which of the following statements apply to your company's use of OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

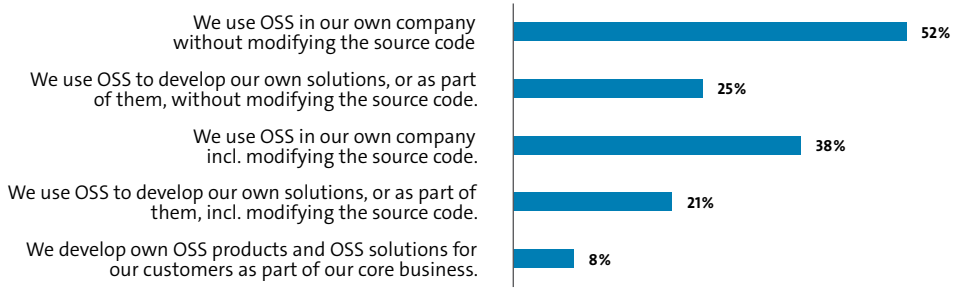


Figure 14 – Use of open-source software by type

Which of the following statements apply to your company's use of OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | Multiple responses possible | Source: Bitkom Research

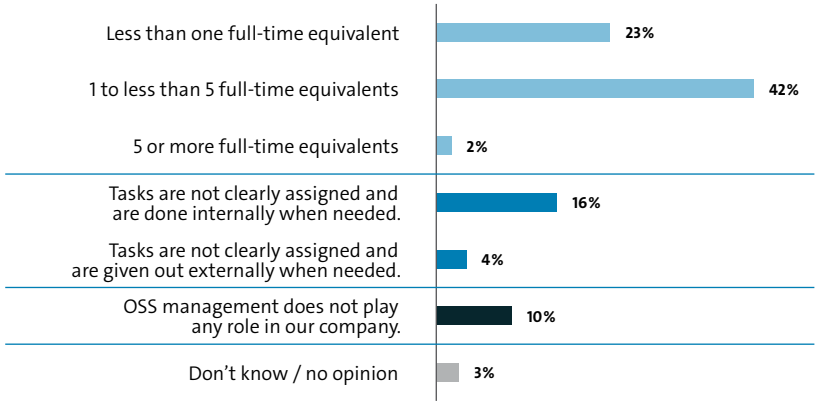


Figure 15 – Open-source software management

How many employees in your company focus on OSS management?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820) | Source: Bitkom Research

with 20 to 99 employees; 71 percent with 100 to 199 employees). In companies with 200 to 499 employees, this number increases to eight out of ten companies (81 percent). Usage is highest among large companies (85 percent with staff between 500 and 1,999; 87 percent when over 2,000). The starkest increase compared to 2019 was registered in medium-sized companies (+10 percentage points from 71 to 81 percent at companies with 200 to 499 employees.

The most frequent use case in companies was the deployment of OSS-based solutions without modifying OSS source code (see Figure 14). More than half of all German companies with 20 or more employees (52 percent) use OSS in this way. Four out of ten companies (38 percent) use OSS applications in their own company and modify the source code. Furthermore, the surveyed companies rely on OSS as part of their own products and services, which, at every fourth company, are passed on to their customers without modifying the source code (25 percent) and with a modified source code at every fifth company (21 percent). Developing stand-alone OSS products or solutions is part of the core business of a mere eight percent of the surveyed companies.

Two thirds of the surveyed companies (67 percent) that use OSS have designated staff that focuses on OSS management (see Figure 15). On average, 1.5 full-time equivalents deal with OSS management at these companies. At four out of ten companies, one to four full-time employees are in charge of OSS management (42 percent). At one quarter of the companies, less than one full-time equivalent is assigned to OSS

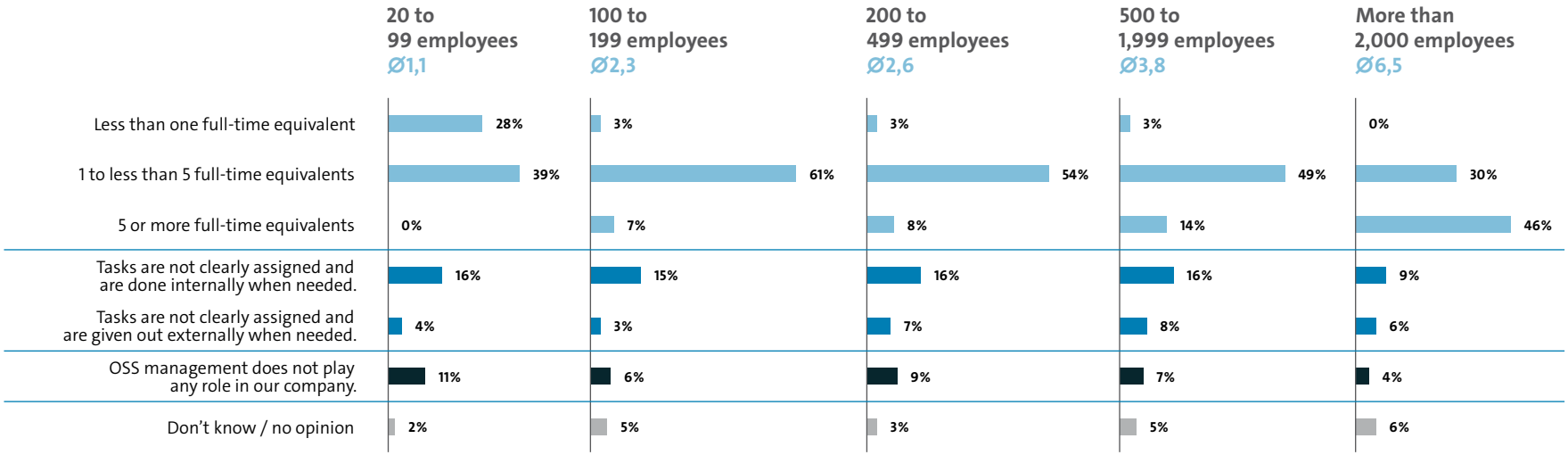


Figure 16 – Open-source software management by business size

How many employees of your company focus on OSS management?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820)
The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

management (23 percent). Only at two percent of companies, five or more employees are responsible for OSS management. By contrast, every fifth company (20 percent) has no clear staff assignment and tasks are assigned internally (16 percent) or externally (4 percent) as needed.

When accounting for business size, it becomes clear that the number of employees assigned to OSS management grows proportionally with the size of the company (see Figure 16). While the average is at 1.1 full-time equivalents in smaller companies with 20 to 99 employees, this number increase to 6.5 full-time equivalents in large companies with 2,000 or more employees. Among medium-sized companies, an average of two to four full-time equivalents are in charge of OSS management (2.3 at companies with 100 to 199 employees; 2.6 at companies with 200 to 499 employees; 3.8 at companies with 500 to 1,999 employees).

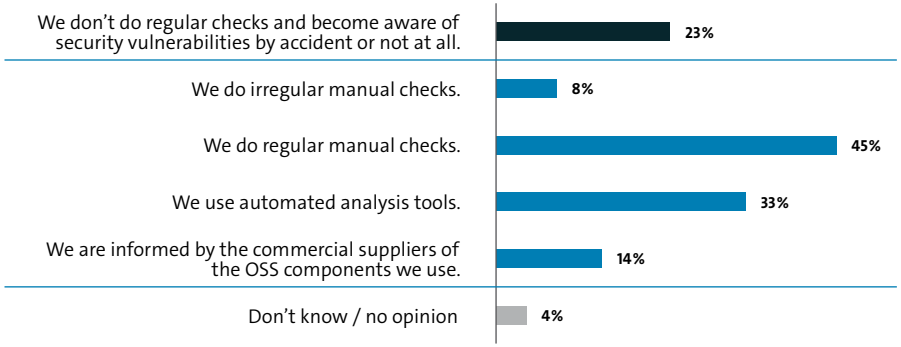


Figure 17 – Open-source software security checks

What is your company's approach to checking the security of the OSS components you use?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820) | The sum may not add up to 100 percent due to rounding | Multiple responses possible | Source: Bitkom Research

As described in ↗ Section 1.1, nine percent of the companies see the greatest disadvantage of OSS in potential security vulnerabilities. The importance of IT security and error-free use of OSS for companies is also reflected by the fact that seven out of ten of the surveyed companies (73 percent) state that they perform security checks on the OSS components they use (see Figure 17). Almost half of the companies perform regular manual checks (45 percent). Additionally, one third uses automated analysis tools to identify security vulnerabilities (33 percent). A smaller share of the companies relies on information from commercial OSS component providers (14 percent) and irregular manual checks (8 percent). However, almost every fourth of the surveyed companies does not perform targeted security checks on the OSS components they use (23 percent).

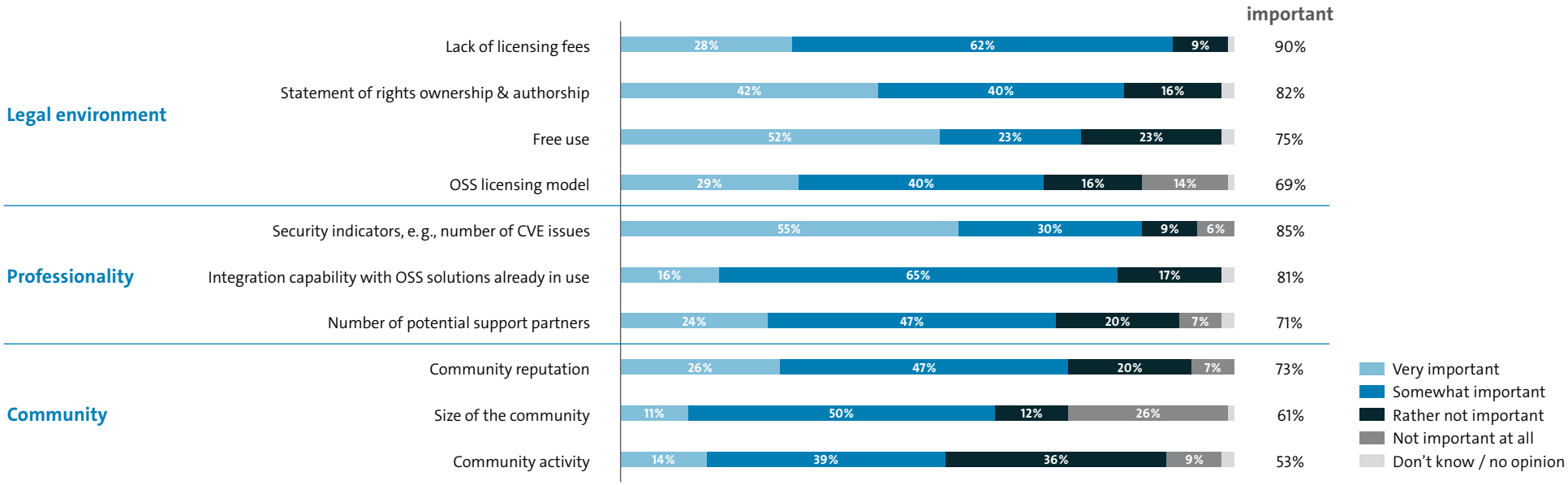


Figure 18 – Criteria for selecting open-source software projects

How important are the following criteria when selecting OSS projects in your company?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820)

The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

When selecting OSS projects, issues of IT security also play a central role. The reported selection criteria for OSS can be roughly subdivided into three categories: legal environment, reliability and compatibility, and community (see Figure 18). The number one criterion for choosing OSS projects is that there are no licensing fees, which is an important criterion according to 90 percent of the surveyed companies. An additional central criterion according to the companies is that of security indicators (e. g., the number of public reports of security vulnerabilities) – this is a »very important« criteria for more than half of those surveyed (55 percent, and 85 percent overall importance). For eight out of ten companies, rights ownership plays an important role (82 percent) as well as the capacity for integration with OSS solutions that are already in use (81 percent). Seven out of ten companies report that the number of support partners (71 percent) as well as the reputation of the community (73 percent) are important criteria.

