Open:UK

State of Open: The UK in 2023
Phase Two, Part 1
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PART ONE: INTRODUCTION

## 1.1 OpenUK as a unique organisation and its Reporting

As the UK's organisation for the business of Open Technology - open source software, open hardware and open date, implemented through open standard and open innovation our Purpose is UK Leadership and global collaboration in Open Technology.
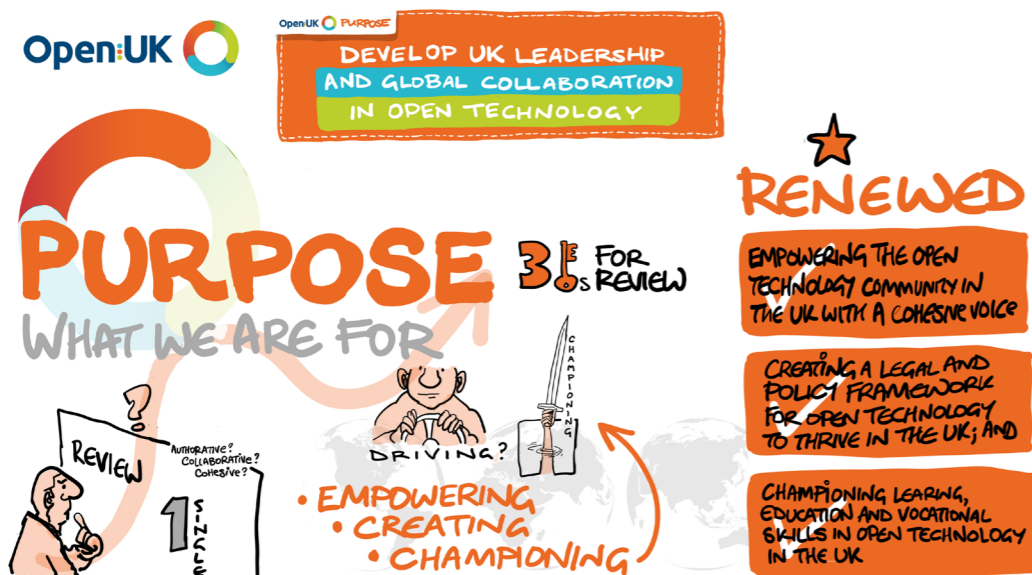
OpenUK has a unique focus as a country organisation with this breadth of Open Technology. This arises partly from the breadth of its focus and recognition of the need to amalgamate the "Opens" in a future facing tech sector.

Also unique is the breadth of its activities which is not currently reflected in other country organisations in this space as can be seen in our Mission:

Community: Convene the UK's Open Technology community to harness its power;
Legal and Policy: Lead and advocate for the use and development of Open Technology; and
Learning: Encourage education and skills for all in Open Technology.
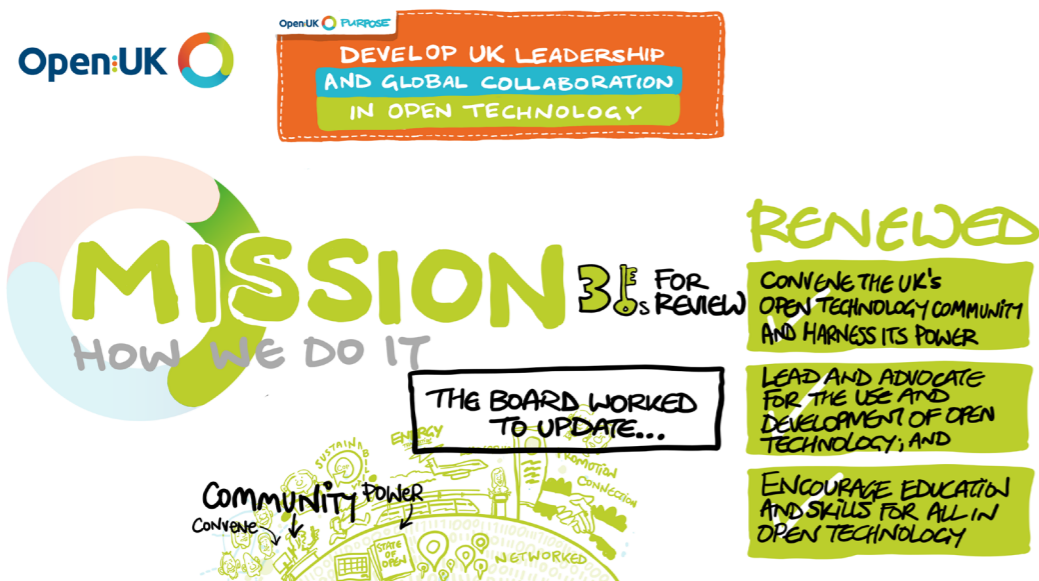
Our third unique factor is that OpenUK's focus on people not companies. We are not a traditional membership organisation.

Of course our home grown companies - the normal focus of Open Source country organisations - are important to us and participate in our work. We also recognise the importance of the global companies employing much of our leading remote-working, UK-based, Open Technology workforce.

Our focus on people is important to us, to our sector and to a better understanding of it. People and their skills and talent are a fundamental basis of all technology. Our founders interviewed for this report reiterate and emphasise this through their interviews. They are not only the users but the creators of tech.

As is borne out by our research, there are a significant number of UK-based workers who form part of a global dispersed Open Source workforce, and an equally significant leadership in this space. This workforce, and their impact on the economy and UK tech sector is often missed. We will explore more on this, on migration and the future of work in Part 3.

Open Source has been the "Submarine under the Digital Economy" for many years. The internet, cloud, blockchain, AI, and importantly our national digital infrastructure are built on it. OpenUK's reporting allows this force to "up periscope" and share their value with you.
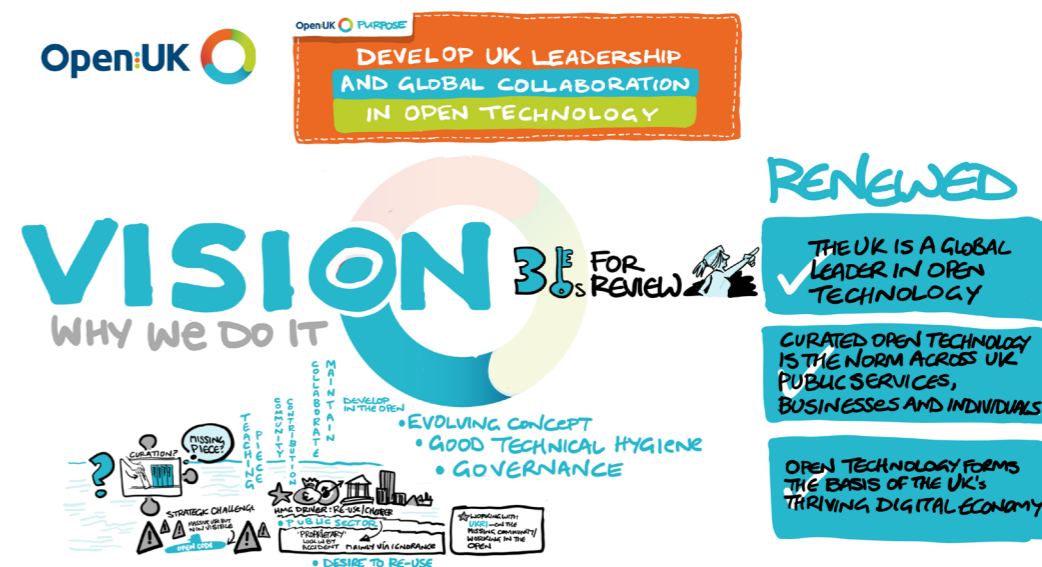
Within our Policy remit we have worked in partnership with Symmetry for 3 years, researching to build ground breaking reporting specific to Open Source Software[2].This research allows the boundaries to be pushed and the importance of the Values of "Open" to be clarified for all.

OpenUK is not a pay to play organisation and is funded by Sponsorship, Donations and Grants. We are grateful to our many sponsors and partners who make our work possible[3]. All are welcome to participate. Contact OpenUK on admin@openuk.uk.

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2   "Open Source Software" is used throughout this report as a capitalised term to mean software where the source code is freely shared and the code is made available on an Open Source Initiative approved licence. However we recognise that this is more than a legal definition and the additional value of "Curated" Open Source Software - code with contributions, collaboration, community and good technical hygiene and governance all form a necessary part of "Open Source Software."
3   https://openuk.uk/participants/sponsors/

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1.2 Introduction: Show Me the Money!

Amanda Brock
CEO
OpenUK

In this Report, we question the value of Open Source Software to the UK economy and consider its recognition as a distinct sector contributing value to the UK.

The Founder Funding Story

For Open-Source-based businesses, scaling without investment is hard due to a lack of licensing royalties and the applicable business models' dependency on large volumes of users. Adoption at pace is a key differentiating advantage of businesses based on Open Source. In a series of interviews with investors and founders we consider what drives the Bay Area's success in scaling Open Source businesses. These expand our normal strictly-UK focus to include individuals in the Bay Area. UK Open Source Software businesses are often overlooked in the UK. Their skills-based, internationally-dispersed workforce, US primary sales market and positioning themselves as international-not-UK companies, alongside a propensity for US VC funding and flipping into US corporate structures, means that being overlooked in the UK may not be so surprising.

OpenUK's work encourages a diverse future-workforce and pool of future-UK-founders of Open Source Businesses. We hope to share their stories in future reports. I am grateful to those established Open Source business founders included here for sharing their stories and insights.

What is the value that the Open Source Software sector brings to the UK economy?

Using the output of our 2023 Survey with data for 2022 in a ground-breaking approach to calculating the economic value of Open Source Software in the UK - based on GVA - we establish both the economic worth of Open Source Software to the UK economy and a new, modern methodology to calculate the "Value" of this intangible sector - Showing the money in Open Source Software.

> Our economic calculation establishes[4] that in 2022, the Gross Value Add to the UK economy from Open Source Software is estimated to be £13.59 billion. So what does that mean? Contextualising it with the UK Tech Sector contribution at £50 billion in 2022, the directly attributable contribution from Open Source Software is therefore 27%, more than a quarter of the overall Tech Sector contribution. This is the first GVA contribution analysis for Open Source we are aware of anywhere in the world.

Thanks to Runa Capital, we discover the top UK-owned software repositories on GitHub and discover the number-one-placed Significant Gravitas, the UK company behind Auto-GPT with 100,000 GitHub stars.

The people

Building on Phase One[5], developer participation is 3,268,606 UK GitHub accounts[6]. On a per capita basis that's over 4.5% and remains higher than any country in the world. The UK remains 1st in Europe, followed by Germany (2.8m) and France (2.2m). The UK is 5th highest for developers anywhere in the world. Further analysis from the survey focused on skills, security and sustainability and additional UK-focused GitHub data on individuals, will be shared across the next two phases of this Report. Phase 3 will be published on 6 September covering Skills, the Future of Work and Security. Phase 4 will be shared during COP28 and cover Sustainability and Greener Software.

Splitting this Phase into 2 Parts - open AI

Scoping Phase 2 in January, Dr Jennifer Barth and I planned our survey, a focus on economics and Open Source businesses scaling and as an aside, agreed on a brief update on "open source and AI." It was unforeseeable then that a small update on "open AI" would necessitate dense reporting now.

This necessitated splitting Phase Two's Showing US the Money into: Part 1, "The Economics of Open Source Software," made up of economic analysis and a review of UK Open Source businesses and Part 2, "AI Openness". Part 2 is released contemporaneously with this Part 1 on 13 July, 2023 and brings together for the first time significant global Thought Leadership on putting the "Open" into AI.

Can I see the money?

Famously Marc Andressesn, of VC giant, Andressen Horowitz said "software is eating the world,"[7] but also wrote, "Today's stock market actually hates technology, as shown by all-time low price/earnings ratios for major public technology companies." A decade later, the stock market loves technology companies (despite the rollercoaster of the recent economic downturn and layoffs). Announcing the opening their first office outside of the US in the UK, Andressen Horowitz recognised that "the U.K. government is willing to create policies that encourage start-ups to pursue decentralisation."

Their choice of the UK reflects well on our ever-improving UK tech status. But can the UK be a true tech power? I believe that it can indeed, but that the UK's critical path to this success will require greater understanding of, and engagement with Open Source Software. As Luis Villa, Co-Founder of Tidelift, said to me some years ago "I can't imagine any start-up in the Bay Area not building on Open Source Software."

Progress has been made in the start-up space, thanks to investor tax breaks, talent visas and a more entrepreneurial vibe, but this has been slower for Open Source Software businesses. Understanding is improving, but UK-based Open Source founders who want to "see the money" continue to be impacted by understanding of "risk." Risk-taking is not a terribly British behaviour. Even less British is "failure". But risk-taking is a calculated activity and question of understanding, unlike gambling. With understanding failure is less likely.

Making an educated bet, without taking much risk (I am, after all, Scottish) I'll wager that the combination of the UK's status in Open Source Software with its status in AI will be the formula for success. This will open the UK's eyes to the potential of Open Source Software alongside open innovation and open AI.

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4   See Section 3.2.5 below

5   State of Open: The UK in 2023, "A Year in Review" https://openuk.uk/stateofopen/
6   GitHub figure as a 29 June, 2023
7   https://a16z.com/2011/08/20/why-software-is-eating-the-world/

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PART TWO: SCALING UK OPEN SOURCE BUSINESSES AND STEMMING MIGRATION

2.1 Background

For some species, migration is an inevitable part of their lifecycle. This is not so for Open Source leaders and businesses from the UK. Yet, many of them migrate. As is the case with many other countries, this bleed of some of our best talent to the US, may not be inevitable.

To stem that tide and to facilitate the goals of Government and those who aspire to Government here in the UK, to build a diverse and appropriately skilled digital workforce of the future, and to build businesses to boot - we must understand what causes that flow away from these shores.

Our research, by way of interview, has largely shown the success of the geographic location "The Bay Area" - San Francisco, California and the surrounding area - and a few other US hubs. This success may not actually be "the American Dream" per se, but the consequence of a geographic gathering of particularities making these areas fertile ground for experimentation, investment and growth… and failure. Many founders have now built and successfully exited Open Source companies there. Many investors have made significant returns on their investment.

Phase 3 of our 2023 Reporting[8] will include a consideration of individual talent, skills and migration of Open Source Software talent and will also consider the potential place of Open Source in stemming individual talent migration and the future of work in a world of distributed working based on skills not location.

2.2 The Foundations for Bay Area Success

Our learning shows the foundations of Bay Area success for Open Source businesses and that the UK has failed to match these within its geography. But why is this so?

The Bay Area Open Source success factors appear to be:

(i) The scale of the US geographical domestic market - something that in a digital world UK businesses can build for and overcome from day one, in the way they scale and go to market;
(ii) Investors - with experience and understanding of Open Source Software businesses with an appetite for risk means the US investors have been more willing to make investment into Open Source Software ideas and start-ups and equally on better terms than UK investors. Fundamentally the UK must better understand Open Source business and risk to be more willing to invest appropriately; and
(iii) Skills - A skilled workforce, with the adjacent and complementary product, business and commercial, and governance skills needed to build and scale Open Source Software based businesses. These skills are developed through both understanding and experience. Whilst the UK has the engineers to innovate it lacks the adjacent skills to scale.

Alongside these Open Source specific inhibiting factors sit the more generic traits of "failure" and "risk-taking."

Where founders on their 10th failed start-up are admired for their determination in the Bay Area, they are likely to be shamed for a trail of failed businesses in the UK.

2.3 The Voice of the Investor

2.3.1 Thought Leadership: The Voice of the Investor - Heavybit

HEAVYBIT INDUSTRIES

Tom Drummond,
Founder and Managing Partner

2.4 The UK Founder who Moved to the US

Tom is the Managing Partner of a VC fund in San Francisco - Heavybit. With a background in engineering as a computer science undergraduate from Cambridge, UK. He worked in a European VC for many years, investing primarily in enterprise software, moving to California, with Heavybit opening its doors in 2008. It has grown from 2 to 12 staff. In his prior fund, as strategic investors they found that the richest place to go fishing was California where the most interesting companies were based. He believes that the Bay Area is the best place to start and build an enterprise software company and focuses on bottom up enterprise software companies, companies building developer tools or infrastructure software for engineers and technical users. Heavybit has been investing in developer-first startups for years, having closed its most recent 80m fund in 2022

Heavybit isn't positioned as an Open Source enterprise software investor, because he sees that as a redundant statement. To invest successfully in enterprise software, in the current market, current technology, requires some element of Open Source Software. Investing is less about the software licensing model and more about who the team is - how talented they are, do they have that special spark to go out and build a really substantial company? Also the usual parameters for any investor: how big is the addressable market; what sort of proof points or demonstration of traction can you see? Investing in very early stage companies, maybe no more than two talented individuals and an idea, means that there is often little in the way of traction or metrics to interrogate. The most talented founders are often creating whole new markets. Heavybit assesses the ability of the founders to evaluate them based on its partner team's decades of experience.

