NEXT GENERATION INTERNET

D3.3 GOVERNANCE MODELS FOR FUTURE DIGITAL COMMONS

Revision: v.1.0

Work package	WP3
Task	Task 3.3
Due date	31/12/2025
Submission date	17/12/2025
Deliverable lead	CNRS
Version	1.0
Authors	Valérian Guillier (CNRS), Mélanie Dulong de Rosnay (CNRS)
Reviewers	Karolina Gyurovszka (MIN), Nick Gates (OFE), Eugenia Kypriotis (MAR)

Abstract	This report studies governance of Digital Commons through the concept of the bundle of rights, an analytical framework initially developed by legal scholars to describe the various rights that constitute ownership. Since ownership, through open licensing, has been one of the most widely studied features of DCs legal governance, one of the aims of this task was to study governance beyond this. In order to do so, we analysed governance documents of three DCs (Open Food Facts, Debian and Matrix) which were available online (bylaws, rules, codes of conduct, etc.) We identify four categories of rights: Produce & Monitor, Lead, Communicate & Represent, and Care as well as three objects to which governance applies, namely: resources (including their production), communities (including sanctions) and organisations (towards sustainability through autonomy, independence, the provision of infrastructure and shared values).

Grant Agreement No.: **101135279**
Type of action: **HORIZON Coordination and Support Actions**
Topic: **HORIZON-CL4-2023-HUMAN-01-14**
Call: **HORIZON-CL4-2023-HUMAN-01-CNECT**

	We conclude that commoning, the process of governance through which collective action improves its internal working to become more inclusive and democratic, is more important than the resulting governance model building blocks.
Keywords	Governance, self-governance, Digital Commons, typology, bundle of rights, resource, production, community, code of conducts, infrastructure, values, organisation, independence, autonomy

Document Revision History

Version	Date	Description of change	List of contributor(s)
V0.2	08/10/2025	First version of the outline for comments from all partners	Valérian Guillier, Mélanie Dulong de Rosnay (CNRS)
V0.7	26/11/2025	First version of the deliverable available for review	Valérian Guillier, Mélanie Dulong de Rosnay (CNRS)
V0.8	04/12/2025	Comments from the reviewers	Karolina Gyurovszka (MIN), Nick Gates (OFE), Eugenia Kypriotis (MAR)
V0.9	16/12/2025	Final version implementing reviewer's comments ready for formatting	Valérian Guillier, Mélanie Dulong de Rosnay (CNRS)
V1.0	17/12/2025	Final version to be submitted to the EC portal and published on the project's website and the institutional repositories Zenodo and Hal	Margherita Facca (MAR)

DISCLAIMER

Funded by the European Union

Project funded by
Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

NGI Commons (*Open Source and Internet Commons for Europe's Digital Sovereignty*) project is funded by the European Union's **Horizon Europe research and innovation programme** under Grant Agreement number 101135279. This work has received funding from the **Swiss State Secretariat for Education, Research, and Innovation (SERI)**.

COPYRIGHT NOTICE

Valérian Guillier, Mélanie Dulong de Rosnay, D3.3 Governance models for future Digital Commons, NGI Commons, 46 p., December 2025. DOI: 10.5281/zenodo.17865999

Project funded by the European Commission in the Horizon Europe Programme		
Nature of the deliverable:	**R***	
Dissemination Level		
PU	*Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)*	✓
SEN	*Sensitive, limited under the conditions of the Grant Agreement*	
Classified R-UE/ EU-R	*EU RESTRICTED under the Commission Decision No2015/ 444*	
Classified C-UE/ EU-C	*EU CONFIDENTIAL under the Commission Decision No2015/ 444*	
Classified S-UE/ EU-S	*EU SECRET under the Commission Decision No2015/ 444*	

* *R: Document, report (excluding the periodic and final reports)*
DEM: Demonstrator, pilot, prototype, plan designs
DEC: Websites, patents filing, press & media actions, videos, etc.
DATA: Data sets, microdata, etc.
DMP: Data management plan
ETHICS: Deliverables related to ethics issues.
SECURITY: Deliverables related to security issues
OTHER: Software, technical diagram, algorithms, models, etc.