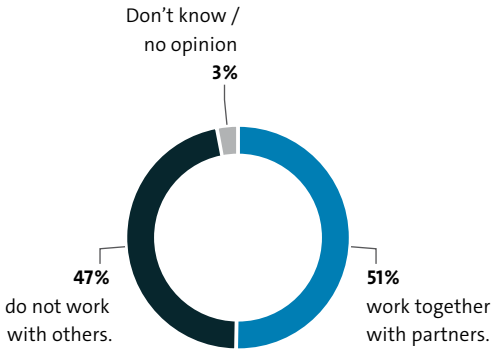


Figure 19 – Cooperation on open-source software

Does your company work together with other partners in concept or implementation?

Base: Companies with 20 or more employees that use, integrate, develop, or enhance OSS (2021: n=820) | The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

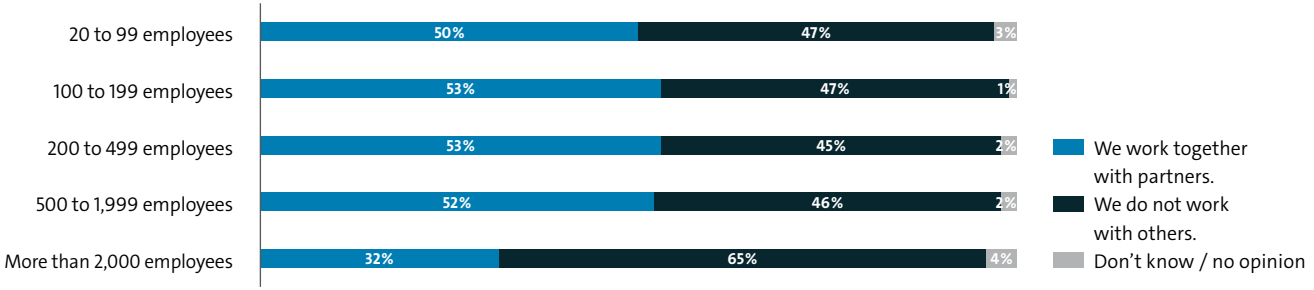


Figure 20 – Cooperation on open-source software by business size

Does your company work together with other partners in concept or implementation?

Base: Companies with 20 or more employees that use, integrate, develop, or enhance OSS (2021: n=820) | The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

Openness and collaboration are an important feature of OSS projects, which also applies to collaborating with external partners. Half of the surveyed companies (51 percent) work together with partners who support them in using OSS software (see Figure 19), while the other half uses OSS without external support (47 percent). This is the case particularly in large companies with 2,000 employees or more (see Figure 20): Two thirds of the companies of this business size does not work together with external partners (65 percent), only one third cooperates with partners (32 percent). In small and medium-sized companies, the distribution is more even. A good half of those companies work together with partners (50 percent of companies with 20 to 99 employees; 53 percent of those with 100 to 499 employees; 52 percent of those with 500 to 1,999 employees).

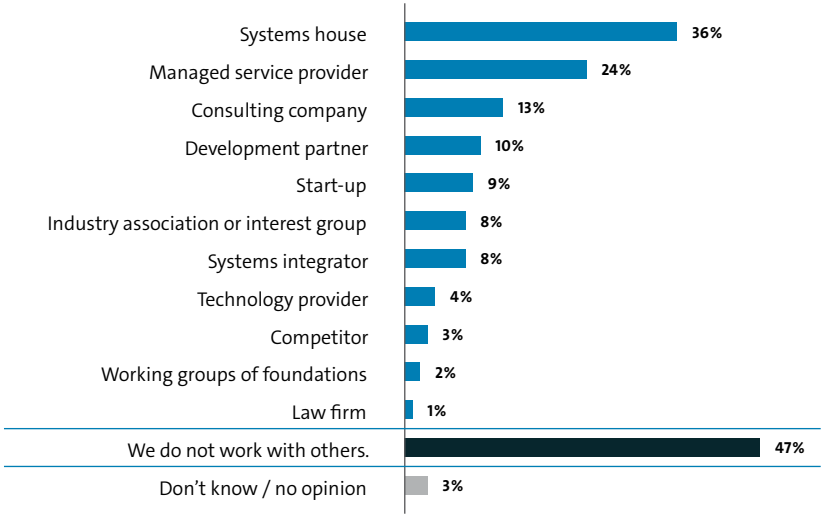


Figure 21 – Cooperation partners on open-source software

With whom of the following partners does your company work on OSS concepts or implementation?

Base: Companies with 20 or more employees that use, integrate, develop, or enhance OSS (2021: n=820) |
The sum may not add up to 100 percent due to rounding | Multiple responses possible | Source: Bitkom Research

Companies that work on OSS projects together with partners frequently enlist systems houses as partners (36 percent), followed by a managed service providers (24 percent) or consulting companies (13 percent: see Figure 21).

DAIMLER

Case study: Embrace FOSS to drive the digital ecosystem

FOSS is everywhere! It is in our vehicles, mobile apps, backend systems and websites, and even used on the shop floor every day. We embrace FOSS to increase the efficiency of software development, foster reuse and reduce costs, speed up innovation cycles, and attract new talent. As a player in a highly regulated industry, we have set up internal rules and processes to make sure we play it safe and at the same time open up to the worldwide FOSS community.

At Daimler, we encourage our developers to not only use FOSS, but to also contribute to existing open source projects and to publish new projects of our own. Internally, we promote the concept of Inner Source to apply the practices of open source to internal collaboration. To give you a better impression, we want to briefly explain a few of our inner and open source projects at Daimler.

For example, we contribute to **Catena-X**: This project is an alliance for secure and standardised data exchange for all participants in the automotive value chain. The alliance provides the network and the technologies for one of the central challenges of the automotive industry. The alliance has aligned with the Eclipse Foundation to create the Eclipse Tractus-X project in which the alliance members – of which we are one – collaborate to create open-source technologies.

As creators of open source, we publish open-source projects like **Mercedes-Benz Cars Operations 360** (MO360). This project is the new digital production ecosystem of Mercedes-Benz cars. It makes worldwide vehicle production transparent with maximum efficiency. The new digital ecosystem comprises a family of software applications which are seamlessly connected via shared interfaces and standardised user interfaces. We published a part of this, our MO360-ftk frontend-toolkit for creating modern web applications, as open source. Another example is **SecHub**. It orchestrates a host of tools for static and dynamic security application testing. The advantage of SecHub is that it provides one single interface for developers and build systems; developers don't need to know each individual tool inside out, but can easily configure their security needs in one configuration file. Existing products can be easily replaced and new products added without effort for the development projects. SecHub was one of the first projects that we published on GitHub.com.

And these are just some examples. We continue to promote awareness for Open and Inner Source through organizational roles, trainings, an internal conference series (»FOSS Friday«) and other activities. Our full executive management support is particularly expressed in our ↗Mercedes-Benz FOSS Manifesto which encourages our developers to actively participate in Inner Source, and to create and contribute to Open-Source-projects – so Daimler can become a good citizen in the worldwide FOSS Community!

Case study: Audi is accelerating innovative development using Kubika-O

Challenge: A secure, stable, and central platform for innovative development in several clouds

The mission of Audi AG is to use technology to be one step ahead. To satisfy this demand as well as changing business requirements, the parent company commissioned Audi's IT team to create a secure, stable, and central runtime environment. Audi IT was to create a platform that enables innovative developments by employees of all the group's brands on a large scale. The project was also to yield a flexible, modular architecture that supports iterative work, reduces risks, and eliminates dependencies. In a constantly changing environment, it is no longer sensible to operate systems without change for ten or more years. For this reason, Audi decided to create a multi-client system that facilitates small adjustments and updates where needed.

Solution: The as-a-service runtime environment Kubika-O

Together with Red Hat, Audi decided to create a new as-a-service runtime environment called Kubika-O, which is based on enterprise open-source technology. One strategic goal among others was to make use of the open-source software's benefits such as flexibility and scalability, while avoiding being tied to one particular provider. The software foundation of Kubika-O is Red Hat OpenShift, an enterprise Kubernetes platform for building, automating, scaling, and managing container-based applications.

Advantage: Delivering applications faster with stable, cross-cloud foundation

Previously, projects became backlogged due to time-consuming provisioning processes that could require lead times as long as six months. With automation through Red Hat OpenShift, Audi IT can quickly provide tailored Kubernetes clusters and add-ons for each Kubika-O project. As a result, experienced developers and those new to Kubernetes can work more efficiently to create, deliver, and migrate innovative solutions across on-premises as well as cloud environments.

Kubika-O supplies Audi's platforms, applications, and projects with a consistent foundation across several cloud vendors. This multi-tenant Kubernetes environment supports several key operational applications, including Audi Open Source Diagnostics, a measurement data management application as well as the Used Car Platform, used by Audi dealers.

Audi's teams can now use the modular, responsive container infrastructure and robust automation technology, included in Red Hat OpenShift, to scale applications using shared resources – without having to rely on physical infrastructure or proprietary software.

»Red Hat OpenShift has helped us create a secure runtime for our projects and containers with low dependencies, all based on open-source technology,«, says Sebastian Kister, product team lead and product owner, Kubernetes and Public Clouds at Audi AG.

1.4 Participation in open-source software

Open-source software lives off the active participation of its users in developing and enhancing software. The basis of any successful OSS projects is an active OSS community, which works on projects collaboratively. More than half of the companies with 20 or more employees (55 percent) is actively involved in developing and enhancing OSS or allows its staff to do so (see Figure 22). This is a clear increase compared to the previous study.