The fund is predicated on the idea that the only way to go to market in our modern world involves a substantial bottom up component - believing in the power of individual developers to not just create and build interesting software but as decision makers. That leads to lots of positive downstream consequences for enterprise software spending. A lot of what the firm does is help founders work through issues - converting non-paying users into large enterprise customers, finding lots of non-paying users, finding developers, doing developer evangelism, content marketing, etc.

There's obviously a macro benefit of being in the US. It's homogeneous - a large single market, with no language, tax or employment law barriers. That's true for really anywhere in the States but the Bay Area, in particular, has a concentration of talent and capital that there isn't in other other geographies. The US places 40% of global VC dollars - 40% of that is given to the 50 mile stretch from San Francisco to San Jose. 50 to 25% of the world's capital is in a small area. That concentration of capital helps accelerate companies. Talent is the other big piece of the picture with lots of very, very large tech employers headquartered in the Bay Area, there is

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a lot of general background activity for developers and software engineers, whether moving between companies, thinking about starting their own, or just being involved in the wider community meetups. A critical mass of people and capital that has made it a lot easier for businesses to scale. They meet founders from the UK who go to California to raise capital or to set up an office or just to participate in the community out there.

He sees Americans as more risk tolerant than Europeans. The idea of California is of being the place you go to take big risks in search of big rewards, going back to the Gold Rush Days - a spirit of entrepreneurialism that is very present in the US, but in California, in particular. When it comes to building Open Source companies, many companies start from great Open Source projects, not built with a business model in mind but with someone who needs "to build this piece of software, because it's bothering me, to build something to fix the problem".

If you want to monetise Open Source you need developers to love your software first. There's a lot of Open Source Software out there. It's increasingly hard to get distribution for that software. We like to think the cream rises but it's not always the case. There's a lot of challenges in how you make sure that "your favourite developers" engage in your Open Source ecosystem or community. That's "job zero" in Open Source before you get to worry about building a big business - along with managing product design, distribution issues, community management issues. There's a whole host of challenges.

Talking about Open Source founders Tom says, " They're either so talented, or the problem that they're addressing is so acute, and the solution is so socially transformative, that it ends up just being widely adopted. They attract other people to the software that they're building, to build something of real value to other engineers and developers and it gets adopted organically. The thing that's important is the software."

He sees much less shame, stigma, and fear about things not working out, or people not liking it in the Bay Area. "There's just this willingness to put oneself out there, to put one's product out there, to put one's ideas out there, it's a cultural phenomenon. People are very unabashed about who they are and what they do. In many ways, failure is rewarded, failure is celebrated, failure is a badge of honour. It's evidence that you tried, evidence that you put yourself out there. This idea of celebrating one's failures is pervasive. With a very high concentration of capital in the Bay Area, investors seek out the biggest returns. Many Bay Area investors are comfortable investing in Open Source companies because they've seen a lot of Open Source companies go out and make money. The majority of the world's largest Open Source companies are based here, founded here. That gives investors every confidence to invest in the next Open Source company. It wasn't always that way. It took time for that to happen. It took really big outcomes, really big wins, for people to get really excited about putting lots of money into Open Source."

He gives the example of GitHub, based around Open Source Software, and successful companies like Hashicorp, Mongo, and Elastic. There's a huge list of businesses that were founded there which raised money there and had big outcomes. investors have confidence to put more money into Open Source - they've made money in it already.

He says a good investor does more than provide capital. They work hard for their investments to give them the support, guidance, the direct interventions they need to scale quickly. Support around marketing and go to market, around community building, supporting a bottom up go to market. If you're building an enterprise software company, it's pretty much a given

that some substantial portion of the software you build will be Open Source. It has big benefits when it comes to scaling and distribution, to building a competitive moat and competitive advantage. The conversation over there has sort of evolved to beyond "is this an Open Source business" to "what variety of Open Source is it", "what is the licensing model, the packaging model". Today Open Source is an investment category in and of itself.

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2.4.1 Case Study: Percona

Peter Zaitsev,
Founder

Russian by birth, Peter moved in 2006 to the UK, via the US, deciding to set his business up in the UK as the environment was friendly to international immigrants, allowing them to set up a business and to do this quickly - more so than other countries that were immigrant-friendly. English language was an important factor in the decision. He had studied in Moscow to Masters level and then became involved in Linux and MYSQL. The work he did in the community allowed him to work remotely in MYSQL AB, and eventually move to the US before the UK. Remote working in Open Source Software is something that has allowed not only Peter but many of his staff who he has hired in an unlikely location due to their skill set.

Percona hires on skills not location, based on unique skill sets. He set up a business perhaps because he had a lack of skills as an employee - "if you tell me to sit I have to stand up".

There was a co-founder at Percona, Vadim Tkachenko who is CTO while Peter is CEO, which is unusual as they both come from a technical background. Peter was CEO for 16.5 years until recently and stepped aside to pursue his interests as an entrepreneur. After some soul searching he realised that he is better in 0-1, maybe he is "an adrenaline junky" and as the company grows "it starts to run you rather than you running it". There is inertia in a maturing business which a founder is not always good at shifting. People need a CEO of a larger company to be consistent for example, which is not him, but as a founder, this creativity is what he thinks made him good.

Company Growth without Investment
The company grew to turn over $50m per annum. Peter the state of the market and luck as being crucial elements. At the time he founded Percona, Open Source began to grow and the "cool kids" post the dot com crash were using it. These he views as an easy time for Open Source, being in the right place and time. But he acknowledged that they made some good decisions.

MYSQL AB had some old-fashioned-Swedish-Management-Style-type-processes and ethos, about making a difference. That was a big shock to someone coming from Russia where there is a "Big Boss" and you do what he says. In a true Open Source company the model is different, and people tend to follow an ethos where things are discussed and decisions are made in a more collaborative or collegiate way. Even Linus who called himself a "Benevolent Dictator" runs software where anyone can propose a commit.

Although Peter moved to the US, Percona did not take investment. He had absorbed a lot from MYSQL AB's mindset. The founders had built it to change the world, and to spread Open Source. This 'romantic' notion of Open Source influenced him, but it also exposed him to the impact of VCs where as the company took investment it had to please its investors and things in the company changed. Sales numbers understandably had to meet investor expectations. For Peter, he did not want to be in that position - he wanted to be independent and to be able to follow his own path, even if it is unconventional and to avoid the power struggle he might

have with an investor. He wanted to balance the "monetary and growth goals" with the "social or Open Source principle goals." The latter might not align with VC goals. It was also worth recognising that VCs are investing other people's money - such as a pension fund - and they need growth, so that mentality of growth first and foremost, is understandable. But not for Peter.

The US seems to be a better market for Open Source Software businesses to grow and it has a lot to do with marketing - the US really gets the idea of 'get rich quick.' In Europe, the mentality is to spend decades of hard work to build something. In the US the view is that in 3-5 years you can build something and create phenomenal personal wealth. A lot of people are addicted to this concept or idea. From this, you can see how the fastest growth would be in a culture that encourages that and the US is one of "the" places to be for that. You also hear that China is good for this too - although in a Western way we don't always think about that. The market is set up to support this mentality.

Relationship with Failure
Another key factor however is the relationship with "failure." If you raise the money and fail, that's something that just happens and it's not necessarily on you as a problem. The same investors might even invest in you again as you are seen to be on a learning process.

However, as we look at the economic shift in the last year, the start-up ecosystem in the UK is much better than it was when I lived there, when the fast-paced-start-up culture just wasn't there. Today it seems to be significantly more widespread.

> The people who made money invest in the next generation of start-ups. In the UK so many of the companies have been bought by large companies, whereas in the US right now, the investors are those who sold and there is a concentration of them in the Bay Area, and they invest in local companies.

We are seeing more companies across the US, not just the Bay Area companies receiving investment, partly because the overhead is so high there now.

Remote Working
Remote-based companies are more popular than ever and offer an opportunity for people to take remote working jobs. At Percona the UK is a prime source of remote working staff in Open Source due to the English language and the fact that it has a good education system. This is generally on the engineering side. The UK has the English language advantage. If selling in Europe you need a range of languages, whereas the UK-US connection is English-language, and the US is a more sales-focused culture. The UK is not so good at this, even as some of its neighbours in Europe with small Open Source companies. The UK companies tend to move or get sold and grow, whereas more of the European ones stay in that start-up mode and seem perhaps to be less ambitious, but a healthy small business ecosystem.

A new dimension, for the UK in particular, will be what happens with AI, where the UK has a strong positioning and we will see increasing Open Source opportunities.

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2.5 The UK Founders who Stayed and Grew with US Money

2.5.1 Case Study: Snyk

Guy Podjarny,
Founder

Guy is the founder of Snyk, a technology company with a Unicorn valuation, offering a Developer security platform. He was born and raised in Israel, became involved in cybersecurity in the Israeli army after which he went on to a development job in an application security company in Israel. This company was then acquired by a Canadian company, so Guy relocated to Canada. After this company was then acquired by IBM, he resigned and founded a company in the DevOps space which was sold to Akamai. He then became CTO of Akamai, and moved with the company to the UK in 2014. A year later, he left Akamai to found Snyk.

A Dispersed Skills-based Workforce

Snyk is a UK-headquartered company with over a thousand employees across the globe. It started with a presence in London and Tel Aviv, with teams scattered across these locations, and naturally expanded to the US. The US is Snyk's primary business centre today due to the number of employees there. They've made numerous acquisitions in Europe and the US East Coast, and have European branches in Switzerland, Sweden, and Romania as well as other global offices in Sydney, Singapore and Tokyo. The UK remains their primary location where the R&D executives are based.

> Like most Open Source businesses, the majority of Snyk employees work remotely with their offices being used as cultural or social centres. It offers a great deal of flexibility and doesn't hire people based on location, but rather finds individuals and ecosystems across locations that have particular skills or advantages for the company.

In the UK, for instance, there is much better knowledge around user experience, developer community and community leadership as well as monitoring product methodologies, whilst Zurich has strong ties to ETH university, which built an AI-based programme analysis engine offering AI and problem-analysis expertise.

Snyk built a product-led company, modelled on developer tooling companies. Snyk's initial product, which focused on Open Source security, is very successful; however, in the early days they were unsuccessful on the revenue generation front. Today, their platform builds on their Open Source security offering with further products focused on securing first party, container and infrastructure code as well as many other services in the broader platform.

Raising Outside of the UK

Initially, they raised a seed-round and then a seed-extension. After two years, generating revenue was tough, but they expanded their technology support, to understand and satisfy the needs of customer security teams so the curve started going up. From that point on, they started multiplying revenues by large amounts and growing the company as well as doubling down on employee hires which increased rapidly each year. Initial funding did not come from the UK as Guy was well connected to US investors who led the first seed round and he felt that UK investors seemed to be risk-averse.

After the company started growing they received the support of Accel in London which was the only UK-led funding round they had.

It would be unfair to say that there were challenges to raise in the UK - even though there was a clear reluctance to invest in the UK and the investors were too cautious even in the venture scene - as Snyk didn't make a great deal of effort to raise investment in the UK.

After four years, Guy brought in a CEO to allow him to focus his time on product vision. He sees a lack of experienced growth stage executives in the UK as one of the biggest challenges to grow and build here. As a result, he tapped into the US for those people and skills and relocated a few US-based people to the UK.

> Today, Guy sees a huge appetite for seed-stage investment and more high-risk investment in the UK, and believes that there is certainly no lack of funding. He sees UK tax incentives that are amazing and which help to secure the risk of investment[9]. For Guy, that came about 8 years later and Snyk's A-round funding onwards is still US-dominated, but perhaps would not have been if that was available when he had started.

The Benefits of Open Source

By supporting Open Source projects and making its product free for Open Source maintainers[10], Snyk effectively showcased its commitment to being a good Open Source community member. They help Open Source maintainers identify and fix vulnerabilities in their projects, creating a visible process through pull requests and emails. This approach and evangelism attracted developers to Snyk, who saw the secure practices implemented by Open Source projects.

> Open Source played several crucial roles in Snyk's success:
>
> 1. It served as a growth and distribution vehicle for the company, enabling the establishment of new best practices and adoption of Snyk's products at scale;
> 2. Snyk's initial offering focused on Open Source security, emphasising the importance of responsible Open Source usage within enterprises; and
> 3. By engaging with thriving developer communities centred around Open Source, Snyk adopted a positive brand image as a helpful and supportive member of the development ecosystem, encouraging more engagement with the company benefiting from its products.

9   https://www.gov.uk/guidance/venture-capital-schemes-tax-relief-for-investors
10   https://www.linuxfoundation.org/blog/open-source-maintainers-what-they-need-and-how-to-support-them

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2.5.2 Case Study: Weaveworks

Alexis Richardson,
CEO and Founder

Alexis is Founder and CEO of the cloud native app deployment company and creator of GitOps, Weaveworks, with its HQ in London. The company swapped from the UK to a Delaware corporation on taking VC investment, now totalling $50m.

A Journey to Open Source

Alexis' career started at Goldman Sachs as a derivatives trader, shifting to tech around 2001 as CEO of start-up, MetaLogic, building software to deliver front office applications for financial services and online gaming apps. Discovering Open Source through Finnish investors working with MySQL, he began to meet people working in Open Source in London. By 2004, it was clear that MetaLogic wouldn't succeed and he set up a new company, Cohesive, to focus on delivering Open Source software products and take advantage of its transparency to allow buyers to see what your product does and give rapid feedback, which promotes technical sales.

Back in 2004 people needed support for their growing use of Open Source. Alexis built a support business model for Cohesive but initially didn't get funding - at a similar time Red Hat was transitioning from being a Linux distribution to a support company, inventing the Subscription model for support. The economics of Open Source support are hard and it's only profitable at scale. Cohesive built one of the first curated Open Source stacks.

At Cohesive, Alexis founded RabbitMQ in 2007 after identifying a 'market gap' in open source messaging products. RabbitMQ was based on AMQP - a new protocol from JPMorgan to address this need. RabbitMQ isn't tied to a single language, meaning web apps developers using Ruby on Rails benefited from it equally as bankers building Java and .NET apps.

RabbitMQ customer adoption led Alexis to the US West Coast where he saw a different attitude - a sort of pioneering spirit plus pragmatism that worked really well for developing new software tools. He left Cohesive to focus full-time on RabbitMQ with Western European funding - it was almost impossible to get the US VCs to engage. Rabbit was acquired by VMWare in a middleware acquisition spree bringing Alexis into a division of VMware with a group of interested people, becoming the cloud application platform business unit - along with Redis, Spring and Tomcat - where they built Cloud Foundry. This rolled into the US company Pivotal spinning out of VMWare and EMC in 2013.

Deep Understanding of Open Source

Alexis left pivotal in 2014 founding Weaveworks using his experience of running several really major Open Source projects and commercialising them in different ways. Containers were new so Weaveworks offered management and monitoring services for Container Application users, building Open Source projects around that. Weaveworks quickly evolved into one of the first companies providing software for Kubernetes container management, and then invented GitOps to deploy Kubernetes applications.

Alexis got involved in setting up the Cloud Native Computing Foundation ("CNCF") and he co-wrote the original charter. While running Weaveworks as CEO he also served for 4 years as CNCF Technical Oversight Committee ("TOC") Chair; he was followed as TOC Chair by the UK's Liz Rice.

UK-Based International Open Source Company

Weaveworks is backed by international VC money. Alexis found this very different from previous initiatives, but Open Source projects find it difficult to scale a business without VC money. There are consequences of this and the business model turned out to be less straightforward than expected.

> As a UK Open Source company with a UK operating HQ and US registered entity, Weaveworks is often forgotten in the UK's internal fabric. Unlike traditional UK companies where MPs visit to ask them how they're doing, Alexis says "we're not considered British - despite Weaveworks in some ways having a bigger impact than these 'UK companies'." Like most Open Source businesses it's positioned for sales purposes, as an international company, with most of its customers being US and its team is international and distributed - hired on skills not location.

