
State of Open: The UK in 2021

Phase One

March 2021



Introduction

Purpose of the Report

This Report will be published in 2021 in three phases and will seek to demonstrate:

- *the exceptional leadership and centre of open source excellence in the UK;*
- *the uptake of open source software in UK business and industry; and*
- *the value of open source software to the UK economy.*

Open source software has been described as the “engine powering the digital economy”, referenced as being in up to “90% of codebases” and forming the vast majority of the code sitting under the public cloud. This inevitably contributes billions of pounds to the UK economy. In many cases the role played by open source software is not understood by its users, sometimes even its presence and generally its pervasive scale is missed. OpenUK believes that open source software is the submarine under the digital sea and will use this Report to share that information, allowing business, industry and the public sector to better understand, plan and take account of it. All calculations have been made as hypotheses based on, and with respect to, published report calculations and publicly available data.

We will demonstrate its role in the UK in three

report phases:

Phase One: Literature Review and Interviews with industry leaders

- Establishing where open source sits within the UK as documented and using existing information.

Phase Two: Quantitative Survey

demonstrating uptake across business

- Quantitative survey of business to understand the place of open source software in UK business and industry in 2021.

Phase Three: Economic Analysis of Value generated by open source software

- Consider the value of open source to the UK digital economy.

This report has been created by Smoothmedia on behalf of OpenUK.

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Phase One of this Report has been sponsored by GitHub, SUSE and Open Invention Network.

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1.1 Introduction

from RedMonk

Open Technology, Open Innovation, 2021 and Beyond



2020 was a watershed for open innovation. The power of open data and open business practices in 2021 was perfectly illustrated by the rapid rollout of vaccines for Covid-19. Look at the success of the Oxford vaccine, commercialised by AstraZeneca, but also manufactured by Serum Institute of India and contract manufacturers across Europe. We've seen an entirely new industry model created overnight, based on the sharing of intellectual property, that will benefit billions of people around the world. Sharing IP allowed the world to respond to a crisis incredibly rapidly, and the UK was a world leader.

Business velocity, the ability to respond to change effectively and quickly create compelling new digital services for customers, is today enabled by making software developers more productive. Speed is everything in the world of digital services.

It's no exaggeration to say that the modern economy runs on open technology. Without open source software, which powers the cloud, there would be no Google, no Facebook, no YouTube, no Deliveroo, no Uber. Enterprises today increasingly mandate the use of open source technology in new projects. The packaged applications they buy run on Linux, the open source operating system. Apple makes extensive use of open source in its operations, as does Amazon. Open source is the most significant in enterprise software today, powering the cloud and literally scores of unicorns, companies valued at more than \$1bn.

Challenger banks such as Monzo and Starling are built on open source. British media companies including News UK, The Guardian and the Financial Times all run on open source software. Asos and Autotrader are powered by open source. Ocado builds robots to power its warehouses with open source software.

One major change over the last 10 years is that enterprises now

don't simply use open source technology, they actively contribute to it. Many enterprises today have a GitHub repo, to share the code that they use and build collaboratively with third parties. Openness powers collaboration and software sustainability.

Digital Transformation is driven by open source technology, culture and processes. Businesses are reshoring, investing in their own software development capabilities, striving to hire the best people, and competing in this global market for talent on the basis of being part of the modern, open, software economy.

Another area where open is paying dividends is open data. The UK has notable strengths in artificial intelligence and machine learning, which has seen substantial direct investments in the UK by the likes of Amazon, Apple, and Google. Deep Mind for example partnered with Moorfields Eye Hospital, using its data to develop faster ways of identifying common eye diseases from routine scans. Open data sets and commercial models to take advantage of them are going to be a major frontier of healthcare innovation in the 21st century.

Open government, linked to open data, leveraged by local software developers and grassroots organisations, offers the opportunity to dramatically improve governmental effectiveness.

The rise of open source software, open data and open APIs and associated working practices are the world's major engine of economic growth right now. For the UK to succeed at scale with new digitally-driven businesses and organisations, it will need to foster and encourage open innovation. That's why it's so good to see OpenUK taking on the mantle of campaigning organisation in this space.

James Governor, co-founder of RedMonk

1.2 Introduction from OpenUK



Linux on Mars, is, thus far, the highlight for open source software in 2021. It will take a lot to beat that. Whilst the Perseverance Rover may not have come from the UK, the open source community thrives on being a global community, collaborating, innovating and celebrating our achievements together. Thanks to our friends at NASA for allowing us to use the imagery from the Rover landing in this report, reminding us of the power of open source software, across not just the world, but the galaxy.

The UK may not be home to NASA, but it is a geographical centre of excellence for open source software. In fact, not just for software but for Open Technology, with a thriving open data community led by the likes of the Open Data Institute and Icebreaker One and is world leading in open hardware, as the home of micro:bit, LowRisc and RepRap.

In the UK, as with the world at large, the pandemic has accelerated the pace of digital transformation and whilst 30% of the UK economy was estimated to be digital in 2018, even more will be today. Open source software is the engine that powers the digital economy, resiliently, sustainably and without fuss.

Its transparency engenders trust. Our experience of the pandemic brought that to the fore in the role out of the test and trace apps which are almost without exception open source. We are likely to see a continuation of that utilisation as further digital tools supporting the pandemic response are built globally and collaboratively on the most innovative open source software.

Geopolitical shift is apparent globally, but nowhere has it been more definite than the UK with its Brexit from Europe. The infrastructure underlying the trend to Digital and Data Sovereignty, is based on sustainable open source software. Software that originates in diverse and global collaboration is now impacting locally whilst focusing globally.

As Carlo Daffarahas told this Report, "companies using open source in a significant way tend to be twice or more as efficient as companies that don't." In Phase One of this Report, we deep dive into the existing literature, setting the scene and the work we plan to do in Phase Two, a business and industry survey on UK adoption and utilisation of open source and Phase Three which is a deep dive into economics and value generated to the UK economy by open source software. In all of this, our approach is collaborative and we will work with other global organisations undertaking similar projects to ensure as far as possible that we are aligned.

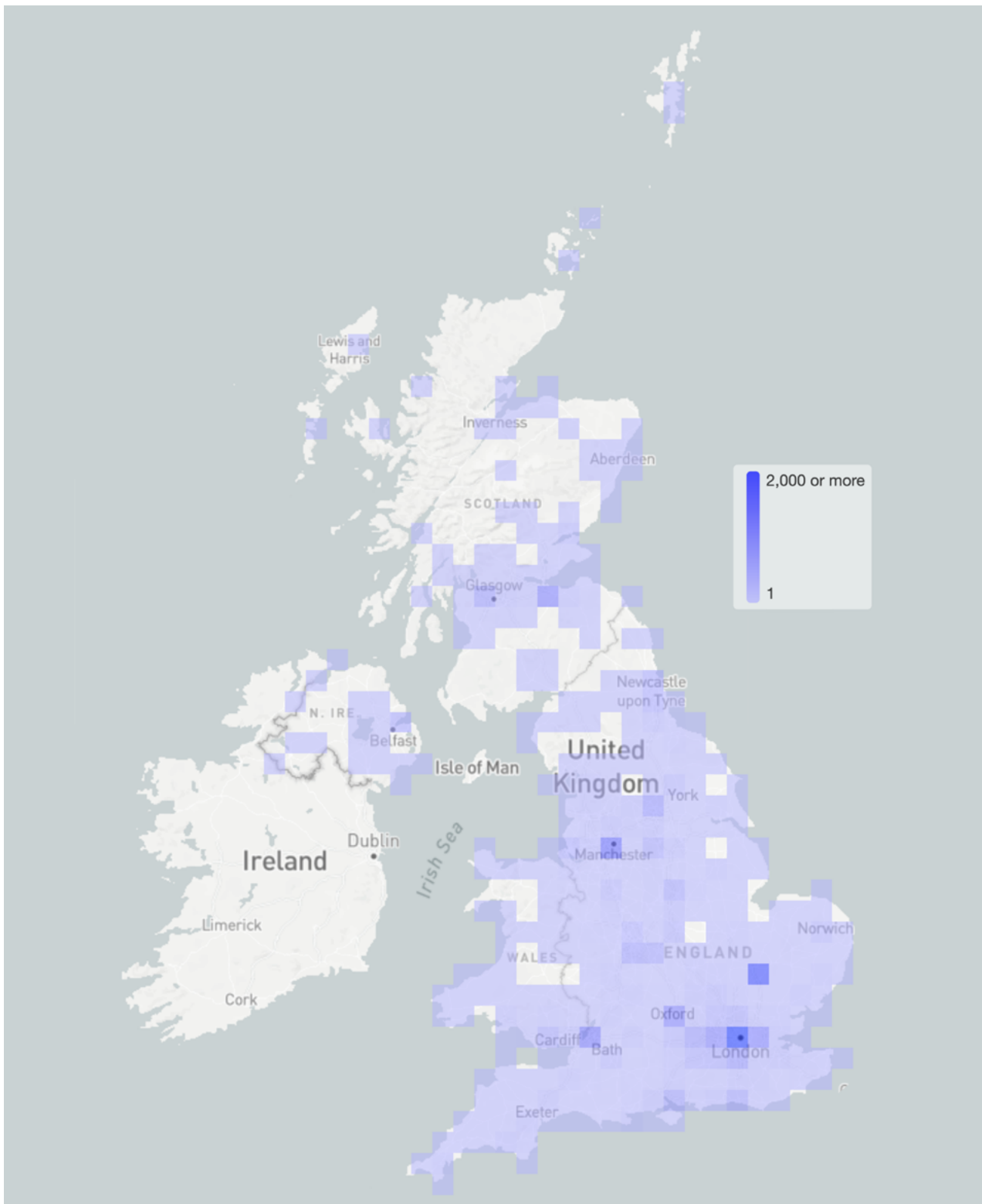
The UK is one of the world's largest contributors to open source software and a centre of excellence in this arena, and with that in mind we are working to develop UK leadership in open technology.

All companies have become digital companies. All companies are coming to terms with being software companies. They are also open source companies. They just don't know it yet. When they realise, OpenUK will be here to support their journey.