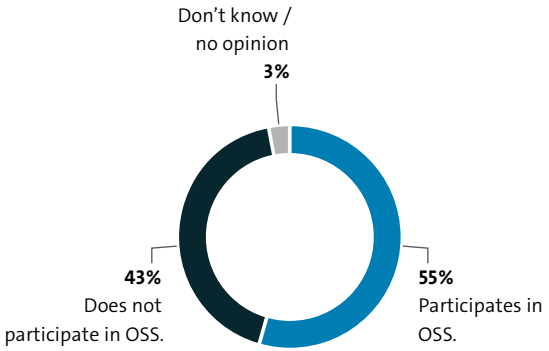


Figure 22 – Participation in open-source software

Is your company involved in developing or enhancing OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

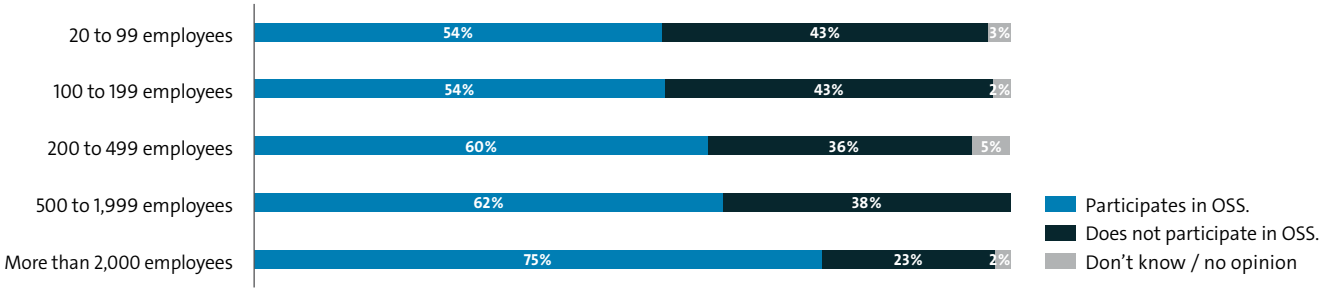


Figure 23 – Participation in open-source software by business size

Is your company involved in developing or enhancing OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

In 2019, only every third company with more than 100 employees (31 percent) was actively involved in developing or enhancing OSS.

The bigger the company, the more pronounced their participation in OSS projects is (see Figure 23). While a good half of smaller companies with staff numbers between 20 and 199 is involved in the development of OSS (54 percent), this number rises to three quarters among large companies with more than 2,000 employees (75 percent). It can be surmised that higher participation is facilitated by the fact that the number of employees whose work focuses on OSS increases with the company size (see ↗ Figure 16).

The companies' participation in OSS projects looks as follows (see Figure 24): Four of ten companies (36 percent) support OSS projects financially by buying ancillary services and enterprise editions. One fifth of companies (21 percent) allows individual employees or teams to participate in OSS projects as part of their work. A small amount initiates and oversees own projects in the OSS community (11 percent). Only few companies participate by giving modified OSS source code back into the community (9 percent).

Figure 24 – Forms of participation in open-source software

In what way is your company involved in developing or enhancing OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding | Multiple responses possible
Source: Bitkom Research

NORDEMANN

Case study: ElasticSearch license change

Prof. Dr. Christian Czychowski

Sebastian Dworschak

Relicensing of popular software also reveals weak spots in the open source management of some users

The relicensing of the ElasticSearch software has caused quite a stir this year. The search engine, which has been enjoying growing popularity, changed its license earlier this year from the very permissive Apache 2.0 license to a much stricter Server Side Public License (SSPL). The result was a controversial public discussion and, in parts, fierce criticism from the open source community. This is also due to the very strict design of the SSPL license that is now being applied, which, due to its design, has not been recognised as an official open source license by the relevant Open Source Initiative (OSI). Simultaneously – probably due to media attention – this change has resulted in increasing uncertainty among many of the software's users regarding whether and under what conditions they can continue to use it.

The software's usage scenarios differed significantly. While some of them were hardly affected by the license change upon review, things were a lot more difficult when looking at cases of more complex integration of the software. In some cases, however, it turned out that it was possible to continue to use the software without any changes. A closer look at the new licensing shows that there is more to it than the heated debate about SSPL licensing. In several cases, usage was determined by another license that was offered, the so-called Elastic Licence v2. Moreover, other relevant components were continued to be provided under an Apache 2.0 license and, depending on the version currently in use, licensing issues were only raised when the software was changed or updated.

With that said, this highlighted the sometimes-significant differences in the way companies handled and managed open-source software, some of which are also reflected by the results of this survey. While those clients who were used to dealing with open source-related issues had a fairly clear overview of their concrete use of software components, their version, integration, and usage scenarios, other clients required taking several steps to work this out. However, this often showed that continued use of ElasticSearch was possible. At the same time, we were often confronted with classic legal issues of open-source software solutions, which could have been dealt with far more efficiently if they had been dealt with earlier and more proactively.

Nordmann offers comprehensive consulting on legal issues in IT and open source.
Christian Czychowski and Sebastian Dworschak will gladly answer all your questions.
↗info@nordemann.de | ↗www.nordemann.de

Case study: How does SAP organise the development of open-source software?

A quick look at the results of Bitkom's most recent Open-Source Software Monitor shows: Using open source is popular. More than two-thirds of the surveyed companies use open-source software (OSS). However, only a small part of those companies contributes their own code to open-source projects. Possible obstacles to doing so are indeed relatively easy to overcome – provided that the company is motivated enough and has dedicated OSS management in place.

Contributing to OSS has a long tradition at SAP. In 2004, we were among the founding members of the Eclipse Foundation and, in 2008, we published our requirements for publishing code as OSS as »SAP's Open Source Outbound Process«. Today, SAP ranks in ninth place among the leading organisation in the Open Source Contributor Index – with over 1,700 employees contributing to OSS on GitHub at least once in 2020.

In this outbound process, our Open Source Program Office (OSPO) **distinguishes four different categories**. First, we are supportive of our developers **when they work on open source projects in their spare time**. Our only requirement is that they pay attention to certain conditions. Employees must be able to rule out conflicts of interest, i. e., keep professional and private matters separate. This is especially true for internal company information, which, of course, must not be used in open-source projects.

The other three categories refer to contributions made during staff working hours. **Bugfixes** can be done without an approval process if in principle, the software has been approved for use in the company, or if it doesn't require a previously cleared Contribution Agreement (e. g., CLA, DCO).

The rules that apply to contributing **new features** are only slightly stricter. It requires prior approval by the direct superior. Additionally, it should be made sure that enough time is earmarked for additional contributions, including things like support and corrections.

When **publishing an open-source project** of their own, staff must involve the OSPO and possibly other departments such as Legal or Export Control. Teams that wish to publish a project must submit an appropriate request to the OSPO through the internal Enterprise GitHub system. The OSPO then oversees all aspects of the publication, which also uses a GitHub-supported process, including how to correctly publish a Readme, copyrighting and licensing information, the obligatory licence scan, and also the coordination process with SAP's branding to find a name. Every individual step is entered as a separate GitHub issue. The repository is published after all GitHub issues have been closed, i. e., all partial steps have been completed. Ongoing maintenance and development of the project then become the responsibility of the team in charge. Simultaneously, the OPSO monitors compliance with publishing standards using appropriate tools.

The primary goal of all these guidelines and process steps is to make it as easy as possible for developers to contribute to OSS as private individuals and as SAP employees while keeping track of all aspects of risk management (IPs, licenses, external effects) for the company.

↗ Open Source Contributor Index
↗ Contribution Agreement
↗ Compliance with the standards for publishing OSS projects

1.5 Open-source software compliance

Software is open source only if users are free to execute it, read it, modify the source code, and pass it on in modified or unmodified form. For this reason, however, open-source software is not a legal vacuum. The essential freedoms of OSS are partly bound to concrete duties and requirements, which are laid out in licenses. Non-compliance with licensing requirements can result in written warnings, cease and desist letters, and indemnities, which may cost companies dearly.

To prevent this from happening, companies that rely on OSS should have appropriate OSS compliance management in place. A first compliance component could be an OSS policy, a written document containing guidelines and rules of OSS conduct within a company. An OSS policy of this type should be standard reading for any company employee working with OSS.

However, there is a great need to catch up among companies that use OSS, integrate it into their products and solutions, develop and enhance OSS, or participate in OSS projects and communities. Only about every fifth companies (22 percent) that works with OSS has an OSS policy in place (see Figure 25).

The majority of OSS users (76 percent) has not defined any such codes of conduct. The breakdown by company size underscores that especially smaller companies seldom have a clearly defined policy for using OSS (20 percent of companies with 20 to 99 employees have a policy as well as 22 percent in companies with 100 to 199 employees; see Figure 26). Among companies with 200 to 499 employees, every third has an OSS policy in place (31 percent); every fourth among large companies with 2,000 or more employees (42 percent).

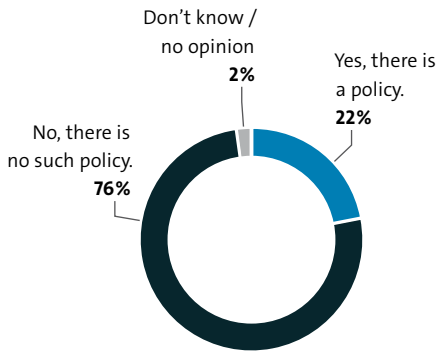


Figure 25 – Open-source software policy

Does your company have an OSS policy in place, i. e., a document that contains guidelines and rules for handling OSS in your company?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS, or participate in OSS projects and communities (2021: n=843) | Source: Bitkom Research

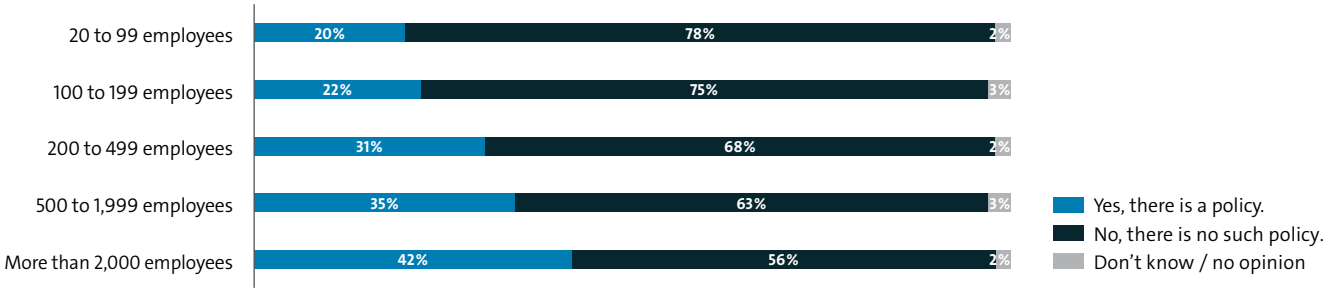


Figure 26 – Open-source software policy by business size

Does your company have an OSS policy in place, i. e., a document that contains guidelines and rules for handling OSS in your company?