Positioning yourself as a British company could be a bad idea if you want to attract people from around the world. Weaveworks has 100 folks across Egypt, the Far East, Canada, America, Mexico, South America, lots in Europe, but of course lots in the UK. "Every single person I talk to uses Open Source, it's not something that is in question but how many of those users want help and support?"

There's been a shift in UK investors who are now much more experienced, due to a generation of entrepreneurial exits, people coming through the system as it were and he sees up to 30 or 40 decent VCs, who understand what's going on. That was not true in the past. They are willing to accept Open Source as part of a business model in a way that was tough to find 10 years ago. They understand this is an international space, they understand it's got complications and nuances.

Open Source is our Digital Infrastructure

> Infrastructure Tech is where you find Open Source companies at scale. Over time, fewer and fewer ad hoc people are involved in infrastructure because it becomes too difficult - like normal software delivery, like work. There's a "phasing": Phase One - very exciting, a new thing; Phase Two - not proven but starts to stabilise; and Phase three - non-exciting to the people who like new things but valuable to users with some value as a potential business. The challenges to make it sustainable are often answered by a vendor. Companies and people in the Infra space work on databases, message queues and in Weaveworks case a deployment orchestration engine (aka "gitops").

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As user adoption occurs, Open Source users have expectations of new features or security patches. If there's a security issue in a library the infrastructure tool uses, a single volunteer maintainer might not be able to meet user expectations. Open Source today tends to self-organise into two structures, communities or commercial Open Source organisations. Each manages this differently.

UK engineers are good at software infrastructure - middleware which the American companies make but it's not widely talked about or understood - the plumbing and plumbers' tools for digital. Look at the annual UK awards for start-ups in the UK, they don't even have a category for infrastructure technology and most good Open Source is infrastructure technology. The best UK Open Source companies today operate internationally with a foothold in the UK. The phenomenon of the founder moving to the US is a consistent pattern but Weaveworks worked as an anti-pattern and stayed. Contributors are global and there's a separate world of Open Source. What's challenging for the UK, is there aren't many examples of successful Open Source companies despite a lot of great engineers being UK-based, good at infrastructure and hired across international companies.

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2.5.3 Case Study: Budibase

bb budibase

Michael Shanks,
CEO & Co-Founder

Budibase, based in Belfast, Northern Ireland, aims to leverage Open Source Software to build, customise and deploy operational software at speed. It was founded in 2019 and through its solutions supports over 75,000 teams by creating a collaborative space to automate workflows and access data securely. Founder, Michael Shanks is an engineer by profession and the CEO & Co-Founder of Budibase. It has raised £10 million in funding from the US and set up a US company as the group parent to accept this funding.

Benefits and Adoption through an Open-first Approach

Budibase's low code software solutions help businesses build operational tools that streamline data and organise existing processes and workloads, for example Michael explains that one of its most common uses of Budibase web applications is replacing excel spreadsheets and truly leveraging the data stored in databases and spreadsheets. As he says, "our web app is an interface where users can interact with gathered data, secure the data and manage access." IT Teams use Budibase to create internal tools within a couple of hours as opposed to the usual monthly timelines.

The team took an open-first approach as Michael explains, "We built it entirely on Open Source Software, we distributed it as Open Source on an open core model." There were multiple benefits of doing so, the main one being distribution - even though they are based in Belfast, their solutions are accessible across the globe so anyone can consume it.
Michael emphasised another key benefit - community feedback - noting that community improvements and the overall engagement with the solutions was instrumental in the adoption and development of their tools. "We get a lot of good community contributions in terms of feedback and people working with us to solve issues in the early stages. This has helped us get in-the-door at some incredibly large companies. That would not happen if we were a proprietary product."

A key element is that an Open Source licence does not require permission from legal and procurement teams, making it easy to adopt and install Budibase's tools.

Combatting the Challenges of Open Source Software

Fundamentally, as Budibase is driven by Open Source Software, it is a free product, which poses its own unique challenges. As Michael says, "when giving away a free product, you have to provide genuine value". The value comes from both the free version and paid additional features when using an open core model. Walking the fine line of balancing free adoption and profitability can be tricky, as Michael feels the business model around it is the most challenging part of an Open Source business.
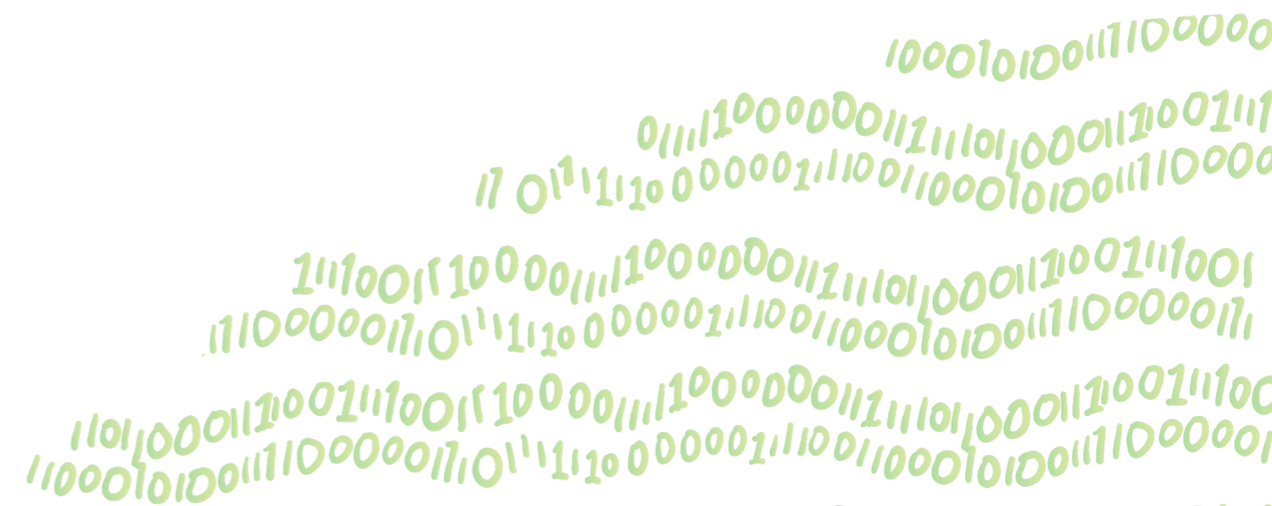
To combat this, their philosophy is to provide it as an Open Source solution, i.e. build and distribute it for free, allowing mass adoption and once that happens, they are able to deploy premium features. Michael sees this as a natural progression of giving value early on and creating the need for additional add on features, as he says, "the way these scale over time is hopefully very product-led and organic."

Representing Belfast

The ecosystem you operate in has a significant impact on scaling potential, and Budibase is proud to be based in its hometown of Belfast. With a team of 25 people, 18 are concentrated in Belfast while the others are sprinkled across Europe.

Many US companies are not able to leverage the benefits of being close to Europe - this proximity to Europe allows Budibase to dip into the European market and have stronger access to talent, resources and innovations. He believes that being closer to other European technical hubs and then being close to the US in regard to time zones in the UK, puts Budibase in a great position, "to take advantage of both Europe and the US. And that's probably one of the biggest strengths of being in the UK. Northern Ireland in particular has a great engineering ecosystem as a lot of large US companies are set up in Belfast, mainly due to the reasonable cost of living and breadth of technical and specifically engineering talent."

Although Belfast may not have the sparkle and shine of London, Michael truly sees it developing in the right direction and creating its own little world that can grow and develop into a supportive hub for tech start-ups.

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2.6 The UK Founder who Stayed and Sold to the US

2.6.1 Case Study: Jetstack

Matt Barker,
Global Head of Cloud Native Services,
Venaf and Co-founder Jetstack

Matt Barker co-founded Jetstack which is headquartered in London, in 2015. Jetstack is an established cloud native technology services company helping enterprises build platform infrastructure using Open Source Kubernetes software. It is probably best known for being behind Cert Manager[11], the de facto way of managing X.509 certificates in Kubernetes.

Ahead of the Game
Matt has been a loyal supporter of Open Source Software since the beginning of his professional career in Canonical and worked in this area long before its widespread popularity - he was keen to be a part of an industry he identified as "a growing future movement." He felt that the Open Source ecosystem was not merely about technical know-how, but more about a way of life that became, for him, a strong personal identifier.

He was certain that Open Source Software 'had the potential to do amazing things for businesses.'

A People-first Approach
Jetstack started with £1000 and a couple of engineers. By the time Jetstack was sold three years ago, there were around 30 permanent staff members and an additional number of contractors. Matt emphasised that the majority of the team is intact and is now integrating itself into the buyer, Venafi.

He strongly believes that "our people are our business model." Primarily because the company is based on Open Source solutions and relies on community contributions, creativity, innovation and flexibility to grow their offerings and team. Joining Venafi has meant they are able to share this expertise with a large, global customer base and also use their knowledge to help build out product features that benefit both proprietary on-premises, and Open Source, cloud environments.

Made in the UK

Almost a decade ago, primarily through his interactions with UK-based VCs, Matt felt that there was ample capital for tech investments in the UK, but there was a lack of knowledge regarding tech companies built and reliant on Open Source Software.

He notes, "I didn't feel that many people in the UK knew enough about Open Source so it was a risk for me to take money from one of these companies and be forced to change my overall organisational vision of creating value-add Open Source solutions. I couldn't find investors that really understood what I was doing."

What he could find in the UK however was top class talent, incredible inventors, innovators and adept technical engineers. The UK has a wider range of engineering talent and expertise than almost anywhere. "There is a good pool of engineers in the UK. Even if they don't know about the particular technology, they are adaptable and open minded enough that you can easily train them. Some of our best team members have been people who we've taken on as graduates or as interns and they have grown to be outstanding."

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Jetstack's goal was not solely to make a profit - it was to "start with a small team and work closely with customers to understand the challenges and problems around Kubernetes." This focus fits well in the UK with its longstanding focus on innovation, experimentation, technical curiosity, autonomy and freedom in open source - as Matt says, "that was our vibe."

One of the highlights of the Jetstack journey was the donation of the cert-manager project to the Cloud Native Compute Foundation. Cert-manager had reached thousands of stars on Github, and was being downloaded over a million times a day. This donation solidified the project at the heart of the ecosystem and was a worthy outcome of the work of the team.

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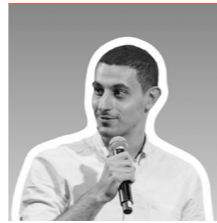"Show us the Money - The Economics of Open Source Software" 23

2.7 The Founder who Branched into the UK

2.7.1 Case Study: Unum
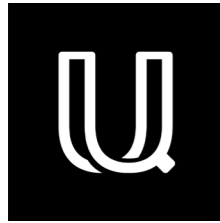
Ash Vardanian,
Founder

Unum, founded in 2015 and headquartered in Armenia, was the brainchild of an ambitious and driven technologist, Ashot Vardanian. This was not his first venture as Ash started coding at the young age of seven and prior to graduating from high school had created multiple success-ful applications. He self-funded Unum in his early twenties as he deeply believed in its poten-tial to scale and grow into a global organisation with future plans to move into the UK and US.

The Beginning: Ready, Steady, Go
Unum started as a 'deep-tech' research lab focused on designing next-generation AI infrastruc-ture.

While building Unum, Ash visited dozens of countries and conferences to establish connec-tions with labs and enterprises worldwide and link them with Armenia, where Unum is based today. His path towards modern AI was through infrastructure, as he says, "It's not just about building models, training them or new custom datasets - it's more about building the tools that everyone will need to essentially scale AI and data processing." With seven and half years in the making, today Unum is led by 13 engineers, representing some of the best talent of Arme-nia. Ash shares with us that it's only been six months since they prototyped the first technolo-gy - which follows an Open Core path.

An Open Core idea
Unum follows an open core business model as it has an Open Source version and a proprietary version, for every piece that they design. The core differentiating factor between them is effi-ciency. As Ash explains, "when you start processing data at a large scale, the cost of compute becomes very important. Start-ups don't understand this metric. They never face the prob-lems of scale. Things are different for the Enterprise customers, or the front-runners of the AI arms race, spending Billions on data centres. The proprietary version is meant for them."

Unum's innovation comes from years invested in theoretical Computer Science research and low-level engineering, allowing them to harness untapped hardware potential. This approach is manifested in UStore, USearch, UForm, and UCall, among other FOSS projects that Unum maintains. A database, a search engine, a family of pre-trained neural networks, and a remote procedure call library. As Ash says, "All of this makes up a data lake that we now integrate with enterprise customers worldwide. That will be the infrastructure driving the next decade of growth at extreme scale across both the private and public sector."

AI Explosion: Global Expansion
With the rebirth of AI and related technologies, Ash feels that it is time to go global.

"For our software to be used in every country, in every business, we need to be present in two locations, Palo Alto and London." He highlights some of the benefits of being placed in London, citing connectivity as one of the main drivers. He says, "we want to be in a place where we have international airports with regular flights to every major part of the globe."

Unum is not an AI company that builds AI models, and is more focused on infrastructure for databases search, data management, pre-training and runtimes - meaning that they have a global, limitless customers base, that is not limited by size of organisations. They mostly sell to big tech companies and need to be able to fly to any part of the globe on any day. Aside from connectivity, he feels that the talent pool both in California and London is invaluable and hosts some of the best brains in the business. He believes London is "probably the best in Europe," but would benefit further from opening its borders to global talent and making the process of working in the UK as a non-national simpler and more straightforward. As he says, "I look at every country, no matter where I travel, people are the main equity, the main value. London is a huge selling point for me."

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2.8 The UK Founder Finding their First Money

2.8.1 Case Study: Syntasso

Paula Kennedy,
Co-Founder & Chief Operating Officer

Founded in 2021 by a group of experienced and passionate industry experts with a breadth of Open Source knowledge, Syntasso is London based. Paula proudly explains, "A lot of the founding team at Syntasso were the same folks that founded CloudCredo in 2012. We've all been through the Pivotal journey and the VMware journey and have all happily hopped back into launching another startup." The founding team left VMware in January 2021, self funded and founded Syntasso, with the combined goal of helping platform teams thrive and build platforms to better serve application developers. Syntasso's current offering, Kratix, is an Open Source framework available on Github that makes it easy for platform teams to build better platforms.

Currently all their software is Open Source and free to use. But as they grow, they recognise that their go to market product will need to have subscription-based enterprise version, so they can leverage two streams of revenue, subscription and marketplace, where their software will provide integration to lots of other vendors' software – "we've already got 25 to 30 'promises' available, these are an abstraction offering capabilities as a service. These promises offer Open Source Software but in the future, we may offer paid for promises and so we'll get revenue that way. The other way is through our customers and potentially charging customers an annual subscription for an enterprise version of the Open Source product or offering paid for support."

Syntasso: Starting up Local
Syntasso operates a hybrid working model headquartered in London with their small yet strong team of eight people based in and around London. The Open Source model and offerings allows them to broaden their target market to anyone who "uses Kubernetes and has multiple application teams with a platform team that's trying to serve them. So it's potentially massive." They are at the beginning of their journey and driven by Open Source products and able to experiment and not restrict themselves to one type of customer, a flexibility gained by the sheer nature of their Open Source solution.

With ample US experience (from their time at Pivotal and VMware), they are excited to be based in the UK with both its challenges and benefits. The UK is different to the US in that it is more risk-averse - but they are happy to be UK focused for two reasons:

1. Their investors are UK based and can leverage their multiple connections and networks; and
2. The level of skills available in the tech sector in the UK is invaluable.

Paula says, "The fund we're hoping to go with for our seed is European based, and they have connections everywhere. In terms of hiring, I think we're lucky because we've got this amazing network of people that we've worked with in the past. There's a lot of talent available to hire, hiring is going to be relatively straightforward because we know some very good people. I'm not at all worried about any skills shortage in the UK, I think we're going to be absolutely fine."

Looking to the future: Syntasso is heavily involved in Open Source and they are strong supporters of the Cloud Native Compute Foundation (CNCF). Kratix itself is not yet in CNCF, as it is still growing and iterating on the code but they see themselves donating Kratix to the CNCF in the future, which is why it has been given a separate title.

This would allow them to "gather contributions from the community. "There are challenges around it, like herding cats and trying to get people aligned, but the community contributions and working with a huge diverse pool of people outweighs the complications of trying to get alignment. It's worth it - dealing with that wider community to be able to come up with something that can serve people better."