Amanda Brock, CEO, OpenUK

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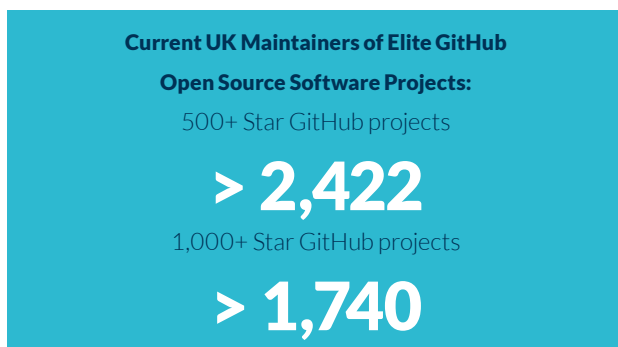
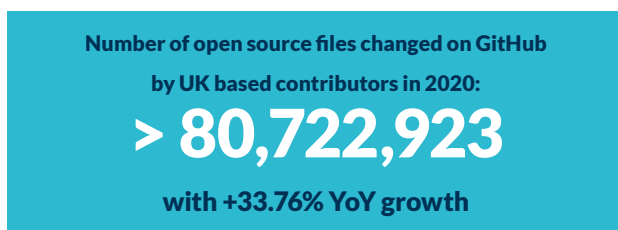
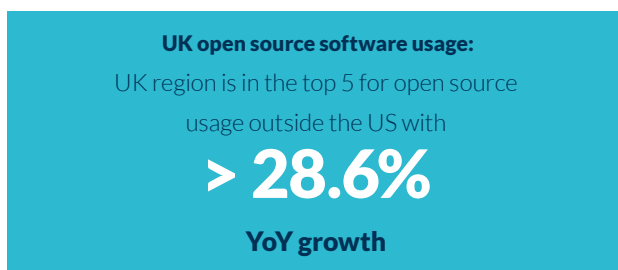
The UK and Open Source as seen by GitHub



Tidelift's 2020 The Managed Open Source Survey suggests that, in assessing what programming languages technologists rely on most, the top three languages are JavaScript (78%), Python (52%), and Java (41%). In fact, the top five languages reported by respondents exactly match the most recent RedMonk language ranking from June 2020, with PHP and C# (.NET) ranking fourth and fifth.

The ranking of programming languages above is reflected in the overall digital economy and has started to impact the open source world, as James McLeod, FINOS Director of Community, explains "JavaScript and Python exist as a result of open source collaboration and encourage diversity of thinking from across the scientific community. Although banking engineers might tailor future banking systems around the microservices and data analytics advantages of technologies like JavaScript and Python, open source opportunities for traditional banking systems and software engineering do exist through communities like the Open Mainframe Project and Eclipse Foundation."

As a sponsor of this report, GitHub has shared the following 2020 data with us:



This is reflective of the UK's status in open source contribution, its large developer population and former position as the EU's largest contributor.

"There's definitely been a big increase in open source software uptake. Github have recently described a 40% year on year growth in new open source project creation over the last year, which is a strong indicator of that."

Rob Knight, Chief Technology Officer, Enterprise Cloud Products at SUSE

"In 2005...the UK was quite behind in its usage of open source solutions. So back then most of the companies that I was trying to work with were mainly in France, Germany, Scandinavia, to some extent, and the UK was a long way behind, then something changed, I'd say between 2010 and 2015. Things turned around very quickly and I'd say the UK became almost a world leader in open source software deployment and adoption. Perhaps driven by the UK's particular advantages as a place for tech start-ups, we're now one of the stronger countries for adoption and usage of open source software solutions."

Matt Barker, President & Co-Founder, Jetstack LTD

3.0

Literature Review - The economics of open source software

3.1 Measurement and Value

There is a large body of literature on the supply side of open source software - how it is created - but there is almost no literature so far on the demand side of open source. The true extent of use and the productivity benefits to using open source remain unanswered questions. This is surprising, given that it is an essential element of the internet and the public cloud, and as a result undoubtedly quite a valuable input.

As with any other digital goods, the value created by open source software is difficult to measure for two key reasons.

First, the typical ways to measure productivity do not properly capture the value because digital goods are often free to use.

Second, because such digital goods are often distributed under licensing that allows for unlimited copying, it is impossible to know and track how extensive the use is.

Despite the increasing importance of open source software, these issues with measurement have prevented researchers from analysing how its impact varies across different businesses and industries.

This is not the case when it comes to procurement or sponsoring of open source software by governments. Governments are increasingly under pressure to decrease costs and stimulate technology-related activity in their country. According to Frank Nagle, governments are amongst the largest purchasers

of IT goods and services and it has been argued that government use of open source software could lead to large cost savings. At the same time, governments are also interested in seeding technology industries to strengthen the competitiveness and attractiveness of their countries for business investment. Earlier research has shown that one way to do this that has large returns on investment is for governments to fund open source software R&D to help jumpstart their software industries.

"Open source software tends to be a good place to do a lot of cutting edge work. We've found the UK government to be highly supportive of innovative, high-tech startups and scaleups, including schemes for investment and R&D. That's really helped grow the startup scene."

Matt Barker, President & Co-Founder, Jetstack LTD

This is of particular interest for the future of the UK economy, especially as with its departure from the European Union it will seek to maintain its advantage in technological innovation and spill-overs as a technological hub.

To be able to plan an investment strategy and understand the impact of open source software on the UK economy we first need to understand its value.

3.2 Study on France

To understand the relationship between procurement strategies and their impact on the open source ecosystem, we draw on the research conducted by Frank Nagle (2019) *Government Technology Policy, Social Value and National Competitiveness*, focusing on the open source software industry in France.

The study estimated the impact of the French Regulation Circulaire 5608, the French Regulation on contributions to and the usage of open source software, founding of IT start-ups, IT labour, and software patents. The study indicates that, after the law went into effect, there was a significant increase in not only the number of contributions to open source software, but also the number of people contributing to it.

The passage of the law led to an increase of between 50,000 and 57,000 open source contributions per month and between 67 and 245 new contributors to open source software per month.

As a result of the regulation, we see employment within France's IT sector increase between 6.6% and 14% per year. IT labour increases have been shown to have positive effects on firm-level productivity. In addition, the new regulation led to a decrease in software related patents by between 5% and 16% per year likely due to the embrace of open source principles. Although this may at first appear to be a negative outcome, many have argued that software patents diminish innovation and growth in the field.

In aggregate, these results offer governments a significant and cost-effective policy lever that can be used to increase the open source contributions made by their country, creating global social value. The study also shows this increase in contributions led to increased national productivity and competitiveness by increasing the number of firms using open source software.

3.3 UK's World Leading Public Sector Participation

"The shining example that comes to mind is the Government Digital Service, which powers the majority of gov.uk websites. And that's using completely open-source technology underneath. And while we've seen open source adoption grow significantly in recent years, I do think it's fair to say that it's not as embedded across the whole digital sector."

Rob Knight, Chief Technology Officer, Enterprise Cloud Products at SUSE

"There were a number of people who drove adoption of open source software in the UK Government, including Government Digital Services, the team building gov.co.uk. I'd say the...UK was a stepping stone..for the US software companies building the sales base into Europe. There's a lot of investment in US companies coming to the UK, almost a stepping stone to the EU. So that really helped grow London as a tech hub... I don't tend to hear as much or see as much from the government as I used to about open source and that needs to change"

Matt Barker, President and Founder, Jetstack

"I think people realise now that proprietary systems are also not totally secure. I think from the public sector point of view, particularly, we need to be doing so much more online and as efficiently as we possibly can, in order for society to cope with the reality of what's happening in the world. I think using open source solutions would provide a really sensible way of doing that, actually - the approach of using platforms that services can be built on top of - to get the best for citizens and enable things to be done online in the most effective way."

Carolyn Jameson, Chief Trust Officer, Trustpilot

"Back around 2009-10, I wrote something called the "Better for less" paper with Liam Maxwell, Mark Thompson and others, for Francis Maude, the Cabinet Minister. That helped create something called "Spend Control in UK Government" and also supported the formation of GDS. Open source software and open standards were a big part of that. When you're talking about government systems, what often is the case is that you'll get vendors doing proprietary systems and custom building the same thing over and over in multiple different places. This is an issue of the fact that we don't have good communication, don't have good awareness."

Things like spend control were actually formed to challenge what we're doing with projects, why are we doing it, have we considered other alternatives? Once you start doing that, you can start seeing we should open source to encourage other people to come and support that idea of using open source within government. Personally I think it is extremely positive."

Spend control has been somewhat diminished over time. We've done some, there's been some good things in terms of G cloud where there's some questions going on in that space at the moment as well. Is there still a preference towards open source? It's still a policy. Should we do more? Yes,"

Simon Wardley, Expert and Researcher

Drupal Public Sector example

Drupal launched a project that aimed to increase collaboration between four councils within the UK. They asked the simple questions – how can we help councils co-develop, share and maintain open source Drupal code for their citizen-facing websites?

Councils were working separately to create their websites and were allocating a large sum of time reinventing the wheel. Most of the councils want to provide similar information to their citizens, for example when is their next rubbish collection or how do I pay council tax? The four councils were working on creating this independently and efficiencies could be gained by exchange.

It made more sense for them to work together and share code. Enter Drupal, an open source project, creating a framework for councils to develop websites together, covering areas like web services and development to name a few. The initial team conducted primary research with councils, desk research and technical audits to understand council needs, work out how they collaborate and prove what's technically possible.

Two key themes emerged. The first is that councils feel significant pressure to improve the services they provide to the public through their website. Second, they want to stop reinventing the wheel and to break out of the cycle of procuring a new website every few years. Some of the findings were that open source technologies can be an acceptable choice for councils, with around 30% using an open source platform. Drupal seemed to be an exemplar open source technology and community as it supports a low code and a configurable approach that many councils can take.

The process needed to be as straightforward and lightweight as possible. They produced a very lightweight means of collaboration using a document called the **memorandum of understanding**. A four page, short document, written in very simple language. The most important thing that it says on it is this is not legally binding - providing comfort but not engaging legal departments. They started looking at some sort of particular issues around websites and started developing some code that had already been developed.

"In less than a year they've got to the stage where they've developed code that is actually running, which is remarkably rapid - it's out there being used by the public very successfully. It's been very successful as a sort of pilot project. It's been regarded as being something that's been very well run and really shows the way that open-source collaboration can happen in the public sector and deliver both increased quality of service provision, but also reduce costs fairly significantly."