EXECUTIVE SUMMARY

Defining what governance Digital Commons (DCs) should adopt is a challenge. The task requires to distinguish between different meanings of governance, and to offer tooling to analyse governance in a non-normative way, that is, without trying to define a priori what a 'good governance' is.

This report is based on desk research on the governance of Digital Commons and other digital artefacts, as well as 26 interviews conducted in 2024 and 2025. Methodologically, it is drawing on the concept of a **'bundle of rights'**, an analytical framework initially developed by legal scholars to describe the various rights that constitute ownership, including those of traditional commons. Since ownership, through open licensing, has been one of the most widely studied features of DCs legal governance, one of the aims of this task was to study governance beyond this.

It is through this lens of a bundle of rights that extend **beyond ownership** that we analysed governance documents of three DCs (Open Food Facts, Debian and Matrix) which were available online (bylaws, rules, codes of conduct, etc.) We identify **four categories of rights: Produce & Monitor, Lead, Communicate & Represent, and Care**. We identify that not all of these categories are present in each project, and specifically, the right to lead is not always evident in certain projects. We also find that codes of conduct are often not referred to by other texts, as if they had a different, independent status.

From this rights-based analysis, we then focus on the objects that require governance. From our analysis, we identify **three objects to which governance applies, namely: resources, communities and organisations**.

Building on what has been set before, we argue that ownership and licensing are part of the governance of the **resource**, along with the governance of the **production** of the resource. We also show that the legal possibility of forking (duplicating a project to move into another direction) should not be considered 'governance', but a last resort damaging option.

When it comes to governing **communities**, these should always be considered in a plural form. Moreover, self-governance is a key principle of the commons theory, and should be considered an essential part of DCs governance. We also analyse the role of codes of conduct and especially the associated **sanctions**: rules without monitoring and sanctions are more likely not to be followed. Yet, when communities take time to produce institutions within which community members may *care* about each other, it helps produce a better and more inclusive commons.

Last, governing **organisations** has many aspects, the first of which might be ensuring DCs **sustainability**. We propose to speak of **autonomy** and **independence** as a way to qualify sustainability strategies. We also see that organisations are often in charge of providing **infrastructure** (technical or not) for the care of the resource and the community. We show that governance of the infrastructure can be considered an important and collective aspect of DCs governance. Last but not least, organisations are often about **shared values** and keep them alive while remaining open to discussion.

This work's final finding is that **the process of governance** is more important than the result, rather than looking for templates and blueprints. Instead of adopting a binary perspective on whether a project constitutes a commons, we argue that **'commoning'** should be understood as the process through which collective action improves its internal working to become more **inclusive** and **democratic**. As long as **fundamental rights** are respected, any working governance model decided and updated by the communities is relevant. Therefore, rather than

focusing on building blocks for 'good governance', we contend that the process of transitioning towards or away from a more common governance model should be the primary consideration.

TABLE OF CONTENTS

LIST OF TABLES

Funded by the European Union

ABBREVIATIONS

DC	Digital Commons
IC	Internet Commons
EC	European Commission
DPG	Digital Public Good
EDIC	European Digital Infrastructure Consortium
FLOSS	Free, Libre Open Source Software
FSF	Free Software Foundation (FSF)
GKC	The Workshop on Governing Knowledge Commons
GNU	GNU's Not Unix
GPL	General Public Licence
KC	Knowledge Commons
IAD	Institutional analysis and development
IASC	International Association for the Study of the Commons
IC	Internet Commons
IETF	Internet Engineering Task Force
MSC	Matrix Specification Change
OFF	Open Food Facts
OS	Open Source
OSI	The Open Source Initiative
PEP	Python enhancement proposal
RFC	Request for Comment

1 INTRODUCTION

1.1 GOVERNING DIGITAL COMMONS?

This report aims to discuss the governance of Digital Commons with the view to analyse current models which may inform future governance choices by communities. There are a few reasons why this is not a straightforward task. “How the commons are governed” is the core of the life long research of Elinor Ostrom and is being continued by the vibrant interdisciplinary scholars community IASC (International Association on the Study of the Commons), as well as many other academics and actors themselves, both inside and outside of this school of thought.