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2.9 The Bay Area Repeat Founder

2.9.1. Case Study: Docker and Dagger

Solomon Hykes,
Founder

Solomon is best known as the founder of the Open Source Container company, Docker. Solomon relocated from France to the Bay Area 12 years ago to grow his start-up - initially founded in France with a school friend - Docker, which was first called dotCloud. Docker is an Open Source platform that automates the deployment, scaling, and management of applications inside containers. It's a revolutionary technology that makes it easier for developers to create, deploy, and run applications anywhere, on any device. He recently founded a further Open Source start-up, Dagger.

During the early years, Solomon and his friend were trying to fund their R&D work on the dotCloud product through consulting; however, this was time consuming and as his partner was not interested in pursuing the tech path, Solomon moved to the US with one of Docker's previous employees who later became the company's official co-founder and together they spent a few years iterating on this product. He left in 2018 to take a break.

Open Source start-up, Dagger was founded in 2019. Solomon's experience working in different industries as a software engineer helped him learn a lot and to connect the dots across different silos in tech, and in turn to build a better understanding of Open Source Software and the software products needed in the ecosystem.

Finding Investors as a Beginner: Docker

Fundraising for a tech start-up can be a daunting task, especially for beginners in the industry. When starting Docker, Solomon and his co-founders were complete outsiders with no connections or prior experience. This made it incredibly difficult to raise funds as they were unfamiliar with the process and lacked the necessary network. Their initial experience with fundraising was through a traditional small business incubator in France.

Everything changed when they joined Y Combinator, a renowned start-up accelerator in the Bay Area. Y Combinator was interested in the team's technical expertise and ability to adapt and iterate quickly and Solomon relocated to the US to follow this opportunity. They invested small amounts of money in the team's potential, even though the founders did not have a well-formed business plan or a clear idea of what they wanted to build. Through Y Combinator, the founders gained valuable insights and learned the importance of focusing on solving a specific problem for users. This led to the development of their fundamental ground-breaking technology, "Containers".

Containers are isolated units of software that can run on any machine, without any dependencies or conflicts. This makes it easier to build, test, and deploy applications in different environments, such as any local machine, on a test server, or in a production environment. Although they initially felt that their technology had broader applications, they realised the need to pace themselves and build momentum.

With the support of Y Combinator and the Bay Area ecosystem, they followed the traditional start-up model, raising a seed round and later a Series A round. They faced challenges along the way, including the realisation that their initial business model was not viable.

They pivoted to focus on Docker, a Container platform that allowed developers to deploy applications easily. Despite the challenges, the founders successfully raised enough funds to sustain their growth and make the necessary changes to their business model which at the time was called PaaS (platform-as-a-service) and then transformed into a pure software.

Financial Challenges in Scaling an Open Source Start-up

After the successful launch of Docker, its exponential adoption and viral spread led to significant excitement and growth.

This enabled the company to raise a substantial amount of money - $300m. Solomon says, however, that they failed to exercise discipline. While they initially had a sustainable platform-as-a-service business model, their mismanagement and lack of discipline pushed them to the brink of failure. Despite this, the company survived and refocused on its core mission and products. While there was an asset sale of commercial products, Docker remained independent and continues to thrive by providing a paid version of its core product, the Docker platform.

Expensive lessons were learned, but the company managed to find its footing again and Solomon left the business.

Dagger - the Next Steps

Solomon's next start-up, Dagger, founded in 2019, experienced relative ease in raising funds due to Solomon's track record with Docker. Dagger is an Open Source programmable Continuous Integration/ Continuous Deployment ("CI/CD") engine that runs pipelines in containers and allows CI/CD pipelines to be developed as code, in the same programming language as any given application.

They participated in Y Combinator; however, this time was a special case as Solomon's previous experience made him into a visiting partner at Y Combinator giving advice. He then transitioned to becoming a co-founder with two of the attendees. In 2021, Dagger secured a $7 million seed round led by New Wave Venture, a European fund. They later raised a Series A round in early 2022, led by Red Point.

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Dagger maintains a focus on financial discipline and capital efficiency, aligning with this approach since the beginning. While Solomon acknowledges the UK as a leader in investment, he sees the European investment scene as a whole, with regional leaders such as Paris, and London emerging in the UK. Solomon mentioned that there is significant growth and improvement in the European investment ecosystem compared to his early experiences in 2010. He considers what has changed and responds, "It seems to me that the ecosystem has matured. There is more money available; more appetite for risk, for example by investing in younger, less proven teams; more opportunities for infrastructure and developer tools ventures to get funding; and more successful founders and engineers reinvesting their money and experience into the ecosystem, for the next generation of startups to benefit from."

Difficulties of Growing an Open Source Business

Creating a successful Open Source business and product is a complex task that lacks a definitive playbook. Despite numerous opinions and case studies, there is still a need to make the process more systematic. Many people draw incorrect lessons from the success of free Open Source offerings like Docker, assuming that growth comes at the expense of monetisation. In Docker's case, there were ample opportunities for monetisation within the ecosystem. Big Tech have skillfully leveraged Docker's platform to generate significant revenue. The key lies in executing and building valuable products around Open Source technology.

"For you to have the big outcomes, you have to have paid losses. There's this idea about the distribution of returns and venture capital, which just doesn't follow a standard bell curve. Your average venture funds just don't, there are a handful of returns. And everything else is sort of meaningless. Everything else kind of comes out in the wash. Like if you were in a business that exists for $10 billion, then you can suffer 10 companies losing $5 million piece, right. And that, again, from an investment point, that's really pervasive - no one out here is worried about downside protection or saving your money, worried about can this be genuinely big? Can this really scale? Again, that is inherent."
Tom Drummond, Founder and Managing Partner, Heavybit

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2.10 Thought Leadership: Entrepreneur in Residence's Conclusions

Venafi
Jetstack Consult

Matt Barker,
Global Head of Cloud Native Services,
Venafi / Co-founder Jetstack and
OpenUK Entrepreneur in Residence

What do the Case Studies Show?

In the past businesses have gone to the US. As I sit here a couple of days past Independence day and reflect on what makes Brits different from Americans, I am reminded of a recent conversation in which I was told:

"Americans were willing to get on a boat with no idea of where they were going, to build a dream of a better life. All differences in culture and approach pretty much stem from there on out."

As I read the case studies of Open Source businesses that have grown and succeeded in the UK, I am struck by just how reliant we still are on our American cousins. But why?

Having been plugged into the Open Source Software market in the UK for going-on 20 years now, it never fails to amaze me how often I'm introduced to someone through friendship circles in the UK who says 'oh I'm behind that project.' When I look up who they are and what they do, I realise they live and work from a house in the middle of nowhere in the UK, and are essentially responsible for making large parts of the internet work.

So we're certainly not short of ambitious, innovative Open Source Software engineers.

In my role, I also hear from many foreign-born entrepreneurs that the UK is a great place to do business. It's easy to set up a company, it has a strong legal framework, it has generous tax breaks for innovation, and it has a world-class education system.

So it's not that either.

It's not like we don't have people to sell to either. We have a strong economy, we're the proud owners of a global financial hub, and we are home to plenty of international business we can sell to.

So if it's not that, then what is it?

"For you to have the big outcomes, you have to have paid losse
"Failing fast and failing early is an important philosophy. There's no stigma for me with failure. If anything that's like, this is a hardened entrepreneur. This is someone who's been through the wringer. I don't know if that's true in the UK. There is that cultural, societal element of shame, or this guy's no good, because the last one didn't work out." Tom Drummond, Founder and Managing Partner, Heavybit

My personal view says it comes down to the way we think. It's no doubt that in the past we've been able to think big. Castles, bridges, ships, even empires. But is that still the case?

In speaking to many people trying to build companies in the UK, they are frustrated. They are frustrated that we don't have the ability to do that any more. We're unable to take big financial bets on the opportunities we believe in. We haven't learned how to scale on a global stage. We're less likely to swallow our fears and push past that next stage to take the chance to reach the top, rather than check out and buy that property we've been refreshing on Zoopla.

And for these reasons, we're still reliant on America. They give us a sense of what's possible, the money to unlock that, and a confidence we don't seem to want to give ourselves.

But it's not just one way traffic.

Brits are still innovating, building, and exploring. But they're maybe doing it for slightly different reasons. Where Americans are doing it to be a huge commercial success, and take the number one spot, Brits are doing it to scratch an itch, prove a point, or simply to satisfy themselves 'it is possible'. Fortunately, this is still where a lot of big technological breakthroughs are coming from, and currently in the hands of the people who I meet living quiet lives running huge, successful projects.

But from my experience, a lot of this ends up being to the benefit of the Americans.

Brits know how to create cutting edge Open Source Software, but Americans know how to grow and commercialise it.

Fortunately we're learning, and where 10 years ago it was second-hand from the likes of Elastic, Confluent, MongoDB, it's gotten a bit closer to home thanks to the success of Snyk, Revolut, Babylon, Hopin and others. It was only a few years ago I was struggling to find people in the UK with any first hand experience of productising and commercialising software at a large scale, but as we continue to evolve, I'm growing more certain in the ability to find those people now we've created a few home runs of our own.

As a dual British and American citizen, I like to think of myself as being able to see both of our respective strengths a little bit more clearly.

In many ways I think the UK Open Source Software market would benefit from starting to embrace our American sides a little more in order to help us grow and succeed. These case studies give me more confidence that we're reaching a place where that's possible.

So let's think a little bigger, push a little further, bet a little bigger - and that's going to help us in the long run, even if we do still need to rely a little bit on the 'special relationship'.

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PART THREE: THE UPDATED UK FIGURES

3.1 2023 State of Open Survey

A proximity survey distributed in June 2023 collected 339 responses, out of which 244 were participants from across the UK, representing all sectors of the economy. Unsurprisingly, the bulk of the responses came from the technology and communications industry (39.4%), followed by professionals in scientific and consulting roles (17%), and education (5.4%). The extensive questionnaire covered topics such as engagement with technology, investment in Open Source Software and costs, Open Source Programme Offices ("OSPO"s), security, skills, engagement with AI, Sustainability, and more, to present the emerging trends in the UK use of Open Source. For the analysis we are limited to the 244 valid responses. The survey shows that UK organisations of all ages have been engaging with Open Source Software, from more established companies, to start-ups.
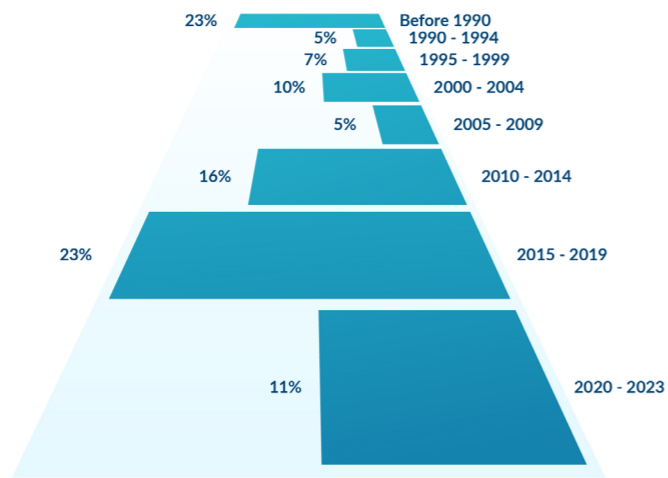
Year business was established

Figure 1. Year business was established
Source: Q7 OpenUK State of Open Survey 2023

Although organisations of all sizes make use of Open Source Software, it is predominantly small organisations with fewer than 50 people (39%) and large organisations (34%) with a strong use. This echoes findings of the previous OpenUK surveys, and highlights how important Open Source Software is to both small and large businesses. Overall, more than half the response come from small and medium size enterprises up to 250 employees.
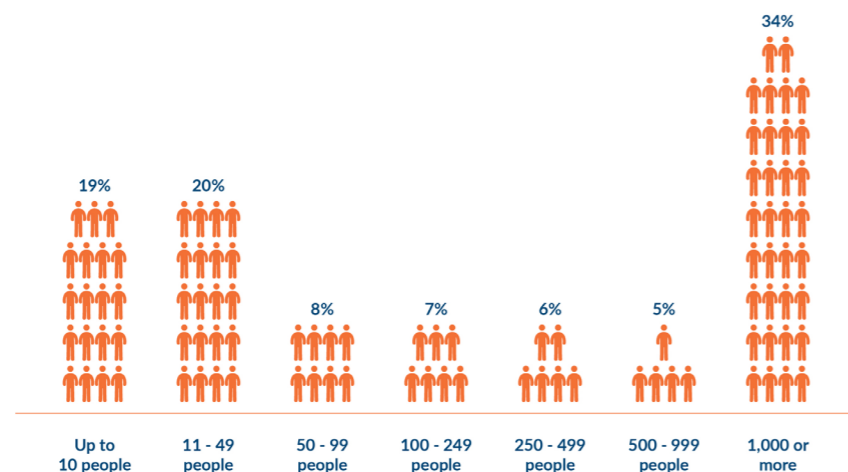
Number of employees

Figure 2. Number of employees
Source: Q8 OpenUK State of Open Survey 2023

Only 6% of respondents replied that they do not use Open Source Software, whereas most (32%) organisations have been using Open Source Software for 4 to 10 years, with a significant portion (22%) using it for more than 15 years. This could imply how deeply rooted Open Source Software is in the UK market.

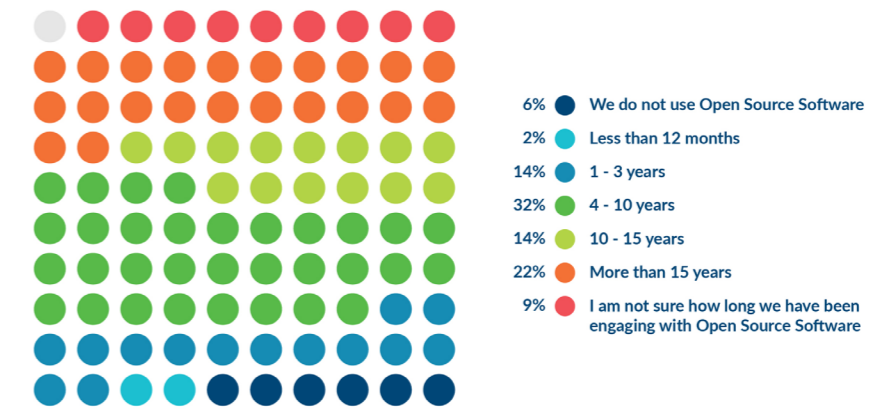### How long has your organisation been using Open Source Software

Figure 3. How long has your organisation been using Open Source Software?
Source: Q10 OpenUK State of Open Survey 2023

There are several types of Open Source Software technology and tools in use. The most common types of technology used have broadly remained unchanged compared with the findings of previous OpenUK surveys. About two-thirds of the respondents (68%) use container or cloud native technology, such as Docker, Kubernetes or Cilium. This is followed by databases (65%) like MySQL or Cassandra and software tools such as Snort, Notary and Trivy (65%). Operating systems like Linux and Android are used by 64% of respondents.

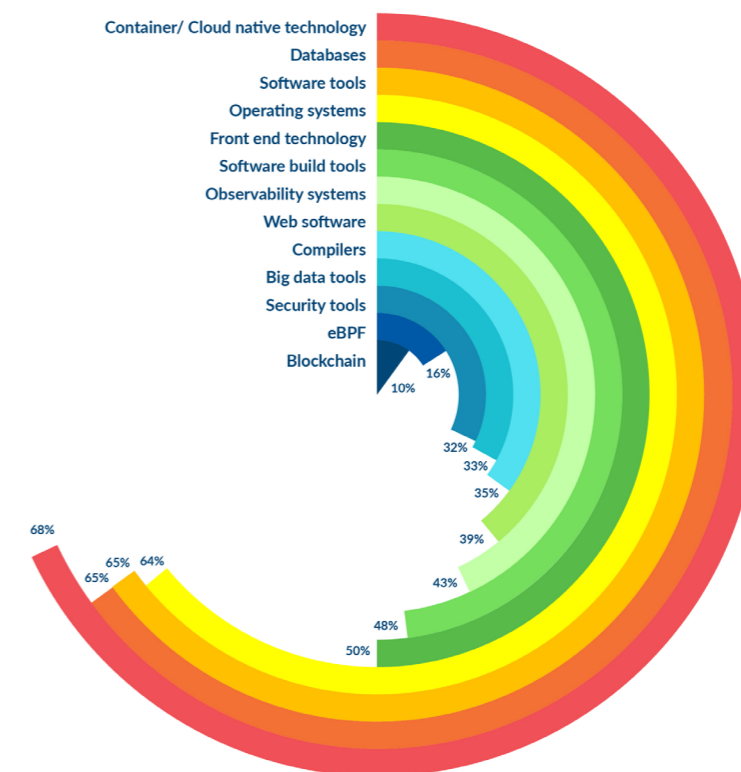### Types of technology use for Open Source Software

Figure 4. Types of technology use for Open Source Software
Source: Q11 OpenUK State of Open Survey 2023

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Sharing code is an essential part of Open Source Software. This not only improves innovation but this also shares learning. 81% of respondents answered that they make their code publicly available. The most likely place to find code is GitHub.com, with 69% of the total sample using it as a repository (84% of those who share code).

