



Development of a Funding Mechanism for Sustaining Open Source Software for European Public Services

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Study Authors

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Table of Contents

Executive summary	6
1 Introduction	8
1.1 Context.....	8
1.1.1 Critical open source software.....	9
1.1.2 Open source innovation	11
1.2 Scope.....	11
1.3 Approach.....	11
1.4 Definitions	12
2 Top-down funding mechanisms	13
2.1 Approach.....	13
2.2 Drivers of funding organisations	14
2.2.1 Manifestation	15
2.3 Funding sources	15
2.4 Funding facilitators.....	16
2.5 Funding models.....	16
2.6 Key findings	17
2.7 Summary	19
3 Bottom-up funding mechanisms	22
3.1 Key findings	22
3.2 Summary	24
3.3 Exclusions.....	27
4 An analysis of funding mechanisms	28
4.1 Identified shortcomings/sustainability issues.....	28
4.2 Potential Solutions	28
5 Sustainability needs	30
5.1 Mature software vs start-ups	30
5.2 Types of needs.....	30
6 Consultations with open source experts	34
6.1 Approach.....	34
6.2 Workshop	34
6.2.1 Aims	34
6.2.2 Attendees	35
6.2.3 Primary outcomes	35
6.2.4 Suggestions and cautions.....	36
6.3 Interviews	39
6.3.1 Observations by the European public services interviewees	39
6.3.2 The view of open source advocacy.....	41

7	A blueprint for a European funding mechanism.....	43
7.1	Plugging the funding gap.....	43
7.2	Mission, aims, and principles	44
7.3	Targeted beneficiaries and projects	45
7.3.1	What to fund.....	45
7.3.2	What not to fund.....	45
7.3.3	Beneficiaries	46
7.4	Award sizes, numbers and fund size	47
7.4.1	Number of projects.....	47
7.4.2	Amount granted per project.....	47
7.4.3	Fund size	48
7.5	Application, selection, and fund disbursement process.....	50
7.5.1	Application process.....	50
7.5.2	Project selection process.....	51
7.6	Disbursement process.....	52
7.7	Disbursement channels	53
7.8	Provision of non-financial support	53
7.9	Preparations leading to fund setup	53
8	Overview of non-financial sustainability needs and solutions	55
8.1	Issues related to current licensing landscape	55
8.2	Need for a secure embedded operating system with very-long-time-support ..	57
8.3	Need for building and keeping platforms for FOSS projects and communities..	57
8.4	Issues related to market power, big tech companies and malicious business practices.....	58
8.5	Suggested non-financial solutions and who should act.....	58
9	Conclusions and recommendations	60
9.1	Conclusions.....	60
9.2	Recommendations for next steps	60
	Appendix A: Experts interviewed.....	62
	Appendix B: Workshop attendees.....	64
	Appendix C: Glossary and acronyms	65
	Appendix D: Data from GitHub Government collection	67

List of figures

Figure 1 - Rationale for the study	8
Figure 2 - Open Source is Taking Over Europe!.....	9
Figure 3 - Open source usage cycle	9
Figure 4 - Finding Critical Open Source Software.....	10
Figure 5 - Top-Down research groups	13
Figure 6 - Top-Down research dimensions explored.....	13
Figure 7 - Key findings on top-down funding mechanisms	17
Figure 8 - Differentiating factors of top-down mechanisms.....	17
Figure 9 - Transversal features of top-down funding mechanisms	18
Figure 10 - Types of bottom-up funding mechanisms	22
Figure 11 - Findings on bottom-up funding mechanisms	23
Figure 12 - Funding mechanisms issues	28
Figure 13 - Solutions needed	28
Figure 14 - Drivers behind the usage of marketplace lending.....	33
Figure 15 - Workshop discussion items	34
Figure 16 - Key elements for the design of the funding mechanism and dependencies between them	44
Figure 17 - Categories of beneficiaries	46
Figure 18 - Number of projects and grants / year.....	49
Figure 19 - Total initial fund size	50
Figure 20 - Disbursement process for fast-track and normal track funding calls.....	53

List of tables

Table 1 - Synoptic view of analysed top-down funding mechanisms	19
Table 2 - Synoptic view of analysed bottom-up funding mechanisms.....	24
Table 3 - Two possible goals for a funding mechanism for open source.....	41
Table 4 - Example of assessment criteria and rating calculation.....	52
Table 5 - Non-financial issues and solution directions	58

Executive summary

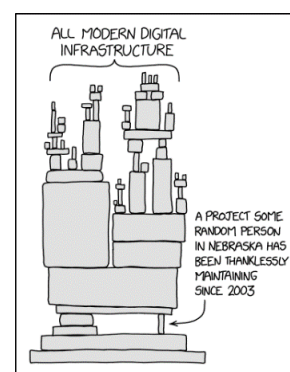
This study was commissioned to find solutions for two areas of open source software that European public services heavily rely on, but are in a vulnerable state. The first are small open source projects maintained by single individual or very small developer groups, rendering them unsustainable or “in a critical state”, and second, the pipeline of fresh open source software created by individual or small groups of software developers.

The need to sustain open source

European public services continue to increase their use of open source software. This is positive and beneficial not only for public services, but also the European open source ecosystem and the general public. However, a natural consequence of this is an increased reliance on open source software, making it a strategic resource which needs to be nurtured and sustained.

Critical open source software

Research by Google released under the OpenSSF¹ shows the existence of software from fragile software communities, that multiple applications within the organisation rely on. The XKCD comic illustration on the right² represents the situation. Highly relied upon projects become critical either when the small team that maintains it cannot afford to hire additional staff; or when the software is deemed stable (or boring), and cannot attract fresh talent to join them. Critical software can be likened to ticking time-bombs, which need to be quickly found and defused.



The innovation pipeline

By its very nature, open source is a hive of innovation and attracts large numbers of individuals and small developer teams. We seem to take it for granted, that original and innovative open source software will continue to appear on the horizon. The fact is that open source software projects transition from the innovation stage, through to widespread adoption and then maintenance (some of which are critical). These projects may need financial support at various stages.

For their own sake, and as public institutions, European public services need to protect the open source innovation pipeline for technology that may be used by them in the future i.e. GovTech or technology for government.

Sustainability needs

This study investigated the sustainability needs of critical open source software and individual and small developer groups. Critical software project communities said, they were short of money, and also needed to attract people to their projects. They also needed marketing, business and hosting type of non-financial support. The individual and small developer groups’ needs were primarily financial, and quite small, ranging from €30/week to a one off payment of €5k.

Can’t existing funding mechanisms help?

The team investigated 32 European, US and international funding mechanisms that support open source software projects. Disbursements range from millions of euros from larger foundations, to just tens of euros/month from mechanisms such as Patreon. These

¹ https://github.com/ossf/criticality_score

² <https://xkcd.com/2347/>

funds greatly benefit and support European open source.

There are gaps in funding, especially towards the two stakeholder groups mentioned above. Most funding is for new projects, hardly any for long term maintenance projects. So, critical projects will not qualify for example. Even for new projects, funds favour more breakthrough/scientific innovation type of projects and do not address grassroots innovation. So, there is no fund specifically aimed at GovTech related innovation. Additionally, most of the funding institutions are US based and do not always align with European social needs and challenges.

In conclusion, there is a clear need for a European funding mechanism to help sustain critical open source software communities and to support grassroots innovation for GovTech projects.

Validation workshop

Before moving forward to propose solutions, the study team felt it crucial to validate these findings. Therefore, a group of 20 open source experts were invited from existing funding mechanisms, public services, open source bodies and other government and private sector organisations. The group analysed the research, shared their own experiences and discussed potential solutions. There was unanimous acknowledgement that these groups were indeed not well served, and the Commission was praised for taking this initiative. It was also felt that there a need for a new funding mechanism targeting individuals and groups creating and maintaining software for the government sector.

Plugging the funding gap

There are several ways to plug this funding gap. One option is to utilise an existing open source funding mechanism or technology programme. Another, which this document describes (but does not necessarily recommend) is a proposal to set up a separate pan-European funding mechanism. The report outlines the objectives of the fund, identifies the specific target beneficiaries, and suggests disbursement sizes and mechanisms.

The proposed fund would be for an initial three years, which after an initial six months of set-up will operate for two and a half years. During this time it will provide funding units of €5k to individual developers, to units of €50k to more established software. The proposed budget for the first three years is €17.3M. At this early stage, the study does not concretely suggest how to obtain such funding. Suggestions include diverting funds from existing programmes or asking European public services to contribute to a central pot, and/or accepting corporate and individual donations.

Benefits

The new fund will support approximately 300 projects. Software communities that are in a critical state are a key target, as are new developments. Inevitably such a fund will positively stimulate activity in the European GovTech sector, and benefit projects that support positive societal impacts or the open source ecosystem as a whole.

Open source licencing related findings

The report also analyses the some of the challenges arising out of the open source licensing landscape, which the authors believe have contributed to poor the financial state of open source software communities. These observations are meant to ignite debate, rather than to apportion blame, and represent a viewpoint expressed by many interviewees.

Annexes

The report is accompanied by annexes which contain the original interviews and detailed supporting material for the summarised text in the main document.

1 Introduction

This report is the final output of a study sponsored by ISA² (Sharing and Re-use action 2016.31) and managed by the Commission’s open source programme office, to establish financial and non-financial solutions which could help European public services³ sustain and protect two areas the:

- Critical⁴ open source software they use; and
- Pipeline of innovative software created by individual or small groups of developers.

Nomenclature: This study related to open source software (OSS) which is also called free and open source software (FOSS). For all intent and purposes, the Commission considers these terms to be synonymous. For brevity, unless stated otherwise, any references to software in this document refer to open source software.

1.1 Context

In line with public bodies worldwide, European public services continue to increase their use of open source and enjoy the resulting benefits. As users of open source, and by virtue of being good software citizens, European public services acknowledge they have a duty of care towards open source in general, alongside ensuring their open source systems run safely for their intended period of use.

The study is part of a wider initiative by the Commission to encourage European public services to tackle open source issues collectively. It builds on open source initiatives such as IDA, IDABC, ISA², EU-FOSSA⁵, ISA², the European Commission’s 2020 open source strategy⁶ and the recently published DG Connect 2021 study on the impact of open source on the EU economy⁷.

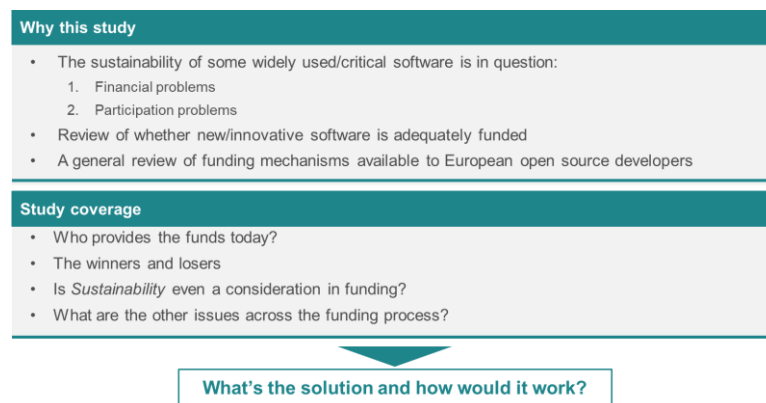


Figure 1 - Rationale for the study

³ Local, regional, national, and European public bodies providing services to European citizens and businesses.

⁴ In this context, a software is deemed critical, if its continued healthy existence is in question. See section 1.1.1 for reasons why such criticality arises.

⁵ https://ec.europa.eu/info/departments/informatics/eu-fossa-2_en

⁶ https://ec.europa.eu/info/departments/informatics/open-source-software-strategy_en

⁷ <https://op.europa.eu/en/publication-detail/-/publication/29effe73-2c2c-11ec-bd8e-01aa75ed71a1/language-en>

1.1.1 Critical open source software

European public services are steadily increasing their use of open source

Over the last two decades, both public and private sector organisations have increased their use of open source software. Within Europe, public services and the European institutions have led the way and continue to increase their use of open source.

The Tallinn declaration⁸ commits and mandates the European Commission and European public services to increase their use of open source.

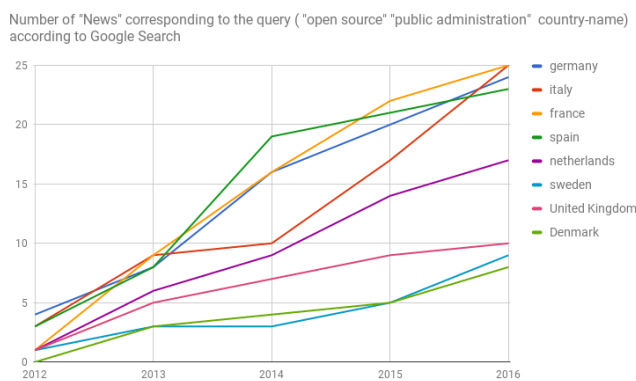


Figure 3 - Open Source is Taking Over Europe! ⁹

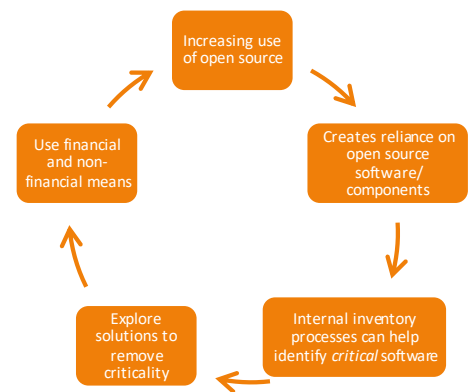


Figure 2 - Open source usage cycle

⁸ The Tallinn declaration of 6 October 2017 can be seen in the OSOR article below via this link <https://joinup.ec.europa.eu/collection/open-source-observatory-osor/news/open-reuse>

⁹ Source: <https://itsfoss.com/open-source-adoption-europe/>

Increased usage leads to increased reliance on open source software

With open source being used in core systems and solutions from Data Centres to public facing service delivery web and mobile applications, public services are heavily reliant on open source.

Rightly, public services are increasingly treating open source as a strategic resource, which needs to be protected.

This protection, internally translates to for example cataloguing the software in use, being licence compliant, and ensuring adequate support contracts.