While the complexity of this work initiated over three decades ago cannot be summarised in a report, the following pages are grounded in this literature, initially developed for tangible commons such as pastures or fisheries, according to which communities defined property and usage rules towards sustainability of the shared resource. Hereafter, with this report, the NGI Commons project aims to contribute to the growing scholarship on the governance of the commons applied to intangible artefacts such as knowledge, infrastructure, and other Digital and Internet Commons.

As explained in the previous NGI Commons “Active communities of commoners and relevant commons” D1.1 report, the idea of Digital and Internet Commons has often been linked to a vision of freedom that is close to the libertarian vision of freedom, meaning as little rules as possible. The work of clarifying differences between open and commons has already been done (*Broca & Coriat, 2015; Litta & Bihr, 2025; Pélissier, 2021*) but this genealogy also implies that governing the commons is not always considered relevant by the actors. Originally and still in some cases, theoretical and practical work on DC/IC governance has been reduced to the governance of the sole resources (through open licences), as if the organisation of access, usage and other rights over the resource would be the only feature to require governing by the community, and disregarding the need to govern the community itself. Indeed, the study of governing DC/IC replays a century-old political debate between two conceptions of freedom: a first one that we could call liberal freedom (understood as “without any constraints”, as supported by the most open licenses) and another one we could call social freedom (understood as “protected by rules”, including limits to full open access as far as the ownership is concerned).

On top of this, governance is a polysemic term, which has been broadly used in many contexts. Initially a synonym of government, the concept of governance has been used in the last 40 years in a context where there is a structure of decision without government, like in firms (with the rise of shareholders instead of owners). It has also been used in a context of international law where there is a coordination between sovereign states without a single entity able to govern the other (including examples like enforcement of human rights, international courts and multilateral organisations to fight the climate crisis) (*Paye, 2005*). In the context of internet infrastructure policy and technical norms-setting, the concept of governance has also been widely used to study the decision-making process and the geopolitical forces at stakes within international technical standardisation organisations applying the principle of multistakeholders governance by both governments and private actors (*Levinson & Cogburn, 2016*).

Discussions around governance can therefore appear far separated from the discussion around DC/IC. One could also wonder where this discussion could lead if we get to Digital Public Goods (DPGs), which are considered close to DC/IC as analysed in NGI Commons D1.1 report. This is also a question that can be considered relevant when Digital Commons are being (co-)developed by public bodies, including States.

Some Member States actually coordinate a recently created Digital Commons EDIC (European Digital Infrastructure Consortium) launched in December 2025 by the European Commission to "support sovereign European digital infrastructure and technology". An EDIC is "a new instrument enabling Member States to jointly develop, deploy and operate cross-border digital infrastructures with dedicated governance and legal personality" (*European Commission, 2025*). Governance is therefore a matter of multilateral organisations, as well as one of the very questions this EDIC has been created for.

While this report does not aim to solve the aforementioned questions, it will study the *self-governance* of Digital Commons (*following Dulong de Rosnay & Stalder, 2020; Guillier et al., 2025*). Having a governance is one of the distinctions between DC and merely open access or openly licensed resources, where self-governance (beyond the rights granted by the licences) is not necessarily present and varies widely, for example, in Free Libre Open Source Software (FLOSS).

A large body of academic literature researched the governance of FLOSS, a subset of DC/IC, in particular. Governance has been extensively studied although in different forms: many quantitative studies have focused, for example, on the *contributing.md* and *governance.md* files in Github FLOSS repositories (text files that describe how to contribute and the decision-making processes) and deduced a few tendencies, often ignoring the fact that the written word as a label or a statement can differ from the actual governance practices (*Gaughan et al., 2025; Izquierdo & Cabot, 2023; Noori et al., 2025*).