Where do you make your code publicly available - Total sample
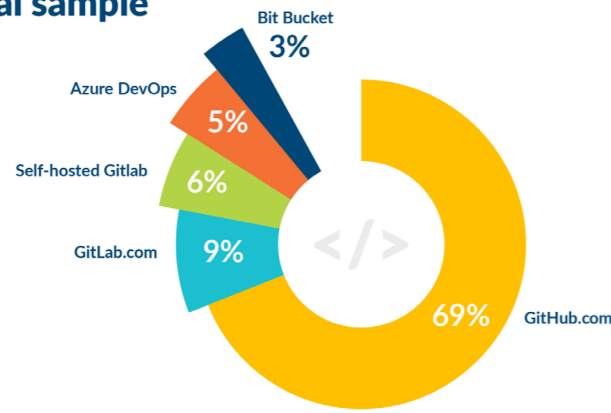

Figure 5. Where do you make your code publicly available - total sample
Source: Q12 OpenUK State of Open Survey 2023

Compared with the findings of the OpenUK survey in 2022, governance has somewhat improved. In 2022, only 11% of those consuming and contributing to Open Source Software reported that they had an OSPO, while this year 23% reported that they have an OSPO or a unit responsible for creating policies, processes and guidelines for Open Source Software and community engagement.

This increase could be due to the different composition of the sample, but it could equally represent more awareness of Open Source governance. Only 8% of those who do not currently have an OSPO or a similar unit intend to create one in future.

Having OSPO or similar for policies, processes, guidelines

Figure 6. Having OSPO or similar for policies, processes, guidelines
Source: Q17 OpenUK State of Open Survey 2023

The importance of learning from others, working together and strengthening the Open Source community are reported as the top benefits for those involved in Open Source Software. These non-financial benefits highlight the deeply-rooted belief in the social value of Open Source Software, across all organisations regardless of size.

Nine out of ten (91%) of organisations in the Open Source Software space collaborate with others across the entire spectrum of the economy, such as the private sector, public sector, non-profit enterprises, academia and volunteers.

Collaboration is first equal as a benefit, with the value of community contributions close behind.

This is followed in fourth place by saving on the costs of licence fees, a shift from cost savings being the top benefit reported in both the 2021 and 2022 OpenUK survey, despite the economic downturn.

Due to the dynamic nature of Open Source Software, costs - relating specifically to the 'Curation of Open Source'[13] - evidenced as the cost of maintenance and security, remain, just like last year, the main challenge reported by respondents.

Maintenance concerns is the second most important challenge for respondents, followed by security concerns - both fundamental to the good curation of Open Source Software.

Top benefits and challenges
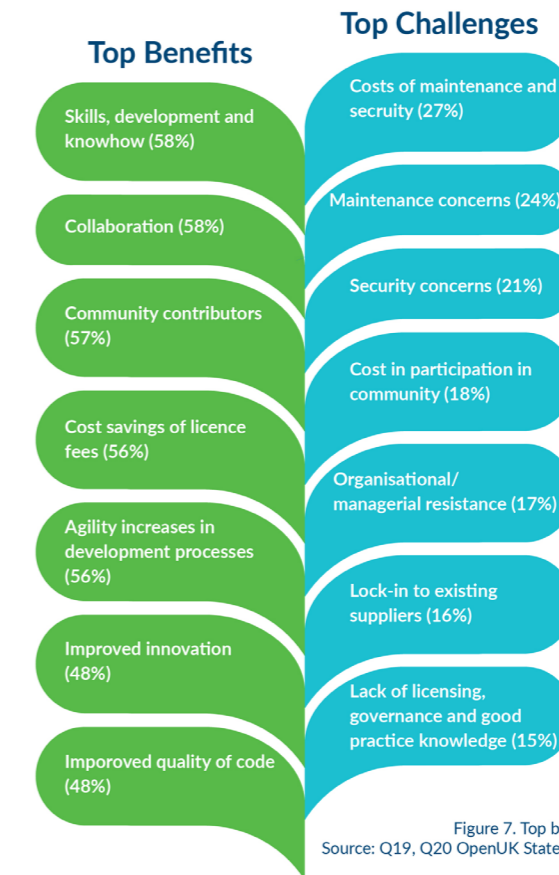
Figure 7. Top benefits and challenges
Source: Q19, Q20 OpenUK State of Open Survey 2023

The ranking of challenges this year is very similar to that of the OpenUK 2022 Survey, with the difference that this year lock-in to existing suppliers is also reported as a key issue. This is perhaps reflective of the economic downturn or a growing understanding that simply using Open Source Software does not of itself add the value expected.

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12   OpenUK, State of Open: The UK in 2022 Phase One. July 2022
https://openuk.uk/wp-content/uploads/2022/10/OpenUK-report_phase-03_FINALMASTER_V6.pdf

13   See State of Open: The UK In 2022 for a fuller explanation of this by Eric Brewer, https://openuk.uk/stateofopen/

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Curation is in fact achieved through the good technical hygiene and governance practices that unlock the true potential and values of Open Source Software - through skills development, collaboration, and community contributions that sit alongside the reassurance that documentation, plans for maintenance and security management bring.

These elements added to the legal definition of code being publicly shared on an Open Source Initiative ("OSI") approved licence, collectively form the true basis of what Open Source Software is. In fact, there is a need to curate Open Source Software through use of open development, community, collaboration, contribution, etc to unlock its values and achieve the avoidance of lock-in.

The survey included a qualitative comparison between the trade-off of challenges and benefits, inspired by research by the Linux Foundation.   There is a recognition that code being shared on a royalty free licence does not create software without cost as cost is effectively incurred in meeting the requirements of end user curation - making the code usage fit the environment in which it is being used and ensuring that it complies with any legal and regulatory requirements to make the selected code fit for the purpose that the user has selected to use it in. This is a cost and risk that sits firmly with the code user.

This approach to risk and liability, aligns well with the UK's principles-based approach to regulation. Borne by the end user, the risk and any associated costs may be managed in-house by the user or through contractual arrangements with experts. Whilst risk may shift with a monetary exchange, liability may of course legally remain with the end user.

An impressive 82% of the respondents believe that benefits exceed costs, despite the fact that specific costs have been reported as significant concerns. This is also confirmed quantitatively in the next section, where we examine the costs vs revenue generated by Open Source Software.
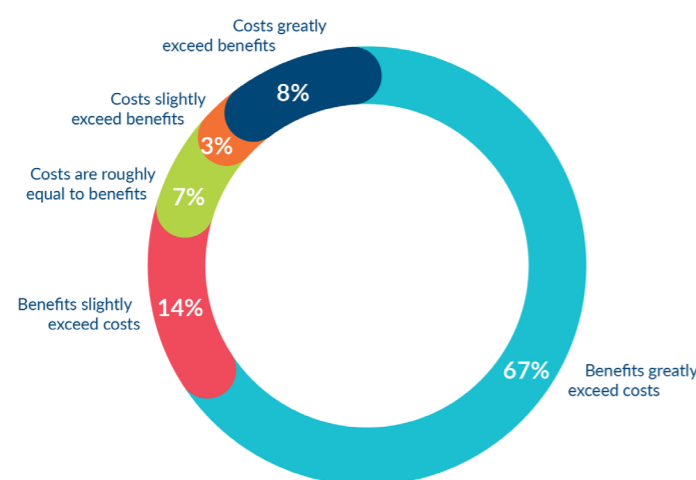
Relationship between benefits and costs

Figure 8. Relationship between benefits and costs
Source: Q21 OpenUK State of Open Survey 2023

3.2 Background to our Economic Thinking

3.2.1 Three Years of Pioneering

Over the last three years, OpenUK has been a pioneering force in trying to give an answer to one of the most important questions about Open Source Software: how much is it worth?

This may sound like a naive question to those unfamiliar with the complexities of measuring intangible assets without traditional economic ownership, more akin to digital public goods. For some, this is exactly the question that matters. Without an economic value, how can a business distributing key assets as Open Source Software identify its own worth or an investor understand the risk and value of an investment to that business?

Economic value is for many the quintessential component of the contribution of a business.

Acknowledging these varied opinions, OpenUK embarked on a journey in 2021. The first step was to understand how the value of Open Source Software can be defined. We found that its power lies in the Open Source community - a collaborative space of shared learning and skill development, with a strong cooperation ethic and a clear sense of responsibility. For investors and policy makers though, much more than this is needed.

We moved forward by examining the different ways other organisations across the world measure the contribution and value of Open Source Software.

3.2.2.Contribution of Code

Some of these efforts focussed on the contribution of lines of code and the numbers of projects, employing techniques such as COCOMO 2 to map costs of production of Open Source Software. [15]

This could assume that all lines of code are created equal (the contribution), which in practice may vastly overestimate the true value added of each line of code, especially as both coders and the technology used become more efficient, and consequently more laconic with their code. The same applies to using the number of projects, as they have varying impact.

The more typical macroeconomic approach would be an accessible way to calculate the value of Open Source Software, if it were not for significant data gaps. As we tried to replicate findings of the European Commission Study for the UK published in 2021,[16] it became evident that it is not possible to get accurate and rigorous data about the number of Open Source Software developers, their wages and overall contributions, as this data is not always publicly available without lags or compatibility.

This is a significant obstacle in the creation of a meaningful data time series that would allow researchers, policy makers and businesses to understand the progress of Open Source Software as a separate business sector.

14   Measuring the Economic Value of Open Source, Linux Foundation, March 2023
          https://project.linuxfoundation.org/hubfs/LF%20Research/Measuring%20the%20Economic%20Value%20of%20Open%20
Source%20-%20Report.pdf?hsLang=en

15   European Commission Study about the impact of open source software and hardware on technological independence, competitiveness and innovation in the EU economy https://digital-strategy.ec.europa.eu/en/library/study-about-impact-open-source-software-and-hardware-technological-independence-competitiveness-and, 6 Sepetmber, 2021.
16   Ibid.

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3.2.3 Beyond Macroeconomic Perspectives

Many researchers have approached the topic of the value of the Open Source Software economy from a macroeconomic perspective[17], deploying more traditional economic methods, such as looking at the contribution of employees in the Open Source Software sector to the economy, and adjusting for the population of a country.

We were not deterred by these challenges. We tested the latter approach, making assumptions about the number of Open Source Software professionals in the UK and their wages based on projections and evidence from different sources, and provided tentatively an estimate of the value of Open Source Software in the UK.

Not being satisfied with this, we tried to update it as more reliable data became available, but we were still far from perfection. Yet, by testing different assumptions we obtained different estimates of similar magnitude for 2019 and 2020, which confirmed that overall we are on the right track.

What is encouraging, is that anecdotal evidence seems to confirm the growth picture we have been quietly observing over the last few years in the UK.

As a result, since 2021, OpenUK has been providing estimates about the possible value of Open Source Software to the UK, with the largest obstacle being the lack of compatible and comparable data.

2022 was a profoundly transformative year for the UK and the tech industry overall. Due to the data we were able to collect that year, we provided the first range estimate of investment in Open Source Software in the UK (£4.87 billion to £5.65 billion).

9 Key facts from State of Open: The UK 2022

£4.87 - £6.65bn — 1. UK spends £4.87 - £5.65bn on Open Source Software

11.9m — 2. 11.9m Open Source Software Package downloads in UK 1st half of 2022

78% — 3. 78% believe Open Source Software not a greater security risk than proprietary

100% — 4. 100% of organisations <3 years old use Open Source

41% — 5. 41% of companies collaborate with competitors in Open Source (co-opetition)

27% — 6. 27% of UK organisations contributed to Open Source >10 years

Top 3 Benefits — 7. Cost Saving Collaboration Community

Top 3 Challenges — 8. Cost of Maintenance & Security Participation Cost Lack of Coding Technical Knowledge

Top 3 Roles Being Recruited — 9. Back End Dev Cloud Engineers Agile Software Dev Leads

Figure 10. 9 Key facts from State of Open: The UK 2022
Source: State of Open: The UK in 2022

Investment is frequently the vehicle that enables companies to start-up, move to scale-up and become established businesses, even Unicorns. Further, investment is an essential metric of the potential of an industry, the more investment there is, the more it has the potential to attract.

Given the interest this approach has attracted, this year the same iterative approach is being used, by collecting the same type of data with the 2023 OpenUK survey.

As previously, there is an estimate of the time spent on Open Source Software (for the time use component) by organisation size and contribution, and the amount of investment by organisations (for the capital input).

This method is largely consistent with the way software investment is estimated internationally.[18] The ambition is that as better quality data becomes available over time, we will be able to provide more accurate estimates to inform discussions on Open Source Software business strategy and investment to emphasise its importance.

In addition, this year's survey includes questions about the cost aspect of Open Source Software, investment intentions along with the annual questions on technology use, challenges, opportunities and the benefits an organisation can get from Open Source Software.

9 Key facts from State of Open: The UK 2021

£43.15bn — 1. Using EC Report methodology open source contributes £43.15bn pa GDP

5th — 2. UK is 5th for global open source contribution

89% — 3. 89% UK companies run open source software

69% — 4. 69% UK SME's contribute to open source software

72% — 5. 72% UK companies see collaboration benefit of open source

51% — 6. 51% UK companies look for open source skills in hiring

58% — 7. 58% of companies have open source governance and a security policy

£46.5bn — 8. £43.15bn estimated value to UK business in 2020

9. Open Source contributing to environmental sustainability in UK
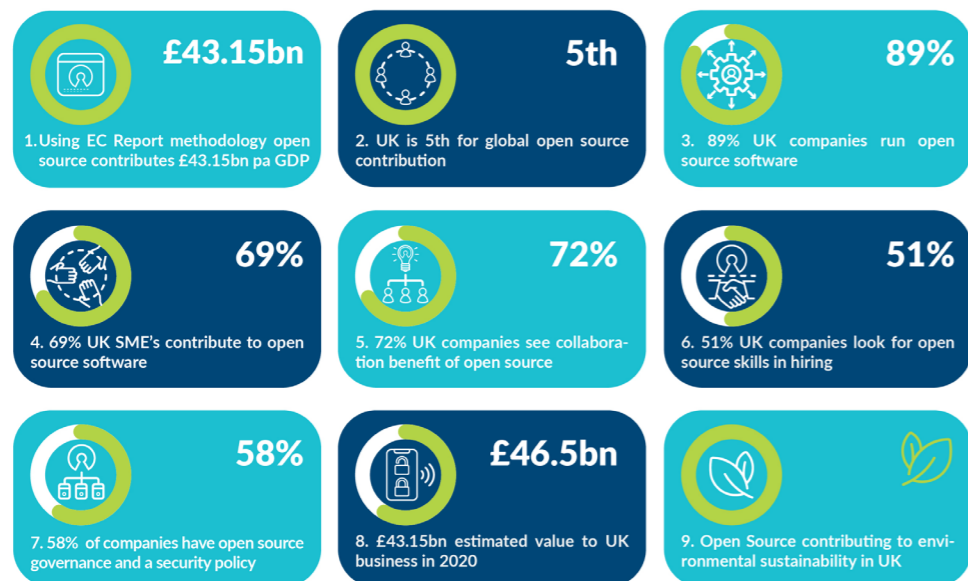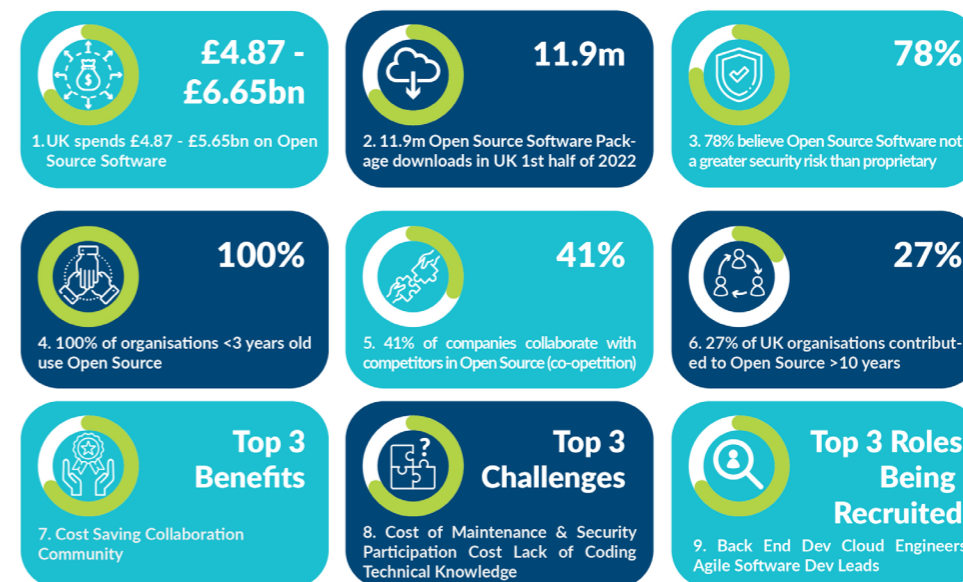
Figure 9. 9 Key facts from State of Open: The UK 2021
Source: State of Open: The UK in 2021

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17   See The State of Open: The UK 2021 for a discussion of more traditional macro economic approaches to valuing technology.