Base: Companies with 20 or more employees that use, integrate, or develop OSS, or participate in OSS projects and communities (2021: n=843) | The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

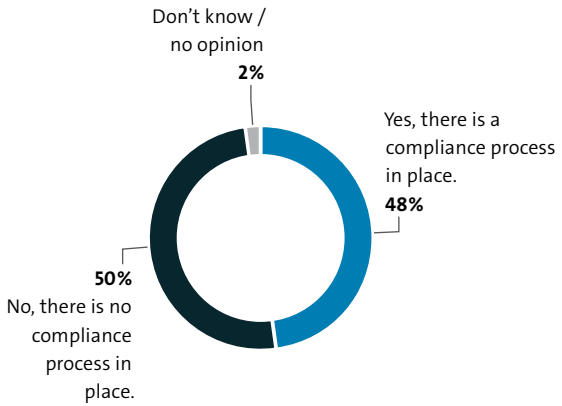


Figure 27 – Open-source software compliance process

Does your company have a written compliance process for handling OSS? By compliance process we mean a standardised procedure for handling OSS.

Base: Companies with 20 or more employees that use, integrate, or develop OSS, or participate in OSS projects and communities (2021: n=843) | Source: Bitkom Research

When it comes to compliance processes in companies (see Figure 27), the results differ strongly, more than doubling in proportion compared to OSS policies. Almost half of the companies (48 percent) that use, integrate, develop or enhance, or participate in OSS, have compliance processes in place, i.e., clearly defined and written standardised procedures.

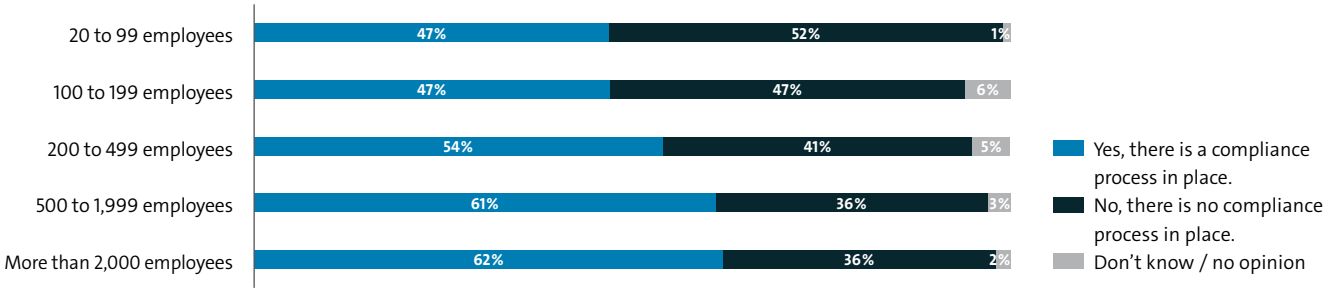


Figure 28 – Open-source software compliance process by business size

Does your company have a written compliance process for handling OSS? By compliance process we mean a standardised procedure for handling OSS.

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS, or participate in OSS projects and communities (2021: n=843) | Source: Bitkom Research

A closer look at business size shows that particularly smaller companies have room for improvement. Here, the percentage is double (47 percent in companies with 20 to 99 employees). Among the larger companies, six out of ten have already defined standardised procedures in form of compliance processes (61 percent in companies with 500 to 1,999 employees as well as 62 percent when larger than 2,000 employees).

Compared in this way, companies with more than 20 employees that integrate OSS into products and solutions for their customers (see Figure 29) are particularly aware of OSS compliance issues. Every third of these companies has a compliance process in place (36 percent). Moreover, three out of ten companies that use OSS solutions internally have a compliance process in place (29 percent).

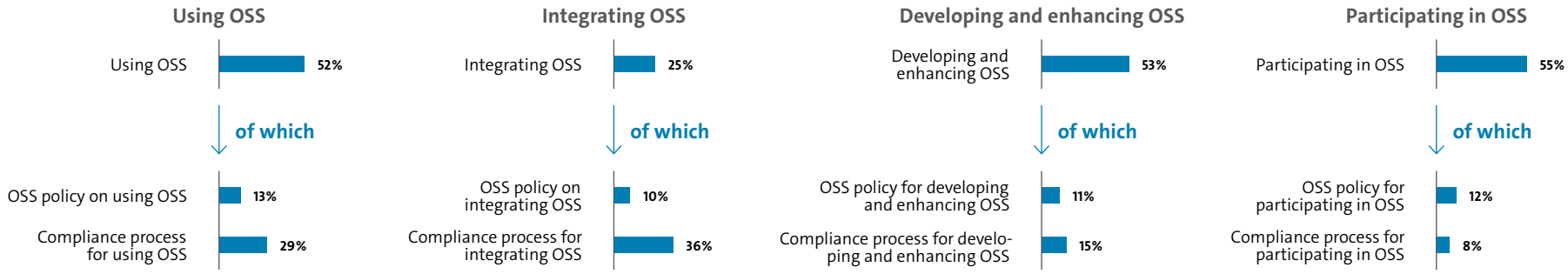


Figure 29 – Overview of open-source software compliance

Which of the following statements apply to your company's use of OSS?

Does your company have an OSS policy in place? Does your company have an OSS compliance process in place?

Base: Companies with 20 or more employees that use (2021: n=598), integrate (2021: n=289), develop or enhance OSS (2021: n=607), or participate in OSS projects or communities (2021: n=629) | Source: Bitkom Research

bitsea.

Expert statement: Hidden risks in software systems

Open-source software (OSS) is everywhere and has become indispensable for modern software development. In addition to its wide dissemination, OSS is characterised by the special way it is created. Most of it is developed through collaboration by experts all over the world.

When using OSS, companies expect cost advantages and more speed for creating their own applications. But beware! Even »public domain« products created by a community are subject to **copyright law**. As the creators of their work, every developer gives out clear rules under which conditions their software may be used. These can take on very different forms. It is therefore very important to become familiar with them. They may be opposed to the own strategy – for example, a company obligation to, in turn, make the modified code freely available.

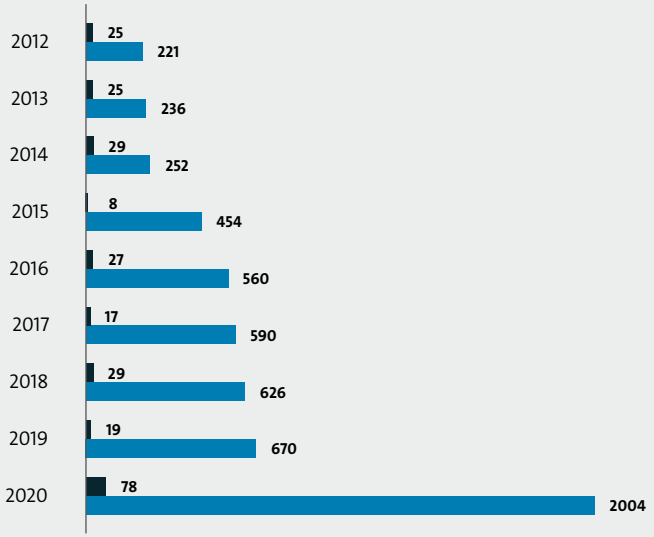
When using OSS, however, one needs to consider more than legal pitfalls. Like in every other software, **security vulnerabilities** are regularly discovered in OSS components. They are published in databases like the National Vulnerability Database (NVD) and are typically fixed by the community in a timely manner. For this reason, it is important to know which of these components are used in one's own software, so that they can be swiftly »patched« when a security risk arises. Without continuous monitoring of OSS, application security can be in danger.

Despite these risks, many companies state that they **do not have formal processes in place to track and manage their OSS use**. When a code is then scrutinised for the first time, many teams discover that their application contained much more OSS with a risk potential than previously thought.

This is illustrated by studies on the knowledge of using OSS components in companies. The following chart from our partners at Revenera illustrates the extent to which companies are informed about their own use of OSS (black bar) compared with their actual use (blue bar). A clear trend has been observable for a couple of years now: The number of open-source packages in use is rapidly increasing but users are less and less aware of it. This increases the danger of bringing home the above-mentioned risks.

There are many reasons for this increase in use from a software technology perspective; at the same time, the management processes for OSS have hardly been improved on in the past 10 years.

To summarise: Companies that rely on open-source components are prone to heightened risks brought about by security vulnerabilities and compliance violations – this often happens without their knowledge. For this reason, it is recommended to establish an **Open Source Office** or OSS point of contact for developers, who know how deal with these new risks.



Number of known vs. used OSS components

Source: Revenera Professional Services Audit Data 2012–2020

Bitsea identifies hidden risks in software systems and supports users with ensuring IT compliance. We consult customers regarding the use and management of OSS. Our customers include well-known corporations from the automotive sector, telecommunication, logistics as well as Aerospace. Bitsea is an Open Chain project partner.

↗www.bitsea.de

Expert statement

Wolfgang Ihde
Senior Manager

Even though open-source software is often dubbed »free« software, it is by no means »obligation-free« software. Open-source license requirements often contain diverse terms, which are not always clearly formulated at first glance. Non-compliance, however, can result in expiry of rights of use or lead to the company being confronted with injunctive relief, indemnity claims, or even criminal charges.

The current Bitkom survey, Open Source Monitor 2021, shows that about 70 percent of all companies use open-source software. Many of these companies, about 75 percent, state that they have no open source policy in place. About 50 percent of the surveyed companies report not having an open source compliance process. But why is creating an open source policy and an open source compliance process so important?

Compliance typically describes a state in which rules and laws are adhered to. In the context of software asset and licensing management, compliance is achieved when software is correctly licensed, and the terms of use are adhered to. To prevent or reduce legal violations, companies must implement organisational measures and establish internal processes.

Ideally, open-source compliance should be seen as part of a holistic compliance management system. Establishing a holistic compliance management system requires a combination of technical and operational measures.

A minimum requirement here is creating and complying with an appropriate policy. This must include certain key elements, including binding rules and responsibilities, codes of conduct and procedures as well as determining and factoring in the open-source software that is in use or has been developed by the company. However, the mere existence of a policy is often not enough to ensure that software developers can safely handle open source and are also protected legally. To achieve this, it is advisable to develop a »license playbook«. This should contain the properties of the most common licenses and compile all the currently used open-source components. Employee training is also a good opportunity for raising awareness.

The last item required to complete the compliance management system is the use of open-source scanners. They facilitate analysing software and categorise open-source components according to the licenses they use.

We will gladly support you in drawing up, introducing, and implementing a holistic compliance management system in a sustainable fashion as well as any other issues you might have relating to the management of open source.

1.6 OpenChain Standard ISO 5230

The open-source license compliance standard developed by OpenChain, a Linux Foundation project, was published as the international standard ISO/IEC 5230 in late 2020. Half of the companies (47 percent) that use, integrate, develop or enhance, or in other ways participate in OSS have heard of the OpenChain standard (see Figure 30).