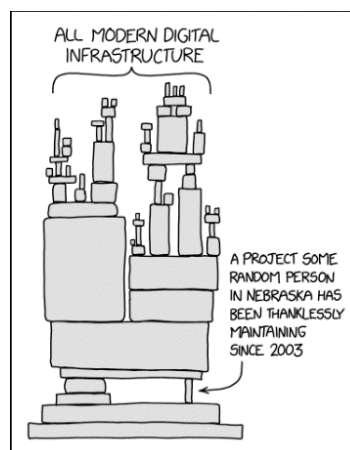
Externally, it means sustainability. Firstly, ensuring the software used by European public services continues to exist, and second the pipeline (typically individuals and small developer groups) that creates new innovative software, remains healthy.

Identifying critical open source

Sustainability to keep operations running smoothly today and in the future means identifying *critical software* and resolving their criticality issues.

Critical software is software whose continued healthy existence is in question

Criticality can arise via several scenarios, for example, software supported by just one person, who may not be well; or the software community is not attracting any new people to look after it. The XKCD comic illustration below shows such a scenario.



This image is under creative commons 2.5 license, see xkcd.com/licence.html.

Figure 4 - Finding critical open source software¹⁰

Critical open source software can be a ticking time bomb that needs to be found and defused.

Note: "critical" is always relative to the usage of one actor (be it a public agency, a company, an individual, etc.).

¹⁰ Source: <https://xkcd.com/2347/> reported in <https://opensource.googleblog.com/2020/12/finding-critical-open-source-projects.html>

Mitigating the risk of critical software

There are several ways in which European public services can safeguard themselves from such critical software. One way is to find alternatives and hedge their risks, the other is to actively help the software community in question, and eliminate the criticality, thereby helping the wider open source world too.

The community can be helped *financially* or may need some *non-financial assistance*.

1.1.2 Open source innovation

The second driver for the study is to protect and possibly improve the existing open source innovation pipeline. This pipeline is fed by software created by individual developers or small groups of developers.

This vast army of small developers has created a huge amount of innovative software over the past 50 years.

Over the last 5 years, during the EU-FOSSA 2 projects' hackathons and events, and by attending several open source conferences, European Commission staff from DIGIT had the opportunity to meet a number of open source software developers. These developers expressed the need for very small amounts of funding to sustain them whilst they developed their software - some asked for as little as €30/week!

1.2 Scope

The remit of the study was to examine the following areas:

- (1) Funding mechanisms in the US, Europe and other geographies to understand their:
 - (a) Motivations for providing such funding
 - (b) Access to funds they disburse
 - (c) Specific needs they target
 - (d) Application and selection criteria
- (2) Gaps – which segments are not served?
- (3) Is there a role for an additional European funding mechanism?
- (4) Are there any issues that could be resolved without financial assistance?

1.3 Approach

The study team adopted the following approach:

- 1) **Investigate**: understand existing global and European funding mechanisms:
 - a) top-down funding initiatives, e.g. institutional grants via established funds such as the Ford foundation, Shuttleworth foundation;
 - b) bottom-up funding initiatives, e.g. self-funding, crowdfunding, other

- micro-funding mechanisms and Patreon;
- c) Identification of funding gaps (and opportunities for a European solution);
 - 2) **Consult and validate**: conduct a workshop with a select group of open source experts to validate the investigation findings and seek advice regarding the proposed solutions.
 - 3) **Propose**: draft proposals and guidelines for a new European funding mechanism, and non-financial solutions;
 - 4) **Document**: provide in annexes the material gathered, interview summaries and other relevant material.

1.4 Definitions

Open Source

Open Source Software (OSS) or Free and Open Source Software FOSS software are those published under an OSI or FSF approved license.

The Commission recognises that "Free Software" and "Open Source" may refer to distinct approaches of the FOSS movement, but whatever the approach, the set of software that are considered is the same in both cases (i.e. the set of FSF or OSI licensed software.)

In this document, any use of either term, also implies the other.

2 Top-down funding mechanisms

This chapter summarises the approach and key findings from the top-down funding mechanisms contacted. Annex A contains detailed observations.

2.1 Approach

Twenty top-down funding mechanisms were analysed from six perspectives:

- Vision, background, and history
- Motivation and Targets for funding
- Business model (sourcing, funding, licensing)
- Processes and their efficiency/effectiveness
- Tools used
- Non-financial support and services offered

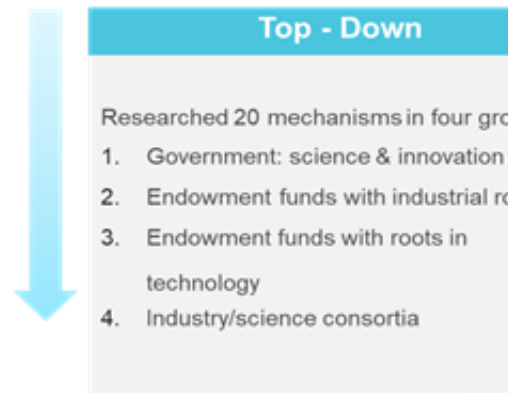


Figure 5 - Top-Down research groups

Analysis Dimensions



Figure 6 - Top-Down research dimensions explored

Information sources:

- Primary sources: interviews and direct exchanges with representatives of existing funding mechanisms, as well as websites of the mechanisms.
- Secondary sources: desk research of reports on funding mechanisms, as well as interviews with other stakeholders and recipients of funds.

Case studies

More than half of the funding mechanisms researched have been documented as *case studies*, based on interviews with owners and stakeholders.

2.2 Drivers of funding organisations

There are several drivers that motivate organisations to fund open source, ranging from ideological to geo-economic, geographical/geo-political and need-based.

Ideological drivers

Many organisations are driven by the very values that underpin open source. This leads them to invest in open source creating a positive cycle:

- open source as the implementation of the openness value;
- open source improves accessibility and reproducibility;
- freeing IP means allowing its global use;
- open source facilitates collaboration via non-competitive software development.

Ideology-driven foundations tend to fund people or initiatives/movements to propagate their ideology; examples include Mozilla or Shuttleworth Foundations. These organisations could also be called "social innovators".

Geographical drivers

EU framework programmes currently show a preference for European initiatives but are open to collaboration with participants from other regions of the world, including China and other developing countries.

The Prototype Fund, operating on behalf of the German Federal Ministry of Education and Research (BMBF), is an example of a national initiative that limits its funding targets to German residents.

The USA (e.g. the National Science Foundation - NSF and the large industrial endowment funds) appear to be primarily focused on the USA itself, with some developing areas. For example, the Sloan Foundations limits its grants to the USA, while the Ford Foundation also covers ten underdeveloped countries/regions.

Geo-economic drivers

Some contributors expect a geo-economic return¹¹ (e.g., NSF, Sloan Foundation, the EU Framework Programmes), a contribution to the open source software commons, or participation/equity if a project becomes a commercial success (e.g. the Shuttleworth Foundation expects a participation by 30%).

Need-based drivers

Other drivers include the need for some companies to fund open source software that they rely highly on. For example, the Ubuntu Foundation, funded by Canonical Ltd. together with Mark Shuttleworth, is funding Ubuntu Linux, which is a key infrastructure for Canonical itself.

¹¹ Geo-economics is a successor to geo-politics: a combination of industry-politics (nowadays for tech) and geopolitics (with military power replaced by economic power, e.g., "economic warfare") <https://en.wikipedia.org/wiki/Geoconomics>

2.2.1 Manifestation

These drivers manifest themselves in approaches adopted by the funding organisations.

For example, some foundations fund only or mainly natural persons, others only projects or developers working within institutions.

The study has found that most top-down and industrially-driven foundations and business platforms are based in the US, and that they more often represent the typically American hard business/social approach (e.g. Sloan / Ford / Mozilla Foundations). Initiatives that can be classed as driven by the open source software community, bottom-up or grassroots, and self-organisational appear to be more often based in Europe and Canada.

2.3 Funding sources

Primary sources of funds are:

- government funding:
 - national science foundations and scientific institutions such as NSF, EU Framework Programmes;
 - open source software development, publication under an open source software licence;
- endowments:
 - Traditional industrial, e.g. Ford Foundation, Sloan Foundation, Gordon and Betty Moore Foundation;
 - Modern technological, deriving from proceedings of other IT activities, e.g. the sale of assets such as an IPv4 address block¹² or an internet access network¹³, or from the investment in open source software of proceedings from other technological ventures¹⁴;
- common business ventures, e.g. Mozilla vastly relying on Google funding in co-ventures¹⁵;
- industry/research consortia collaborating on non-competitive technology e.g. NumFOCUS;
- legacies, collaborative funding and sub-granting mechanisms, e.g. NLnet.

¹² As in the case of Amateur Radio Digital Communications (ARDC)

¹³ As in the case of the NLNet Foundation, which supports organisations and people that contribute to an open information society, which in 1997 sold off its commercial networking operations to UUNET, resulting in an endowment with which it makes grants

¹⁴ One of the most relevant cases is that of Mark Shuttleworth, who invests in open source software both through the Shuttleworth Foundation and through Canonical, the company behind the development of the Ubuntu operating system

¹⁵ See <https://thenextweb.com/insider/2013/11/21/mozillas-reliance-google-increasing-90-2012-revenue-came-one-source/>; <https://cio.eletsonline.com/corporate/mozilla-extends-firefox-deal-with-google/65783/>

There appears to be a whole hierarchy of funds trickling down from endowment funds/industry/science foundations to open source software organisations. From there to open source software projects, then further down to open source software developers/community. This flow is complemented, in much smaller measure, by funds coming from individuals/users (see Bottom-up funding in the next chapter).

2.4 Funding facilitators

Many other actors are involved in this open source software funding economy, for example (commercial) security audit specialists, ethical hackers (such as "bounty hunters"), bug bounty platforms (for example HackerOne, Intigriti), intermediaries (e.g., the German Prototype Fund, NLnet), fiscal sponsors, payment processors (e.g., PayPal), etc. These actors do not directly provide or transfer funds, but usually contribute as facilitators at various stages of the funding search / delivery process.

2.5 Funding models

Most of the funding by far goes to scientific projects through the national science foundations and scientific institutions (e.g., the NSF and the EU Framework Programmes) and the large industrial/endowment funds.

Industry consortia are the second-largest player, often in collaboration with universities and research institutes.

For those looking to start a business, the European Innovation Council (EIC), part of the EU Framework Programmes, provides an interesting hybrid option of a grant combined with equity funding. The latter will be provided by the EIC Fund, which is now financed by the EIC but will also be opened to others.

The idea of funding open source software as a contribution to an open source software/internet commons i.e., a vital public good, is widespread (e.g. the EU Framework Programmes, Ford, Mozilla). The same is true for the idea that the public sector, the private sector, and civil society are in a power constellation in which civil society is the weakest party. For example, the crypto-anarchistic movement uses technology and open-source software to protect and empower citizens. The most recent example of this is cryptocurrencies.

The public sector is sometimes also seen as weak, due to a lack of resolve or capacity (e.g. Mozilla, Code4RO). In some cases, civil society uses open source software to help itself, but also to help the public sector. For example, Code4RO is building the IT infrastructure for Romanian citizens instead of the government of Romania.

2.6 Key findings

We discovered four categories of top-down funding mechanisms with:

- funding from government ;
- endowment funds with traditional industrial roots ;
- endowment funds with roots in technology; and
- industry/science consortia.



Figure 7 – Key findings on top-down funding mechanisms

We discovered important differences between mechanisms:

- For some funding mechanisms, open source is considered as a means to reach other objectives, while for some others supporting open source is the goal itself;
- the visions of the funding mechanisms determine their funding choices: some are led by industrial-political and geoeconomically drivers, while others are rather ideology driven;
- the funding mechanisms tap into a variety of funding sources, with some mechanisms getting their funds from several concurrent sources;
- the funding models adopted differ also in relation to the diversity of visions described above;
- the size of each grant or fellowship may enormously vary (e.g., from 3,000–5,000 USD to millions of USD per year).



Figure 8 - Differentiating factors of top-down mechanisms

Major transversal findings (Figure 9), common to most of the mechanisms

analysed in this group, include the following:

- open source – or in many cases openness in a far wider sense – has become a vision;
- only a few grants go to projects studying open source itself;
- funding can be outsourced into sub-funding and funding services providers;
- endowment funds typically use about 5% of their endowment per year for funding;
- all funds get far more applications than the funds they have available; this determines strict funding policies that significantly filter the applications received;
- science/industry consortia see open source software as a way to collaboratively develop non-competitive, foundational software;
- most of the major top-down foundations and business platforms are based in the USA;
- legal entities under which the various funding mechanisms operate usually exploit specific configurations for non-profit organisations; for example, the most used legal entity for such organisations in the USA is the so-called “501(c)3 organisation”;
- sustainability issues were found to affect not only individual developers, but also more organised funding targets (e.g. established communities / projects or developers operating under the umbrella of institutions).



Figure 9 - Transversal features of top-down funding mechanisms

Areas not adequately served

It is clear that the top-down funding mechanisms studied do not cater to the two target groups of this study:

1. critical open source software they use; and
2. pipeline of innovative software created by individual or small groups of developers.

2.7 Summary

The table below shows existing top-down funding mechanisms for FOSS, their views on FOSS, and their FOSS-specific characteristics and activities.