Other bodies of scholarly work have studied closely selected DC and Knowledge Commons (KC) projects to try and understand how social groups organise (*Frischmann et al., 2014 and all publications of the GKC workshop*). There is also literature (*Dulong de Rosnay et al., 2019; Dulong de Rosnay & Musiani, 2020; Medosch, 2025; Tréguer & Dulong de Rosnay, 2020*) on community networks as Internet Commons (IC), which we won't specifically analyse in this report. While there are many articles on governance within Wikipedia and Wikimedia projects (*Barbe et al., 2015; Jemielniak, 2014; Jullien, 2012*), the most emblematic DC after FLOSS, the rest of the literature on other DC and KC projects and communities is quite scarce. There is almost no literature specifically on the governance of open-hardware projects. Interestingly, the governance of open data is, with few exceptions (*Carroll et al., 2020; Ruhaak et al., 2021*) often analysed under the scope of how states improve their own governance practices using open data (through citizen participation, transparency on data related to governments, and evidence-based decision-making), rather than focusing on the communities that create them (*Zygmuntowski et al., 2021*).

1.2 TOWARD A TYPOLOGY OF GOVERNANCE

This report aims at offering a possible typology to analyse DC governance, relying on two linked theoretical frameworks: *post-Ostromian institutional commons* and the *bundle of rights*. The first one focuses on the institutions created to manage the commons, while the second one is a representation of ownership as a bundle of multiple rights.

In the studies that have been conducted on the commons, it is broadly acknowledged that 'good governance' is not a one-size-fits-all solution, but rather the governance that is being developed, refined and improved over time for each project. Therefore, trying to work on a typology is not going to provide or prescribe normative *direction* for what good governance is, but rather *categorise* the different aspects of governance in order to create a framework, which will make it easier for researchers and practitioners to analyse and understand existing governance models.

The framework hereafter, although using adjacent concepts of the Ostromian conception of commons, is not directly based on the IAD (Institutional Analytical Design) framework (*Ostrom, 2005*), an important tool for investigating how people interact within commons. Neither does it focus on the techno-legal rights on the DC, the contracts, licenses and other digital tools used to enforce the governance over the resource only, which are not the core of this research. Multiple governance implementations have been conceptually defined, one of the most recent attempts might be Schneider et al. (*2021*).

In order to contribute to thinking about those gaps in the literature, we propose to consider the following questions:

- What are the components of governance of DC?
- How intricate and coherent are these components with each other?

A typology needs to be coherent to understand how parts of the governance are fitting together. In order to produce a typology, we first need to understand what characteristics could help classify DC governance features or tools.

This report is based on interviews with DC actors, some were conducted in 2024 for NGI Commons D1.1 report (those interviews' transcriptions are available in its Annex and as open data) and new interviews were conducted in 2025 dedicated to this task only. Research questions and findings are also guided by desk research on existing literature on DC governance, as mentioned mostly Open Source Software and Wikipedia, the main bodies of works studied in the literature.

After this introductory section on governing Digital Commons, towards a typology of DC governance models, Section 2 of this report introduces governance as a 'bundle of rights' beyond open licensing. We explain how the notion of the bundle of rights has been conceptualised by Ostromian literature to segment property rights over common pool resources according to roles. We then propose to analyse internal governance texts, such as by-laws or code of conducts, of three case studies (Open Food Facts, Debian, Matrix) and we classify those texts into a bundle of rights (beyond ownership) based on roles (Produce and Monitor, Lead, Communicate and Represent, Care) on which we reflect critically.

In the third section of the report, we elaborate on the various levels of governance of DC:

1. The governance of the resource itself and how it has to go beyond rights licensing to also address the production of the resource;

2. The governance of the communities; and

3. The governance of the organisation, with a focus on shared values specific to DC, the provision of infrastructure, autonomy, and independence.

In the fourth section, we explore other tools used to describe the governance that the previous sections didn't necessarily cover, and their potential limits or drawbacks. We then discuss the relevance of thinking the commons as an objective rather than a (set) of defined characteristics.

2 GOVERNANCE OF DIGITAL COMMONS AS A BUNDLE OF RIGHTS

The governance of DC has often been reduced to its legal aspects and the open licenses governing or regulating rights over digital resources (creative works, open data), without addressing the actual governance of the community, the way decisions are taken within the project beyond licensing.

As a reminder, open licenses following the copyleft model are specific types of copyright contracts that allow any users to freely access a digital resource, reuse it and sometimes, with the copyleft model, under the condition to share the derived works under similar conditions. We argue in the introduction of this report that licensing is far from being the only element to be considered when studying DC governance, and we propose to question what a bundle of rights may mean for DC beyond ownership or usage of the resource[1].