18   https://one.oecd.org/document/DSTI/CDEP/MADE(2016)5/en/pdf

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Our findings echo the reported benefits of Open Source Software's value for users published earlier this year by the Linux Foundation.[19] That attempted to measure the value of Open Source, by looking at the comparative benefit users get. Further, we also asked about engagement with governance structures and AI. This Phase Two Report presents a summary of these findings, in Part 1, with Part 2 including those on AI.

Investment depends on the overall market conditions in an economy, and often it is external factors that influence it, perhaps even more than the measurable performance of a business. The last two years have been quite turbulent for markets, and the UK has been one of the large advanced economies that have not returned to pre-Covid growth levels.

3.2.4 2022 was a Difficult Year for the UK

2022 was a taxing year overall, with low demand, increasing interest rates making borrowing more costly, high energy prices, supply chain challenges and a major shock to the economy in September 2022 due to the mini budget. These factors have increased uncertainty in the market, and unfortunately Open Source Software businesses were also affected by mass lay-offs in the technology sector from late 2022 onward.

In the UK, the technology sector barely grew (0.1% growth rate)[20], albeit starting from a higher base, as 2021 was a boom year with the massive shift to digital activities (when the growth rate was around 12%). This narrative is confirmed by our estimate for investment in Open Source Software, which is noticeably lower than 12 months ago, when we published our investment estimate for 2021. What is encouraging though, is that investment in Open Source Software remained somewhat resilient, by staying not too far from the lower end of the 2021 estimate. The total investment by enterprises in Open Source Software in the UK in 2022 was up to £3.63 billion, which is surprisingly not too far from the lower end of our 2021 estimate. To put this in an international context, the 'Open Source Software Economy', based on our sample findings, is equivalent to the U.S. Energy Department spend on carbon removal[21] in 2022.

It is worth noting that there are two more effects at play that could reduce investment in Open Source Software:

1. Possible increased reliance on voluntary labour and non-transactional support from the Open Source community, due to reductions in funds to purchase services from enterprises. In 2023, for the first time we collected data on unemployment from our survey respondents, including the impact this had on contribution, beginning the process of review as to whether an economic downturn boosts Open Source but whether it's partially due to increased availability of unemployed contributors;[22] and
2. Technological change, and specifically two aspects of this:
   a. Costs of technological goods fall over time (making investment cheaper when it is not in the latest technology available); and
   b. The large-scale deployment of affordable, accessible AI technologies that replace human effort, especially in routine, data-intensive tasks, including coding.

Has your contribution to Open Source Software increased since becoming unemployed?

Yes **41%** No **15%** Not contributing in a personal capacity **44%**

Figure 11. Has your contribution to Open Source Software increased since becoming unemployed?
Source: OpenUK State of Open Survey 2023

According to survey responses however, it is likely that conditions specifically for the growth of Open Source Software will improve, as:
- 47% of respondents anticipate their investment to stay the same in the coming 12 months as in the previous 12 months;
- 44% of respondents will increase investment in it in the coming 12 months compared to the past ones; and
- 2% responded that they intend to decrease investment.

The magnitude of this for the future of the sector can be explained - if those who intend to increase their investment do so by the average investment of our sample, it will add a further £225.2 million to £326.6 million of investment in technology in the UK.

Investment intentions in the coming 12 months

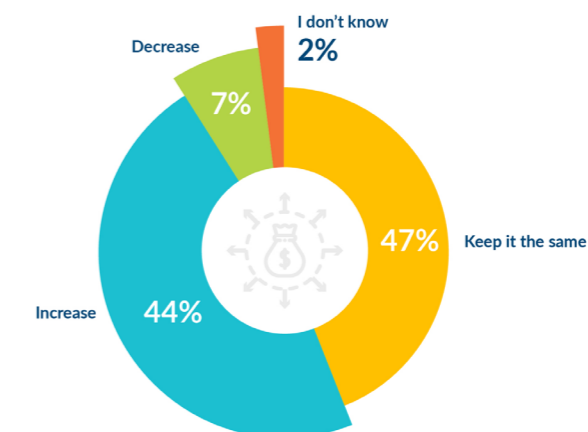Decrease **7%** I don't know **2%** Keep it the same **47%** Increase **44%**

Figure 12. Investment intentions in the coming 12 months
Source: Q16 OpenUK State of Open Survey 2023

19   Measuring the Economic Value of Open Source, Linux Foundation, March 2023
      https://project.linuxfoundation.org/hubfs/LF%20Research/Measuring%20the%20Economic%20Value%20of%20Open%20
Source%20-%20Report.pdf?hsLang=en
20   GDP quarterly national accounts, UK
      https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/quarterlynationalaccounts/januarytomarch2023
21   https://www.reuters.com/business/sustainable-business/us-energy-department-spend-37-billion-carbon-removal-2022-12-13/
22   For the question there were 27 responses.

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3.2.5 A New Number for Open Source Contribution to the UK

One of the most important metrics in a productive economy is Gross Value Added (GVA), which is often used as the equivalent of the output approach to the measurement of GDP. This figure is the value generated by any unit engaged in the production of goods and services, for a specific sector, in the economy.

We used estimates from the Department for Digital, Culture, Media and Sport (DCMS)[23], for the 2022 GVA of the UK IT, software, and computer services industry[24] of £50.71 billion.

Our findings on the average revenue from Open Source Software by companies in this sector in the UK in 2022 from our sample identifies £13.59 billion of value (GVA) generated by products and services related to Open Source Software. This means that the Open Source businesses' estimated £13.5 billion contribution is 27% of the Tech Sector's contribution to UK GVA.

Value (GVA) generated by Open Source in the UK in 2022

£50.71 bn = 27%

UK IT, software and computer services

of UK Tech Sector GVA from Open Source Software

- -

£13.59 bn

UK, Open Source Software services

Figure 13. Value (GVA) generated by Open Source in the UK in 2022
Source: OpenUK State of Open Survey 2023

To our knowledge, it is the first time there has been an attempt to measure the value of the services produced by Open Source Software businesses, as we were able to estimate average revenue by these businesses from our 2023 survey responses.

This finding is important as it demonstrated that besides investment, open innovation, sharing of knowledge and collaboration, the productive capacity of Open Source Software accounts for over a quarter of the UK tech sector GVA in 2022.

3.3 Economic Output of the 2023 Survey

Smaller firms that are more or less established, with many early in their growth trajectory earning below £249,000 (37%), make up about a quarter of respondents transitioning with revenue from £1 million to £4.9 million (25%). Despite their small size, 13% of organisations had revenue between £10 million and £50 million in 2022.

Revenue of companies with fewer than 250 employees in 2022

£50m - 100m 2%
£20m - 50m 2%
£10m - 20m 9%
£5m - 9.9m 7%
£1m - 4.9m 25%
£250k - 999k 9%
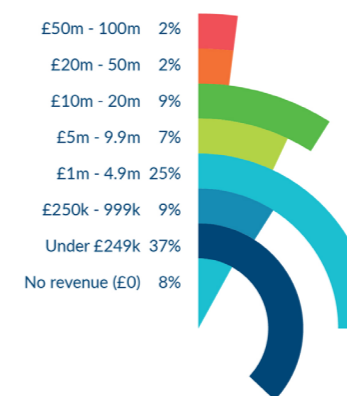Under £249k 37%
No revenue (£0) 8%

Figure 14. Revenue of SMEs (fewer than 250 employees) 2022
Source: Q8-9 OpenUK State of Open Survey 2023

Larger enterprises with more than 250 employees follow largely the expected pattern, with the vast majority (63%) reporting revenue of more than £200 million in 2022.

Revenue of larger enterprises (more than 250 employees) 2022

£50m - £100m
£20m - £50m
Below £20m
12%
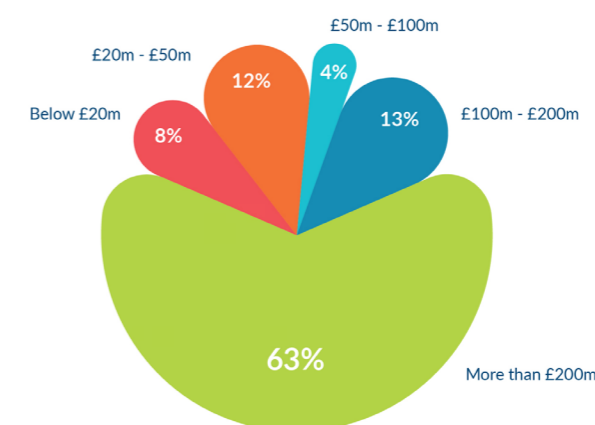4%
13% £100m - £200m
8%
63%
More than £200m

Figure 15. Revenue of larger enterprises (more than 250 employees) 2022
Source: Q8-9 OpenUK State of Open Survey 2023

Note: Results for revenue below £20 million have been aggregated for disclosure control due to the sample size.

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23 The UK Department of Culture Media and Sport was disbanded and moved into the UK Department for Science, Innovation and Technology in February 2023, https://www.gov.uk/government/organisations/department-for-science-innovation-and-technology. The figures used relate to the calendar year 2022.

24 UK Department for Digital, Culture, Media and Sport (DCMS), available at https://www.statista.com/statistics/284995/it-software-and-computer-services-industry-gross-value-added-gva-in-the-uk/

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One of the most critical components for the calculation of the Value of Open Source Software, following the prevalent methods for the measurement of own account production software, is knowing how much time is spent in the development, contribution, maintenance and distribution of Open Source Software - in other words knowing the time use factor. The majority of respondents spend little time on these activities: 40% of respondents reported that their staff spends less than 10% of their total working time on Open Source Software-related activities which is also the median value for time use.

Percentage of time use on Open Source Software development, contribution, distribution and maintenance

- None
- 1% - 10%
- 11% - 20%
- 21% - 30%
- 31% - 40%
- 41% - 50%
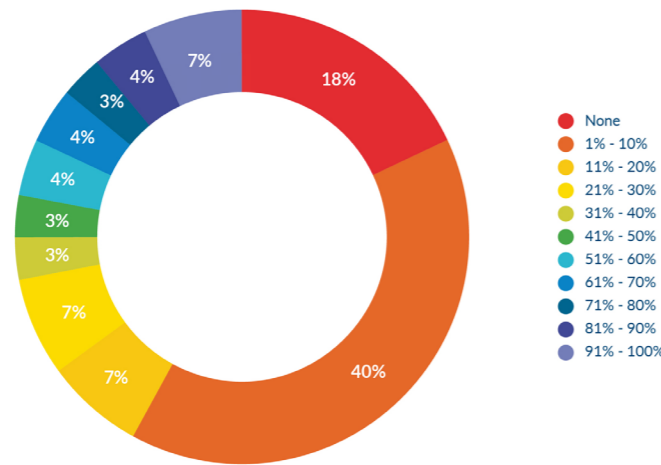- 51% - 60%
- 61% - 70%
- 71% - 80%
- 81% - 90%
- 91% - 100%

Figure 16. Percentage of time use on Open Source Software development, contribution, distribution and maintenance
Source: Q13a OpenUK State of Open Survey 2023

When asking business leaders specifically if they are currently contributing to Open Source Software by code contributions or other contributions other than in the course of employment during their personal time, more than half (53%) do so, from a few hours to even more than the full time equivalent of 40 hours per week.

Contributions to code during private time

- More than 40 hours per week **2%**
- 11 - 40 hours per week **5%**
- 6 - 10 hours per week **12%**
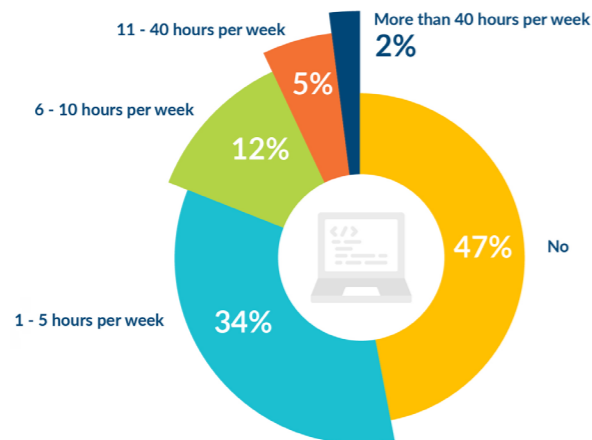- 1 - 5 hours per week **34%**
- No **47%**

Figure 17. Contributions to code during private time
Source: Q3 OpenUK State of Open Survey 2023

Respondents spend 9% on average of their revenue on Open Source Software. This can include wages, overhead costs, governance, membership fees, cloud subscription, research and development, and other costs. Despite this, 18% of organisations reported that they spend nothing on Open Source Software, which can be seen in correlation with the reasons they have chosen to use it, predominantly cost saving and knowledge sharing.

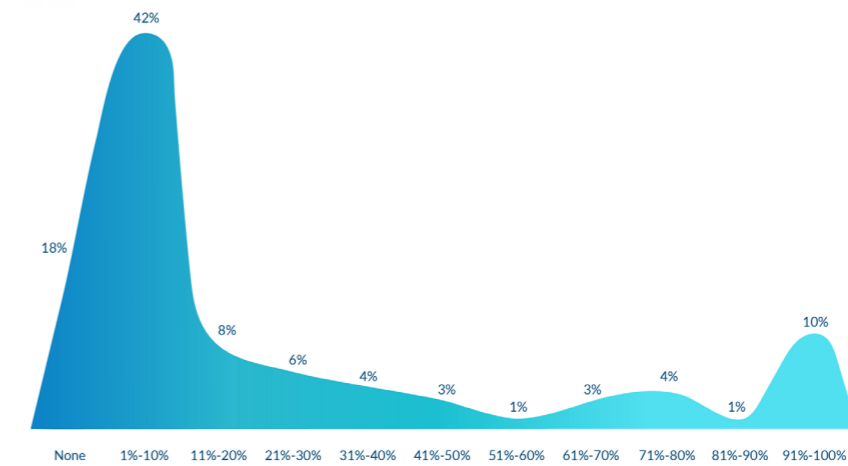### Percentage of revenue spent on Open Source Software

Figure 18. Percentage of revenue spent on Open Source Software
Source: Q15 OpenUK State of Open Survey 2023

Another key component is understanding how much of an organisation's revenue comes directly from contributing, distributing, developing or maintaining Open Source Software. This will not only help business planning and broader decision-making about growth, it can also help organisations calculate their return on investment in Open Source Software activities.

According to survey respondents, these organisations receive 11% on average of their revenue from Open Source Software. As with spending on Open Source Software, approximately a quarter (26%) of respondents said that none of their revenue comes from Open Source Software. This could partially be attributed to the collaborative nature of Open Source Software development and activities.

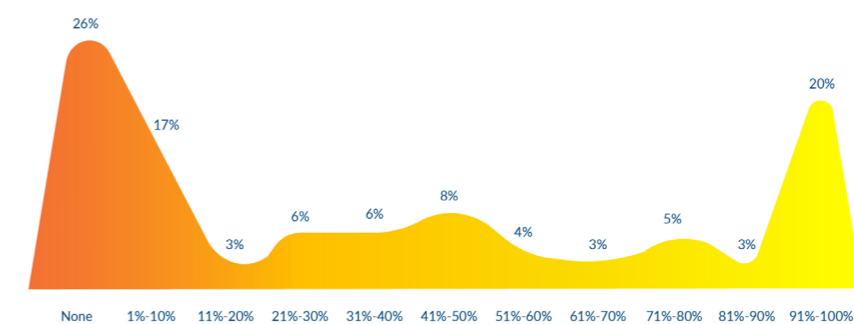### Percentage of revenue from Open Source Software

Figure 19. Percentage of revenue from Open Source Software
Source: Q14 OpenUK State of Open Survey 2023

The difference of 2 percentage points between spending and revenue in our sample indicates that there is approximately a gross return of 22% on investment in Open Source Software. However, this cannot be extrapolated for the entire universe of Open Source Software businesses, as our sample has a large representation of large companies which may skew the results upwards.