Andrew Katz, joint Managing Partner at Moorcrofts

3.4 How big is the Open source contribution in the UK?

Arriving at a comfortable number of that valuation depends on both the equation used and how we assess and measure the various aspects of open source. Here we make a conservative estimate to begin the conversation, and we recognise that these calculations are early attempts that rely on existing calculations from presented and published reports. These calculations draw on the recent work completed by the Open Forum Europe and Fraunhofer, The European Commission Open Source Impact Study, presented on 5 February 2021, report forthcoming. Further investigations into not only how to value open source but also what that value truly is for the UK will be part of the next phases of this Report. Here we make a start by measuring the size of the open source software contributor community in the UK in a number of ways based on the most recent data available and, following that an early estimate of the contribution to the UK economy.

A blog by Ben Frederikson states that in 2018 there were 109,460 GitHub accounts in the UK. According to this author's data, and past EU discussions, the UK has more developers than any of the EU countries with Germany and France. Assuming that all of these are developers and active, then below is a conservative estimate of the number of contributors in the UK in 2019.

Using the above 2018 of 109,460 developers in the UK, and assuming that their number increased by 15% from 2018 to 2019, based on similar growth rates in the UK, then in 2019 there were 126,000 developers in the UK. The author's numbers indicate that there are about 490,000 GitHub accounts in Europe, not 260,000 as is stated as a conservative estimate in the above European Report and there is an assumption that this vastly reduced 'conservative figure' is a consequence of the UK's exit from the EU.

Drawing on the calculations of the European Commission report above, if 260,000 contributors could lead to economic impact of open source software between £60.9 billion (€65 billion or \$77.8 billion) and £84.15 billion (€95 billion or \$113.7 billion) in Europe, then 126,000 contributors in the UK in 2019 can lead to impact between £29.52 and £43.15 billion, on the condition that individual contribution did not change from year to year.

3.5 Alternative Calculations of Contributors and the value of open source

3.5.1 Using one alternative approach to this number, we arrive at 53,820 contributors to open source in the UK.

It's worth working through the value if indeed this is the number although most accounts point to this being extremely low. According to Statista (2021) In the UK there were approximately 387,000 employed and self-employed programmers and software development professionals. In addition to this, there are always supporting roles when it comes to professional IT occupations. In this case, there are almost 198,000 support roles in the software and services sector, making the total number of employees in the UK software industry 585,000 in 2019.

The data above on the number of developers in the UK shows an increase by 73% in 2019, and an impressive 15% from 2018 to 2019. If we were to assume a similar increase for the software supporting roles in the UK from 2018 to 2019, then, the total according to a soon to be published report, states a conservative estimate in 2018, of at least 260,000 contributors in the EU (post Brexit), representing 8% of employees in the computer programming sector.

If this average is assumed to be the same for the UK, acknowledging the diversity of the EU stance on open source software and the fact that the UK was, pre-Brexit the largest of the EU ecosystems of open source software developers, then in 2018, there were 559,000 employees in the UK, of whom, 44,720 were open source contributors.

In 2019, if we assume that the proportion of contributors in the total number of employees increased along with the needs of accelerated digitalisation by 15% (the same rate as the growth from 2018 to 2019), then this proportion increases to 9.2%. As a result, under this assumption the population of open source contributors in the UK for 2019 would be 53,820.

These are, we believe, extremely conservative estimates for the UK, based on an average across the 26 EU Member States, the biggest of which contributes less than the UK.

According to the EU report, in 2018, the economic impact of open source software stood between £60.9 billion (€65 billion) and £89.05 (€95 billion) in Europe. The UK accounted for approximately 17.9% of the EU GDP (in current US\$) in 2018 (World Bank databank, 2021). On the assumption that the economic impact of open source software is of similar proportion (17.9%), **then for the UK it was between £10.9 billion and £15.9 billion** (€12.3 billion and €17.95 billion) **for 2018.**

In 2019 the UK GDP declined by 0.1% according to preliminary data (World Bank, 2021), but the communications and technology sector grew by 5.2% in 2019 according to the latest available data from the Office of National Statistics (2020). Software is a subsector of the communications and technology sector. If we suppose that the software and consequently the impact of open source software grew by the same rate, **then in 2019 it is likely to be between £11.47 billion and £16.74 billion** (€12.95 billion and €18.9 billion).

3.5.2 In the alternative, if 260,000 contributors calculated by the European Commission can lead to economic impact of open source software between £60.9 billion (€65 billion) and £89.05 billion (€95 billion) in Europe, then 53,820 contributors **in the UK in 2019 can lead to impact between £10.5 billion and £18.44 billion**, on the condition that individual contribution did not change from year to year. This does not take into account the increased uptake and usage of open source particularly in the cloud platforms and business, and the likely increases associated with that.

"What open source really does is motivate people - it allows them to try something out, and it has helped people to develop technical skill-sets. Using open source can reduce attrition and improve the recruitment of highly skilled, innovative engineers."

Carolyn Jameson, Chief Trust Officer, Trust Pilot

"At SUSE we hire some of the best open source talent in the world, so we know firsthand that these skills can be hard to come by. I think in the UK in particular we have a very innovative society and we have a very high demand for open source talent. And we do see that reflected in open source technologies being on pretty much every employers tick list when they're recruiting new talent. I think another interesting trend is that the global pandemic has also opened up a whole new set of talent because in 2020, companies were no longer forced to hire based on geography, and that means we can embrace developers around the world wherever they are, but have them contributing to UK companies and UK open source projects, which I think is good for the overall UK open source movement."

Rob Knight, Chief Technology Officer, Enterprise Cloud Products at SUSE

3.6 Linux Foundation FOSS Contributor survey 2020

The Linux Foundation FOSS Contributor survey 2020 identifies key issues in improving the security and sustainability of FOSS as the world depends on its critical infrastructure. The report found four key outputs: 1. The top three motivations for contributors are non-monetary, 2. More focus on security is necessary, 3. Stakeholders need to balance corporate and project interests, 4. There is a need to enhance corporate support for employees' contribution to FOSS. Below we detail the results of the survey for the UK. While the total number of respondents from the UK was relatively small (Out of the total n=1196, the UK makes up 5% of the responses), there is value in reviewing the findings to indicate trends and challenges for the UK's open source ecosystem. Respondents from the United States made up 28% of the respondents, Germany 12%, France 7%, United Kingdom 5% and other countries the balance.

Beyond whether or not the respondents were employed, the survey also aimed to understand whether they were directly compensated for their FOSS efforts. Over half (51.65%) of respondents reported that they receive payment for their FOSS contribution from either their employer or a third party. That figure dropped to 42.9% in the UK, but the response pool was small.

Most of the UK respondents have many years of experience, with approximately 76% of them having more than 10 years of experience in developing software. They also remain very committed to FOSS projects, with 93% of them responding that they have contributed to a project over the last 3 years. In most projects where UK respondents participated, they did so in key roles (maintainers or core participants). There is limited use of security processes in FOSS among the UK contributors, something that is echoed in the larger study and an area that needs attention.

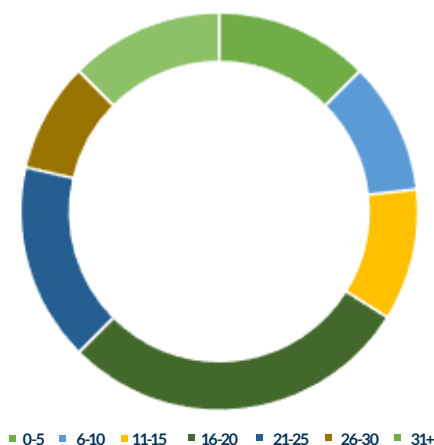


Figure Q 4. How many years have you been developing software? N= 56

Based on these findings, the largest group in terms of experience is people who have been developing software between 16 and 20 years (28.6%), followed by people who have been developing software between 21 and 25 years (16.1%). 25 years (16.1%). This indicates a heavy concentration of very experienced contributors in our sample, which may not be representative of the reality in the UK. The third largest group, with 12.5%, is people who have only been developing software for less than 5 years. This group may represent the high concentration of professionals in software-related roles in the UK, as it has been offering so far incentives for the creation of technology/ innovation hubs. The same percentage of responses (12.5%) is also given by those who have been developing software for more than 31 years.

Number of years of experience in developing software is not one of the traditional ways of measuring developer productivity. Common metrics include a single artifact or deliverable over a time interval, for instance, the number of lines of source code (SLOC) written in a time interval, the number of function points per month, the number of tasks completed per month, or the resolution time for modification requests (for a review see Meyer et al. 2017). However, we cannot discount that there is a positive correlation between years of experience and productivity, and assume that the first two groups (in terms of responses) are likely to be highly productive professionals.

The overwhelming majority (93%) of respondents have contributed to open source projects over the last 36 months, which shows an impressive commitment to taking forward open source projects. Only 7% of respondents have not contributed over the past 3 years, with approximately 5% claiming that it is a temporary pause.

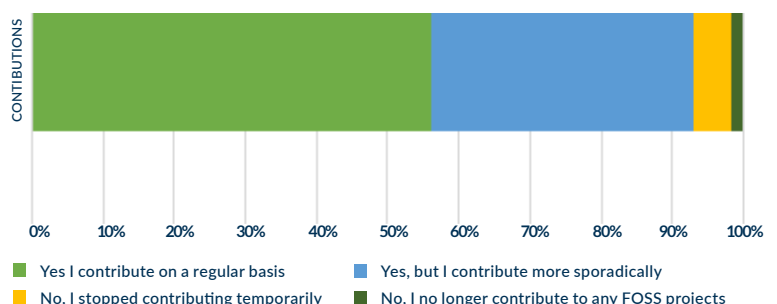


Figure Q 8. Are you currently contributing to any FOSS projects actively (e.g. at least one commit over the last 36 months)? n= 57

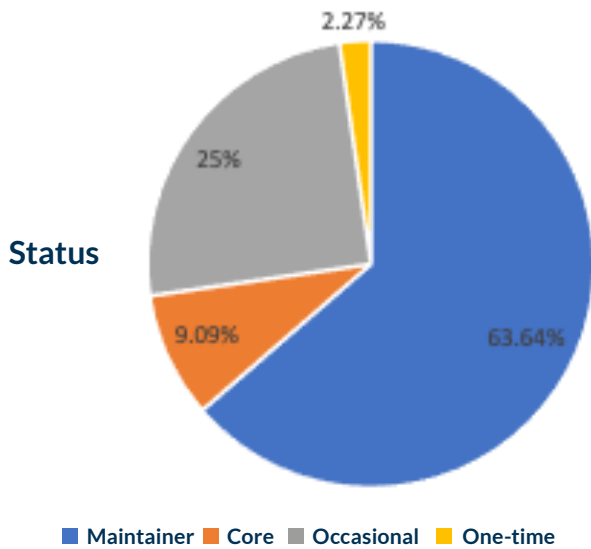


Figure: Q 15. Do you regard yourself as a maintainer, core, occasional, or one-time participant on the following project(s)? n= 44 , about 146 projects, percentages

“When implementing an open source solution, we give primary importance to maintaining and supporting the codebase. If we don’t we could for example, end up with a critical security issue. As open source software evolves so quickly, it’s really important to focus heavily on the operation and maintenance of the open source software once it’s in place. We need to continue to refine effective business models around open-source so that companies can service the software properly”

Matt Barker, President & Co-Founder, Jetstack Ltd

Almost two-thirds (64%) of UK respondents are maintainers, which is an essential role in the development of a project, indicating their deep engagement with FOSS.