Table 1 - Synoptic view of analysed top-down funding mechanisms

Mechanism	Role of FOSS	FOSS specific characteristics and activities
Government		
EU Framework Programmes	Openness as the main driver behind the current research and innovation policy: open data, open access, open science, open innovation, and open to the world.	Just like in the Horizon 2020 programme, open-source software is never mentioned in the current documents on Horizon Europe, nor in the reports and materials that shaped the proposal for this programme.
EU-FOSSA 2 Project	Aimed to improve the security and integrity of critical FOSS	Running bug bounty programmes Studying Open Source usage worldwide Organising hackathons Pre-empting FOSS Support requirements Engaging with developer communities (including micro/small)
ISA2 Sharing and Reuse Awards Contest	Raising awareness about the benefits of sharing and reuse of IT solutions in the public sector (part of the ISA2 action 'Promoting sharing and reuse of IT solutions')	Biannual 'Sharing & Reuse Awards' Sharing & Reuse Conferences
Prototype Fund	Funding independent individual developers and small teams (German innovators) in implementing their open-source software ideas up to the prototype stage	All code produced has been published on GitHub or similar platforms. All open-source licenses allowed, but recommending the (highly permissive) MIT licence
National Science Foundation (NSF)	No FOSS policy, but "Investigators and grantees are encouraged to share software and inventions created under the grant or otherwise make them or their products widely available and usable."	Some open-source related initiatives more than a decade ago, but not anything recent
CERN	MALT project: minimise CERN's exposure to the risks of unsustainable commercial conditions KiCad: share hardware designs under an open-source licence	Published several of its software productions under a FOSS licence Investigating the migration from commercial software products to open-source solutions Adopted the KiCad PCB design suite in its central design office In 2019 the CERN & Society Foundation ran a campaign to collect donations for the further development of KiCad Currently not paying for support, but employing two of KiCad's lead developers
European Space Agency (ESA)	Publishing software developed under ESA contracts under an open-source licence	Using a dozen available ESA-specific licenses, varying from strong copyleft to permissive Maintaining the European Space Software Repository (ESSR), promoting reuse of (open-source) software and providing access to results of previous investments
Endowment funds with traditional, industrial roots		
Ford Foundation	Internet should be designed and governed as a vital public good Impact and capacity of civil society should be increased	Over the last ten years, about a dozen grants to Foss have been made, worth some 2.5 to 3 million USD

Development of a Funding Mechanism for Sustaining Open Source Software for European Public Services

Mechanism	Role of FOSS	FOSS specific characteristics and activities
Ford-Mozilla Open Web Fellows	"FOSS promotes the development of the internet as a public resource."	Fellows are expected to "release any code and non-confidential content created during the fellowship under an open license"
Mozilla Open Source Support (MOSS) award	Support open-source projects that contribute to Mozilla's work and to the health of the Internet	Supporting open-source projects that Mozilla relies on Supports open-source projects that significantly advance Mozilla's mission Supporting security audits for widely used open-source software projects as well as remedial work needed to rectify the problems found
Sloan Foundation	Open source as more than licensing strategy (as part of its 'Better Software for Science' programme: focus on tooling, institutions, economic models, and incentives around the production, maintenance, and adoption of research software)	Several grants that specifically address open-source software Supporting the further development of the Julia programming language The Open Source Alliance for Open Scholarship published a freely available handbook with best practices for researchers to create open source collaborations in academia Sponsored the study of hackathon design and outcomes; produced a series of publications as well as a toolkit
Critical Digital Infrastructure Research	Continuity of our internet infrastructure – a new public good – of which much has been built by volunteers as FOSS; The software needs maintenance, just as physical infrastructure does, but has no specific owner	Funded thirteen research projects that fill gaps in understanding of how digital infrastructure is built, maintained, and sustained: Uncovered significant research gaps in our understanding of how open-source digital infrastructure is built, maintained, and sustained Evidence that more diverse international communities of developers could be engaged more effectively and equitably by open-source projects based in the US and Europe Burnout among developers is a real issue across digital infrastructure projects
Endowment funds with roots in technology		
NLnet Foundation	Stimulating strategic technology research and development in computer networking and the internet Current focus on strengthening the position of the individual user on the internet and on improving the overall security of the internet	Micro-grants for "small, independent projects supporting independent researchers and developers" Running programmes for other funding organisations with compatible goals All projects are based on open standards, open-source software, hardware, and content Coordinated two of the four first research and innovation actions to kickstart the Next Generation Internet (NGI)
Amateur Radio Digital Communications (ARDC/AMPR)	Supporting communications and networking research with a strong emphasis on Amateur Radio; "Free and open source software empowers billions of people and millions of servers. When ARDC funds new work, we will require it to be able to freely spread without limit, to everyone who can benefit and to everyone who can contribute."	Grants across the educational, research, and development spectrum Contracting with research firms and consultants to carry out research and development to produce procedures, techniques, methods, designs, and intellectual property that would then be made freely available Possibly "buying free" certain existing intellectual property
Shuttleworth Foundation	Openness as an experiment in the world; Understanding what would happen if the values, processes, and licences of the FOSS world were applied to areas outside of software, such as education, philanthropy, hardware, and social development	"subscribing to the ethos embodied in FOSS" "applying the free and open source philosophy as the underlying principle to their work" "using permissive licences to allow learning and resources to be used, adapted and shared widely" "giving preference to the use of FOSS in their own initiatives and require partners to do the same" "insisting upon open communications, open reporting, open source software, open

Mechanism	Role of FOSS	FOSS specific characteristics and activities
		resources and permissive licences" One of the current fellows is Julia Reda, former Member of the European Parliament and one of the instigators of the EU-FOSSA 2 initiative
Industry/science consortia		
NumFOCUS	"Promoting open practices in research, data, and scientific computing": "Open code promotes innovation & discovery" "Open-source software is increasingly the standard in academic research" "Open-source software provides significant benefits for industry and business"; i.e., a shared pool of public R&D that companies can use directly to build solutions	Serving as a fiscal sponsor for open-source projects Organising community-driven educational programs Supporting the further development of the Python programming language in data science Sustainability Programme sponsored by the Sloan Foundation: identifying non-financial sustainability mechanisms for foundational projects Projects participating in Google's Summer of Code (GSoC) and Season of Docs (GSoD) NumFOCUS Community Alliance: cross-promoting events and activities of like-minded non-profit organisations and community groups

3 Bottom-up funding mechanisms

Where the previous chapter discussed top-down funding mechanisms for open source software, this chapter presents bottom-up models, strategies, platforms, partnerships, and initiatives.

To cover a wide range of bottom-up mechanisms, the project team has selected a diversity of mechanisms across the various categories.¹⁶

Below we present the main findings of this analysis, consisting of aggregated commonalities and peculiarities. The outcomes were acknowledged by the open source experts the project team discussed these results with, and the fact that they are consistent, and converging gives us trust in their validity.

These findings – together with those from the previous chapter – will serve as the basis for the analysis stage and the design of the funding mechanism.



Figure 10 - Types of bottom-up funding mechanisms

3.1 Key findings

Presented below are the main findings of bottom-up funding mechanisms, many of which mirror those from the top-down mechanisms (see Figure 11):

- many different monetisation/hosting platforms are available, offering a range of options to donors and sponsors, and a range of services to creators;
- fees to use monetisation platforms are typically 3–15%;
- cryptocurrencies such as Bitcoin may be used to support anonymous contributors;
- micro-monetisation mechanisms generally do not work;
- crowdfunding platforms do a good job at bringing together creators (supply) and backers (demand);
- business consortia and companies see open source software as a way to develop a pool of common or shared technology within an economic community;
- business consortia and public partnerships fund their open source software hosting and development through membership fees and joint implementation projects;
- civil society initiatives use similar hosting strategies and facilities as other

¹⁶ See case studies in Annex B.

- open source software communities;
- fiscal sponsoring and infrastructural/administrative hosting are widely available;
- the most used legal entity for non-profits in the USA is the 501(c)3;
- other shared services for open source software projects are available, but suffer from sustainability issues themselves;
- most often, the use of an OSI-approved open-source licence is required;
- bottom-up initiatives are more often based in Europe and Canada;
- individual developers and small groups have relatively small financial needs, but complex long term sustainability issues;
- people from the scientific and business world don't see a role for individuals and small groups in the continuity of open source software projects.

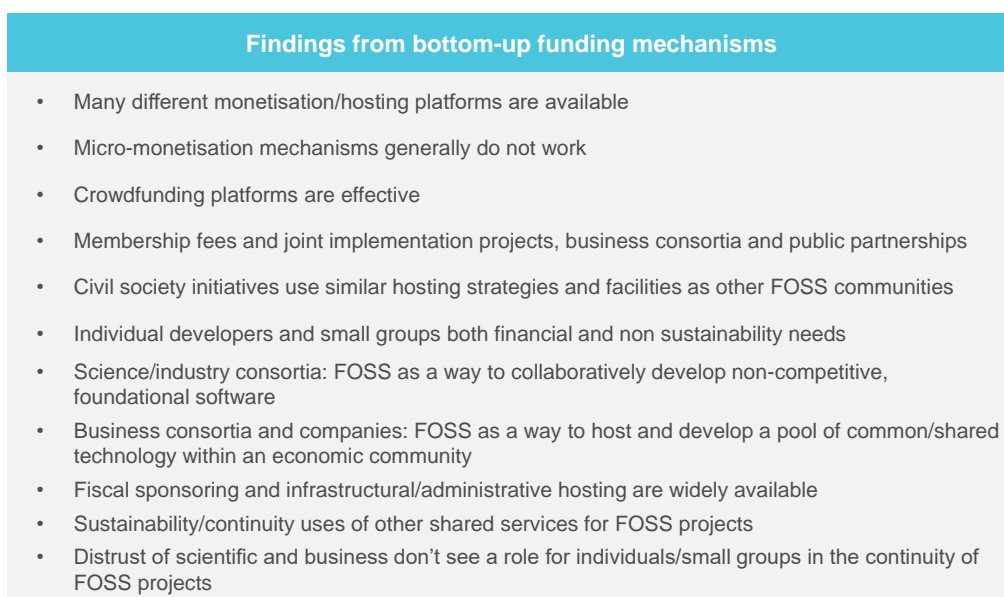


Figure 11 - Findings on bottom-up funding mechanisms

3.2 Summary

The table below shows bottom-up funding mechanisms for FOSS, their ownership and services, and their main features, issues, and effectiveness.

Table 2 - Synoptic view of analysed bottom-up funding mechanisms

Mechanism	Ownership and services	Features, issues, and effectiveness
Micro monetisation		
PayPal Donate button	PayPal: <ul style="list-style-type: none"> US company online payment/wallet platform payment processor 	<ul style="list-style-type: none"> (-) opaque fee structure (-) closed platform
Bitcoin wallet address	largest cryptocurrency network: <ul style="list-style-type: none"> decentralised pseudonymous 	<ul style="list-style-type: none"> (-) transaction fees generally too high to facilitate micropayments (+) can be used by anyone through a local wallet (+) receiving donations requires only the publication of a wallet address (+) pseudonymity allows for sending funds to contributors who insist on staying anonymous (+) transparency: transactions for a given wallet are public (+) FOSS
Patreon	<ul style="list-style-type: none"> US company membership platform where content creators can run a subscription service opposing the established, traditional system used by a wide range of creators and artists payment processor	<ul style="list-style-type: none"> increasingly popular with FOSS developers and content creators creators can ask visitors for support by publishing a 'Become a Patron' button (+) setting up an basic account is straight forward
Ko-fi	Ko-Fi Labs Limited: <ul style="list-style-type: none"> UK company "independent, profitable" social sponsorship platform positioning itself against Patreon as an alternative that charges no fees for basic donations targeting independent creatives intermediary only aiming to provide a set of tools for monetisation	<ul style="list-style-type: none"> creators can present their portfolios and galleries, write blogs, and notify supporters on updates supporting sponsorships, subscriptions, and sales of products and commissions creators can incorporate a Ko-fi button into their WordPress sites using an open-source plugin; same thing can be done for GitHub (-) not a FOSS-driven initiative (-) most members into games and visual effects (-) most of the members cannot sustain themselves through Ko-fi (most creators have a very modest audience)
Other micro-monetisation mechanisms	<ul style="list-style-type: none"> Google AdSense affiliate programmes Redbubble: print-on-demand merchandise EthicalAds	<ul style="list-style-type: none"> (-) Google will pinch off organic search traffic when deploying affiliate programmes (-) micro-monetisation mechanisms generally do not work, due to a lack of visitors/exposure
personal cross-subsidising	individual FOSS developers and small groups are often cross-subsidised through their day jobs and by family members	<ul style="list-style-type: none"> (-) work is often done in their spare time, alongside their day jobs (-) often at a cost of other people (e.g., family members) and themselves (e.g., their health)

Development of a Funding Mechanism for Sustaining Open Source Software for European Public Services

Mechanism	Ownership and services	Features, issues, and effectiveness
Crowdfunding platforms		
Kickstarter	<ul style="list-style-type: none"> US company creators set their projects' funding goals and deadlines, people can pledge money, and if a project reaches its funding goal, all backers' credit cards are charged targeting independent creators <p>positioning itself as an alternative to the traditional art and entertainment world</p>	<ul style="list-style-type: none"> (-) Kickstarter functions only as a platform provider connecting creators and backers; it is not a part of the contract between these two parties (+) all projects are reviewed by the platform before they are launched (+) the platform maintains a list of 'creator tested and recommended services' for fulfilment (+) available tools: funding calculator, Project Budget tool <p>(+) creators keep 100% ownership of their work</p>
Crowd Supply	<ul style="list-style-type: none"> US company aiming at designers, developers, and engineers to launch open-source electronics hardware after the funding goal has been reached, the product can be produced and distributed to the backers <p>Crowd Supply serves as the platform where supply meets demand, and as the distributor of the resulting products (i.e., a store)</p>	<ul style="list-style-type: none"> all orders must be shipped through the platform's shipping and logistics system (fulfilment) <p>Crowd Supply strongly advises creators to make their projects open source, but this is not obligatory</p>
Platforms offering legal and financial services		
Open Collective	<ul style="list-style-type: none"> online funding platform, driven by the FOSS community fiscal hosting: providing open projects ("Collectives") with a legal and financial infrastructure to sustain themselves (a "virtual legal entity") supporting donations, sponsorships, tiered access to contributors, crowdfunding, event management administrative and financial functionality <p>Open Collective Europe: a separate hosting entity for Europe, based in Brussels</p>	<ul style="list-style-type: none"> roughly half of the 4,700 Collectives are open-source projects most open-source projects by far are hosted under the Open Source Collective umbrella the use of an OSI-recognised open-source licence is required (+) also available to loose affiliations (+) the most popular FOSS projects collect tens or even hundreds of thousands of USD annually (-) but only the most popular projects can sustain themselves this way (+) the Open Collective software is available under a (permissive) open-source licence <p>(-) there is another level of FOSS projects beneath the ones that can be helped through fiscal sponsorship (a large number of FOSS developers want to remain free)</p>
Platforms offering project and community services		
Code Shelter	<ul style="list-style-type: none"> platform driven by the FOSS community aiming to connect experienced developers with projects that need their help <p>project owners can invoke help by assigning maintainer access rights to Code Shelter through their repositories on GitHub or GitLab</p>	<ul style="list-style-type: none"> (-) main problem for smaller projects is that their maintainers are no longer available or no longer have the time (-) Code Shelter started one year ago, but so far has not really taken off (number of projects too small) (-) although newcomers start enthusiastically, they are hard to activate (-) so the platform is quiet right now, but remains fully functional (+) there is no acute sustainability problem for the platform itself <p>(-) the site needs a new user interface and design, but the return would not justify the spending</p>
FOSS Torrents	<ul style="list-style-type: none"> project driven by the FOSS community offering FOSS packages for download over the peer-to-peer BitTorrent network <p>FOSS Torrents creates and hosts the torrent file, and sends out announcements for new versions</p>	<ul style="list-style-type: none"> (-) the project itself is suffering from financial sustainability issues, and at risk of falling into maintenance mode <p>(-) but its users are suffering from similar problems, so it is almost impossible to ask the project owners for money</p>