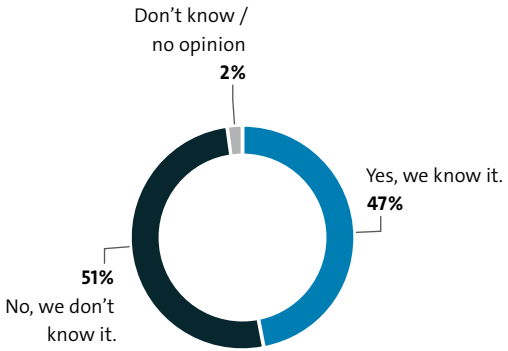


Figure 30 – Awareness of OpenChain Standard ISO 5230
Do you know the OpenChain standard for OSS compliance, or ISO 5230?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820) | Source: Bitkom Research

The number of companies unfamiliar with the OpenChain standard is highest among smaller companies (52 percent among those with 20 to 99 employees as well as 54 percent among those with 100 to 199 employees; see Figure 31). In comparison, a mere four out of ten of medium-sized companies with staff between 200 and 499 (41 percent) and the large companies with more than 2,000 employees (40 percent) report not knowing the standard.

On average, every third company (35 percent) reported being aware of the OpenChain standard but not having attended to it in greater detail. Among large companies with more than 2,000 employees, only one fifth of the surveyed companies (20 percent) has not yet addressed the OpenChain standard. Every fifth large company (20 percent) has already completed the standard's implementation.

.

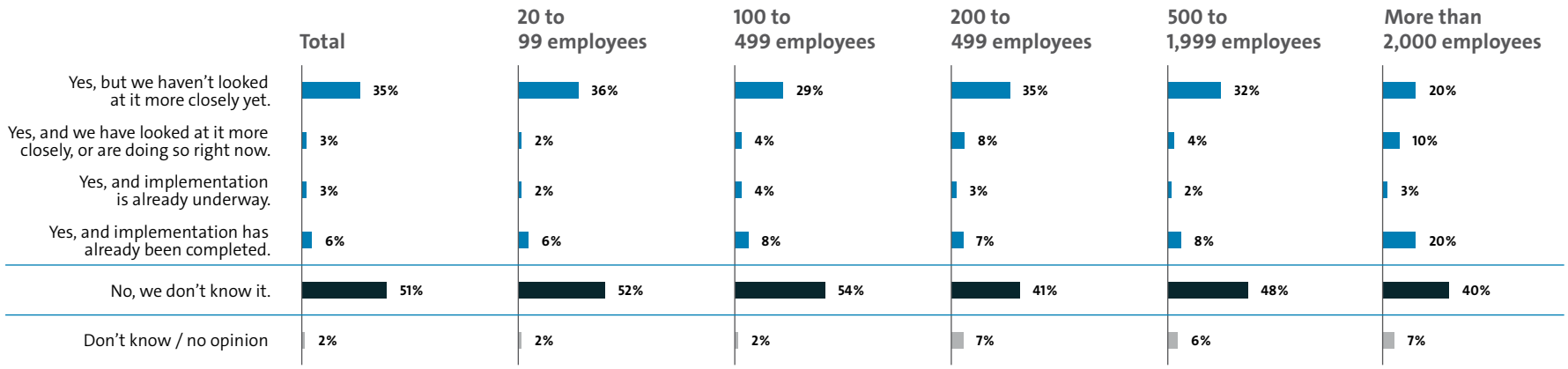


Figure 31 – Handling the OpenChain Standard ISO 5230

Do you know the OpenChain standard for OSS compliance, or ISO 5230? If so, has your company looked at it more closely?

Base: Companies with 20 or more employees that use, integrate, develop or enhance OSS (2021: n=820) The sum may not add up to 100 percent due to rounding

Source: Bitkom Research

Two thirds of the surveyed companies with more than 20 employees (63 percent) have a positive rating of the value added by the OpenChain standard for OSS compliance (see Figure 32). The greatest added value is seen by large companies with 500 to 1,999 employees – among these, nine out of ten companies (93 percent) expect added value from ISO 5230.

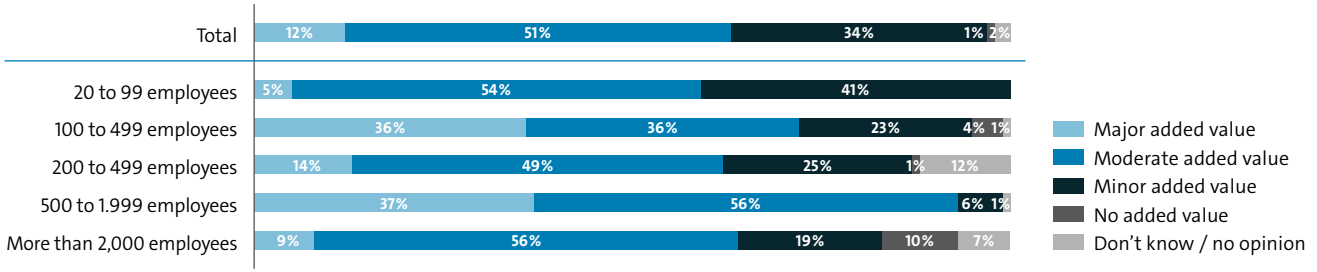


Figure 32 – Value added by the OpenChain Standard ISO 5230

How do you assess the added value of the OpenChain standard for OSS compliance and ISO 5230 for improving OSS compliance?

Base: Companies with 20 or more employees that have already looked into the OpenChain standard, or ISO 5230, respectively (2021: n=92) The sum may not add up to 100 percent due to rounding | Source: Bitkom Research

{metæffekt}

Case study: Open source within commercial business

Software Asset Management & Open Source

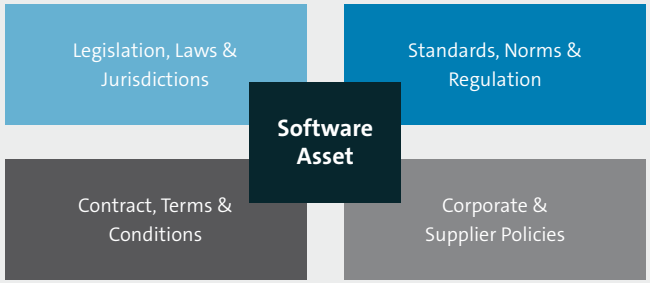
Within commercial organisations software components from various suppliers are captured by the company's software asset management. To support the use and integration within the own business processes and internal development of assets (products and solutions) different characteristics are assessed and tracked along the lifecycle of the individual software components. Commonly, ITIL and ISO/IEC 19770 derived approaches are applied as baseline of an internal software asset management process.

The management of free and open source software (FOSS) must be integrated into these established processes. Differences to commercial software components must be identified and evaluated within the corporate context. Within these activities the curriculum and requirements of the OpenChain Project are considered highly valuable and relevant.

The characteristics of software components can be attributed to four areas.

Legislation, Laws & Jurisdictions

Generally, legislation and case law apply when handling software. Copyright law, contractual terms and conditions, property rights, and liability provisions are of particular importance. Within a business case the jurisdictions along the supply chain from the suppliers, the inhouse development sites into the target markets must be respected.



Software assets – context and influences

Contracts, Terms & Conditions

The legal framework is complemented by contracts with manufacturers and suppliers. While these define the relationship of the contractual partners, the use of software components is determined by individual terms and conditions. In practice, there are diverse variants with respect to software licensing; FOSS licenses included.

Standards, Norms & Regulation

Standards, norms, and regulation must be determined for a given business case and are applied by addressing the specific requirements. ISO/IEC 27001 covers compliance requirements from an information security perspective (A.18) and anticipates measures for maintaining an asset inventory (A.8). For many products and solutions in operation, the building blocks of the BSI's compendium for basic protection must be applied. The compendium assumes imperative conformity to legal and security requirements.

Corporate & Supplier Policies

Corporate policies are derived to cover substantial requirements in the core business domains and minimize risks. References to the selected standards and derived principles guide different disciplines within an organization including development and product management.

Conclusion

The use of FOSS licenses, including their specific constructs, obligations, and implications, demands an adjustment of the software asset management processes within an organization. Managing FOSS with determination and confidence preserves a company's ability to act and stay competitive. The Bitkom Open Source Monitor discloses a demand for improvement in this respect. Especially with respect to compliance a need for action becomes apparent for the German industry and administration.

{metæffekt} GmbH[1] supports companies integrating FOSS in corporate processes and procedures. For an implementation of continuous compliance processes, technical knowhow, methods, and professional services are provided.

1 ↗ https://metaeffekt.com

Expert statement

Marcel Scholze
Director, Open Source Software Services

ISO 5230 – the OSS Management Standard

With the publication of ISO 5230 at the end of 2020, the Open Source compliance industry standard of the Linux Foundation's OpenChain project, which had been developed and established by numerous well-known global companies since 2016, took an important and major step. The demand of OSS compliance management programmes is increasing globally, across industries and for any size of company. ISO 5230 as an officially adopted international standard provides excellent guidance and ultimately also the possibility of certification.

Finally reliable and scalable software supply chains – from compliance to security

The risk of security issues and licence breaches can lead to financial, reputational and business continuity damage as well as loss of trust. However, this risk is not an individual one; it affects all participants in the software supply chain the same way.

To mitigate risks and meet external requirements, companies are often forced to assess and audit all incoming software with regard to OSS compliance. Without company-wide transparency over which OSS and licenses are used as well as comparable OSS compliance systems, the expenditures for OSS compliance measures in B2B are incurred by all recipients of products and services containing software.

In the B2B context, if a large number of companies are soon ISO 5230 compliant and can demonstrate this, it will enable overarching transparency and trust in OSS compliance and the use of compliance documents, leading to a reduction in costs downstream in the supply chain.

An inevitable standard

The feedback from this study, only six months after the publication of ISO 5230, is a very strong indication of rapid and widespread implementation across a wide range of supply chains and B2B purchasing conditions.

The recently published ISO 5962 on Software Package Data Exchange and requirements such as the U. S. Governance Executive Order 14028 on Cybersecurity are driving OSS compliance even further.

Our OSS management consultancy with clients from various industries and the public sector also reflects the fact that now is the time for organisations to deal with OSS strategic enablement and management as well as compliance, security and certification.

PwC advises and implements or audits and certifies Open Source Management Systems and offers Managed Services for code scanning, SBOM creation and supplier audits.

↗ www.pwc.de/en/opensource

2 Open-source software by industry

The first chapters of this report have given a representative overview of the use of OSS in companies in Germany with 20 or more employees. Additionally, this chapter will look at selected industries regarding the use of OSS. The project consortium has decided to take a closer look at the following five industries, whose industry-specific results are now put into relation to the overall results: automotive industry, finance and insurance sector, retail, IT and telecommunications (ICT) as well as the mobility and logistics sector.