Calculated by project rather than percentage, respondents were maintainers in 93 projects, core contributors to 13 projects, occasional in 37 projects and one-time contributors in 3 projects.

There are a number of security processes necessary to ensure the robustness of projects. Most of the projects of the UK respondents do not meet these criteria, with the exception of the support for SSL/TLS on website, downloads and infrastructure at 76% [29 projects] (this feature sits in the intersection of security and functionality/efficiency of a website). About 11% of projects [4 projects] have a

security policy in place, 24% [9 projects] a vulnerability disclosure policy, and 27% [10 projects] have a maintainer/ core participant with focus on security. In terms of specific tools, in almost 1/3 of projects there is use of a static analysis tool (32%, or 12 projects) or software component/ dependency analysis tool (32%, or 12 projects), and in 18% [7] of projects there is use of a dynamic analysis tool. Finally, in about a quarter of projects (24%, or 9 projects) there is a threat model for the project, while no project undertaken by respondents in a key role had a CII Best Practices Badge. These findings, although they relate to only a tiny fraction of FOSS projects undertaken in the UK, indicate that security should be strengthened, from the early stages of development of a project by having these processes in place to deal with any issues that may emerge in advance, not retrospectively, as much as possible.

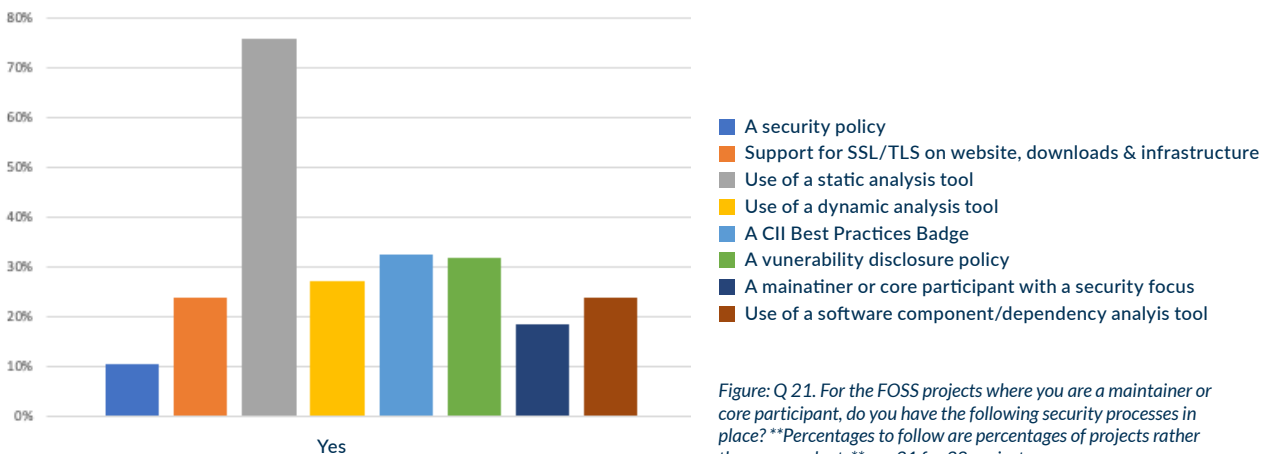


Figure: Q 21. For the FOSS projects where you are a maintainer or core participant, do you have the following security processes in place? **Percentages to follow are percentages of projects rather than respondents** n= 21 for 38 projects

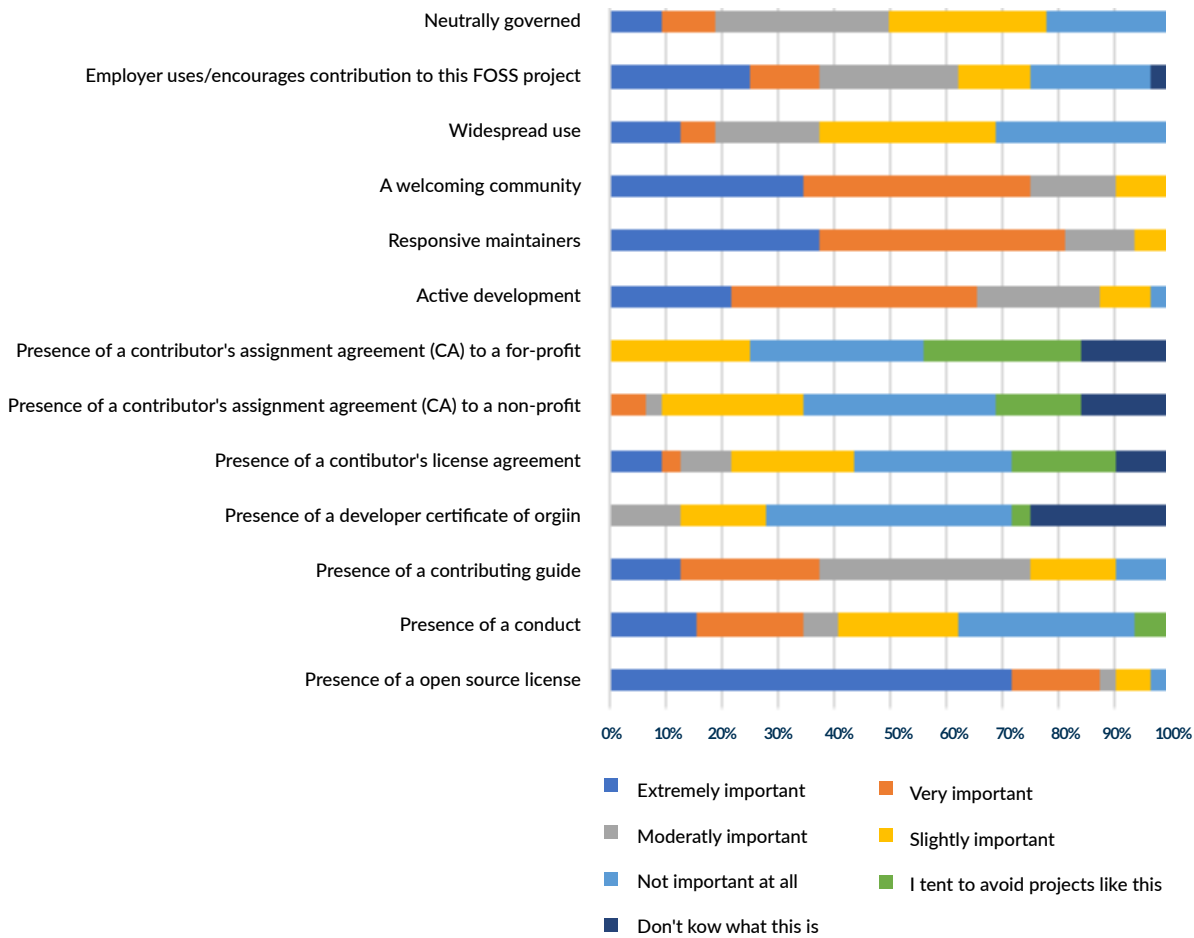


Figure: Q 33. When thinking about whether to contribute to a FOSS project, how important are the following things? N = 32

What stands out from the responses here is the presence of an open source licence is deemed to be extremely important by 72% of respondents. For the rest of the responses there is no clear emerging pattern, with the exception of those features that contribute to the sense of a community that is united by its own goals. The majority of respondents found it very important (the sum of 'extremely' and 'very') in active development (66%), responsiveness by maintainers (86%) and a welcoming community (75%). The presence of a developer certificate of origin was the least important finding (44% of respondents said it is not important at all).

As in the larger findings, primary motivations for contributing to open source projects are not income related with the top three answers being I enjoy learning (58%), since I use FOSS I feel I should contribute back (45%) and contributing allows the respondent to fulfill a need for creative, challenging or enjoyable work (45%). The bottom three motivations are valuing the recognition of peers (55%), payment to develop FOSS (48%) and expectations that contribution will help advance a career (45%).

3.7 Alternative Approach to economics of digital economy: Open source adoption and value

3.7.1 "Measuring total cost of ownership is simply anachronistic"

As the Italian member of the Commission's first working group on open source in 1998, we focused on "Total Cost of Ownership", because IT platforms were mostly the same for every company and most proprietary software vendors were focusing on TCO alone to push their own IT infrastructure. It was the most widely used economic framework for measuring things.

The overall idea behind TCO is simply not adequate today, because the concept of IT infrastructure is not the same anymore. We are not measuring productivity or the value generated by their employees. Companies have a whole different perception of what the user is.

When we perform the measurement of how much code is in general software products out there - it's upwards to 70%, and probably in recent years, it's been more like 80%. So open source software is up to 80% of IT, and it is even more in platform environments where the reuse of open source components for infrastructure systems is even higher.

What would be a great change would be starting to measure the value provided by IT infrastructures in general. We still see companies and authorities using outdated models to understand the value that IT brings them.

The first problem is that lots of companies don't even know how much open source is used. It's difficult to even get a glimpse of how much open source is used inside of companies or platform environments. The second is in how to measure this value.

How do you value open source?

Many academic endeavors use what is called the substitution principle - this software is something that has been developed by 10 people for one year and the cost of replacing is X or Y. You're not measuring what is an enormous amount of value that comes from the fact that the software is out there, is being used in the wild. There is an enormous amount of value simply not taken into account. You can build on existing components, can make them

better or tune them to do exactly what you need. This is a value that you don't get from proprietary software distribution.