Development of a Funding Mechanism for Sustaining Open Source Software for European Public Services

Mechanism	Ownership and services	Features, issues, and effectiveness
FOSS (business) consortia and companies		
Eclipse Foundation	<ul style="list-style-type: none"> not-for-profit association based in Brussels platform providing a business-friendly environment for open-source software collaboration and innovation: <ul style="list-style-type: none"> vendor-neutral governance and processes IP management and licensing ecosystem development and marketing IT infrastructure <p>15 working groups; events (conferences and hackathons)</p>	<ul style="list-style-type: none"> hosting more than 400 open-source projects funded mainly by its more than 300 members employing a full-time professional staff (-) aiming at companies and FOSS organisations (continuity); no role for individual FOSS developers (+) "getting your project funded is not a problem" (-) but some foundational projects are vulnerable <p>(-) "a copyleft licence reduces your opportunity to be used by industry"</p>
OW2	<ul style="list-style-type: none"> non-profit FOSS organisation based in Paris projects from other regions are welcome, but the focus is on Europe "an independent community promoting open-source software for information systems and fostering their business ecosystems" taking an economic standpoint and seeing FOSS as part of the software industry (no advocating/lobbying for FOSS) <p>providing technical infrastructure, community services and marketing services</p>	<ul style="list-style-type: none"> membership is open to companies, public organisations, academia, and individuals accepting only projects with OSI-approved open-source licences hosting more than 80 FOSS projects, mostly middleware and information infrastructure software backed by more than 5,000 supporters <p>(+) after two years of negative income, OW2 achieved a positive result in 2019</p>
Kotlin/JetBrains	<ul style="list-style-type: none"> a Java-like programming language that targets the Android operating system developed by JetBrains, headquartered in Czechia <p>offering a family of software development tools, most of them closed source</p>	<ul style="list-style-type: none"> business strategy aiming to charge those creating value and making money from the tools, while allowing the language to blossom and providing access to non-commercial users so language and core tools are completely open, while tools for productivity and creating business value are restricted or even closed source and are commercially available resulting in a sophisticated matrix of products/components and licences implementing a multi-tiered open-core model (+) Kotlin became highly popular among Android developers after Google made it preferred language for Android app developers <p>(+) after which the value of the JetBrains company exploded</p>
Initiatives from the public sector and civil society		
OS2	<ul style="list-style-type: none"> a network of Danish public bodies (mainly municipalities) that use and produce open software focusing on digital solutions for the (Danish) public sector spreading knowledge and use of open source in Danish municipalities, regions, and state institutions creating and sharing development power <p>ideas are turned into projects, which are turned into new products</p>	<ul style="list-style-type: none"> all results from the OS2 network are released under an open-source licence or a Creative Commons license, with OS2 as the legal owner of all IP rights currently about two dozen products available almost all members of OS2 (currently 74) are municipalities even though the OS2 network does include suppliers, they have no voting rights (and pay no fees) software development projects are funded through an agreement between their initiating partners <p>maintenance is funded through an agreement between all the partners using and supporting the product</p>

Mechanism	Ownership and services	Features, issues, and effectiveness
Code for Romania (Code4RO)	<ul style="list-style-type: none"> civil society organisation consisting of almost 2000 volunteers creating open-source digital tools to solve societal challenges part of the international 'Code for All' network of civic tech organisations running several programmes in education, health, environment, care, and participation: <ul style="list-style-type: none"> for building solutions to Romania's problems for helping the civil society and the government 	<ul style="list-style-type: none"> (+) Romania has a large IT industry, and software developers are well paid compared to the rest of the country (-) a severe imbalance in the country's IT workforce, e.g., a lack of user experience (UX) designers, business analysts, and software architects (-) 20–25% of all members don't live in Romania, but elsewhere in Europe and in other countries like the US and Canada (-) Romanian government has no open-source software policy (-) unable to take any funds from the Romanian government, due to fear of corruption (+) current funding allows a paid staff of 12 full-time employees (-) development of FOSS through grants is going well, but difficult to fund administration, management, maintenance, and support of software, and helping institutions (users) in building capacity (-) current funding is just adequate for the current applications, but the organisation is struggling this year for the first time <p>(-) never applied for funding from the EU, because of the bureaucracy and inflexibility of the institution</p>

3.3 Exclusions

The study did not cover the following funding mechanisms:

- GitHub Sponsors
- Outreachy, the grant program by the Software Freedom
- Conservancy
- Liberapay.com donation platform (as liberapay's code is free software, it is likely that the majority of this platform's users will be FOSS maintainers and/or contributors).
- Other open source ecosystems' donation initiatives: e.g. <https://www.clojuriststogether.org> for Clojure libraries and the Cognitect company (sponsoring Clojure authors through GitHub Sponsors mechanism).
- Some of the crowdfunding methods mentioned here – see <https://wiki.snowdrift.coop/market-research/other-crowdfunding>

4 An analysis of funding mechanisms

This chapter summarises the key findings of the above two investigations.

4.1 Identified shortcomings/sustainability issues

Funding mechanisms issues
1. A lack of continuity of projects; focus exclusively on innovations
2. No generally working funding mechanisms for grassroots innovations
3. An inherent lack of visibility of foundational software, software libraries, niche applications, and even popular applications
4. Govtech projects – lack of European fiscal and infrastructural hosting platforms
5. FOSS funding mechanisms and foundations are dominated by US-based organisations
6. Some very specific sustainability issues in civil society (Code4RO)

Figure 12 - Funding mechanisms issues

FOSS used by government organisations is not fundamentally different from FOSS used outside the public sector, but does require specific attention to security and safety, openness and transparency, and interoperability.

We have identified six financial sustainability issues¹⁷ for FOSS relevant to the European public sector, caused by the universal ways we organise innovation, a lack of visibility of certain types of software, a lack of European FOSS platforms for Govtech, and some highly country-specific problems.

4.2 Potential Solutions

To address these sustainability issues or problem areas, a dual approach is needed.

1. One comprises providing financial support
2. The other infrastructural hosting, business, governance and marketing support for Govtech projects, especially those leading to sustainability of critical open source projects

One wonders whether in some way some existing funding mechanisms could plug these gaps.

Solutions needed
<p>Financial</p> <ol style="list-style-type: none"> 1. The maintenance and sustainability of critical FOSS used by European Public Services 2. Innovative grassroots projects run by individuals and small groups 3. Individuals and small groups working on ideas that benefit the wider FOSS ecosystem <p>Non-financial (Services)</p> <ol style="list-style-type: none"> 1. Infrastructural hosting, business and marketing services for open source projects 2. Governance of the sustainability of FOSS used by public administrations

Figure 13 - Solutions needed

¹⁷ These can also be seen as areas that inadequately supported today, and which a potential European funding mechanism can support.

From our research, three mechanisms are potential contenders:

1. the EIC Pathfinder instrument (part of EU Framework);
2. Germany's Prototype Fund; and
3. The Linux Core Infrastructure Initiative, CII (now merged into the Open Source Security Foundation (OpenSSF)).

As of now, these mechanisms do not provide the necessary funding and services as identified above.

Therefore, it is reasonable to state that there is a clear need for a new European funding mechanism to focus on sustainability and small developer led innovation for open source software, to safeguard and protect the ongoing and future strategic and operational systems of European public services.

5 Sustainability needs

This chapter expands on the sustainability needs of the two primary targets for this study, namely:

1. Projects deemed critical, as they may fail to exist
2. Individual developers/small developer groups

There are some common sustainability needs of the two target groups, and some quite distinct. See below for an explanation.

5.1 Mature software vs start-ups

The main difference between mature and start-up software developments is the degree of dependence of the software and the developer(s) who initially created it. Of course, in the case of critical open source software, the software is mature, and yet there is likely a high degree of dependency on the originators or current maintainers, as they mostly lack staff who work in that project.

In the case of Startups at least, livelihood needs are important to sustain their activities in open source. As reported by one of the open source advocates interviewed within this study¹⁸:

“Many FOSS projects were started by developers for their own needs, not to sustain their families. But at the time they didn't realise how much blood, sweat and tears it would take to sustain these projects.”

As the Shuttleworth Foundation puts it, “We fund you as an individual to offer the best, most efficient support, and help you iterate ideas and realise your vision.”¹⁹

Critical software projects may need finance, or most likely fresh blood to join their projects and share the workload.

5.2 Types of needs

The developers, community representatives and funding institutions/platform stakeholders have expressed needs from their different perspectives.

Finance

A major area of need is finance. Many open source developers work and create open source software in their spare time. When pressure grows to complete or maintain a growing project, there is a major conflict between earning enough and completing their work. Further, they have to self-fund server and other costs.

Visibility to attract new talent

As mentioned in Chapter [2](#) on the top-down analysis, this is a major need for

¹⁸ Hadi Hariri, Vice President of Developer Advocacy at JetBrains

¹⁹ <https://shuttleworthfoundation.org/thinking/2020/10/23/webinar-faq/>

three types of software projects:

- smaller projects, many of which are in their early development stages (many of which could turn into highly innovative mature projects later)
- solid proven software which is deemed to be stable
- initiatives driven by younger individual developers, who do not yet have the capability to attract the attention and the funds from potential backers

In cases where small amounts of money are distributed (and dispersed through different open source projects, such as in crowdfunding platforms), funds follow a long tail distribution that is only worthwhile to those at the top of the pyramid and most visible for any reason.

What is needed to make these mechanisms work goes beyond micro-monetisation: developers need tools and tactics to help them get exposure, without having the feel of marketing or "begging". This includes for example getting training on skills to connect these projects to other projects and people, provide training on skills related to open-source sustainability, and provide support infrastructure specifically aimed at sustainability²⁰.

Online visibility must also take in consideration the constraints and peculiarities of search engines. For example, affiliate programmes, which provide with some small fees the developers / communities that display on their site ads promoting other works, should work better when embedded in (YouTube) videos and audio (e.g. podcasts) than on websites. This is due to the fact that search engines see affiliate marketing as a competing model and may tend to reduce the SEO of the site using it.

Funding solutions or platforms should allow integration with developers' or projects' web pages or social media account to increase projects' visibility.

Ethics

The open source community individually and collectively relies heavily on a cooperative, transparent culture, which permeates the entire ecosystem. These key principles are mostly built around the concept of freedom²¹.

Fundraising platforms must therefore provide a safe and trusted platform where people are honest and open with one another as they collaborate to bring creative projects to life. "A team should be always watching over the platform and reviewing feedback from the community".

Privacy

Privacy of donors to FOSS projects is key. Donating to certain projects reveals a lot about a projects' technical setup, but may also spread to ones' political inclinations, etc. It also gives a lot of business information to the funds provider.

Therefore commercial mechanisms like GitHub sponsors (with donations going to the US, and falling under the legal regimes there; and with Microsoft being a very large proprietary SAAS supplier) are bad for public safety and market health. The fact that it is 'gratis' does not make it a community service, and the fact that they

²⁰ NumFOCUS runs in particular a Sustainability Programme (sponsored by a large grant from Sloan) to sustain its foundational projects.

²¹ <https://fsfe.org/freesoftware/freesoftware.en.html>

'monopolise' donations through their platform is something to urgently tackle before the current 'weak' position in the market turns into a larger problem.

Independence

At least in one interview, it was reported the need for more independence from the behaviours of platform owners, who may suspend user accounts for futile reasons. This could be seen, as for the ethics, as a form of the need to comply with key open source principles (freedom, in this case).

Human contact

In some cases, developers have expressed the need for human proximity, at least with platform operators, if not with lenders. This may be considered as a particular instance of the respect for open source principles, if not specific to the project.

Simplicity and efficiency of process

Simplicity of process for registering on a (crowd)funding platform is essential for developers: for example, the registration process takes about 15 minutes in Patreon. This should also take into account that many FOSS developers have expressed quite small financial needs, such as a few hundred Euros to hire a web developer. In such cases, funding applications become highly inefficient.

So, for small amounts of funding for example circa €5k-€15k, the process could be light, for up to €50k, medium, and for > €50k, a more detailed application could be justified.
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Assistance for collecting/receiving/administering funds

In order to be able to handle inflows and outflows of money efficiently and in compliance with applicable rules, especially in case of many smaller flows (e.g. in crowdfunding), developers and communities may require assistance for accounting and administration. In some cases, this assistance may also consist in acting as fiscal representatives of the developers or of the communities.

Adequate return

Any funding to open source through funding platforms must ensure that fees and commissions leave sufficient, meaningful margins on the collected funds.

Diversified offer

Project owners or communities should have the possibility to offer both basic free services and advanced paying services. Furthermore, creators are more and more using goals (e.g. a code audit) that can be sponsored (compare crowd funding) and tiered access. From the available tool set, creators should be able to select their own mix, depending on their specific needs and wishes.

Anonymity/pseudonymity

The pseudonymity provided by a decentralised network could be useful in sending funds to anonymous contributors. This is important because there are many contributors who insist on staying anonymous, sometimes for personal reasons, sometimes for legal and security-related reasons inherent to the project. Privacy is a recurring need expressed by several open source developers.

Transparency

Anonymity does not have to be opposed to transparency. For example, a Bitcoin address (when the same one is used over a longer period of time) provides transparency to supporters and visitors, because all incoming and outgoing transactions are publicly available on the blockchain. This is relevant as transparency, (also in operations) is considered a key open source principle²².

Have a supporting ecosystem

A specific need of open source software is to have an ecosystem supporting it, i.e. an open and diverse community, which includes attracting new people and contributions.

Unsurprisingly, some of the needs expressed on open source funding processes correspond to drivers generally applicable to the diffusion of marketplace lending identified according to a Deloitte research²³, i.e. the practice to use online platforms to connect borrowers with investors willing to offer loans.

As shown in Figure 14, ease of the application process and little documentation required (which correspond to the need for a simple and efficient funding process) resonate with open source projects too.