The fundamentally positive attitude towards OSS is at a high level among companies of all industries (see Figure 33). The level of interest is the highest in the financial sector (73 percent), followed by the automotive industry (72 percent). In all other industries, two out of three companies are interested in OSS. This accounts for 66 percent in each the ICT industry, the mobility and logistics industry, and retail, which is on par with the overall figure of 67 percent. While the interest among banking and finance as well as the automotive industry remained relatively constant compared to the previous Monitor Study in 2019, there has been a drop of interest in the retail sector (from 80 to 66 percent).

Banking and insurance are pioneers when it comes to developing strategies on how to use and participate in OSS (see Figure 34). Almost four of out of ten companies have a strategy for the use of OSS in place (39 percent). The ICT sector comes in second place (32 percent). The process of adopting an OSS strategy is least advanced in the retail sector, where only

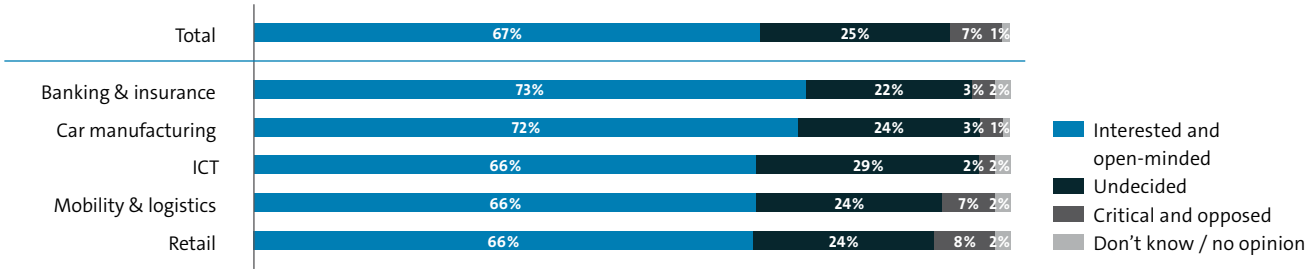


Figure 33 – Attitudes towards open-source software by industry

What is your company's general position on OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

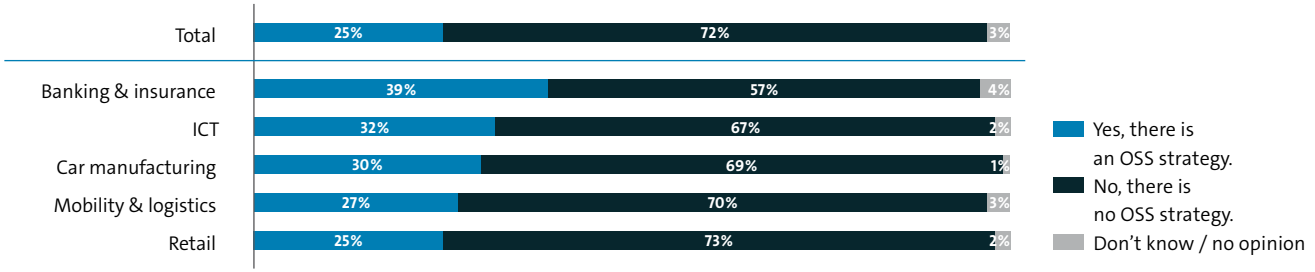


Figure 34 – Open-source software strategy by industry

Does your company have a strategy for using and participating in OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

every fourth company (25 percent) has an OSS strategy in place. The majority of companies – independent of industry – has some catching up to do regarding the strategic use of OSS.

Despite the differences between industries regarding interest and strategy for the use of OSS, it is similarly widespread in all industries (see Figure 35). In every industry, seven out of ten companies on average reported that they use OSS (between 72 and 74 percent).

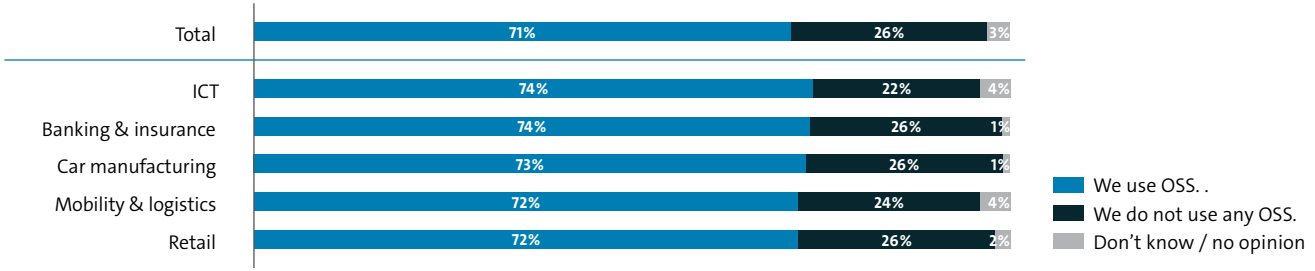


Figure 35 – Use of open-source software by industry

Which of the following statements apply to your company's use of OSS??

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

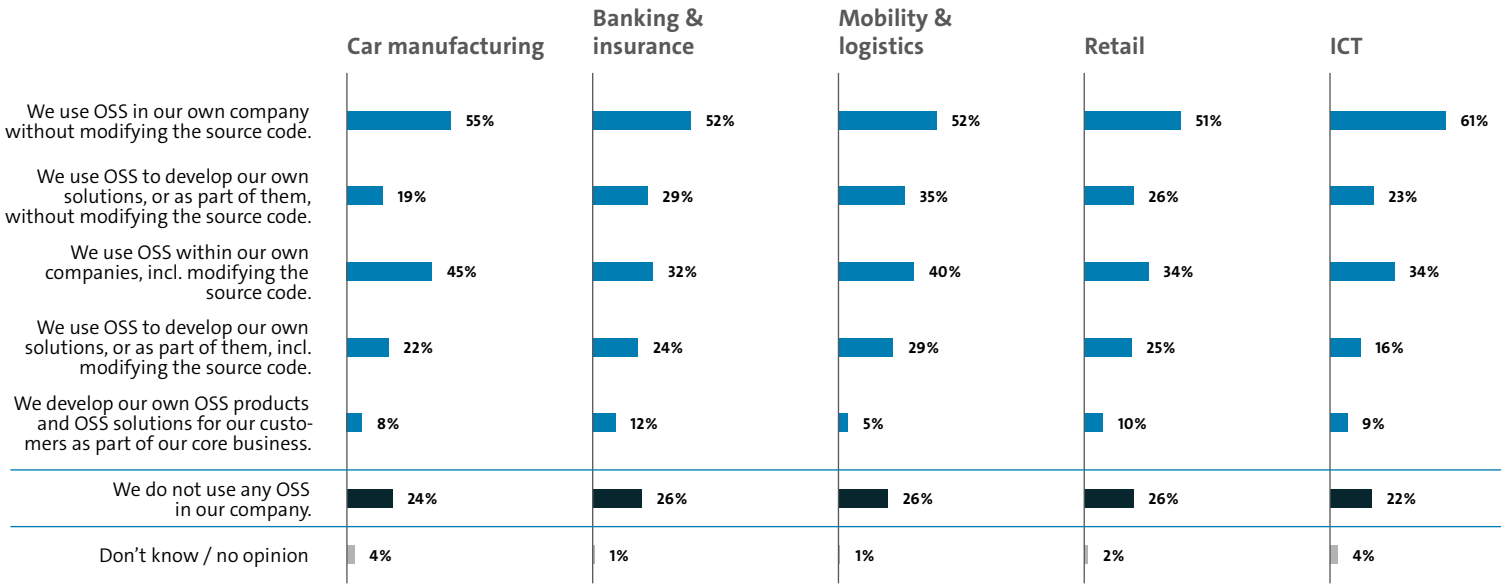


Figure 36 – Type of open-source software use by industry

Which of the following statements apply to your company's use of OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | Multiple responses possible | Source: Bitkom Research

A look at the type of OSS use shows that different industries use it differently (see Figure 36). More than other sectors, the ICT companies use OSS more without modifying source code (61 percent, followed by 55 percent in the automotive industry). The automotive industry is proportionally more likely to use OSS solutions with modified source code for internal use (45 percent, followed by 40 percent in mobility and logistics).

When comparing industries, developing own OSS, or use of OSS components as part of own solutions, is done most frequently in the mobility and logistics industry, either without modifying source code (35 percent), or with modifying source code (29 percent).

How active the automotive industry is in software development also becomes clear when comparing the industries involved in developing or enhancing OSS (see Figure 37).

Six out of ten companies from the automotive industry participate in OSS projects (61 percent), which is above the overall average of 55 percent. In mobility and logistics companies, only about half of the companies participate (48 percent). The ICT industry is at the bottom of the pile. Only four out of ten companies take part in developing and enhancing OSS (42 percent).

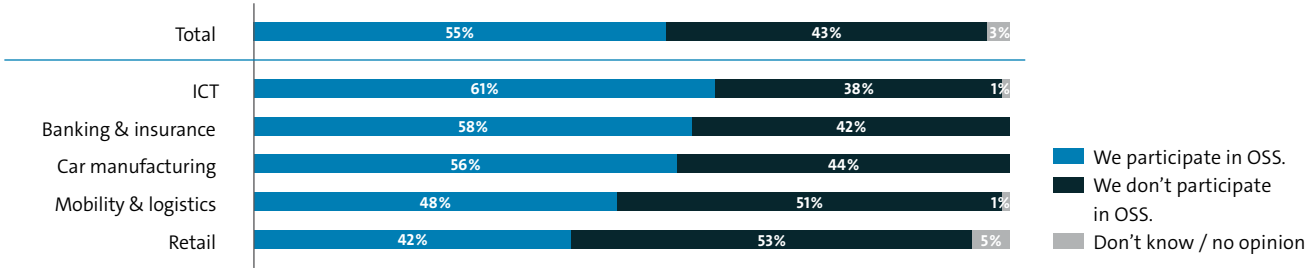


Figure 37 – Participation in open-source software by industry

Is your company involved in developing or enhancing OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | The sum may not add up to 100 percent due to rounding
Source: Bitkom Research

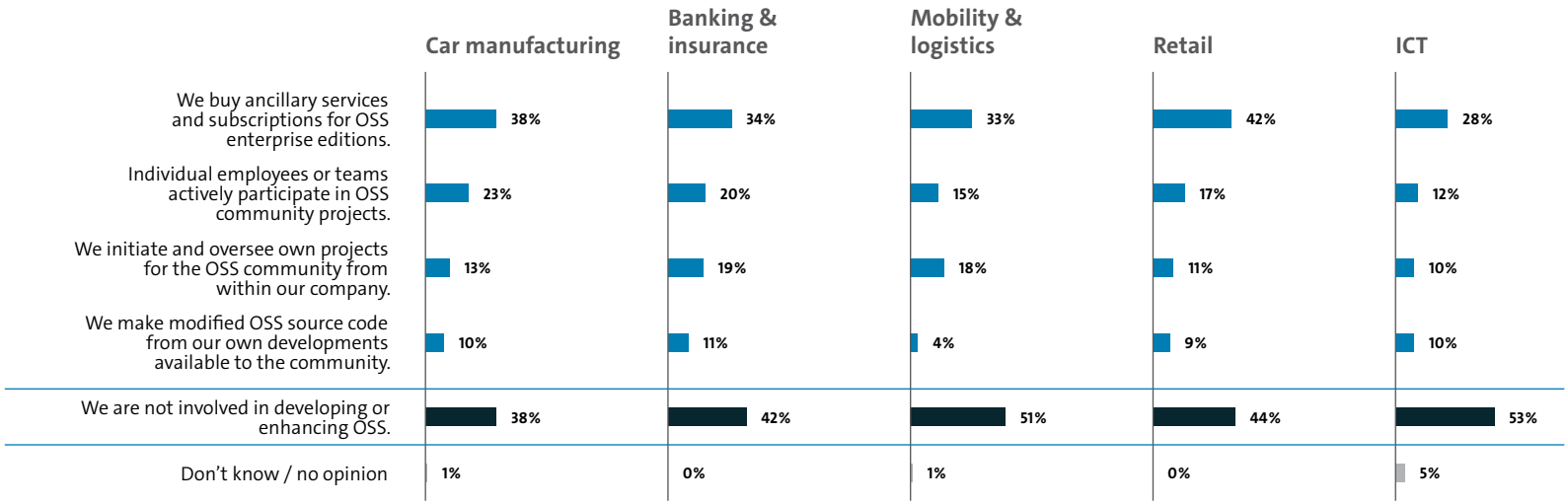


Figure 38 – Type of participation in open-source software by industry

In what way is your company involved in developing or enhancing OSS?