There are now several key researchers that are pushing the economics discipline in general, towards the measurement of value. The GDP-B approach, for example, moves away from simply measuring monetary transactions to the value of things. And I believe that this will probably become more common in IT and digital ecosystems in general.

In early 2000 open source was still controversial and now open source is the basis for nearly everything. So it probably makes no sense to say we do open source - everyone does open source.

Carlo Daffara, Researcher who worked on open source economics for two decades.

"There's two major ways open source adds to the bottom line. One is that it means that companies don't have to build, they don't have to reinvent the wheel for everything so they can save a lot of the time that they would have spent on that and just use open source software. The second part is that they can be along for the ride, as open-source software improves over time, they get all of the benefits of that improvement without having to invest their own effort into improving it...the pace of change is the thing that I see as the most obvious measure"

Cheryl Hung, VP Ecosystem, Cloud Native Computing Foundation

3.7.2 Tarzan Economics and Open Source Software, an alternative approach for the UK?

My forthcoming book *'Tarzan Economics: Eight Principles in Pivoting Through Disruption'* is all about sharing the transferable lessons music has learned on its twenty year 'first to suffer first to recover' journey through digital disruption with everyone else. As individuals, organisations and institutions all find themselves staring at their own 'Napster moment' as we come out of the pandemic, music's journey can help give you the confidence to let go of the old vine of doing business and reach out for the new.

It is closely aligned with the work of Open UK, which champions collaboration with open source software, open source hardware and open data, across the UK and which is looking over the course of 2021 at the value of open source software to the UK economy. Indeed there's a chapter titled 'self interest versus the common good' which guides us on when it pays to throw our hat into the collective ring and navigate disruption together.

It is my fascination with how we measure things - important things like the economy that surrounds us - that puts me inside the socks of Open UK's mission. In the chapter 'Judging the State We're In' I question how we measure the economy. So much of what we value is free, and if we don't pay, then its value may not get picked up by Government statisticians. How much has Zoom affected our past 24 months? Where does it sit in Government accounts? To paraphrase Robert Solow: 'the digital economy is everywhere, except in government statistics'.

My worry is that what matters most is what's measured least and that extends to the contribution of the cloud to our economy. The cloud poses three statistical challenges for our beancounters: pricing (Bezos's law states 'a unit of [cloud] computing power price is reduced by 50 per cent approximately every three years'); accounting (capital expenditure decreases as you adopt the cloud yet productivity goes up); and locating the activity (global cloud services do not fit easily inside national accounts). GDP has had its cyclical ups and downs in what Diane Coyle calls its 'brief but affectionate history', but on this occasion it may finally have got lost in the cloud.

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accounting (capital expenditure decreases as you adopt the cloud yet productivity goes up); and locating the activity (global cloud services do not fit easily inside national accounts). GDP has had its cyclical ups and downs in what Diane Coyle calls its 'brief but affectionate history', but on this occasion it may finally have got lost in the cloud.

The cloud is just one of many examples of why a misguided view about the state we're in creates a fear of letting go of what we know as we fail to measure what we don't. The benefits of the cloud, and of the openness it brings are hard to measure and harder to capture. The opportunity cost of not doing so is too easy to ignore. That's why Tarzan Economics matters to Open UK and open source software as much as it matters to music or any other sector of society that experiences the tide of digitisation gathering around its feet.

We're in chartered waters when measuring the value of open source software. Music streaming taught us what happens when you democratise access, shifting power from the few (the top 40) to the many ('57,000 artists represent 90% of monthly streams on the platform'). Open UK knows this, as collaborative use of the software spreads the benefits far and wide, and software too has moved from being owned by a handful of major companies to 10's if not 100's of thousands of open source developers, and is now in the hands of the many.

Post-Brexit Britain needs to exploit its first mover advantage wherever and whenever possible. For example language may help explain why Britain is one of only three net exporters of music (the others being US and Sweden) is one of the top five contributors globally to open source software projects, and it may help expand collaborative openness across borders.

Finally, instilling ourselves with a healthy dose of Tarzan Economics in our review of open source software's value and the cloud economy, can give us the confidence to let go of what you can measure and reach out for what you can't mean. We're all on a steep learning curve about capturing the benefits of digital disruption and collaborative innovation, and not just worrying about its costs. To return to Robert Solow's adage: the cloud economy, just like the digital economy, is everywhere, except in public statistics. By being more open, we can begin to measure and maximise its contribution.

4.0

Digital Transformation And Pandemic

4.1 Tidelift Report - the impact of the pandemic on infrastructure

In June 2020 Tidelift fielded their annual managed open source survey of technologists, which included 600 technologists, on their use of open source software focusing on what are some of the challenges they have faced and how they can strategise to overcome and combat these effectively, especially during the current COVID-19 pandemic.

As a result of these efforts, they came across some relevant, interesting themes and trends currently shaping open source usage and the wider ecosystem that can be considered for the UK.

4.2 More open source in a downturn

Understandably one of the key Tidelift findings was strongly linked to the impact and economic ramifications of the current pandemic. We can see a downturn in the usage of open source, due to budget constraints, as 42% of respondents reported their organization's application development budget was cut because of the current economic downturn. This was a common trend not only in the digital sector but across all of the organizations in a variety of industries including retail and manufacturing.

As Matt Barker, a recession was,

"definitely an accelerant for people looking to try and make the software infrastructure run a bit more efficiently and open source software was one of those ways".

Matt Barker, President and Co-founder, Jetstack Ltd

There is a corresponding trend in motion as well - the uptake of digitalisation in some industries that were lagging behind. The rapid pace of digital acceleration forced organisations to digitise their offerings and processes in order to operate remotely. Non-profit organisations, governments and service led companies all had to accelerate their digital adoption - relying heavily on open source software solutions and tools.

Easy integration and the widespread availability of open source is viewed more favourably by organisations as a way to protect their budgets and innovate in an agile and efficient way - avoiding the high cost associated with producing code or purchasing expensive proprietary software tools. 44% of survey respondents believe their organization's leaders are likely to encourage the use of more open source for application development during the downturn.

Over the past 20 years, we've seen a recurring pattern in open source. When times get tight, organisations look to move more workloads to open source to take advantage of its cost-savings and efficiency boosting benefits. The COVID-19 induced recession is no different—our data shows that 44% of organizations report plans to use more open source during the current downturn, while only 2% say they will use less."

Donald Fischer, Co-Founder of Tidelift

4.4 Uptake of open source software increases in times of financial crisis, readying ourselves for the third wave

The pandemic is changing the way organisations and leaders view open source solutions, shedding light on its added value and unique attributes that solve various challenges.

We can see an uptake of open source in times of financial crisis, but cost saving is not the sole reason for this. It is coupled with time saving drivers, as developers are able to move rapidly and incorporate numerous lines of codes that already exist as opposed to creating codes themselves and starting from ground zero. As 48% of respondents highlighted increased efficiency of application development and maintenance as a key reason why open source usage was being encouraged.

As organisations are increasing their adoption of open source tools due to its efficiencies, they also face their own set of challenges. When asked to identify the most critical challenges their teams faced when using open source software, the biggest barrier for the respondents was overcoming the approval process of use. Requesting to use new open source components can be a lengthy and bureaucratic process. A recurring challenge identified in various research studies within the wider environment of the digital sector.

"The global pandemic has really helped to accelerate open source adoption in the enterprise. As companies have been forced to adapt to change quickly, we saw open source use increase dramatically as companies needed flexibility - they didn't have the time to go into a long evaluation and a long sales cycle when their offices were suddenly shut down and everyone moved to remote working overnight. They needed new innovative solutions yesterday and open source was able to fill that gap for a lot of them."

Rob Knight, Chief Technology Officer, Enterprise Cloud Products at SUSE

5.0

Cloud Computing is open and has grown a high UK skill set

5.1 IBM Report

In February 2021, IBM, in collaboration with O'Reilly Media, released *The Value of Open Source in the Cloud Era* based on a survey of 3,440 professionals in software development. There is a strong **relationship between the adoption of open source software and growth of cloud**, as nearly all respondents use open source software in their operations. A staggering 70% of respondents said that when they choose a cloud provider, they prefer one based on open source. The report highlights the benefits of cloud and the importance of CNCF in supporting and pushing forward cloud native.

The link between the widespread use of free and open source software and migration to the cloud brings together the defining features of the digital in the past twenty years. It is driven by the efficiencies afforded in both areas. The report suggests four key ways that open source and cloud need to be considered together,

"[Open source] makes the cloud possible; the benefits of open source development apply just as much to cloud vendors as to others; many developers who have released free software make a living by offering that software in the cloud; and open source may soften the common concerns aired today about privacy, control, and abuse in large data centers, because open source tools provide a bit of transparency into what's happening in those data centers." (p 4). One of the key benefits of open software may be the comfort that developers won't be locked into a single vendor, as more of them are turning to hybrid strategies.

"The value of open source in the digital sector...there's three main themes... The first is flexibility and agility, the second theme is transparency and community and the third's freedom from vendor lock-in. Most proprietary platforms make it very hard to migrate your data out of that platform and that's done by design."

Rob Knight, Chief Technology Officer Enterprise Cloud Products at SUSE

The report also makes clear that knowledge and skills of open source (including Kubernetes, Linux or Istio) are highly valued across all organisations. When the companies in the survey are hiring, 51% of respondents considered knowledge of open source an important factor. Additionally, 67% thought

"I think companies around the world are looking to transform their infrastructure, they want to remove legacy and they want to embrace cloud native and microservices."

**Rob Knight, Chief Technology Officer,
Enterprise Cloud Products at SUSE**

"Kubernetes is like Linux, but for the cloud era. This generation of technology is all about cloud-based applications and what we are calling edge applications, which means on your phone, in your car, all the things that are going to be powered by high bandwidth connection to the cloud. We're going to have another explosion, a second internet powered by these, this new wave of tech and a whole load of new government, consumer, and business experiences off the back of that. Being good at Kubernetes has become essential to pretty much every business, it's going to be the platform on which everybody runs their applications."

Alexis Richardson, CEO, Weaveworks

that experience with open source provides greater long-term value than experience with the technologies of specific vendors. In fact, a key assertion of the report is that, "Learning open source technologies is more important than learning proprietary cloud tools, in terms of career growth". (pg.10). Among the respondents, about 65% preferred to possess skills related

to the underlying open source technologies (such as Linux, Kubernetes, or Istio), while about 35% preferred skills related to a specific cloud platform (i.e., IBM, AWS, Azure, or Google).