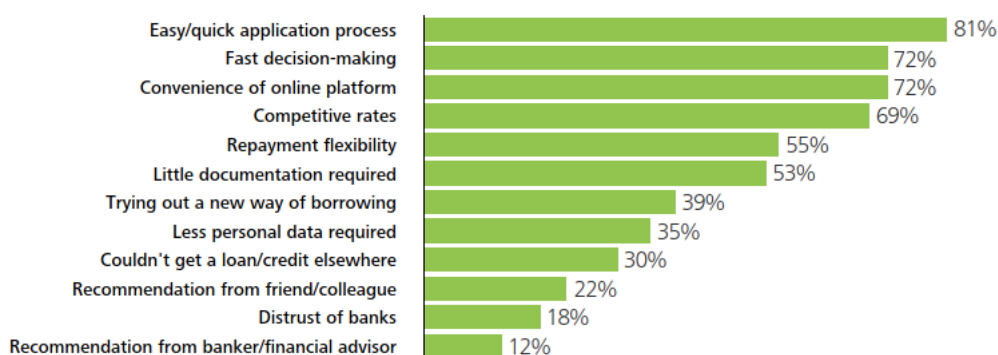


Figure 14 - Drivers behind the usage of marketplace lending

(Source: YouGov plc 2016 © All rights reserved, Deloitte analysis)

We can group some of the needs reported above as follows:

- "Ethics", "Independence" and "Human contact", under "Ethics",
- "Simplicity and efficiency of processes", "Assistance for collecting / receiving / administering funds" and "Lack of back account", under "Administrative simplification",
- "Adequate return" and "Diversified offer", under "Financial sustainability".

Visibility has been the one most heartfully reported, as it is a prerequisite for many of the smaller, little known projects or for individual developers not yet considered by wider communities.

²² <https://opensource.com/open-source-way>

²³ [Marketplace lending – a temporary phenomenon?](#) Deloitte LLP, 2016

6 Consultations with open source experts

6.1 Approach

The European Commission, recognising the importance of this study, requested consultations with open source experts from the European public and private sectors. After identifying the selection of open source experts, consultations were conducted via two mechanisms:

- holding a workshop;
- conducting interviews.

6.2 Workshop

6.2.1 Aims

The objectives of the workshop were to:

- present the findings of the study's top-down and bottom-up investigations;
- discuss the findings and gain comments/validation of those findings, leading to agreement on the funding gaps created by current funding mechanisms;
- collectively discuss, identify, and agree the needs of European public services as regards sustainability of critical open source software and the open source innovation pipeline;
- assess whether these needs can be adequately met by existing models, or whether there was a genuine funding gap, and potentially, a new funding entity may be needed;
- discuss the ideals, structure, and high level *modus operandi* of such a potential a European open source funding mechanism.

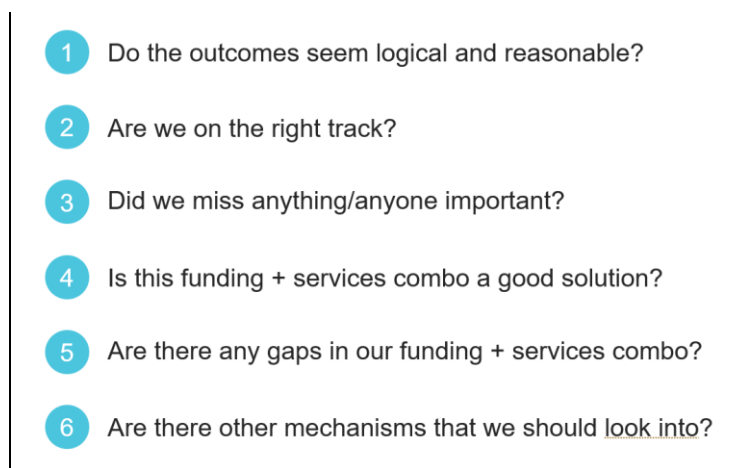
- 
- 1 Do the outcomes seem logical and reasonable?
 - 2 Are we on the right track?
 - 3 Did we miss anything/anyone important?
 - 4 Is this funding + services combo a good solution?
 - 5 Are there any gaps in our funding + services combo?
 - 6 Are there other mechanisms that we should look into?

Figure 15 - Workshop discussion items

6.2.2 Attendees

20 open source experts²⁴ drawn from the following stakeholder groups attended the workshop:

- **Funds:** this group included administrators or managers of foundations or other non-profit entities already operating in the open source sector;
- **Government:** this group included digital public service owners, managers, or implementers, responsible for planning, designing, developing, testing, operating, and improving digital public services on the base of open source infrastructure;
- **Open source SMEs:** this group included businesses having interests in the open source software community; they usually participate to call for tenders, support developers and provide a management structure to them;
- **Civil society, advocacy, and activists:** this group included individuals and organisations in a society that are independent of the government and hold interest in the use of open source software;
- **Academy and research centres:** the environment or community concerned with pursuing research, education, and scholarship on open source.

6.2.3 Primary outcomes

The outcomes from the workshop can be summarised as follows:

Validation of the study approach

The workshop attendees appreciated the systematics and thorough research carried out by the contractor and applauded the comprehensiveness of the ground covered by the investigation.

Agreement with the findings

Overall, workshop attendees agreed with key findings and conclusions of the investigation. At several points, they shared their own experiences and perspectives on the information sources and funds contacted and clarified why they were set up the way they were.

Sustainability

Attendees recognised the need to protect European public services from critical software. They were highly concerned that they may not know all of the software which was deemed critical, and appreciated the European Commission's initiatives in this regard.

They also echoed an understanding with the funding/sustainability needs of individual and small developer groups, and recognised that such level of support was not universally available throughout Europe.

²⁴ The list of attendees is reported in [Appendix B](#): Workshop attendees

Confirmation of the funding gaps

Most importantly, after assessing the available sources of funding, there was unanimous agreement that the specific areas targeted by the study, were not adequately funded, and therefore there is a real need to set up a new fund to cater to that gap.

Suggestions and warnings

For a new fund, workshop attendees gave a number of suggestions about how to set up the fund, best practices, and additionally, how to avoid potential pitfalls.

European Commission

Workshop attendees appreciated this engagement opportunity by the European Commission and welcomed future opportunities to be consulted. They commented on the maturity of the work being done by the European Commission on open source (EU-FOSSA 2, ISA² and others), and welcomed the recently announced European Commission's open source strategy and the setting up of an OSPO.

6.2.4 Suggestions and cautions

Participants reached consensus on several principles that must shape a funding mechanism supporting open source software for European public services :

Principles, philosophy, and remit

- The structure of the funding mechanism should be light-weighted and non-bureaucratic: the fund must be suitable for the open source ecosystem, in line with the agile nature of communities.
- The mechanism should foster diversity in cognitive styles, skill sets and backgrounds in open source communities and ecosystems.
- The funding mechanism should not interfere with the decisions and priorities of OSS communities.

Scope

- The proposed funding mechanism must fund European and non-European projects alike: limiting this possible new initiative to a European-only beneficiaries would be a fatal mistake: as much of the software that European public services depend on is not geographically bounded, the potential barriers to entry would lead to the incapability to sustain critical software.
- The proposed funding mechanism should sustain both innovation and maintenance of open source software: although funding maintenance looks like a challenge compared to funding innovation, projects are diverse and not equal in terms of innovation; innovation might however come up from different angles, and is therefore legitimate to invest in projects showing different degrees of innovation, if they can qualify as a "winning project"²⁵;

²⁵ For example, the group called "[The Maintainers](#)" explores the area of making sustainable the network of maintainers

- Projects should have relevance to European public services (in terms of actual or possible use, or dependency on projects used in European public services) to be eligible for support.

Beneficiaries / target projects

- Beneficiaries should include not only individual developers and communities but also businesses, particularly SMEs: 80% of developers work on open source projects on behalf of companies that do not aim to commercialise the software but rather require it for internal use; furthermore, smes can be powerhouses for innovation.
- Open source software projects to fund would include:
 - Innovative grassroots open source software projects ;
 - Open source software with a strong societal impact ;
 - Individuals and groups working on ideas that benefit the open source ecosystem;
- Specific funding programmes should be dedicated to focus areas of interest (e.g., Blockchain technology / Digital infrastructures);
- It was debated whether applicants who want to remain anonymous should be allowed to apply for and receive funding.

Size

- The experts felt that the initial fund size should in one measure be proportional to a percentage of open source expenditure (or total IT spend), and the other based on the needs of the fund's recipients. In any case, the fund should be strongly linked to total IT budget of the organisation and become an integral part of it.

Setting up the fund

- The new funding mechanism should be an independent entity, although it would be possibly promoted by European public services; the European Commission may have a role as a facilitator of the process and federator of the interests of the different European public services;
- the new funding mechanism will have to be flexible and adjustable in its design and be built step by step.

Sustaining the fund

- The new funding mechanism should mostly rely upon public financing;
- The new funding mechanism should accept contributions from businesses (in exchange of tax break or incentives); consensus was not reached, on the contrary, on the opportunity to receive contributions from individuals as well, considering that such channel would not create a meaningful volume of capitals;
- Public institutions should be the main financial source of the fund. The fund should also be able to receive contributions from private companies, which could be facilitated with tax breaks and incentives. Nonetheless, this last point was not discussed in depth as many felt that it would not create a

meaningful volume.

Organisation

- The organisation must be composed of different layers (steering layer, executive layer, programme management layer, advisory team); (project) management profiles are required for the executive and project management layers, open source experts for the advisory team;
- The administrative power (collecting funds) should be segregated from the operational power (allocating funds);
- The assessment team should not be composed by fixed stakeholders, but rather a panel of external experts temporarily hired for assessing different types of projects, possessing specific knowledge and experience on the domains of the applying projects;
- It was debated whether the assessment process should be open, allowing the open source community to vote for projects, and whether the assessment should be complemented by an external review committee composed by volunteers only.

Application, assessment, and disbursement process

- The application process should be easy to use, light-weight, and non-bureaucratic: applicants should be asked to provide only basic information through a simple and clear application form, in English;
- Subjects other than applicants may participate in the application process: projects that deserve and need funding may be also proposed by the community, and communities behind an applying project could be used for endorsements (and quality checks) in the application.
- A two-tier selection process should be adopted, to filter applications.
- The duration of the process should be relatively short, lasting from few weeks (for smaller grants) to few months (for larger grants).
- Selection criteria would include:
 - Relevance to Europe, for example in its roots or in its developer or user community;
 - Consistency with open source principles;
- Projects should be assessed considering their maturity as part of an ecosystem rather than individually taken; the "degree of innovation" should not be the only evaluation criterion as opposed to long-term sustainability;
- While the application process should be very light, the contractual aspect shall be heavily regulated to ensure that no abuses occur, public money being involved;
- Payment should be made as a mixture of upfront, milestone/task and final delivery disbursement;
- Intermediaries may be used as disbursement channel;
- Blockchain could be used for payments.

Non-financial support:

- The new funding mechanism should be looking for complementary ways to support the development of an open source sustainable ecosystem for example hosting, marketing, business support, licensing consulting.

6.3 Interviews

The inputs provided during the workshop were complemented by a series of interviews focusing on the needs of European public services on open source. These following three people were interviewed:

- For representatives of European public services: Leonardo Favario of the Italian Ministry for Innovation and Digital Transition, and Bastien Guerry from France's Etalab.
- For a broader open source and political view: Julia Reda, a former Member of the European Parliament, academic and advocate for open source.

6.3.1 Observations by the European public services interviewees

Leonardo Favario (Italy) and Bastien Guerry (France), two representatives of European public services, stated their recommendations on different domains related to open source projects, as follows:

Cloud strategy

As Leonardo Favario reported, the Italian government IT strategy is focused on the cloud transition of the public services' software tools. This is a forced transition that will require to the public services to slowly abandon their obsolescent data centres and migrate towards cloud solutions. The first step of the strategy will involve the data centres then the software. This second step is certainly more critical because software re-engineering may (or will be) needed, as the original software were not built for cloud native platforms. In this framework, is very difficult to highlight a piece of software or code that is critical since there are so many.

Similarly, Bastien Guerry claimed that France has a new cloud strategy that aims at protecting the privacy of data that French public services will upload on the cloud.

Security issues, catalogues, and dependencies

The Free Software unit wants to work with the French National Agency for the Security of Information Systems to identify those open source libraries that need to be monitored for security, viability, and sustainability reasons. .

Following this security issue, Leonardo Favario highlighted another Italian public administration use case. Public services use hundreds of open source packages to deliver their services. Those can be little packages (majority of them) or big infrastructure. Among these hundreds of packages, there are many flows and dependencies so whenever the providers or the public services release the source code, security issues may raise. Many flows means many vulnerabilities. Security should be put in the top list of arguments to look at when a source code update is released.

With respect to open source software catalogues, Bastien Guerry reported the existence of a specific list of reusable projects built by French community. Those are really helpful to monitor the dependencies among open source software. The aim is to have a list from which is easily discoverable the dependencies that a reusable software is creating, greater are the dependencies higher the level of criticality that the software receives. Thanks to this, they have detected 3 thousand dependencies.

In addition, there is a catalogue of recommended software for public services, from which is to possible extract at least 10 solutions which are critical for example LibreOffice.

On the Italian side, the scanner project is still in a pre-building phase. The goal is to scan the dependencies and then select the most critical open source software based on the level of dependency created.

Relevant sustainability issues in the European open source framework

- Cultural gap: There is a cultural gap between public services and open source Communities that needs to be filled. An idea is to create knowledge centres that are locally based (e.g. at municipality level). This will put the open source community much closer to the issues of local administrations and vice versa. This will help communities to advertise their software and the municipalities to raise gaps/bugs or new features. Build interconnections between these two entities.
- Funding problem: it is hard for the public administrations to fund OSS easily. Public services might have CAPEX (from extra budget) but often they do not know how to allocate these expenditures in the "book records". (Italy can't fund OSS with credit cards such as done in France). Having a proxy (e.g. an association) can help to spend the extra budget.
- Communities: it is necessary to get closer to communities in order to better understand OSS needs. Is likely that the community does not need millions of funds but just other help. The proxy solution (Association on behalf of the public administration) is a possible way to get closer their needs and understand better their evolution
- Research: funding European open source research and enhance research for OSS at a public level is a key need.
- Cloud: it would be appropriate to fund open source solutions that are key to what is an appropriate cloud strategy and not look at Amazon or Google just because they are well fashioned.
- SMEs: these are a distinct force for EU, but is not always clear their contribution to the open source community. They do not advertise their work efficiently and effectively.

Goals of a to-be European funding mechanism for open source projects

Lastly, Bastien Guerry suggested two goals that a funding mechanism should chase and two possible ways to do it, as reported in Table 3.