Ownership can take different forms in traditional, tangible commons, and consists of multiple rights which are allocated to some users and not to others. This has been conceptualised as a bundle of rights (*Schlager & Ostrom, 1992*). In this section, we want to explore the existence of such a bundle for DC, and what would be its specific characteristics for intangible medium of knowledge and online DC.

Some references in the literature apply the notion of bundle of rights to free and open licensing as an analogy, but very few attempt to systematically analyse free licenses as a bundle of rights (Douglas, 2011). This analysis relied on important approximations, first of which was to assimilate copyright to a property, and to deal with copyright as ownership (*Guillier 2024*).

The objective of this section is to consider the application of the bundle of rights to the governance (beyond the licensing of the resource) of three cases of DC: Open Food Facts, Debian and Matrix. In order to do so, we study their governance texts (official texts available online, of legal nature or not, ownership-related or not) which segment, organise, or structure different rights (beyond copyright over the resource).

2.1 STUDYING GOVERNANCE TEXTS AS A BUNDLE OF RIGHTS

Our goal in this section is to assess if there is a specificity for the governance of DC (compared with other types of tangible commons which also require community rules to function), and if yes, to contribute to the definition of a possible governance bundle of rights applicable to DC.

Schweik & English (2012) have already explored in great extent the governance of “software commons”, adapting the IAD framework and referring to Ostrom’s seven rule categories (p. 91 and following) to classify FLOSS governance rules. We would also like to try to inscribe our work within the Governing Knowledge Commons (GKC) research framework.

Ownership, understood as a bundle of rights, stems from theoretical work by American lawyers at the turn of the XXth century, specifically Wesley Newcomb Hohfeld and John Roger Commons. More recently, Fabienne Orsi (*2013, 2015*) shows how, in this branch of legal realism, and especially for J. R. Commons:

[1] This section develops ideas first drafted for a presentation given by one the authors in 2024 for TIC-Information et stratégie (*Guillier, 2024*) and by both authors for the 2025 International Association for the Study of the Commons (IASC) biannual conference (*Guillier & Dulong de Rosnay, 2025*).

> *[o]wnership is not considered an absolute right of a person over an object, but has to do with a bundle of rights which connects by a complex network of social and legal relationships the owner and other people around a specific good. (Orsi, 2015)*

F. Orsi explains how ownership – in the understanding of the legal scholar J. R. Commons – comes first from a state-given right (rather than an absolute or natural right). Therefore, the state can set limits to this right. Subsequently, J. R. Commons suggests multiple rights and bans he connects to ownership, some of which are linked to the State (e.g. right of way, taxes, public nuisances). These rights are *positive rights* given to the public (right of way) or negative rights (use of ownership can't be the pretext for nuisances for others). Other rights are more obviously connected with our classical understanding of ownership (use rights, right to rent, right to mortgage, etc). The list provided by J.R. Commons is not exhaustive, but hints toward what can be understood as an understanding of ownership as a bundle of rights. Besides, this conception of ownership acts as an alternative to the opposite conception which grounds ownership on the right to exclude.

The bundle of rights (extended and elaborated upon by other lawyers, and foremost the scholar W. Hohfeld) has then been used by E. Schlager and E. Ostrom in order to implement the structure of the collective governance of the commons. Rights of Access, Withdrawal, Management, Exclusion, Alienation have been associated with different roles around a fishery in the case studied by E. Ostrom & E. Schlager (1992).

The bundle is used to distinguish who can exercise:

- *rights of access* to the common resource,
- *rights of withdrawal* (*e.g.*, of wood from a forest),
- *rights of management* (of rights to access, of rights of withdrawal),
- *rights of exclusion* (rights to decide who will and will not have access or other rights) and
- the *right of alienation* (the right to sell the resource or to transfer other rights).

The bundle can be adapted according to the nature of the resource (*for instance: harvest, gleaning, pasture, grazing in De Moor, 2011*). The bundle of rights based on the role actors play is summarised in Table 1.