Base: All companies with more than 20 employees (2021: n=1,152) | Multiple responses possible | Source: Bitkom Research

The most widespread form of participation across all industries is to foster the continuing development of OSS as a sponsor by purchasing ancillary services and enterprise editions (see Figure 38). Four of ten retail companies support OSS in this way (42 percent), while only three out of ten ICT companies do so (28 percent). Participation of individual employees or teams in OSS communities is most common in the automotive industry (23 percent) and the financial sector (20 percent). Participation through initiating own OSS projects is found predominantly in companies of the financial sector (19 percent) as well as in mobility and logistics (18 percent). Across all industries, making available modified OSS source code is scarce (4 percent in mobility and logistics and up to 11 percent in banking and insurance).

Osborne Clarke

Case study

Dr. Hendrik Schöttle
Rechtsanwalt, partner, specialist lawyer for IT law

Legal open source compliance – transparent and scalable even when the legal situation is disputed or unclear

Initial scenario

Our client planned the global deployment of a comprehensive and very complex software. The software contained thousands of third-party components, largely OSS, but also commercial software using hundreds of different licenses.

This client wanted to know whether the software can be used legally compliant. This meant reviewing whether the third-party components could be offered as software-as-a-service (SaaS).

Our client was using tools to identify licenses and compile licensing information. However, these tools were not able to answer any legal questions.

Challenges

During our assessment, three challenges came up:

1. Many legal issues relating to (open-source) software licensing are uncertain or disputed and are poorly documented
2. The large number of licenses calls for a comprehensible presentation of the results
3. It was important to the client to be able to comprehend and assess the legal (un-)certainty of the results

Solution

These challenges were ultimately met using a legal-tech solution, developed by Osborne Clarke. Disputed legal issues were broken down into individual issues, which were assessed using scores and assessment logics. Wherever required, all the steps and results were comprehensively documented in writing.

Moreover, the results were automatedly mapped against individual usage scenarios to evaluate whether this specific third-party component use was compliant with the license.

Lastly, the client received a risk assessment with percentage values for legally disputed issues. The results were thus transparent and comprehensible for our client, who was able to adjust the logic to his own risk assessment.

Since the solution also takes commercial licenses into account, it was possible to evaluate all software components, instead of focusing solely on OSS.

Result

The solution we developed enabled our client to quickly legally assess a large number of licenses in a clear way and to match them against the intended use case in order to check their compatibility.

Osborne Clarke has long-standing experience in providing comprehensive legal and technical advice on open source and offers solutions in open-source software (OSS) compliance and contributions.

↗osborneclarke.com/oss

3 Open-source software in the public sector

A novelty of this study is that organisations of the public sector were also interviewed to facilitate gaining insights into the use of OSS in the public sector. Compared to private enterprises, the interest of public agencies in OSS is significantly lower (see Figure 39). Only one third is interested in using OSS and open-minded towards the subject (32 percent), while this is the case for two thirds of private businesses (67 percent). Most public sector organisations are undecided (43 percent) and almost every fourth organisation has a critical or opposing attitude (23 percent).

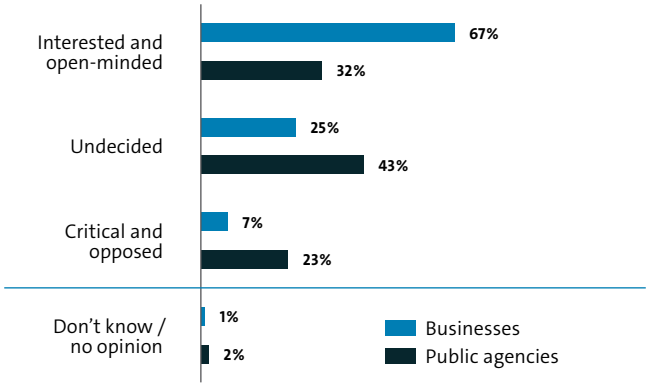


Figure 39 – Attitudes towards open-source software in the public sector

What is your organisation's / your company's general position on OSS?

Base, public sector: All public sector organisations with 20 or more employees (2021: n=100) | Base, businesses: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

At a strategic level, the public sector is on a similar level as private businesses, or even has a slight edge (see Figure 40). 30 percent have an OSS strategy in place, while only one fourth of companies do so (25 percent).

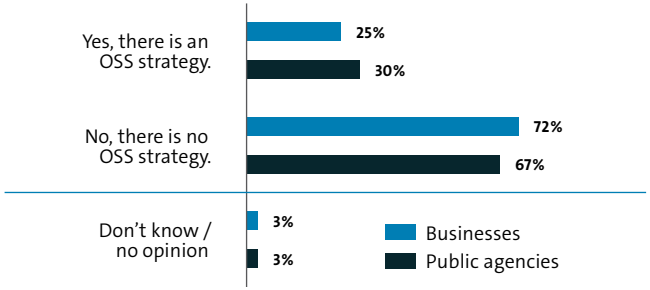


Figure 40 – Open-source software strategy in public agencies

Does your organisation / your company have a strategy for using and participating in OSS?

Base, public sector: All public administration organisations with 20 or more employees (2021: n=100) | Base, businesses: All companies with more 20 or more employees (2021: n=1,152) | Source: Bitkom Research

Despite their lower interest and higher scepticism, nearly two thirds of public sector organisations report using OSS (64 percent, see Figure 41), which is almost on par with private businesses (71 percent).

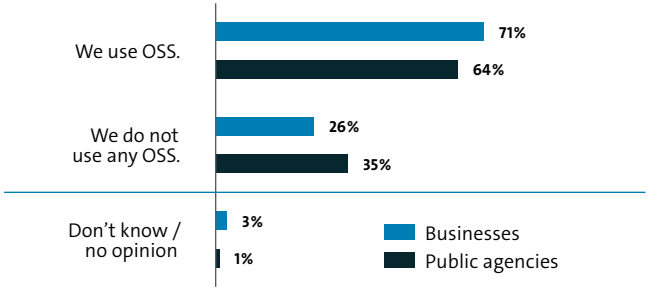


Figure 41 – Use of open-source software in public agencies

Which of the following statements apply to your organisation's / your company's use of OSS?

Base, public sector: All public administration organisations with 20 or more employees (2021: n=100) | Base, businesses: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

In most cases, OSS are used in public agencies with modifications to its source code (see Figure 42) – at nearly four in ten organisations for internal use (38 percent) and three in ten for developing own solutions (29 percent). OSS with modified source code is used significantly less in public agencies than in private enterprises. This is done in less than two out of ten public organisations (18 percent), while about four in ten companies reported making adjustments (38 percent). One fifth of public agencies use OSS with modified source code for developing own solutions (19 percent).

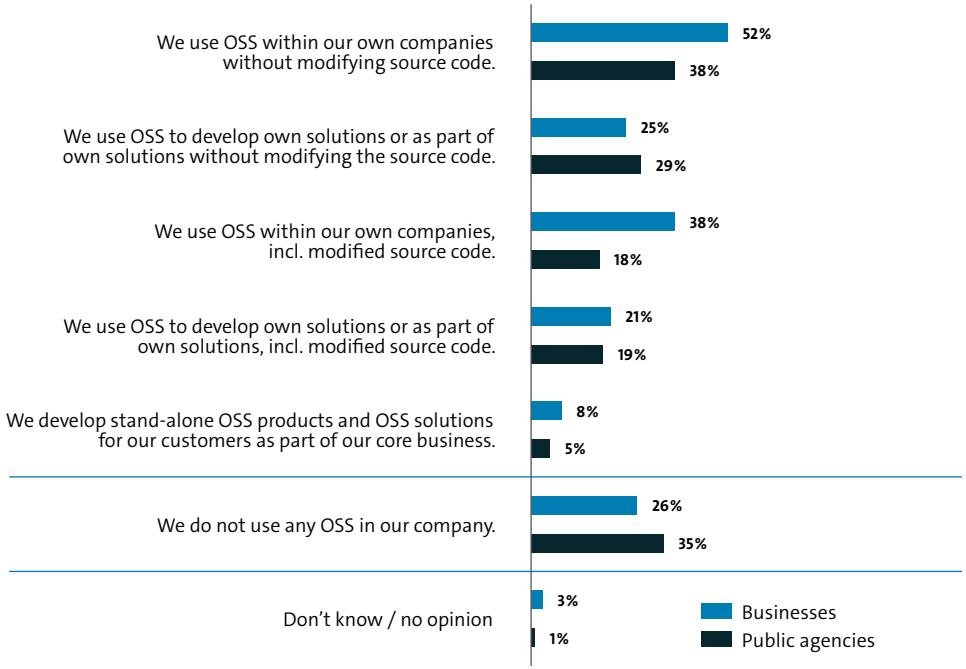


Figure 42 – Type of open-source software use in public agencies

Which of the following statements apply to your organisation's / your company's use of OSS?

Base, public sector: All public administration organisations with 20 or more employees (2021: n=100)
Base, businesses: All companies with more than 20 employees (2021: n=1,152) | Multiple responses possible | Source: Bitkom Research

Less than half of public sector organisations (46 percent) participate in developing or enhancing OSS (see Figure 43). Compared to private enterprises, participation is at a lower level. Among them, a small majority participates in OSS projects (55 percent).