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PART 4: WHAT DOES GITHUB TELL US RE UK TOP REPOSITORY HOLDERS[25]

Using GitHub's API we automatically collected data on Open Source repositories with more than 1,000 GitHub stars and the top repository owners (organisations only) by the total number of stars in all of their repos at the end of June 2023. Then our investment team manually reviewed this data, starting from the top, detected UK organisations and collected additional public data points to profile them fully. This process allowed us to create a few interesting ratings of UK organisations having open GitHub repos.

1) Top Software Repos by GitHub stars, which are owned by UK tech companies: Figure 20
- Only repos that contained software — we checked repos manually and excluded some popular tutorials and other educational repos (e.g. elsewhencode/project-guidelines)
- Only repos owned by tech businesses — we excluded some software repos owned by non-profit foundations (e.g. TryGhost/Ghost) and government agencies (e.g. gchq/Cyber-Chef). Note that repos of digital consultancies were included (e.g parallax/jsPD).
- Only one repo per organisation — Jgraph has two popular repos related to the draw.io project, and we included only the top repo by number of stars (jgraph/drawio-desktop).

2) Top UK Digital Consultancies, sorted by the sum of GitHub stars across all their repos: Figure 21
- We defined digital consultancies as mostly service businesses (e.g. studio or agency) publicly doing custom tech projects for other customers.
- Links between GitHub users and businesses were obvious beyond the the Torchbox case. This agency was included thanks to its project Wagtail, which has own Github org (https://github.com/wagtail).

3) Top UK Small tech businesses, sorted by the sum of GitHub stars across all their repos: Figure 22
- We included only organisations founded in the last 10 years (since 2013) with an active UK entity (Companies House data), which claim to have at least one co-founder or CEO in the UK.
- Only small tech businesses — we focused on tech businesses having their own software products (not pure education, consulting or paid support model) and excluded charities, sponsorship-oriented projects and large corporations.
- Most of the companies from this rating would be considered as "tech startups" by VC investors, but we intentionally avoided this definition here as often there is debate and variation in this term.

4) Top UK Large tech businesses, sorted by the sum of GitHub stars across all their repos: Figure 23
- The same approach as above, but for the remaining companies, characterised as large companies.

25   All data and analysis in this section 4 has been provided by Runa Capital, https://runacap.com/

Top Software Repos (owned by UK Tech Companies)

	Repo	Description	GitHub Org	UK Entity	Created	Repo Stars(K)
1	Significant-Gravitas/Auto-GPT	Experimental autonomous version of GPT-4	Significant-Gravitas	SIGNIFICANT GRAVITAS LTD	2023	141.3
2	Textualize/rich	Python library for formatting in the terminal	Textualize	TEXTUALIZE LIMITED	2019	43.7
3	jgraph/drawio-desktop	Code of draw.io (team tool for diagramming)	jgraph	JGRAPH LTD.	2017	41.2
4	rclone/rclone	Data syncing between different cloud providers	rclone	RCLONE SERVICES LTD	2014	39.0
5	nocodb/nocodb	Open-source alternative to Airtable	nocodb	XGENE CLOUD LTD	2017	36.6
6	parallax/jsPDF	JavaScript library for PDF generation	parallax	PARALLAX AGENCY LTD	2009	26.8
7	encode/django-rest/framework	Django REST API framework	encode	ENCODE OSS LTD	2011	25.8
8	Stability-AI/stablediffusion	Deep learning-based text-to-image model	Stability-AI	STABILITY AI LTD	2022	25.3
9	openfaas/faas	Serverless function deployment framework	openfaas	OPENFAAS LTD	2016	23.2
10	surrealdb/surrealdb	Scalable multi-model database	surrealdb	SURREALDB LTD	2021	21.2

Top Software Repos
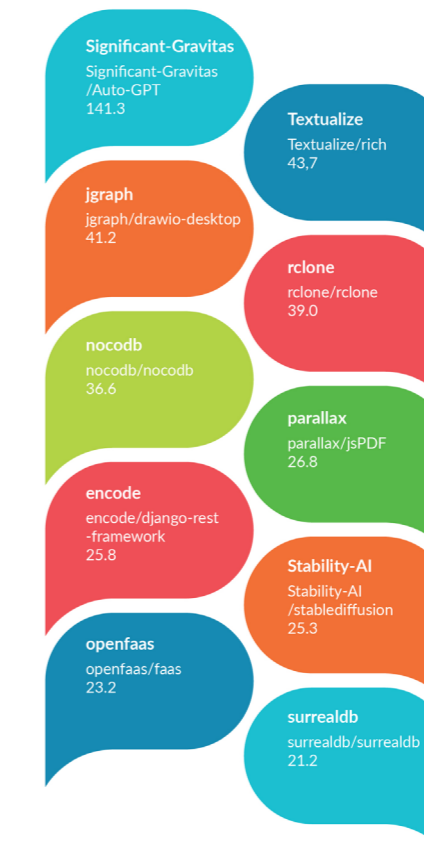### (owned by UK Tech Companies)

Figure 20. Top Software Repos (owned by UK Tech Companies)
Source: Runa Capital analysis of GitHub API Data

Top UK Digital Agencies (by total GitHub stars of repos)

	Website	Description	GitHub Org	UK Entity	Created	Total Stars(K)
1	significantgravitas.com	Game and software studio	Significant-Gravitas	SIGNIFICANT GRAVITAS LTD	2018	141.7
2	dwyl.com	Software dev company	dwyl	DWYL LIMITED	2013	49.1
3	elsewhen.com	Digital consultancy	elsewhencode	ELSEWHEN LTD	2011	28.9
4	parall.ax	Digital consultancy	parallax	PARALLAX AGENCY LTD	2009	27.2
5	torchbox.com	Digital consultancy for non-profits	wagtail	TORCHBOX LTD	2000	17.8

Top UK Digital Agencies
(by total GitHub stars of repos)

Figure 21. Top UK Digital Agencies (by total GitHub stars of repos)
Source: Runa Capital analysis of GitHub API Data

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Top UK Small Tech Businesses (by total GitHub stars of repos)

	Website	Description	GitHub Org	UK Entity	Founded	Total Stars(K)
1	significantgravitas.com	Games and software studio	Significant-Gravitas	SIGNIFICANT GRAVITAS LTD	2018	145.7
2	textualize.io	Python app dev framework	Textualize	TEXTUALIZE LIMITED	2021	70.0
3	stability.ai	Open source AI startup	Stabiliity-AI	STABILITY AI LTD	2019	52.5
4	nocodb.com	Open source Airtable alternative	nocodb	XGENE CLOUD LTD	2021	36.7
5	openfaas.com	Serverless deployment tools	openfaas	OPENFAAS LTD	2017	32.4
6	parity.io	Blockchain infrastructure	paritytech	PARITY TECHNOLOGIES LIMITED	2015	30.9
7	weave.works	DevOps automation	weaveworksx	WEAVEWORKS LTD	2014	30.7
8	invertase.io	Devtools & Integration agency	invertase	INVERTASE LIMITED	2016	28.4
9	surrealdb.com	Multi-model database	surrasldb	SURREALDB LTD	2021	22.5
10	budibase.com	Internal tool builder	Budibase	BUDIBASE LTD	2019	18.8
11	element.io	Sevure communication platform	vector-im	NEW VECTOR LIMITED	2017	18.4
12	mindsdb/com	ML/AI layer for databases	mindsdb	MINDSDB LTD	2017	17.8
13	tldraw.com	Open source drawing app	tldraw	TLDRAW GB LIMITED	2022	15.6
14	pydantic.dev	Data validation software	pydantic	PYDANTIC SERVICES UK LTD	2022	15.6
15	posthog.com	Product analytics software	PostHog	HIBERLY LTD	2020	13.9

Top UK Small Tech Businesses
(by total GitHub stars of repos)

Figure 22. Top UK Small Tech Businesses (by total GitHub stars of repos)
Source: Runa Capital analysis of GitHub API Data

Top UK Large Tech Businesses (by total GitHub stars of repos)

	Website	Description	GitHub Org	UK Entity	Founded	Total Stars(K)
1	deepmind.com	AI research lab (ex startup)	deepmind	DEEPMIND TECHNOLOGIES LIMIT	2010	124.4
2	nccgroup.com	Public cybersec company	nccgroup	NCC GROUP PLC	1999	47.4
3	canonical.com	Ubuntu dev & services	canonical	CANONICAL GROUP LIMITED	2004	27.9
4	arm.com	Semiconductor corporation	ARM-software	ARM LIMITED	1990	17.1

Top UK Large Tech Businesses
(by total GitHub stars of repos)

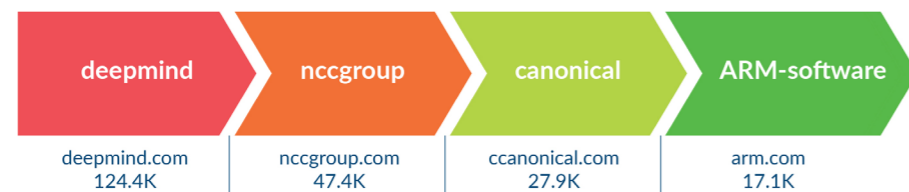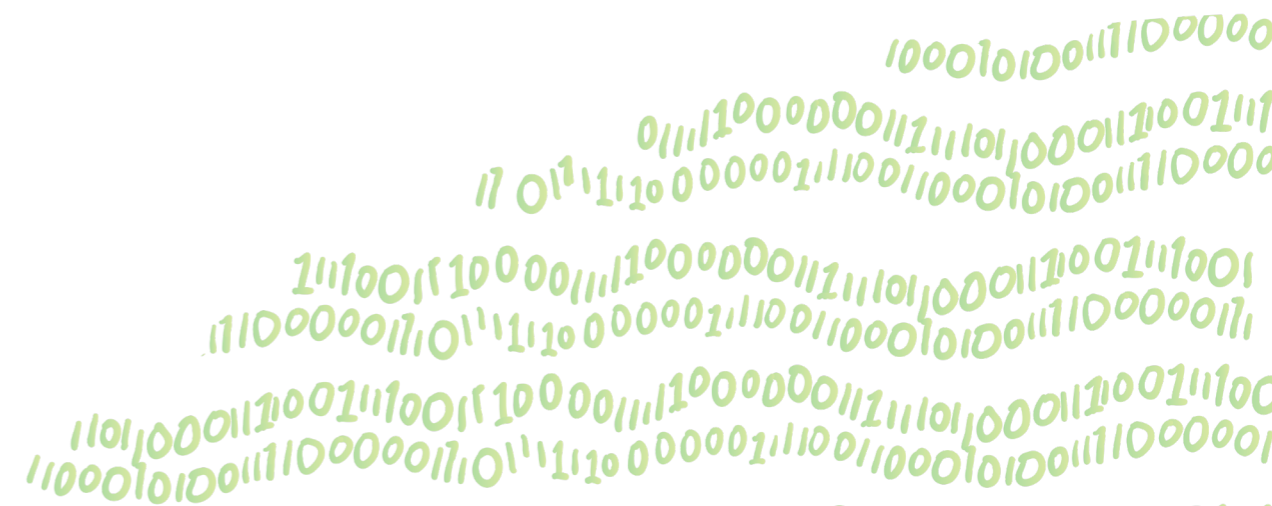| deepmind	nccgroup	canonical	ARM-software
deepmind.com 124.4K	nccgroup.com 47.4K	ccanonical.com 27.9K	arm.com 17.1K

Figure 23. Top UK Large Tech Orgs (by total GitHub stars of repos)
Source: Runa Capital analysis of GitHub API Data

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PART 5: CONCLUSION

5.1 Show the UK the Money in Open Source Software

Dr Jennifer Barth,
Chief Research Officer,
OpenUK

Long have we talked about the UK as a leader in start-ups and entrepreneurial thinking. Innovation, creativity and the desire to build something new are the attributes of those founders and big thinkers in this country, as Matt Barker notes, "full of big creations - castles, bridges, ships and even empires". But the Bay Area surpasses the UK with something that might be more necessary to start something new - a risk taking and fail-fast-fail-often spirit.

That's why we have focused on the movement of organisations, founders and money between the UK and the US and teased this out through the case studies included in this Phase, showing how ideas and capital flow and change with the choices and boundaries of taking (or not) investment and in the particular risk that is Open Source specific business development.

Across all of the case studies we see three themes emerge in the comparison between the Uk and the US:

1. Scale of the US domestic market;
2. Need for investors in the UK that understand Open Source business; and
3. Risk and the particular product, business and commercial skills and experience needed to innovate.

And yet, many want to move to the UK, or to at least straddle the line between the UK and the US via money or relocation or offices across nations. Because the world is global and also because the UK offers proximity to the rest of the world, cheaper real estate and living and, ultimately, still, a culture of creativity, and a growing innovation hub.

Skills, which we will delve deeper into in the next Phase of this report, came up as a particular point for me. Various organisations have relished in the digital talent found in the UK. The idea that the UK is lacking in digital learning and skills seems to be diminishing but the skills that seem to be required now are the experience and insight to build products and businesses.

I like this turn to a new discussion about skills - where remote work is still central to the Open Source Software culture and business model, important when there feels to be a resurgence of place and home - building talent hubs right where we are in the UK. Something OpenUK is exploring further.

Investment, talent and markets aside, this report reflects OpenUK's third annual survey of the state of Open Source Software in the UK. We've learned and grown, included a few different questions but also remembered to track changes over time. Certainly it seems that the conversation is becoming more transparent, clearer and more distinct: we are not focused on 'where is the Open Source Software' and how do we make it visible but rather 'we know our economy, our businesses, our lives are built upon Open Source so let's deepen and widen this around the growing culture and economics.'

Whereas in the previous two State of Open reports (2021 and 2022) we found the top benefit of Open Source Software to be the cost savings now, in 2023, the importance of learning from others, working together and strengthening the Open Source community are the top benefits for organisations working with Open Source Software. This reflects the non-financial and often intangible value of the social values of Open Source Software and core to the way we think about Open Source Software in our reports..

Of course, we worked to provide an economic value for Open Source Software and to move this conversation forward again, pioneering the work to find out the worth of Open Source Software to the UK economy.

The value of Open Source Software in the UK (products and services) is estimated to be £13.59 billion - that's 27% of the value of the tech sector in the UK.

Additionally, additional planned investment in Open Source Software in the UK could add a further £225.2 million to £326.6 million to the UK economy.

We found that there is 11% on average revenue from Open Source Software and 9% on average cost of Open Source Software for businesses in our sample.
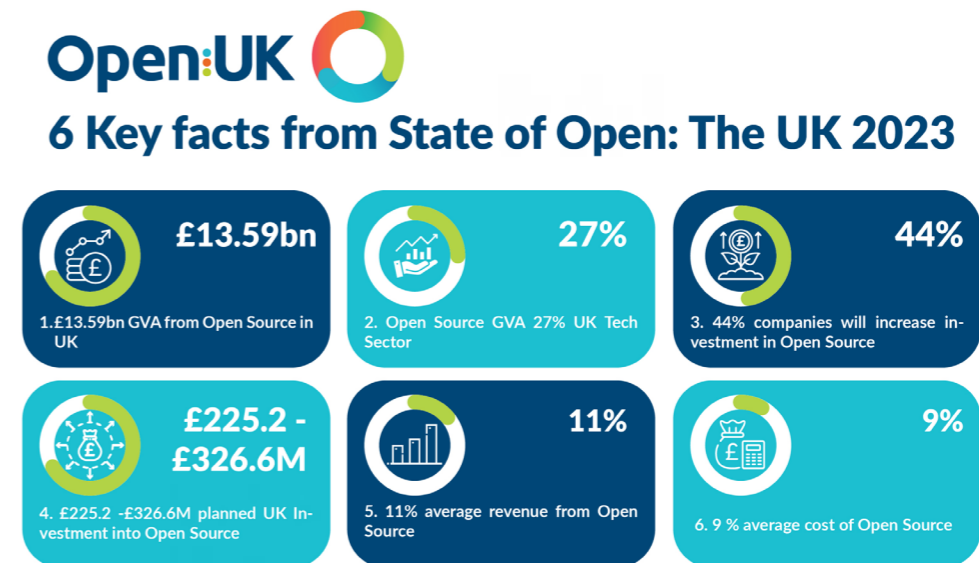

Figure 24. 6 Key facts from State of Open: The UK 2023
Source: State of Open: The UK in 2023

This is the first time that estimates for a variety of key economic performance metrics for Open Source Software in the UK have been presented, showing in multiple ways how it adds to the economy. These findings can be used not only as industry benchmarks, but also by individual companies to understand how they are performing relative to their peers in the industry, set goals and consider their strategy for growth. Naturally, as the survey sample is relatively small, some caution is needed when contextualising these findings but the indication is clear: Open Source Software underpins our productive capabilities in the UK and, according to the experts, founders and industry leaders friendly enough to tell their stories in this report, it is only set to grow and prosper - with the right amount of support from well-established businesses, investors and, of course, government.