5.2 Cloud Native Report

Google wrote Kubernetes and *"created a whole new, secondary sub foundation called Cloud Native Computing Foundation" within Linux Foundation "which is where it now lives, along with other projects, all of which form a family of tools, which are relevant for this new generation of applications. And those cloud-native applications are built using Kubernetes and other technologies like containers, including these GitOps technologies that we invented at Weaveworks, plus new monitoring tools, observability tools, logging tools, all of the gubbins that you need to build and operate applications."*

Alexis Richardson, CEO Weaveworks Ltd

CNCF defines Cloud native: Cloud native technologies empower organisations to build and run scalable applications in modern, dynamic environments such as public, private, and hybrid clouds. Containers, service meshes, microservices, immutable infrastructure, and declarative APIs exemplify this approach.

These techniques enable loosely coupled systems that are resilient, manageable, and observable. Combined with robust automation, they allow engineers to make high-impact changes frequently and predictably with minimal toil.

The Cloud Native Computing Foundation seeks to drive adoption of this paradigm by fostering and sustaining an ecosystem of open source, vendor-neutral projects. We democratise state-of-the-art patterns to make these innovations accessible for everyone.

"We release a lot of open source software and we build a commercial model around it using both software and services and support. We are adhering to what I think has become the mainstream model for doing infrastructure software - software that is running essentially underneath other layers of software written by businesses. Typically our customer is a large business tech department, or even a small business tech department. The people that we're selling to are responsible for even more technology that they create or buy themselves and run on top of the infrastructure. You can sort of visualise the concept of a pyramid or if you'd like a sort of stack of software where it's very important that the bottom line is a stable, secure, trusted, and pretty standard."

Alexis Richardson, CEO, Weaveworks LTD

The Cloud Native Computing Foundation (CNCF) hosts 80+ projects with over 110,000 contributors from nearly 1,000 organizations representing 177 countries. CNCF prides itself on being an open source community driven by End Users. End users are defined as companies that use cloud native technologies internally but do not sell any cloud native services externally. Companies that meet this definition are eligible to join the End User Community, which grew by over 150 members in 2020, indicating strong, continued interest in cloud native technologies.

One of the biggest concerns for organizations as they transition over to new architectures is the successful adoption and implementation of cloud native technologies. According to the CNCF's Cloud Native Survey 2020, 27% of respondents indicated a lack of training was one of the biggest challenges. As a result, CNCF and The Linux Foundation launched new training benefits for the CNCF End User Community.

"When we started, no one really did much of that and now adopting Kubernetes has become essential for very many enterprises and their plans for modern cloud infrastructure. We were one of the first companies in this space to offer services and training around it."

Matt Barker, President and Co-founder, Jetstack Ltd

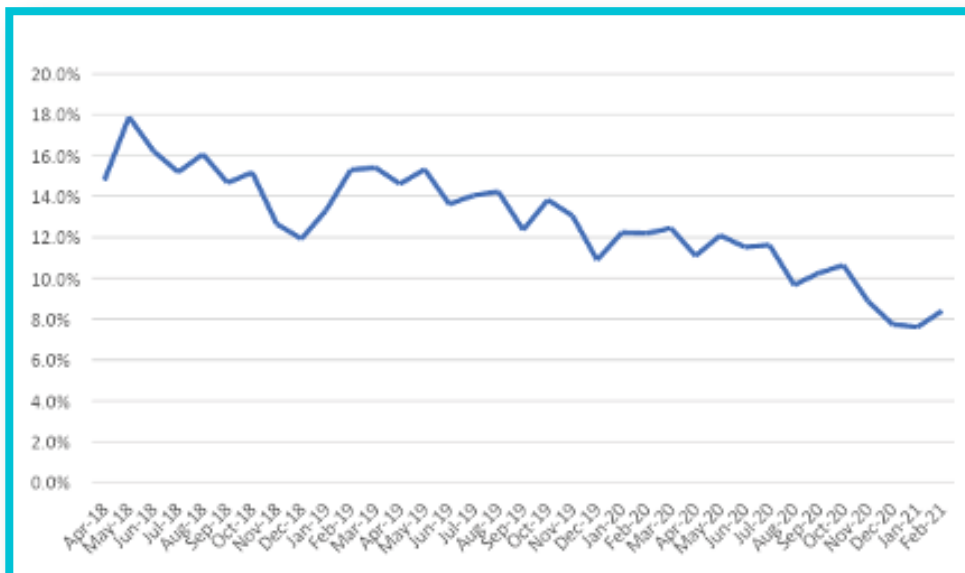
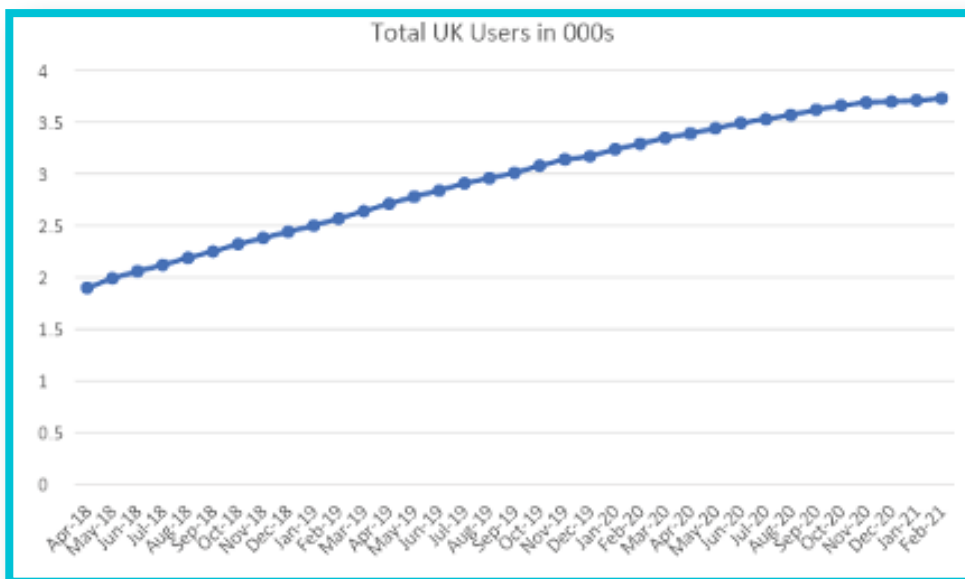
"The UK is one of the leading countries in the world when it comes to open source, it definitely punches above its weight in terms of usage and contributions back to open source.... open source in general allows companies to focus on the things that they do best - on the things that are unique value propositions to them and for things that are not competitive advantages for them, there are open source tools and platforms for almost everything. And this is a good thing because this means that companies can specialise and they can put their focus on those areas that are competitive advantage for them. And then they can rely on open source, which is cheaper and has more people contributing towards it and the pace of innovation is faster in open-source compared to closed source. If you're talking open source in terms of cloud. Then the biggest shift of that is within the last five years."

I would probably say it's [open source is] at least 80% -90% of cloud. The benefits - better security, being able to contribute and fix problems directly with much greater growth of the ecosystem around open source software (vendors and consultancies that have an open source core and then provide managed solutions or professional services around it). The more companies that get behind this, the easier it is for them to adopt, which means there are more companies that got behind it too"

Cheryl Hung, VP Ecosystem, Cloud Native Computing Foundation

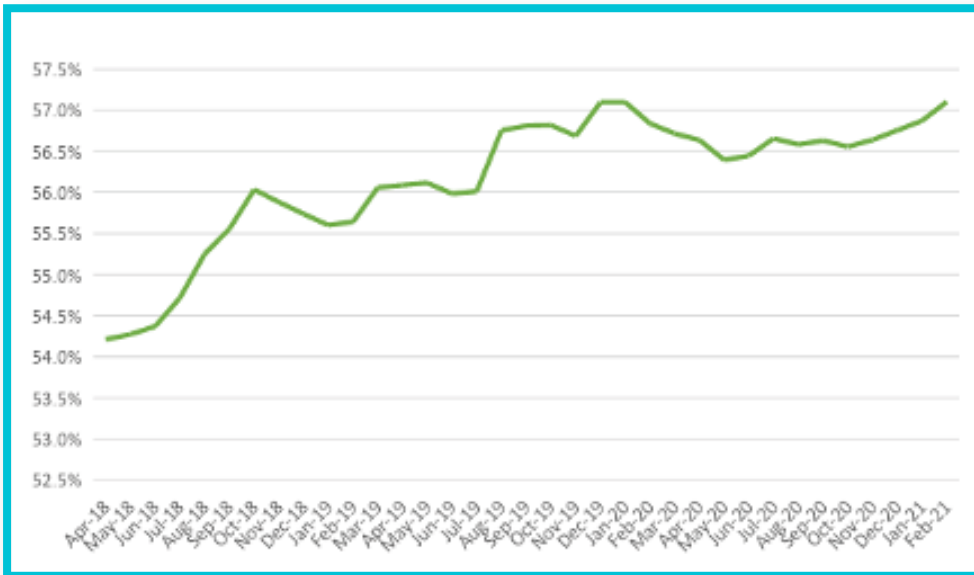
Data from CNCF

CNCF Grafana has data on Github usage by monthly users for a number of countries, including the UK from April 2018 to February 2021. This allows us a glimpse into the change of usage to get a general idea of data specific to the UK. We can only draw tentative conclusions because the data is only a fraction of the real traffic in github.



Which is the most "popular" open source software project?

According to the CNCF sample, Kubernetes accounts for most contributions of users in the UK, consistently. Kubernetes as a platform is a key component of all cloud infrastructure; its multiple versions and software development life cycle (SDLC) are essential for the smooth running of myriads applications.



5.3 Red Hat State of the Open Enterprise March 2021 Report

The acquisition of Red Hat, [the world's largest] provider of enterprise open source software solutions in July 2019 by IBM for \$34billion was the world's biggest tech transaction in history. Red Hat launched The State of Enterprise Open Source: a Red Hat Report for 2021, to help organisations in growing, transforming and preparing for their future use of open source.

Drawing on 1,250 interviews with IT leaders who were familiar with enterprise open source, and who had at least 1% Linux installed at their organisations, the research spanned across USA, Europe, Middle East, Africa, APAC and Latin America, resulting in a global view of just how organizations are using enterprise open source, but also the reasons why organizations in all industries are choosing to innovate the open source way.