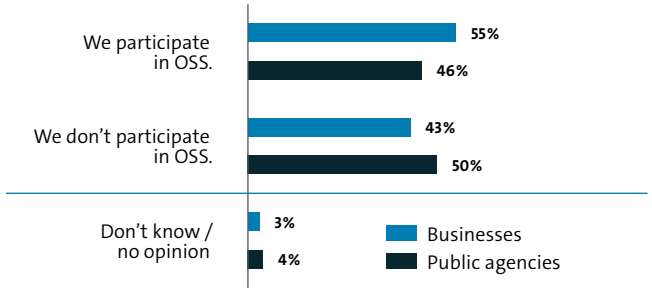


Figure 43 – Participation in open-source software by public agencies

Is your company involved in developing or enhancing OSS?

Base, public sector: All public administration organisations with 20 or more employees (2021: n=100) Base, businesses: All companies with more than 20 employees (2021: n=1,152) | Source: Bitkom Research

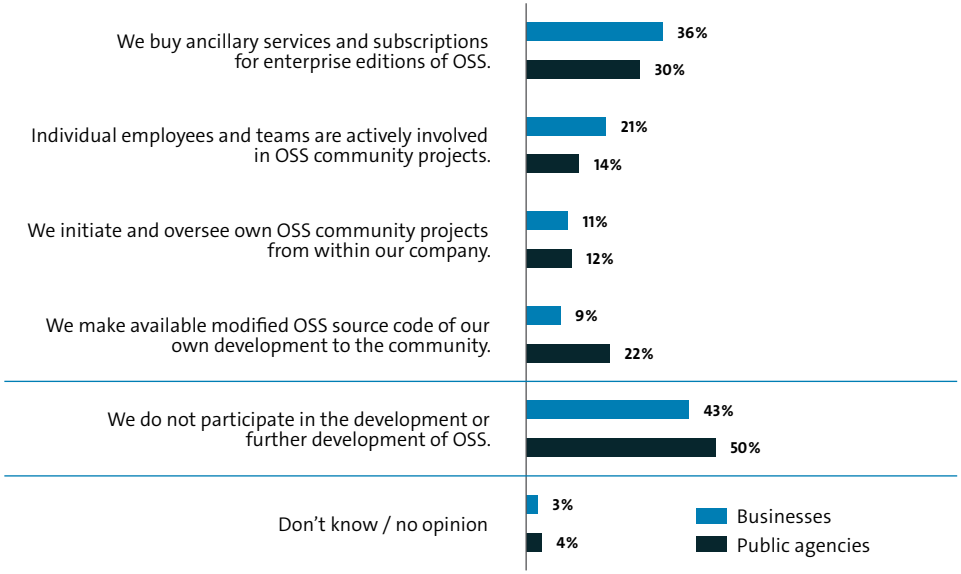


Figure 44 – Type of participation in open-source software by public agencies

In what way is your organisation / your company involved in developing or enhancing OSS?

Base, public sector: All public administration organisations with 20 or more employees (2021: n=100)
Base, businesses: All companies with more than 20 employees (2021: n=1,152) | Multiple responses possible | Source: Bitkom Research

Much like the surveyed businesses, the most common type of participation in the public sector is to purchase ancillary services for OSS (30 percent, see Figure 44). What is striking is that public agencies generally make fewer modifications for internally used OSS (see Figure 42), but more frequently make the modified source code available to the OSS community than private enterprises. Every fifth public agency shares modified source code (22 percent), while only nine percent of companies do so.

publicplan.

Case study

Dr. Christian Knebel
Founder, publicplan GmbH

An OSS-based application portal for all business-related services in North Rhine-Westphalia (NRW)

The publicplan GmbH supports public agencies in implementing ambitious e-government projects. To do so, we have specialised in open-source solutions.

In view of Bitkom's Open Source Monitor, which surveyed public service organisations in Germany for the first time in 2021, we realised that there is a lot of potential for open source in the public sector and all it took was a little courage to go the next step towards using free software.

One of our most far-reaching digital transformation projects of the past few years was the technical implementation of Wirtschafts-Service-Portal.NRW (WSP.NRW), the application portal for all business-related services in North Rhine-Westphalia. This project enabled publicplan to demonstrate how open-source software can successfully be used in public services.

The requirement

The NRW Business Portal Act has explicitly obligated the State of NRW to develop a portal for the electronic processing of business-related public services.

The problem

Wirtschafts-Service-Portal.NRW must facilitate the processing of business-related services in North Rhine-Westphalia independent of time and place. The aim was to facilitate registering a business, for example, from the couch.

The solution

The Wirtschafts-Service-Portal pools all the business-related services of the State of NRW, digitally and easy to find.

By using an open source approach, it is possible for other German states to reuse the portal.

The implementation

Implementation was done by using open-source components that publicplan was familiar with using and integrating, including Drupal, Botpress, Rocket.Chat, and Form.io. We foster those software projects through contributions and sponsorships and thus make a decisive contribution to open-source software.

4 The future of open source software

Compared to the 2019 Open Source Monitor, this year's survey report highlights that open source is a subject that has developed at a high level in the past few years. Having already gained great significance among many companies, open source has now reached other organisations that hadn't previously been active in the open source community. This development is expected to continue in the years to come. A push for digital sovereignty is an important reason for this.

Organisations are looking for possibilities and pathways to modernisation – without having to commit to a single provider or specific solution, instead remaining self-determined in matters of technology. Open source can be an important contribution to this. As a result, companies and organisations from different areas not only use existing open-source solutions but are also becoming active contributors to the open source ecosystem. This is not only true for technology and IT companies but increasingly for companies and business models that are not native to the tech sector. Open source is seen as a source of innovation and can help pushing the digital transformation of business, administration, and the society at large forward as well as to expand, optimise, and change existing solutions.

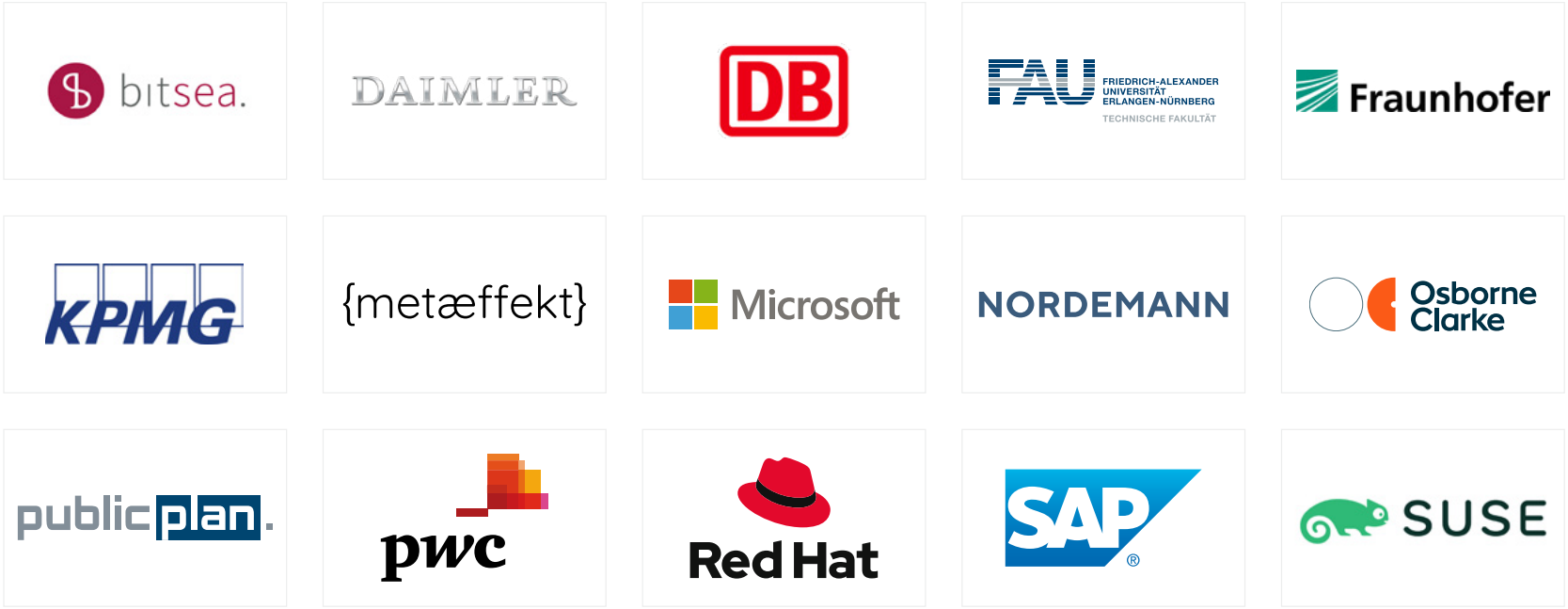
Unfortunately, this development is joined by a negative trend that has been apparent for several years: a lack of skilled professionals in the fields of software development, digital transformation, and technology. Whether it was cloud computing and big data a few years ago, artificial intelligence and blockchain at present, or the future of quantum computing and bio-inspired computing: Innovation in these areas and their diffusion into companies and organisations cannot succeed without the know-how of professionals. However, open source as a means of collaboration will be able to help overcome bottlenecks, make better use of knowledge, and open up new topics, especially for small and mediums-sized companies.

Anyone still in doubt over the opportunities of open source was able to see a range of positive examples during the coronavirus pandemic. The deployment of the Corona Warning App, for example, has demonstrated the potential of open source. Not only was this app developed and deployed in only 50 days, but it was also deliberately realised as an open source project based on a large community. From the onset, the functions and architecture of this app were made transparent, creating opportunities for participation, and thus building trust.

Presently and in the future, we will be faced with more challenges: climate change, health, mobility, energy, and security, to name just a few. We should make active use of the opportunities and potential of open source in general, and open-source software, in particular, to meet these challenges. And we should be mindful of its essence: Working together, jointly developing strategies and solutions, but also learning from each other and learning more about each other while overcoming horizontal and vertical boundaries.

Dr. Frank Termer, Head of Software, Bitkom e.V.

With the kind of support of



Bitkom represents more than 2,700 companies from the digital economy, including a good 2,000 direct members. They achieve annual sales of 190 billion euros, including exports of 50 billion euros, with their IT and telecommunications services alone. The members of Bitkom employ more than two million people in Germany. Our membership spans more than 1,000 SMEs, over 500 start-ups, and virtually all global players. Our members offer software, telecommunications, and internet services, produce hardware and consumer electronics, operate in the digital media sector or are in other ways affiliated with the digital economy. 80 percent of the companies are headquartered in Germany, while eight percent come from the rest of Europe or the US, respectively. 4 percent come from other regions. Bitkom fosters and drives the digital transformation of the German economy forward and is committed to broad social participation in digital developments. It is our mission to make Germany a globally leading location for digital business.

Bundesverband Informationswirtschaft,
Telekommunikation und neue Medien e.V.

Albrechtstraße 10
10117 Berlin
T 030 27576-0
F 030 27576-400
bitkom@bitkom.org
www.bitkom.org

bitkom