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PART SIX: FORMALITIES

6.1 Contributors

Alexis Richardson, Founder and CEO, Weaveworks
Alexis is the Founder and CEO of Weaveworks, and the former chairman of the TOC for CNCF. Previously he was at Pivotal, as head of products for Spring, RabbitMQ, Redis, Apache Tomcat and vFabric. Alexis was responsible for resetting the product direction of Spring and transitioning the vFabric business from VMware. Alexis co-founded RabbitMQ, and was the CEO of the Rabbit company acquired by VMware in 2010. Rumours persist that he co-founded several other companies including Cohesive Networks, after a career as a prop trader in fixed income derivatives, and a misspent youth studying and teaching mathematical logic.

Amanda Brock, CEO OpenUK
Amanda is CEO of OpenUK and Executive Producer of State of Open Con https://stateofopen-con.com Amanda is a Board Member of the Open Source Initiative; appointed member of the Cabinet Office's Open Standards Board; Member of the British Computer Society Inaugural Influence Board; and European Representative of the Open Invention Network. A lawyer of 25 years' experience, she previously chaired the Open Source and IP Advisory Group of the United Nations Technology Innovation Labs, sat on the OASIS Open Projects and UK Government Energy Sector Digitalisation Task Force Advisory Boards. She was General Counsel of Canonical for 5 years from 2008 and set up their legal function.

Amanda is a judge in the IDG Foundry CIO 100, 2023, having been a Judge in the "We are Tech Women Rising Star Awards" 2020-22. Awarded a Lifetime Achievement Award in Women, Influence & Power UK 2022,included in Computing's 100 IT Leaders of 2023, Computer Weekly's Most Influential Women in Tech Long list in 2021 and 2022 and in their UKTech50 Influencers longlist 2021-2023, and in the Involve HERoes list of 100 global Women executives driving change by example. She is the editor of Open Source Law, Policy and Practice (2nd edition) published by Oxford University Press in October 2022, with open access sponsored by the Vietsch Foundation.

Ash Vardanian, Founder, Unum
Ash is the Founder of Unum Cloud, one of the leading software start-ups in AI and large-scale data-processing infrastructure. Previously, he did fundamental research in Astrophysics, created some of the first iOS apps, and managed a family office, investing in tech companies from San Francisco to Hong Kong.

Guy Podjarny, Founder, Snyk
Guy is the Founder of Snyk, the leading Developer Security platform, helping developers secure as they build. Guy was previously CTO at Akamai, co-founded Blaz.io (acquired by Akamai), and was the product manager of AppScan, the first AppSec scanner, through Sanctum, Watchfire and IBM. Guy is a public speaker, O'Reilly author, and an active early stage angel investor.

Dr Jennifer Barth, Founder and Research Director, Symmetry
Jenn has more than 15 years of experience leading independent research on the intersections of emerging technologies and socioeconomic change. She provides companies with independent thought leadership and media engagement opportunities on global issues impacting and shaping our current and future technical-social lives. Her work spans the digital through to social and economic change. She has looked at sustainability, workforce skills and organisational competitiveness strategies through and beyond the pandemic with Microsoft and many other big and small organisations and works as the Chief Research Office researching the role of Open Source Software and its potential to fuel the circular economy with OpenUK. She has experience working on the human impact of artificial intelligence (AI) through fieldwork experiments with IBM Watson, Microsoft and other providers. She is skilled at blending research methods and working with people to bring to life the stories behind numbers. Dr Barth earned her DPhil in Geography from the University of Oxford.

Matt Barker, Global Head of Cloud Native Services, Venafi / Co-founder Jetstack and OpenUK Entrepreneur in Residence
Matt is passionate about how open source can be used as a driving force for value and innovation. Having spent his entire career working for open source start-ups, including Canonical and MongoDB he went on to start one of his own, Jetstack.Jetstack began as a bootstrapped Kubernetes service provider, and helped all manner of companies from small start-ups to large enterprises. In the process of spotting gaps around Kubernetes, they created the open source cert-manager project which has thousands of Github stars and is downloaded more than a million times a day. Jetstack was acquired by Venafi in 2020, the leader in machine identity management. Matt now runs their cloud native services business and continues to explore cutting edge technologies in the open source ecosystem.

Michael Shanks, Founder and CEO, Budibase
Michael is Beflast-based CEO and Cofounder of Budibase - an open-source low-code platform for building internal tools.

Paula Kennedy, Co-Founder, COO, Syntasso
Paula is Co-Founder and Chief Operating Officer of Syntasso; her previous roles include Senior Director of Tanzu Global Education at VMware, Senior Director of Platform Services EMEA at Pivotal and Co-Founder & Chief Operating Officer of CloudCredo. Working in the IT industry for over 20 years, Paula is passionate about community, diversity and inclusion and has a range of speaking experience including DevOpsDays, DevOps Enterprise Summit, Velocity Conference, QCon and the LeadDev conference. Paula is part of the organising committee for Kubernetes Community Days UK and DevOps Days London, and also organises the London Platform User Group.

Peter Zaitsev, Founder, Percona
Peter is an entrepreneur and co-founder of Percona. As one of the leading experts in Open Source strategy and database optimization, Peter has used his technical vision and entrepreneurial skills to grow Percona from a two-person store into one of the most respected open source companies in the business with over 350 employees. Peter now continues to serve as a board member and advisor to a range of open source startups. Peter is the co-author of the book "High Performance MySQL: Optimization, Backup and Replication," one of the most popular books on MySQL performance.

Solomon Hykes, Founder Docker, and Founder and CEO Dagger
Solomon is the co-founder and CEO of dagger.io, the first fully programmable CI/CD platform. Previously, he was the co-founder of Docker, where he served as CEO for 5 years, then CTO for another 5 years. Solomon grew up in France and started Docker in a cellar in Montrouge, in the suburbs of Paris. Due to lack of funding, he left France in 2010 to join the YCombinator incubation program. In 2013, Docker united the Cloud industry around a new standard that is now ubiquitous: the container. Solomon now lives in San Francisco

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Tom Drummond, Founder, Heavybit

Tom is the managing director of Heavybit, and has more than 20 years of experience investing in developer-first enterprise infrastructure startups and helping them scale operations, finance, and GTM. He currently works with successful devtool startups such as Snyk, LaunchDarkly, Netlify, and CircleC.

6.2 About the Creators of this Report

6.2.1 OpenUK

OpenUK is the organisation for the business of Open Technology in the UK, being Open Source Software, open source hardware and open data. As an industry organisation, OpenUK gives its participants greater influence than they could ever achieve alone. Open UK's purpose is to promote UK leadership and global collaboration in Open Technology.
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. OpenUK creates a visible Open Technology community in the UK, and uses that community's impact to ensure that the UK's laws and policies work for Open Technology whilst encouraging the future community in the business of Open Technology through learning.

OpenUK is a not-for-profit company limited by guarantee, company number 11209475 with its registered office at 8 Coldbath Square, London EC1N 5HL, www.openuk.uk, contact admin@openuk.uk

6.2.2 Symmetry

Symmetry looks beyond the surface and behind the curtain of the fundamental innovations and trends shaping our society, markets, culture, and values. We are academics and researchers looking at the intersections of emerging technology and socioeconomic impact, producing independent research for thought leadership and business solutions.

Symmetry'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—helping our clients engage their clients and public imagination.

6.2.3 Runa Capital

Runa Capital is a Luxembourg-based global venture capital firm, focusing on enterprise software, deep tech and fintech startups. Since 2010, we have invested in more than 100 European and US startups, including over ten open source companies.

Runa's early-stage investments include cloud banking platform Mambu ($5.5B last round valuation), open source web server Nginx (acquired by F5 for $700 million), cloud ERP vendor Acumatica (acquired by EQT) and quantum computing company Pasqal.

Runa has supported UK startups like Zopa, DigitalGenius, Chattermill, Evidently AI and Lumai. Its London-based general partner Konstantin Vinogradov focuses on AI and open source software.

6.3 Methodology

The research used a mixed method approach to explore and demonstrate the state of the Open Source Software economy - its value and values - in the UK. Interviews were conducted with industry leaders, founders and Open Source Software experts and included as case studies and thought leadership on the value of Open Source Software.

The research used a proximity sampling for the third annual OpenUK survey, receiving a total of 339 answers. Response collection took place in June 2023. Out of the 339 answers, sorting for those coming from UK based organisations (the focus of the research), there were 244 by participants from across the UK, representing all sectors of the economy. All percentages reported have been rounded, and where replies were fewer than 3 we have aggregated replies where possible to control for disclosure. Responses came from all over the UK, and those from abroad (16%) were filtered out.
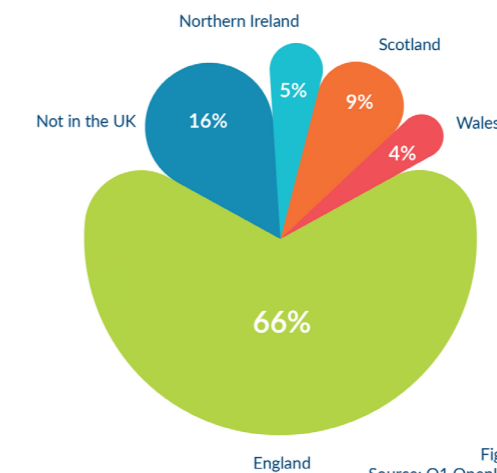
Where are you based?

Figure 25. Where are you based?
Source: Q1 OpenUK State of Open Survey 2023

Out of those, the headquarters of the organisations of more than ⅔ (69%) are in the UK, while 31% reported that their organisation has headquarters overseas.
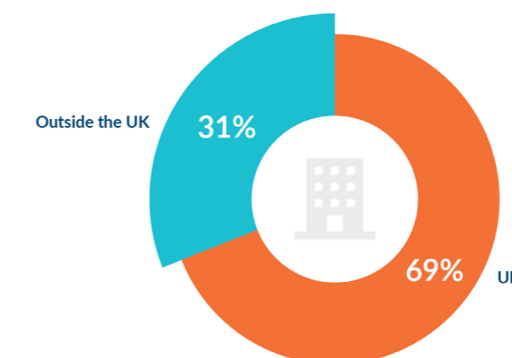
Location of HQ

Figure 26. Location of HQ
Source: Q5 OpenUK State of Open Survey 2023

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Open:UK

Open:UK

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For some of the questions we received a lower number of answers - when excluding "I don't know" options, and "none" answers (especially in Q14). These were Q9 - 193 valid replies, Q13a - 201 valid replies, Q14 - 186 valid replies, Q15 - 156 valid replies. Once we applied a filter removing "none" responses in Q14, we obtained 103 responses for which we had all the necessary variables in a valid form. These are essential questions for the estimation of investment in Open Source Software. Consequently, due to the lower response rate which produced an even smaller sample size, there is a relatively lower level of confidence in the data.

The methodology of the investment estimation is outlined in OpenUK State of the Open: the UK in 2022. To calculate sectoral GVA, we used responses from the industrial categories "Information and Communication" and "Professional, Scientific and technical activities", to approximate the sector "IT, software and computer services industry". Then using estimates from the Department for Digital, Culture, Media and Sport (DCMS) for the 2022 GVA of the UK (£50.71 billion) and the average proportion of businesses revenue from Open Source Software in our survey (approximately 27%), we calculated GVA from Open Source Software. Confidence on this estimate is medium-low and should be interpreted with caution, as although the two industrial categories selected from the sample give an adequate number of businesses, the survey sampling method (proximity sampling) is not representative of the UK economy.

6.4 Acknowledgements

The research was led by Dr Jennifer Barth, CEO and Research Director at Symmetry and OpenUK's Chief Research Officer in partnership with Amanda Brock, CEO OpenUK in 2023. Thank you to our team of economists, psychologists, data scientists and social scientists to all who contributed, and in particular Zin Nwe Zaw Lwin, Dr Dora Kokosi and Matthew Buck of Drawnalism.

We are grateful to the 339 individuals who participated and provided us with essential data in our survey.

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6.6 Who's Quoting State of Open?

We have been delighted to see our work attributed by:

6.6.1 McKinsey Supply Chain September 2022

https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/cybersecurity/software-bill-of-materials-managing-software-cybersecurity-risks
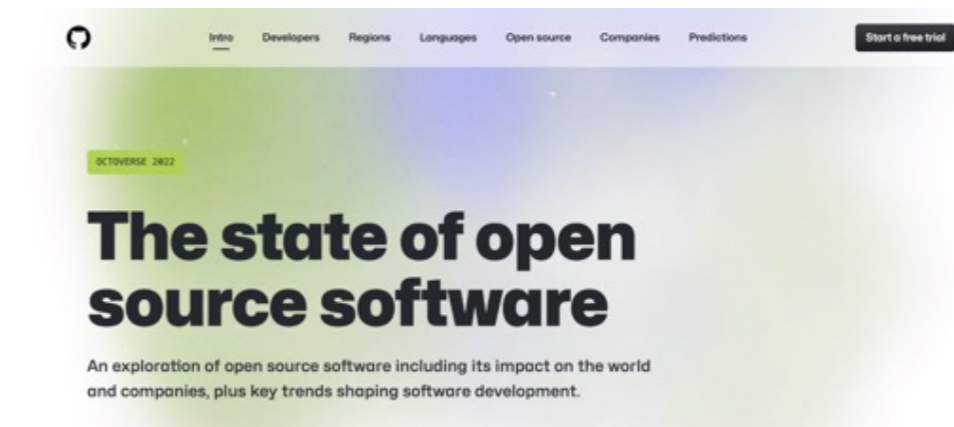

6.6.2 GitHub - Octoverse 2022

https://octoverse.github.com/

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6.7 OpenUK Survey 2023

You can find the survey at https://openuk.uk/stateofopen
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6.8 Sponsors

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6.9 Cover Photos

Cover photos are from our collaborator photographer Tiana Lea, who took 38 portraits for the OpenUK State of Open Exhibition sponsored by Arm[26], and has since taken a further almost 200 portraits at State of Open Con and our Honours list event. We are grateful to Arm for their continued support of this work and will continue to document the people forming the Open Technology community in this way.

Individuals on the front cover of Phase Two: Alexis Richardson, Founder & CEO, Weaveworks; Amanda Brock, CEO, OpenUK; Matt Barker, President & Co-Founder, Jetstack; Andrew Wafaa, Head of Open Source Program Office, Arm; Jennifer Barth, Chief Research Officer, OpenUK and Founder, Symmetry; Guy Podjarny, Founder, Snyk; James Governor, Analyst & Co-founder, RedMonk; Chris Eastham, Chief Legal Officer, Fieldfisher; Chris Howard, Lead Open Source Program Manager, EPAM; Amandine Le Pape, Co-founder and Guardian of the Matrix.org Foundation, COO and Co-founder, Element; Iain Mitchell KC, Honorary KC, OpenUK; Cheryl Hung, Director of Ecosystem, Cloud Native Foundation (Linux Foundation); Basil Cousins, Founder Open Forum Europe (retired); Paula Kennedy, Co-founder & COO, Syntasso; Dawn Foster, Director of Data Science, CHAOSS Project; Hiren Parekh, Director, WIT Consulting

6.10 In Memoriam; Basil Cousins, founder of Open Forum Europe

Basil Cousins was a stalwart of Open Technology in the UK and one of the first to recognise its value. Somewhat ironically, he was one of the founders of Open Forum Europe. He was recognised by OpenUK in its 2021 Honours List and participated in our State of Open Photo Exhibition, having a portrait taken and video made in January 2023[27]. Basil died in March 2023 and will be sadly missed.

26   https://openuk.uk/photoexhibition/
27   https://openuk.uk/soocon23/basil-cousins/

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