90% of IT leaders surveyed currently use enterprise open software, with the top three areas of use in IT infrastructure modernization 64%, application development 54% and digital transformation 53%.

For the third year in a row, "infrastructure modernisation" is the top use for enterprise open source software, as we see an increase from 53% two years ago. This is a recurring theme in the open source environment, as it is becoming more and more common for enterprises to swap their proprietary systems with open

source software. This can be attributed to multiple factors, such as cost saving, increased collaboration, leveraging the open source coder community and many more.

"Digital transformation" ranks a close third, with 53% of respondents. We see an 11 point increase within the last two years. This is driven by the pandemic and a global move to remote working, which naturally forced organizations to accelerate their digital transformation efforts to maintain innovation and continue to meet customer demands. It's in circumstances like these where open source truly shows its power.

Although it still faces some barriers to adoption, such as level of support (42%), compatibility (38%), Security of the code (35%) and a lack of internal skills (35%). Each one is a challenge in its own right but can be addressed through principles dependent on collaboration and transparency to help organisations meet and overcome these challenges.

Key Pillars: Containers and Kubernetes

Open source is deeply reliant on containers and Kubernetes – this is reflected within the enterprise space, where we see just under 50% of respondents worldwide use containers in production to at least some degree. The use of containers and Kubernetes is likely to continue growing. 30% of IT leaders expect to significantly increase container usage over the next 12 months. Kubernetes is overwhelmingly seen as important to cloud-native application strategies for its container orchestration: 66% of respondents view it as “very” or “extremely important,” and another 19% consider it “important.”

By sector we see:

- » Telecommunication: 81% expecting to increase their container usage over the next 12 months and 94% saying that Kubernetes is important to their cloud-native application strategies Only about 1.3%—less than either Germany or South Korea, where net trade surpluses generate
- » Financial services and retail industries were closer to the overall averages of 72% on increased container use and 85% on the importance of Kubernetes Deficit of about 3% of GDP, down from 5% in 2017.
- » Healthcare trailed with a more modest 62% planning to increase container usage, and 66% judging Kubernetes as strategically important.

Why are enterprises adopting open source?

As the pandemic has pushed the pedal on digital acceleration, we see enterprises going through massive digital transformation – making room for open source adoption. The benefits are numerous, but Red Hat’s research sees the top four as higher quality software 35%, access to latest innovations 33%, better security 30%, and the ability to safely leverage open source technologies 30%.

The percentage of respondents citing these three benefits have all risen since first asked the question two years ago. Overall, 87% see enterprise open source as “more secure” or “as secure” as proprietary software. The results pertaining to risk management are even more striking. 84% indicate that enterprise open source “is a key part of my organization’s security strategy.” The processes associated with enterprise open source specifically are also reflected in the 55% majority who say that enterprise open source is more secure than community-based open source.

Cost effectiveness is falling behind as a primary reason organisations consider open source software. Two years ago, lower cost of ownership was cited as the top benefit of enterprise open source. This year, it’s fallen to the sixth spot, well below “access to the latest innovations” in second. This year, 82% of IT leaders also agreed with the statement that “enterprise open source is used by the most innovative companies.” About the same number, 81%, said that it “provides flexibility to customise solutions to meet company needs.”

Giving back

Red Hat’s research shows us that contributing to the open source community has an impact on enterprise adoption. 38% of survey respondents said they care a lot and are “much more likely” to select a vendor who contributes, and 45% are “somewhat more likely” to do so. We’ve always known working in upstream projects is not just the right thing to do – it’s the best approach to open source software development and the best way to deliver open source benefits to customers.

6.0 Open Source in Business

6.1 Overview

There has been a vast increase in the pace of digital transformation during the pandemic. The journey to Open Source is inevitable in a digitised economy and we see it in Microsoft's story.

"If you look outside of the UK, Microsoft is the most successful software company in the history of the world, albeit proprietary for the most part, historically. I think it took new leadership that came from the cloud business and came from the open source side with an open source sensitivity to be able to develop a hybridised model where there's almost a duality that Microsoft lives with. And I think the same is happening in the UK and then across Europe where there's certain ways of thinking. It's not a radical transformation, it's an evolution, but many people at the C level are trusting the technology leadership to drive things and don't look behind the curtain, so to speak. I think it would help if C-suite executives beyond the CTO were more engaged around the importance of this trend and understood that they're part of something that's a global trend, and it's an irreversible trend because it is a social movement.

It actually affects the fabric of what kind of organizations they preside over and I think understanding the underpinnings of what open source is about would be very helpful for them."

Keith Berglet, CEO, Open Invention Network

Microsoft's explains its move Open Source was based on 3 key drivers:

- Cloud: to run a cloud business companies need to contribute to open source as the public cloud is largely built on open source;
- Customer request: Customers ask for Open Source which they did not 10 years ago; and
- Developer Demand: The best developers want to use open source and the methodologies and modalities are regarded as a norm.

"This same story applies to the digital economy globally and what we have seen is a move to digital, to all companies being software companies and ultimately open source companies due to its high level of presence in cloud and ubiquity at this point in time.

Open source has a modality that is quite powerful, the whole idea of collaborative development. It really grips the soul of an organization, particularly the software development teams. I think that's where it starts and then it kind of evolves from there. So you have a pretty prevalent feeling I think in all quarters where stuff is utilised, that open source is critical."

Keith Berglet, CEO, Open Invention Network

"I would say that the UK was quite behind in its usage of open source solutions. So back then most of the companies that I was trying to work with were in France, Germany, Scandinavia, to some extent. And the UK was a long way behind. And then something changed, I'd say between 2010 and 2015. And we went one eighty and became a world leader in open source software deployment and adoption. Since then, the commercial user base has also matured and we're one of the stronger countries for adoption and usage of open source software solutions."

"The main benefits are around developer productivity, speed of deployment, speed of being able to scale your software quite quickly. It's driven by the need for innovation and product creation in order to establish a market offering quickly and build demand. It's less around cost saving."

Matt Barker, President & Co-Founder, Jetstack Ltd

6.2 "Measuring total cost of ownership is simply anachronistic"

This presence of open source software in business and industry with a view through a UK lens, will be explored fully for the first time, in Phase Two of this Report, with a survey including companies traditionally considered to be "non technology companies" across the UK. For Phase One we have considered financial services.

6.2.1 Financial Services adopting Open Source - The UK's 2021 stories so far

"I used to work at Novell many years ago when they acquired Suse Linux and I had the job of going into all the different banks, trying to convince them that they should be using open source software. And just the reticence and concern from a security perspective made it very, very difficult. I think now it has become fairly standard, but I don't know that it's being used to its full potential. I think that's the difference between then and today."

Carolyn Jameson, Chief Trust Officer, Trustpilot

"You can see the evolution [to open source] inside companies and they struggle sometimes. Financial services is obviously making [that journey] and has been utilising open source code for quite some time, but now they're becoming much more involved as leaders and controllers of their own destiny and their own roadmaps. We see that there has been hiring activity over the last five or six years that has brought many, many more technical bodies into that environment. So they are getting it and figuring out what they need to do and how they need to compete and open source is part of that competition strategy in terms of their technical solutions that deliver services that people want."

Matt Barker, President & Co-Founder, Jetstack Ltd

6.2.2 Case Study - Lloyds announcement of its Open Source plan

Open source software and solutions are rapidly becoming an essential part of the fabric of numerous sectors and industries. The financial service sector is one such industry that is finally catching up and allowing open source to seep into its processes and offerings. As traditional banking models are now being compelled to innovate in order to keep pace with customers expectations for agile and secure services.

Lloyds Bank Plc, one of the UK's leading banks, has more often than not been at the forefront of digitalising its platforms and services.

By incorporating open source solutions, they have been able to create a collaborative way forward in regard to building code, which can be easily accessed, studied, modified and shared, meaning that developers and fans of coding from all over the world can spot bugs and build enhancements into their digital products.

Open Source Mission

The Lloyds "Open source mission" – provides robust solutions to how Lloyds Banking Group safely consumes, contributes and publishes open source software, while collaborating with external open source communities. The group has created guidelines that highlight some of the key benefits of adopting open source solutions in the financial sector and explores how Lloyds can contribute back to the open community.

The mission has a clear set of goals that support the successful adoption of open source platforms and applications within Lloyds. It provides a multi-tiered training program for software development teams and other stakeholders in order to help enhance team and collaborator open source skills. It understands that whilst Lloyds is going through one of its biggest digital transformations, it needs to be matched with the adequate resources and skill set. As these changes would require full organisational buy-in and adoption in order to truly make a difference.

Way forward

Lloyds is well on their way to creating an effective digital strategy that relies on open source solutions and brings together their goals of consuming, contributing and community together. By creating a collaborative software development process in the bank, by leveraging the software and actively publishing them, they aim to reduce their costs and development time considerably. They hope to publish some of their internal code as open source and give back to the community, which they believe is the way forward.

6.2.3 Barclays joins Open Invention Network defensive patent pool

Partially pushed by the pandemic, the financial sector has seen a rapid increase in the adoption of open source solutions and software, giving rise to a few risks and concerns, such as patent control on intellectual property focused initiatives. As open source solutions are deeply embedded in an open community ecosystem, occasionally these concerns can come up.

Barclays Plc is the first major European bank to join the Open Invention Network Community, the largest patent non-aggression community to oppose the abuse of intellectual property rights by patent assertion entities (PAE), colloquially known as "patent trolls." By joining OIN and LOT Network, Barclays is able to manage and litigate against patent claims and better protect themselves.

Changes in legal precedent and the economic effects of the global pandemic appear to have further fanned the flames of the patent troll threat. Left unaddressed, the practice of asserting patents of questionable validity and scope in the way calculated to achieve settlement under the threat of greater expense on litigation will continue to divert organisations' resources away from productive innovation, and the development and licensing of valid intellectual property rights.

As the open source community is growing, so are community based organisations that help manage the pitfalls and risks of adopting open source solutions. If we look at the financial service sector in particular, these organisations are able to support banks like Barclays to focus on real innovation as they continue on their digital journey and focus on collaboration as opposed to getting caught up with externalities.

6.3 Challenges to Business Adoption:

6.3.1 Overview

Across the interviewees, "Supply Chain" and "Compliance" were regularly identified as key to the challenge of making open source a convincing alternative.

Tidelift identified the biggest barrier to open source, particularly in larger companies is restrictive policies re adoption.