Table 3 - Two possible goals for a funding mechanism for open source

Objective	Solutions
<p>A funding mechanism should concentrate more on the project roadmap. It is a very important criterion.</p> <p>For example, Peertube is a French open source software very useful for educational aspects. Ministry of Education funded the project because believed in their roadmap. In order to fund Peertube, Ministry of Education used a proxy called Framasoft.</p>	<p>Direct funding: is a very hard and slow process because you need to know well the OSS company, the community, and the project itself. An active participation in the project requires to understand very well the roadmap.</p>
<p>The other goal that a funding mechanism should pursue should be the insurance related to open source software. An insurance to cover from the risk of abandoning the project.</p>	<p>Use a proxy to fund open source software projects. French Ministry Of Education exploited Framasoft, which is an Association, to fund Peertube Associations that fund on behalf of the Ministry. This is a relevant approach in the context of insurance of libraries.</p> <p>Tidelift does this kind of work, business plan. Moving forward with vital products is a good investment.</p>

6.3.2 The view of open source advocacy

Ex MEP Julia Reda reported that there is a growing need for diversity in funding: the defunding of the Open Technology Fund under the Trump administration in USA (although being reconsidered under the new administration) has shown that the open source world cannot rely on just one source of funds.

Ms Reda addressed the following key points for discussing the opportunity of establishing a fund:

- A possible new funding mechanism must be easy to apply for, even through intermediaries, such as a civil society organisation that has the trust of the open source community;
- The country where potential beneficiaries are based should not be relevant; the funding mechanism should be truly open to worldwide applications;
- The fund should not only target innovation, but also maintenance of existing open source software: some of that software may not be used for lack of trust on its stability and usability or maintenance issues; a public organisation may be better placed than a private one, as the latter tend to focus rather on innovation;

- Funding projects under open licenses should be the priority, but not only: also, projects under copyleft licenses should be targeted; compatibility and interoperability should be key under any licensing approach adopted;
- European public services in particular need maintenance, security, usability of their open source software;
- The “European” label should rather refer to those that benefit from the funded projects (public services, businesses, and citizens); “European” should also be the agenda, i.e., the priorities that the fund should address;
- A European open source foundation may be the vehicle handling such a fund;
- There is a gap in open source funding, rather concerning maintenance and base components (e.g., libraries), but not necessarily in innovation;
- As the funding gap concerns in particular smaller initiatives, the fund may work as an incubator of many such small open source projects, similarly to some organisations already doing this in the Netherlands or in Germany;
- The gap is also demonstrated by the fact that, for example, Germany’s Prototype Fund is receiving many more requests for funding that it can handle;
- The fund may work as a “fiscal sponsor”, offering various services such as administration, book-keeping, funds management; Open Collective²⁶, an association collecting and distributing funds to open source projects, is doing this for ca. 2000 projects;
- The procedure to request and disburse funds should be transparent: criteria to select and assess recipients should be clear and public, so to make sure that decisions on grants are not arbitrary;
- Sources of funding may include public services, but also the private sector, provided that it does not have a say in the selection of projects to fund;
- The time horizon of the fund should be between 3 and 5 years;
- The fund may provide many grants for small amounts; it should not be necessary to handle large amounts of money for bigger grants to make an impact.

²⁶ <https://opencollective.com/>

7 A blueprint for a European funding mechanism

This study has convincingly shown the need for additional funding to deal with the two primary targets:

1. Projects deemed critical, as they may fail to exist:
2. Individual developers/small developer groups.

It would not be an overstatement to say that some critical software in use, could be regarded as ticking time bombs that urgently require defusing. Furthermore, European public services need to identify all such critical software.

The second area of assistance is to support EU wide open source innovation, at the ground level.

7.1 Plugging the funding gap

There are several ways to plug this funding gap.

The study has highlighted the existence of many excellent European funding mechanisms. One option is to adapt and use one of these mechanisms.

Another option, which is described in this chapter, is to set up a separate Europe-wide funding mechanism. Just to make it clear, the study is not necessarily recommending, but only exploring the nature of a new funding mechanism, should it be set up. If one is, it would complement existing mechanisms rather than copying or competing with them. At the same time, existing ideas, structures, processes and even software can and should be (re-)used where possible.

This chapter outlines current thinking on an architecture/blueprint for a European open source funding mechanism, and covers the following components:

1. Mission, principles and aims;
2. Targeted beneficiaries and projects;
3. Award numbers and sizes;
4. Estimated fund size;
5. Application, selection, and funds disbursement process;
6. Set up, resourcing and organisation;
7. Proposed next steps.

The schema below shows the key components which require considerations in setting up the new funding mechanism²⁷ and dependencies between them. It only serves to show the level of complexity of the potential funding mechanism.

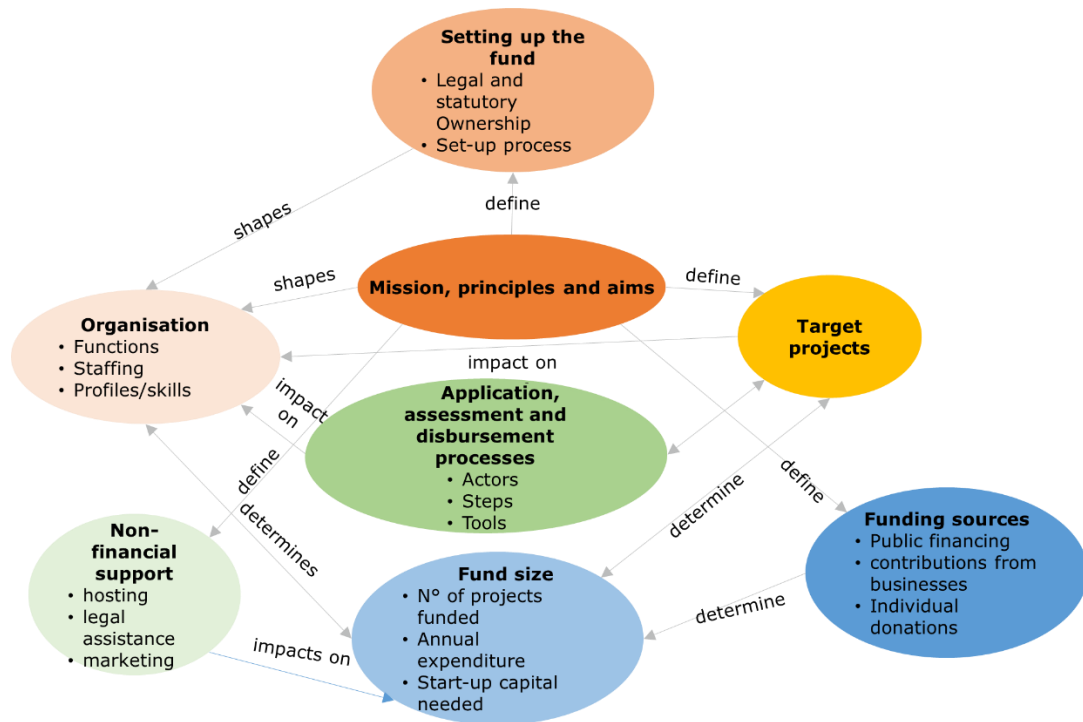


Figure 16 - Key elements for the design of the funding mechanism and dependencies between them

7.2 Mission, aims, and principles

Mission

The mission of the proposed European funding mechanism can be articulated by the following text:

The European funding mechanism will enable European public services to use, safely rely on, encourage innovation in and contribute to the long term sustainability of open source software and its associated ecosystems within Europe, and support open source projects that contribute to a long term positive societal impact.

Aims

The aims of the funding mechanism are:

- seek out critical software and provide financial and non-financial assistance to ensure their long-term sustainability;

²⁷ Unless stated otherwise, in this chapter the funding mechanism refers to the proposed European funding mechanism.

- encourage and support individual/small scale innovation (GovTech);
- target projects potentially making a broad societal impact

Principles

The funding mechanism will rely on using the following principles:

- recognise that European public services rely on and obtain benefits from open source; therefore, they have a duty to contribute, give-back, nurture and sustain open source ecosystems within Europe;
- acknowledge that open source is a shared and valuable public resource and its long term sustainability is vital for European digital success;
- value projects that are consistent with open source principles such as equality, openness, and transparency; this also means there should not be any geographical limitations for applicants;
- encourage the exploration of new technologies/innovation and projects aimed for societal good;
- continually review the relevance of the funding mechanism.

7.3 Targeted beneficiaries and projects

7.3.1 What to fund

Linking back to areas not adequately funded, the target projects would include:

- open source projects/initiatives used by or relevant to European public services which have a "critical" status;
- innovative grassroots projects run by individuals and small groups;
- solutions with a strong societal impact, for example in climate change, healthcare, education, safety/security, and civil society;
- individuals and groups working on ideas that benefit, improve, or enable the wider open source ecosystem, such as working on new open-source licensing models, and people studying and tinkering with the inner workings of open source.

7.3.2 What not to fund

The following areas should not be funded:

- sector-specific (foundational) solutions which can be funded through an industry consortium or one of the foundations (i.e., for which there is a viable (joint) business model);
- solutions developed as part of research and development that can be funded via a scientific/business consortium through the EU Framework Programmes;
- software developed as part of an innovation that can be commercialised and funded through the EIC Pathfinder instrument (i.e., for which there is a viable business model and market opportunity);

- open source hardware that can be commercialised and funded through crowdfunding (i.e., for which there is a market opportunity);
- software with strong ties to commercial companies and/or interests, e.g. Ubuntu (Canonical), Pop!_OS (System76), and PureOS (Purism/Librem).

7.3.3 Beneficiaries

We see the following groups as the prime beneficiaries:

- individual developers;
- small groups/communities of developers;
- representatives of individual or small group developers;
- SMEs developing open source software;
- service providers and partners.

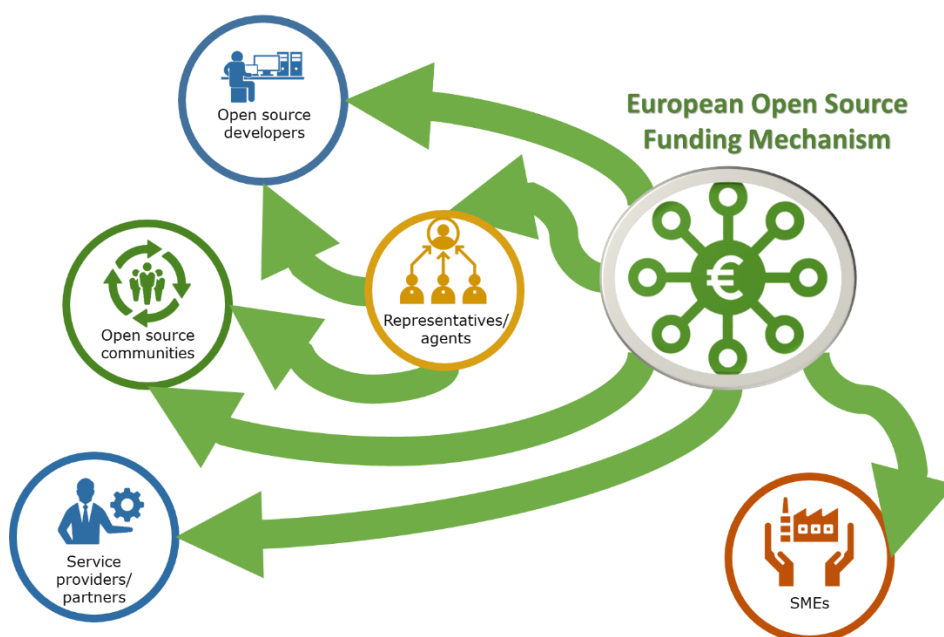


Figure 17 - Categories of beneficiaries

7.4 Award sizes, numbers and fund size

At this initial stage, it is sensible to estimate the potential numbers of projects who may apply for funds and the amounts the fund makes available for disbursement.

7.4.1 Number of projects

NLNet and Prototype fund

To help establish some industry benchmarks:

- To help establish some industry benchmarks: the Prototype Fund funded 40 projects on average/year from 2016 by as of March 2020²⁸;
- NLNet funded 110 projects in 2020.^{29 30}

Identifying projects

Information on GitHub provides an estimate of the number of Government repositories³¹. Applying a factor to calculate the number of active repositories³², then a ratio based on a threshold of criticality³³, we obtain an estimate of about 230 critical open source projects of public relevance. A sensible target for the fund is therefore to provide grants to between 50- 200 projects.

Taking **300 projects per year** as an example, these could be:

- 100 projects of a duration of 6-9 months each (for critical projects and other worthy projects, even if they are not in the GovTech sector)
- 200 “fast-track” projects of a duration of 3 months each (for individual/small development groups)

7.4.2 Amount granted per project

For critical projects

The maximum amount to be granted by project is calculated, similarly to the Prototype Fund, on the average salary of a FTE software developer in Europe³⁴ for

²⁸ <https://okfn.de/en/projekte/prototypefund/>

²⁹ <https://nlnet.nl/foundation/annuals/2020-annual-report.pdf>

³⁰ It must be noted that the Prototype Fund and NLNet have two quite different funding cycles: 2 funding rounds/year for the Prototype Fund, with average grants of ca. €41,000; 6 funding rounds/year for NLNet, with average grants of ca. €21,000. The proposed mechanism merges these two different approaches.

³¹ <https://government.github.com/community/>; the list of repositories included in the collection is reported in [Appendix D: Data from GitHub Government collection](#)

³² <http://oss.x-lab.info/github-insight-report-2020-en.pdf>: 54.21M active code repositories out of 190M in 2020, i.e. 28.53%

³³ As per the specific definition of criticality on GitHub. The numbers for example the two upper quartiles (i.e. the number of repositories with a criticality index from 0.51 above) of the 100k repositories mapped under the https://github.com/ossf/criticality_score project.

³⁴ See <https://www.daxx.com/blog/development-trends/it-salaries-software-developer-trends>

six months, which would be around €30,000. In order for the funding to determine an incentive effect for all developers including those based in countries where salaries are higher, it is recommended to set the maximum funded amount to a higher level, say, €50,000 for projects falling under the normal assessment procedure³⁵. Of course, a deserving project can be awarded further funds in the future.

For individual developers and small developer groups

The fund will provide smaller grants for fast-track projects. The amount granted in this case will vary from €5,000 to €15,000, depending on the complexity of the specific mission assigned to such projects.

7.4.3 Fund size

The fund size for the first 3 years will depend on:

- The awards disbursed
- Annual fund running costs
- Initial one-off set-up charges

Initial term

The proposal is to set up the fund for an initial period of 3 years. This will allow 6 months of setup, and 2.5 years for initial fund disbursement.

Assuming a 6 month funding cycle, this will allow five funding cycles (application/evaluation/ disbursement).

The awards disbursed

Taking the rough estimations indicated in [7.4.2](#) above, the fund assists a maximum of 300 projects a year.

Using disbursements of €5k for 200 projects, and €50k for 100 projects shown an annual disbursement budget of €6 Million. Over 2.5 years of post-setup operation, we have a total disbursement budget of €15M.

Note: of this amount, an element would be allocated to non-financial projects assistance such as provision of hosting services, legal, financial planning and marketing assistance.

³⁵ In lower income countries, where the funding and the related disbursement is more likely to be considered a robust support to the main income, or also the main salary for the contributors, this funding may be perceived not only as a support but also a sort of decentralized activity closer to a job instead of OSS contribution.

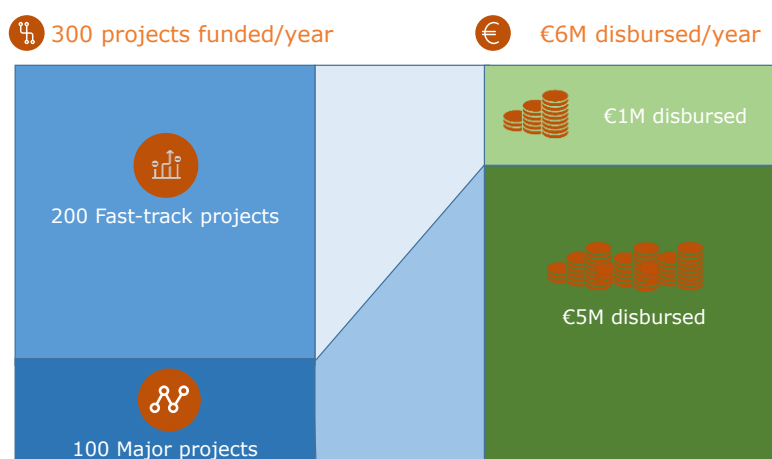


Figure 18 - Number of projects and grants / year

Annual fund running costs

Speaking with existing funds, their administrative costs range between 8% and 20%. Being conservative, we estimate a spend of 12% of the total grants per year. Taking the annual disbursement budget of circa €6M, 14% amounts to **€720k** annually. These are meant to cover:

- 4 in-house staff @ €100k (FTE full cost) → €400k
- Travel → €100k
- Rent, office costs (energy, connectivity, sundries etc.) → €120k
- Other external consulting and miscellaneous costs → €100k

This means an initial administrative budget over 2.5 years x €720k = **€1.8M**

Note: It is possible that one of the European institutions or European public services may provide offices, rent and utilities, and/or second staff.

Initial one-off set-up charges

We expect the following costs for the initial one-off set-up expenses:

- 4 FTEs for 6 months → 2 FTE @ €200k;
- Development of the application portal → €150k;
- Set-up of legal entity and legal fees, travel etc. → €50k;
- Other external consultancy (non-financial service set up) → €50k;
- Miscellaneous costs → €50k;

which gives a total of €500k.

Total initial fund size

The initial amount proposed for the European funding mechanism is €17.3 million, calculated as presented in Figure 19.

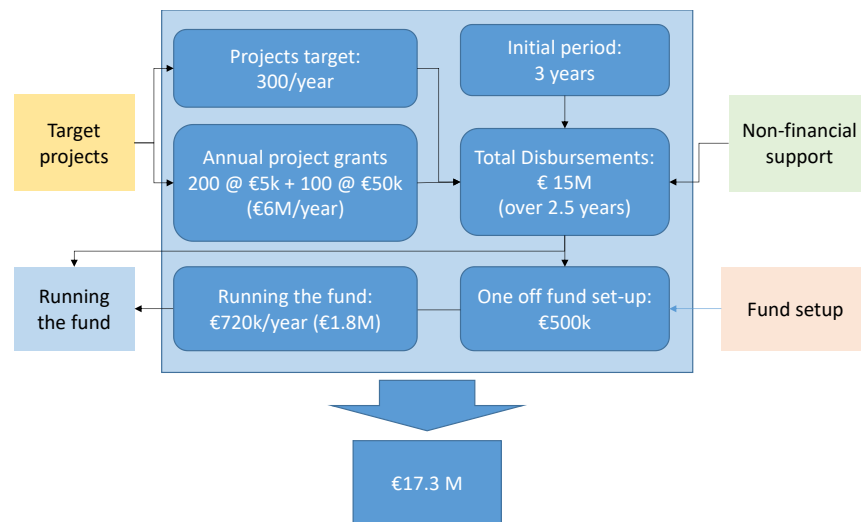


Figure 19 - Total initial fund size

7.5 Application, selection, and fund disbursement process

At this stage, we only highlight the general flow of the application, selection, and fund disbursement process, because there is a lot of detail to be developed.

7.5.1 Application process

Applicants will apply for funds via a user-friendly online portal (to be developed, or copied from another fund and modified), where they should be able to find immediately not only the online forms to apply, but also all necessary information to understand:

- the nature, mission and principles of the fund
- whether they would be eligible for receiving funds
- the process and timing for each call
- the selection and assessment criteria

As mentioned in section [7.4.2](#), applications will be done for two different types of call, and they will have different timings for application submissions:

- **Normal track funding calls:** launched every six months with two months to submit the application.
- **Fast-track funding calls:** launched several times a year (potentially, every two-three months), with one month to submit the application.

Normal track funding calls address longer and more complex projects, while fast-track funding calls address theme-specific, limited activities, including targeted maintenance of existing software.

7.5.2 Project selection process

First level filtering

The first phase of the application filtering process would be the selection process. At this stage all the applications for a specific funding call have been collected.

The selection process would focus on specific points:

- **Formal checks:** submission date, documentation completeness.
- **Alignment** of the application to the call parameters: required funding amount, project duration.
- **Skills:** Since the checks to be performed do not require specific open source skills, junior members of the team are expected to manage this stage.
- **Time taken:** The first level filtering is estimated to take two weeks.

Second level Assessment

In the second phase of the application, the assessment process is initiated. The applications that passed the initial selection process are now being evaluated at a deeper level, with a thorough analysis of the content submitted.

Depending on the type of funding call, the assessment process would start from different perspectives:

- for normal funding calls, the assessment process will take in consideration the adherence of the project proposed to the general principles of the funding mechanism;
- for theme-specific funding calls, the assessment process will consider the adherence of the project proposed to the theme specified in the funding call;
- in both cases, the assessment process would proceed taking in consideration the following parameters, based on the principles set in section [7.2](#), for a complete evaluation of the case.
 - innovation level: how disruptive can be the technology proposed? Could it introduce a new way to get things done?
 - benefit for public services: how much public services may improve or how much public entities may benefit from the adoption of what proposed?
 - social value: what is the social value that can be realised by the solution proposed? Which group of people may be benefit from it?
 - feasibility: can the project be completed? To what degree?

An evolution of the model presented could also implement a hierarchy of parameters to be evaluated, assigning to each of them a weight which, combined with the score that a specific application would get for that specific parameter, will produce a final score. That final score may be used to rank all the applications received, making the selection of the best performing ones.

For example, Table 4 below shows the scores of three applications, using values from zero to five. Each of the evaluation parameters has been assigned a weight.

As highlighted in the last rows, even if the regular scores of the three applications are identical, the weighted scores are different. The scores are then normalised, so that the normalised maximum adds up to 10.

Table 4 - Example of assessment criteria and rating calculation

	Weight	Scores for Application A	Scores for Application B	Scores for Application C
Innovation level	0,8	4	2	5
Benefit for public services	0,9	5	3	3
Social value	1	4	5	3
Feasibility	0,7	2	5	4

Regular scores	15	15	15
Weighted scores	13,1	12,8	12,5
Normalised scores	7,71	7,53	7,35

Assessment capabilities

The assessment process is intended to be open to the open source community. Representatives of the open source community can help assess normal track funding calls.

The fund is expected to consult and use open source experts and civil society organisations, as appropriate in the selection and assessment stages.

All the experts involved in the assessment process should be paid for their efforts, and - to ensure decision neutrality - assessors and potential beneficiaries must not have overlapping or conflicting interests.

7.6 Disbursement process

In the picture below three examples are presented: one for fast-track funding calls and two for normal track funding calls.

Fast-track funding call

For this type of call, the duration of the project is intended to be of about 6 months. In order to keep the process simple and lean, the disbursements will happen in just two moments: at the beginning and at the end of the project.

As mentioned before, it is important to get the project funded at the beginning. This is why a 80%-20% split is suggested here: having the 80% of the funds at day one will make easier to effectively set up and start the project. The remaining 20% of the fund could be allocated at the end of the project, to be disbursed after final checks and validations of outcomes.

Normal track funding call

In this case, the length of the project may vary considerably. Two possible

durations are here presented: 1,5 years and 2 years. Following the same principle mentioned above, it is here suggested to split the amount to be disbursed in three and four instalments, keeping the first one much higher than the others. As shown in the following figure, possible splits would follow a 60-30-10 pattern for the first case and a 50-20-20-10 pattern for the second one.

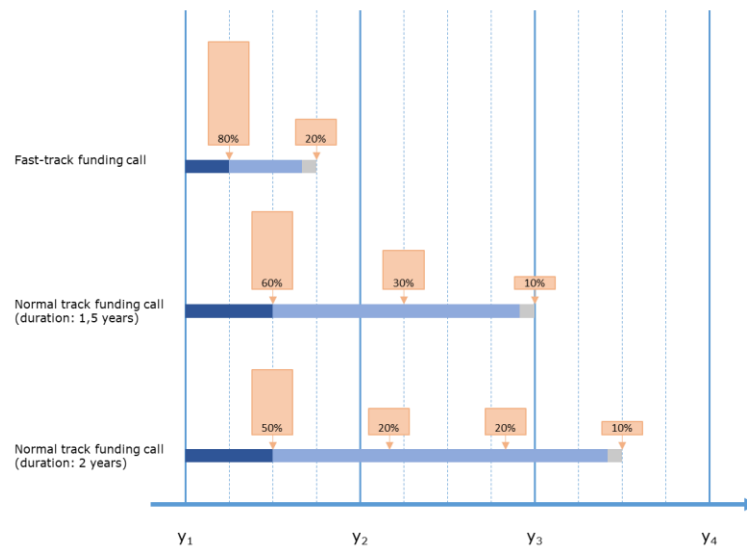


Figure 20 - Disbursement process for fast-track and normal track funding calls

7.7 Disbursement channels

Funds will be disbursed using the following channels:

- it is expected that civil society or existing or other intermediary channels would be used for fund disbursements, thus avoiding the need to set up fresh channels;
- this can include specialist fund distribution organizations if they are able to perform the function adequately;
- applicants must agree to be identified to receive apply and funds, though they can choose to remain publicly anonymous as recipients;
- in due course, the use of emerging payment channels such as crypto and digital currencies can be explored for fund disbursement.

7.8 Provision of non-financial support

Many projects have asked for assistance in expertise, services and facilities rather than money.

Though these are not financial to the applicant, they do cost money to arrange and deliver. Examples include hosting costs, GitHub fees, legal services for assistance with licensing, assistance for marketing and promoting the projects.

7.9 Preparations leading to fund setup

This document forms a baseline of ideas, and will require additional detailed

consideration prior to fund setup. We recommend the European Commission conduct the following activities, ideally in 2022:

- consult an expert group of open source experts of the findings of this study;
- establish a list of key critical open source software in use by European public services today;
- consult European public services and open source experts on the findings of this study to validate the proposals made.

In parallel, with the assumption that the fund is needed, we propose the European Commission to:

- take the lead to set up such a fund, and ask it to examine existing programs which could divert some funds to get this funding mechanism started;
- consider the best way to obtain funds from European public services – individually or from a national level?
- if necessary, consult European public services about their willingness to contribute and level of contribution to such a fund.

The Commission could also work on:

- the design of the fund;
- the legal form of the entity managing the fund;
- its management and funding;
- the resources needed to run the fund.

8 Overview of non-financial sustainability needs and solutions

In this chapter we discuss the non-financial sustainability needs and issues that we identified, both from the investigations of existing funding mechanisms described in Chapters 2 and 3 and additional interviews; and input from the workshop described in Chapter 6 above.

Note that non-financial sustainability issues have a close relationship with the proposed funding mechanism.

8.1 Issues related to current licensing landscape

- One of the main outcomes of our inventory and analysis is that the current FOSS licensing landscape may be a major cause of the (financial) sustainability issues that we have identified as part of this project.
 - Even very widely used FOSS can suffer from sustainability issues, even though copyright law assigns initial ownership exclusively to the creators of the software.
- The FOSS community has been thinking about and working on sustainability and licensing issues for more than two decades now, without managing to find solutions to the bulk of the problems.
 - Several people that have been working on these problems agree that the total amount of money being put into FOSS is simply not enough to sustain all the maintainers.
 - Companies and/or governments need to take an active role in supporting FOSS with significant funding, or most FOSS maintainers will remain severely underfunded and the FOSS commons/ecosystem will be depleted.
 - Industries generally are very good at extracting value from public resources (and exploiting the rules). Interviewees agree that we should not expect commercial companies to act in any other way than in their own interest.
- Even though the current FOSS licensing landscape mainly consisting of a copyleft/permmissive dichotomy is old and seems outdated, it works surprisingly well, especially considering that the copyright laws that it is based on were never designed for a scheme like this.
 - We discuss the current FOSS licensing landscape through its two main licensing types, i.e., copyleft/reciprocal and permmissive, and how FOSS industry/science consortia and FOSS companies deploy various licensing types (including non-FOSS licences) and schemes to protect their interests, sustain their (commercial) productions, and grow their businesses.
- Licensing is the key for FOSS developers to protect themselves and their productions against depletion.
 - The traditional FOSS business model based on the open-core model only works for a few FOSS companies.
 - Pushing FOSS communities to permmissive licensing types (as promoted by industry) may have been a mistake, because they

need the leverage that fully permissive licences lack.

- A dual-licensing strategy based on a reciprocal licence can contribute to the sustainability of a project.
- The picture that emerges from our findings, readings and conversations is that permissive licensing is a business/economic scheme that generally does not work for non-commercial software. For non-commercial software to thrive, reciprocity is required as a minimum, and probably remuneration and/or subsidising as well.
- Reciprocity is key to the sustainability of FOSS, and since reciprocal licensing types are a good match for Govtech FOSS, using a copyleft or other reciprocal licence type could be a requirement for funding under this new mechanism.
- Innovation in this area, however, is still going on.
 - We present two new "post-FOSS" licensing paradigms that are currently being developed (aiming to counter extractive strategies by industry):
 - the post-Open-Source paradigm, and
 - the replacement of intellectual property rights (IPR) by remuneration rights.

Both new paradigms include a remuneration system to compensate software developers for commercial use.

The two new paradigms, however, appear to be too different and complex (compared to the current licensing models) and too unfeasible, respectively.