Tidelift's 'managed open source survey' highlights that although organisations have the intent of adopting open source software and solutions during these unprecedented times, they continuously meet challenges, one of which is restrictive policies regarding the usage of open source. This is a concern that increases as organisations grow in size. Many large organisations have set policies regarding security, risk and compliance, creating a heightened barrier to adoption.

"I feel like the benefits of open source software can be seen by everyone, because it helps the startups and the challengers move quickly to do more with less, and so they [can] be more innovative and creative and push the barriers more with using open source software. For the incumbents, it helps them to spin up Greenfield projects a bit easier. It kind of helps them to compete against some of the newer startups. Open source has the power to help everyone who uses it really. But obviously it's important to do it in the right way - you need the right skills in house."

Matt Barker, President & Co-Founder, Jetstack LTD

6.3.2 OpenChain featured heavily, in these discussions.

Governance is at the heart of open source, and good project and supply chain management. OpenChain provides a compliance format for the supply chain and obtained ISO certification in 2020.

"Providing companies an open source compliance standard that they can trust will only help further drive open source adoption throughout the entire supply chain. I'm really excited to see how it develops further. The Open Chain and open supply chain helped them overcome their lack of perceived trust and adoption risk. And that ultimately resulted in more open source licence compliance that's predictable, understandable, and efficient. and NHS digital gained open source experience that they've been able to use in subsequent projects. So I think it's really important when it comes to the supply chain and open source adoption in large enterprises."

Rob Knight, Chief Technology Officer, Enterprise Cloud Products at SUSE

To deal with adoption concerns, we need to place the overall governance, supply chain management and management of open source projects at the heart of its implementation. An example of doing this, is the 'Open Chain' initiative launched by Linux Foundation. Its core objective is to build trust in open source software by making open source licence compliance simpler and more consistent. This standard is openly developed by a vibrant user community and freely available to all. It is an international standard for open source licence compliance and adopted by various organisations within the UK

The importance of OpenChain was highlighted in one of our research discussions with Andrew Katz, a key figure in OpenChain and a Partner at Moorcrofts LLP. In his experience, OpenChain combats the problem of fragmented code creation.

"The problem", he notes, "is that you have great code out there. When you have all of these different components, each component is going to be under a different licence. You have to comply with all of these licences. It's not unusual for projects to have 20, 30, 40,000 different components, each of which has a licence attached to it. You've got to be able to comply with all of these licences. This is something that's becoming increasingly complex."

Andrew Katz, Joint Managing Partner, Moorcrofts

OpenChain is a framework that helps organisations to comply with these licences. One OpenChain requirement is that individuals working on software development must have a working knowledge and understanding of how open source licensing works. A key part of OpenChain is the OpenChain curriculum: a set of materials that provides the educational foundation for processes and solutions, and provides a grounding in meeting the requirements of open source licensing. The result is that open source licence compliance becomes more predictable, understandable, and efficient for participants of the software supply chain.

Along with the curriculum, the core document is the OpenChain Specification. This sets out the requirements that any open source compliance programme must meet to be regarded as OpenChain conformant. These mandate that appropriate policies and governance are in place.

"Organisations must have a policy for dealing with code acquired from open source projects. It's all about traceability of the software. People who received the software, they'll need to know where it comes from. And the idea is to build trust in the supply chain, so that when you acquire a piece of software, as a customer you know where it's come from and you've got the information that you need so that you then can pass it onto your customer and down the chain."

Andrew Katz, Joint Managing Partner, Moorcrofts

Due to OpenChain's association with Linux Foundation and its ISO standard accreditation, it is seen to be credible, especially in the context of its adoption by major multinationals like Toyota, Google, Microsoft, Facebook, Sony, LG, Qualcomm, BMW and Western Digital. Organisational leaders and technologists are becoming more aware of it and understand the need for it. Although it can easily be said that it requires more time to truly become embedded in the way open source is adopted.

"It's [the use of OpenChain] not going to be something that is suddenly going to change very quickly or it's going to disappear overnight. It's going to have some sort of longevity to it. And that gives [participants in the supply chain] more confidence that there's a real ecosystem of organizations that are complying with this and that are requiring their suppliers to comply with it as well."

Andrew Katz, Joint Managing Partner, Moorcrofts

Andrew Katz is one of the Key figures in OpenChain and recently launched a UK Group with Sami Atabani of Arm. They are both part of the OpenUK Legal and Policy Group. Governance is key to open source and the UK's expertise is world class.

7.0

Conclusion



The historical trajectory of the narrative of open source has been one of continuous and rapid diffusion and growth running parallel to the digital economy with its own momentum and impact. This history is fraught with often unfounded perceptions of threat and risk grounded in resistance to the new, to the open, and a desire to protect the walled gardens of technological advance.

30 years after the start of the open source debate, we are moving from walled gardens towards open fields, making inroads across three key areas of tension: personal motivation, competitiveness of the solution - are they secure, do they scale - and making visible the value of open source to innovation. We now have a deep and thorough understanding around the personal rationale and motivation for participation, we have competitive products that in many cases supersede the competition in quality, performance, security, and versatility and we have a culture of transformation driven by shifts in the digital economy. This culture is driven forward by a need for speed to impact and a rapid deployment of technologically enabled solutions for increased collaboration, productivity, workforce augmentation and dynamism. What we can conclude from looking at the open narrative is that the open source community and suite of products and services sits at the threshold of a new frontier in impacting socio-economic life and transforming the way we work, live and play.

The papers reviewed in this report are at the leading edge of resolving the three tensions of motivation, competitive advantage and the economic value of open to our people and economies. We laid them out here to amplify understanding of just how far we are and how far we need to go. As a first step, we've drawn out the UK specific insights highlighting that the UK is a world leading contributor to open source software with an increasingly skilled talent pool and code at a scale beyond most countries. It is taking on its position of leadership in a post Brexit economy, having previously been the largest European contributor. The UK Public Sector has been a world leader in open source but we need to keep this visible by ensuring some action is taken to re-establish this position. In business we are seeing companies establish and grow as open source companies but also adoption across some of the

verticals where the UK has a leading position including healthcare and financial services.

It has not been easy. Interoperability, legacy systems and the difficulty of businesses understanding the move from user to contributor are all areas in need of work. The emergence of free to use social media and platforms caused a conflation in the mind of the end users between free and open - when in fact these had deep seated data driven models for capitalising on data and personal identity as a commodity. There was a phase of uncertainty about what was the cost of free and difficulty in the public imagination to differentiate open source projects from commercially driven freemium products and services.

Successful digitalisation requires a culture shift. Business and industry must go through a process to become open source friendly and move from being users - whether known or not - to being contributors. Part of this is to make visible the true value of open to businesses and countries. Traditional valuations have been focused on contribution and total cost of ownership which does not demonstrate a true value in a digital environment where much is given freely and monetised in non traditional ways. This report begins a new process for the UK, stepping off from existing valuations and applying this to the UK in a preliminary and conditional first attempt. This work will continue into the next phases, seeking to establish the economic value by looking at the scale of usage.

The third wave of open is linked to the cloud and the cloud is increasing momentum amidst the economic downturn and hopeful recovery caused by the COVID-19 pandemic. Digital transformation is in unprecedented acceleration. In the following phases of this report we will deepen the discussion and understanding of adoption and work to measure the economic impact for the UK. Value exchange has become the crucial currency of the digital economy, innovation relies on the crucial role of open source.

Jennifer Barth, Research Director, Smoothmedia

8.0

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19. Total n= 1196 with 5% of the respondents from the UK.

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23. No of projects = internal calculations

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24. The number of respondents is 18, 14 and 14 respectively, own calculations.

Q.36 Please rank your primary motivations for contributing to the FOSS project you spend the most time on by clicking and dragging the items below. (#1 indicates the most important, #10 is the least important) n=31

25. The number of respondents is 17, 15, and 14 respectively, own calculations. Q.36 Please rank your primary motivations for contributing to the FOSS project you spend the most time on by clicking and dragging the items below. (#1 indicates the most important, #10 is the least important)

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Methodology

The research team used a mixed method approach to build an understanding of the current state of open source software and solutions in the UK economy through industry reports, organisational analysis and multiple publications.

Methods included:

Literature review – an in-depth review of academic publications, industry literature and media knowledge to understand the context within which open source software is adopted, used, managed and leveraged.

Expert interviews: 11 interviews were conducted with industry leaders and organisational heads of large, medium and small organisations within the UK's open source ecosystem.

9.0

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Interviewees and Participants



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Smoothmedia

Smoothmedia looks beyond the surface and behind the curtain of the fundamental innovations and trends shaping our society, markets, culture, and values.

Smoothmedia's mission is to share and grow knowledge about everyday lives. We want to understand the past, present, and future of human interaction with emerging technologies and socioeconomic changes—from behaviour to context, nature to nurture, origin to experiences—so we can help our clients engage their clients and the public imagination.

Dr. Jennifer Barth

Dr Jennifer Barth is an experienced ethnographer and social researcher, with a DPhil from the University of Oxford. Her work is informed by empirical research on the intersections of emerging technologies and socioeconomic change. She provides companies with thought leadership and media engagement opportunities on global issues impacting and shaping our current and future socio-cultural lives.

OpenUK

OpenUK is the industry organisation and advocacy body representing Open Technology in business, being open source software, open source hardware and open data across the UK. As an industry organisation, OpenUK gives its participants greater influence than they could ever achieve alone.

OpenUK is committed to promoting UK leadership in open technology and supporting collaboration between businesses, public sector organisations, government and communities to expand the opportunities available to all around Open Technology on a global basis. It is building a visible community, and using that community's impact to ensure that the UK's laws and policies work for Open and promote learning in Open Technology.

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Amanda is CEO of OpenUK, the UK body for Open Technology, being open source software, open hardware and open data", OpenUK and European Representative of Open Invention Network; OASIS Open Projects' Advisory Council Member (open source and open standards); Advisory Board Member KDE; and a member of various commercial and start up Advisory Boards including Mimoto as well as mentoring C Suite individuals; and was the Chair of the UN's Technology Innovation Labs Open Source and IP Advisory Group.

Amanda is the Editor of the book, "Open Source Software: Law, Policy and Practice", 2nd Edition, to be published by Oxford University Press in Summer 2021 with open access sponsored by the Vietsch Foundation and contributed to by 20 leading figures in open source.



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Phase One

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