- The FOSS community is advised to keep on experimenting with new licensing models though.
- There are compelling arguments to consider FOSS as a vital public/common good, which makes government funding (e.g., subsidies) a natural remedy for structural sustainability issues.
 - We present a convincing (economic) analysis by Dries Buytaert on the sustainability of FOSS from this perspective.
- There are also compelling reasons why government should take an active role in funding and managing the maintenance and further development of FOSS to address the sustainability issues.
 - We present a position paper from the French Ministry for Europe and Foreign Affairs, in which they discuss FOSS as a digital common and a driver for digital sovereignty.
- All of this is highly relevant to the European Commission, both as an agile contributor and active participant in the FOSS community (per its 'Open Source Software Strategy 2020–2023'),³⁶ and as the creator and maintainer of the European Union Public Licence (EURL).^{37 38}

³⁶ https://ec.europa.eu/info/departments/informatics/open-source-software-strategy_en

³⁷ https://joinup.ec.europa.eu/sites/default/files/custom-page/attachment/eupl_v1.2_en.pdf

³⁸ <https://joinup.ec.europa.eu/collection/eupl/eupl-guidelines-faq-infographics>

8.2 Need for a secure embedded operating system with very-long-time-support

- Maintaining a critical embedded system that has to last for decades is hard; the main problems are obsolescence and insecurity.

The delivery time for an aircraft, for example, can be longer than the lifespan of its supporting ICT systems. But there are many more application areas where similar problems occur.

- Many of these areas are already duties of government because of their criticality to society, huge investments, high maintenance costs, and very long periods for development and depreciation.
- What is needed are embedded systems that are cybersecurity-focused, that provide security updates and patches for the expected lifespan of the application.

These systems are currently not available – commercially or as FOSS.

- FOSS is the preferred choice for these critical systems with very long lifespans of say 30 years, and a hardened Linux distribution would be the best starting point for a secure operating system with very long time support.
- It would be highly valuable to have such a system on a European level, managed by a supra-national, non-profit entity, as part of a solid, trusted and secure European technological ecosystem.

8.3 Need for building and keeping platforms for FOSS projects and communities

- The FOSS community has issues in building and keeping the platforms that host their projects, hold their collective knowledge, and facilitate their collaboration and communication.
- As platforms grow and scale, at some point they need to commercialise, thereby often leaving behind projects/communities that cannot afford the commercial service or disagree with the direction the platform has chosen.
- We provide some recent examples of actual and intended transfers of ownership of platforms that are/were crucial to the FOSS community, and how fundamental changes in business/monetisation models and policies negatively affect the usability and affordability of these platforms to the community:
 - the hijack of Freenode
 - the sale of Stack Overflow
 - the intended sale of the .org Public Interest Registry, and
 - the sale of GitHub to Microsoft.
- Many of these issues could be resolved using federated, decentralised and trust-less networks of self-hosted systems.

8.4 Issues related to market power, big tech companies and malicious business practices

- The software industry in general, and FOSS as a derivative of that, is dominated by US companies and hence their business interests.
 - That is also true for FOSS funding mechanisms and foundations, which has consequences for the geographic focus, aims and culture of these mechanisms.
 - The current FOSS licences are mainly based on US copyright/patent law.
- FOSS developers are the supplicants in this power constellation, "having to beg to sustain their projects".
 - They cannot (financially) afford enforcing compliance to their licences, building a (defensive) patent portfolio, filing patents on their own inventions or defending themselves in patent lawsuits.
 - The FOSS community is represented by powerful companies, and they set the agenda and policies for the FOSS world and represent the interests of the industry.
- While the US dominance can only be shifted through countering by the European FOSS community, most people said that the malicious business practices of big tech companies fit into a wider pattern and should be addressed as such.

8.5 Suggested non-financial solutions and who should act

Table 5 summarises the key issues outlined above and suggests how these issues can be resolved and by whom.

Table 5 - Non-financial issues and solution directions

Issue	Solution directions	How to help	Who should act
Current licensing landscape as a main cause	Increase the (legal) leverage of FOSS developers	Support the use of less permissive licences and their development (e.g., EUPL, JLA, education)	The EC as the creator and maintainer of the EUPL and the JLA project
	Reduce the combinatorial complexity of the current licensing landscape by reducing the number of licences in use	Support the consolidation of the current licensing landscape)	The EC as the creator and maintainer of the EUPL and the JLA project
	Develop and deploy new/different types of licences (e.g., including remuneration and licence compliance for business/commercial use)	Participate in the development of new licensing paradigms	The EC as the creator and maintainer of the EUPL and the JLA project

Issue	Solution directions	How to help	Who should act
Industry extracting too much value from the FOSS ecosystem	Increase the resources available to the FOSS ecosystem	Contribute to and participate in FOSS Companies can consider supporting a Free Software they heavily depend on by recruiting maintainers	The European institutions and governments at a lower level as developers of FOSS (e.g., the OSS strategy)
		Set up a funding mechanism	The EC as instigator, other stakeholders as initiators and participants
A structural lack of resources for the creation and maintenance of FOSS projects with demonstrably high value and criticality	Increase the resources available to the FOSS ecosystem	Recognise the FOSS ecosystem as a public/common good, and participate in its funding and governance	Through the funding mechanism
FOSS world dominated by US-based companies and organisations	Increase the market power of the European FOSS ecosystem	Facilitate and support FOSS companies, organisations, projects and communities relevant to Europe	The European institutions and governments at a lower level as customers and active users of FOSS
FOSS world represented by powerful companies, setting the policies	Empower independent organisations and initiatives representing the interests of the community	Facilitate and support community-driven organisations and initiatives (e.g., by becoming a member)	Through the funding mechanism
The lack of a secure embedded operating system with a supported lifespan of decades	Develop a cybersecurity-focused embedded Linux distribution with a lifespan of 30 years	Facilitate and support the development and maintenance of such a Linux distribution	Initiate/fund/support as a hosted Govtech project after the funding mechanism has been established
A lack of control over FOSS hosting/collaboration platforms	Establish decentralised/self-hosted platforms	Facilitate and support the development and deployment of such platforms	The European institutions and governments at a lower level as users/developers of FOSS, and through the funding mechanism
An unfair market dominated by monopolistic large tech companies	Address monopolistic big tech companies and malicious business practices	These problems fit into a wider pattern and should be addressed as such	The European Commission and national governments

9 Conclusions and recommendations

9.1 Conclusions

Investigations of existing funding mechanisms show a gap in funding a number of crucial areas, in particular, funding for:

- Sustaining software for the longer term; there exist today a number of open source software communities, whose long-term existence is in question; this software is called *critical open source software* within this report;
- Individual or small groups of developers, who are working on nascent open source projects of their own and require a small amount of financial support (ca €5k or €10k) to continue;
- Certain projects that do not obtain funding from other sources;
- Specific projects that serve the public sector's needs (GovTech).

Therefore, there is a strong case for setting up funding mechanism to plug these gaps.
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The funding mechanism must operate in a transparent and non-bureaucratic way to make sure that the funds reach the intended beneficiaries timely and effectively. The recommendation is for a light-weighted but stable structure that will be able to accomplish the mission of the funding mechanism leveraging also on the contribution of experts from the open source community.

The funding mechanism can also address non-financial sustainability needs by providing non-monetary services and promoting the discussion on cross-cutting themes that endanger the survival of critical open source software. These include in particular licensing, hosting platforms and cybersecurity solutions.

The proposal contained in this report is based on a series of assumptions concerning types and number of projects funded and time horizon of the fund, that aim at maximising its reasonable outreach. The review of such assumptions and at the end of the need for the European funding mechanism for open source software is definitely a subject of political discussion on the future of the open source movement in Europe.

9.2 Recommendations for next steps

The study recommends the European Commission to conduct a further exercise in 2022 in order to:

- consult a group of open source experts to discuss the findings of this study;
- establish a list of key critical open source software in use by European public services today;
- consult European public services of the findings of this study;
- thereby further validate the need for this funding mechanism.

Once the need for the funding mechanism is validated by European public services, the European Commission should:

- take the lead to set up such a fund, and in particular examine existing programs that could divert some funds to get this funding mechanism started, or
- discuss the possibility of adapting an existing funding mechanism, and also
- discuss this matter with European public services to assess their willingness to contribute to and run such a fund collectively.

Appendix A: Experts interviewed

Interviewee	Function	Organisation
Acero Martin, Fernando Antonio	Colonel, OSS expert	Spanish Air Force
Bergelt, Keith	CEO	Open Invention Network
Blondelle, Gaël	Vice President, Ecosystem Development	Eclipse Foundation
Bouchard, Cajetan	Founder	FOSS Torrents
Busquets Perez, Luis Carlos	Programme Officer	European Commission
Damman, Xavier	Co-founder	Open Collective
de Raadt, Theo	Founder and Lead Developer	OpenBSD and OpenSSH projects
Ellington, Simon	Co-founder	Ko-fi
Farimani, Foad S.	-	FreeCAD community
Favario, Leonardo	Open Source Project Leader	Ministry for Innovation, Italy
Frei, Rasmus	Chief Executive & Secretary	OW2
Funaru-Despan, Oana	Chief Fundraising Officer	Code for Romania
Groh, Adriana	Director	Prototype Fund
Guerry, Bastien	Free Software Officer	ETALAB, France
Hariri, Hadi	Vice President of Developer Advocacy	Jet Brains
Hemel, Armijn	Owner	Tjaldur Software Governance Solutions
Ivănel, Bogdan	Managing Director	Code for Romania
Klint, Paul	Research Fellow	Centrum Wiskunde & Informatica (CWI)
Korokithakis, Stavros	Founder	Code Shelter
Kotlar, Denis	CEO	EEZ - Envoy
Leenaars, Michiel	Director of Strategy	NLNet Foundation
Mottier, Antoine	Chief Technology Officer	OW2
Perens, Bruce	Co-founder	Open Source Initiative
Pickles, Nigel	Co-founder	Ko-fi
Pollock, Rufus	Founder	Open Knowledge Foundation
Pyrovolakis, Odysseas	Programme Officer	European Commission
Råback, Peter	Product Manager	Elmer Software - CSC
Serrano, Javier	Head of Hardware and Timing Section	CERN
Stallman, Richard	Director, Head of GNU project	FSF
Thomas, Cedric	CEO	OW2 Consortium

Interviewee	Function	Organisation
Van Gulik, Dirk-Willem	Co-Founder	Apache Software Foundation
Van Rossum, Guido	Creator	Python
Vloemans, Marc	Head of AI	Eclipse Foundation
Wolfe, Rosy	Executive Director	ARDC/AMPR

Appendix B: Workshop attendees

Attendee	Title	Organisation
Benini, Luca	Professor, Digital Circuits and Systems	ETH Zürich
Brock, Amanda	CEO	Open UK
Di Cosmo, Roberto	Professor, Computer Science	INRIA
Favario, Leonardo	Open Source Project Leader	Ministero per l'Innovazione, Italia
Frey, Rasmus	Head of Secretariat - OS2	OS2
Gamalielsson, Jonas	Senior Lecturer, Computer Science	University of Skövde
Ganten, Peter	Co-founder, management board member	APELL
Groh, Adriana	Director	Prototype Fund
Guerry, Bastien	Free Software Officer	ETALAB
Izdebski, Krzysztof	Policy Director	ePaństwo Foundation
Leenaars, Michiel	Director of Strategy	NLnet
Lundell, Björn	Professor, Computer Science	University of Skövde
Muto, Sachiko	Chief Executive Officer	OFE
Nummelin Carlberg, Astor	Co-founder, management board member	APELL
Phipps, Simon	Managing Director	Meshed Insights
Ribeiro, Paulo	CEO	Linkare TI / Apell
Serrano, Javier	Head of Hardware and Timing Section	CERN
Thomas, Cédric	CEO	OW2
Vecchi, Paolo	CEO	Omnis Cloud Srl
Vereha, Olivia	COO	Code4RO

Appendix C: Glossary and acronyms


Term	Meaning
AMPR	Amateur Radio for Packet Radio
ARDC	Amateur Radio Digital Communications
BMBF	German Federal Ministry of Education and Research
BU	Bottom Up funding mechanisms
CAPEX	Capital Expenditure
CERN	Conseil Européen pour la Recherche Nucléaire - European organization for nuclear research
CII	Core Infrastructure Initiative from the Linux Foundation
Critical (open source) software	Can mean software that is highly useful/needed for an organisation. However, in this document this refers to open source software that is in a critical shape, in terms of its state of health, i.e. it may not survive or sustain over the long term unless action is taken to remedy the causes of criticality.
CWI	Centrum Wiskunde & Informatica
DEP	Digital Europe Programme
DG	Directorate General – a department of the European Commission
DIGIT	Directorate General for Information Technology
EIC	European Innovation Council
ESA	European Space Agency
ESSR	The European Space Software Repository
EU	European Union
EU-FOSSA	A European Union project initiative on free and open source software
EUPL	European Union Public Licence (EUPL), is a licence for open source software
FOSH	Free and Open Source Hardware
FOSS	Free and Open Source Software
FSFE	The Free Software Foundation Europe, a charity founded in 2001 to support all aspects of the free software movement in Europe.
FTE	Full Time Equivalent, refers to measuring a person working for a year
GAIA X	Gaia-X: A Federated Secure Data Infrastructure
HR	Human Resources
ICT	Information and Communication Technology
IP	Internet Protocol or Intellectual Property
IPR	Intellectual Property Rights
IT	Information Technology
JLA	Joinup Licencing Assistant ³⁹

³⁹ <https://joinup.ec.europa.eu/collection/eupl/solution/joinup-licencing-assistant>

Term	Meaning
MALT	Microsoft Alternative Technologies
MEP	Member of European Parliament
MOSS	Mozilla Open Source Software Support
NGI	Next Generation Internet
NSF	National Software Foundation
Open Source Software	Open source software is software with source code that anyone can inspect, modify, and enhance. ⁴⁰
OpenSSF	Open Source Security Foundation
OS	Operating System
OSI	Open Source Initiative
OSPO	Open Source Programme Office
OSS	Open Source Software
PA	Public services
PCB	Printed Circuit Board
SEO	Search Engine Optimisation
Sustainability	The health of a software or ecosystem
TD	Top Down Funding Mechanism
US	United States
UUNET	An early Internet Service Provider
UX	User Experience

⁴⁰ <https://opensource.com/resources/what-open-source>

Appendix D: Data from GitHub Government collection

Description	Attachment
List of repositories in the GitHub Government collection	 Repositories in the GitHub Government c