TABLE 1: REPARTITION OF THE RIGHTS BASED ON ROLE, ADAPTED FROM OSTROM AND SCHLAGER, 1992

	Owner	Proprietor	Claimant	Authorized users
Access and withdrawal	x	x	x	x
Management	x	x	x	
Exclusion	x	x		
Alienation	x			

Some authors already wrote that free and open licences constitute a bundle of rights (*Broca & Coriat, 2015; Dulong de Rosnay, 2015, 2016; Elkin-Koren, 2005; Lessig, 2003*). But it is hard to find literature which demonstrates at a deeper analytical level the affirmation that licenses constitute a bundle of rights. Therefore, we will explore in this section:

- Whether the comparison between copyright, a branch of intellectual property, and ownership can help to conceptualise a bundle of rights;

- To what extent rights over DC go way beyond what is defined by ownership or intellectual property, towards other aspects of community governance.

Rights covered by intellectual property are specific types of ownership, as they are limited. They include *copyright* (applicable to most of the DC resources), *patent*, *trademark*, *trade secret*, and *geographic indication*.

Copyright is a very specific type of "ownership" since it was designed as a balance between the creator's interest and the public interest, which is the reason for the existence of a public domain (*Boyle, 2003; Dulong de Rosnay & De Martin, 2012*), as well as exceptions to copyright (parody, education, libraries, etc), and limitations to copyright associated with compulsory remunerations (for radio, public diffusion of music, etc.). Besides, 'owning' an intellectual production is not what is expected with ownership; we have been used to purchase (whether from cultural industries or from software editors) physical or digital copies. Access (whether or not the resource is a physical avatar) now prevails over ownership, or even replaces it, especially in the case of platform subscription business models.

A similar argument is used by Douglas (*2011*) when analysing the GNU GPL (a famous free software license) as a bundle of rights. In order to achieve this demonstration, Douglas replaces ownership by access, and distinguishes between object code (i.e compiled software) and source code (which is readable by a human, rarely accessible except in open source software) and argues they imply different forms of ownership. He also considers three types of actors (creators, custodian and users).

With a few approximations (intellectual property is assimilated to ownership, and 'owning' is replaced with 'getting access' to so-called 'immaterial' goods), the author analyses intellectual property as a bundle of rights. He then uses this framework to analyse the GNU GPL. The author observes that the user is granted a sum of rights by the free license (access, use, reading, duplication, distribution, imitation, modification, decompilation and reuse). As he focuses on the clause of the license which determines these rights will follow the transform object (the copyleft mechanism requires that derived works should also be further redistributed under the same license), he writes:

> *"Copyleft attempts to protect the rights of users by denying them the right to manage, which can be seen as a way of coercing custodians and users to give others the same rights that they have." (Douglas, 2011)*

Access for all is therefore granted, not by a right to all to decide on governance (what Ostrom would call "a collective choice right"), but rather by denying to all users the right to govern. With free licenses, only "creators" of the resource can (at least theoretically) change the license. This proposal should be credited for delineating usage rights from ownership. However, multiple critics can be formulated. The reasoning applies only to free software, but it could be extended to other free and open licenses and to other digital resources. Still, the argument misses an important point, since 'creators' are considered a homogenous group. Yet, in the production and curation of most DC, distinct (governance) roles are determined and go often beyond what is covered by licenses based on copyright (but may include the right to decide who gets to choose the licenses).

If licenses allocate rights to the collective, the governance of the access and usage of the resource does not address "the question of the provision and the maintenance of the resource – otherwise it would not be produced or nurtured – and available – in the first place. Therefore, it is necessary to reason in a systemic way and also to consider how other rights and duties might be assigned to collectives" (*Dulong de Rosnay, 2014*).

Governance rights that are central in the organisation of DC beyond copyright may include rights of validation, refusal and annulation of changes, creation of new projects (or new branches), ability to take part in the discussion, to steer the project (suggest

new directions, rework part of the project, etc). Governance rights also include the rights to represent (negotiate in the name of, sign partnerships, ask for funding), taking care of the community (communicate, organise events, exclude members of the community) and storing the resource (data, code and contents).

2.1.1 Case study: Open Food Facts, Debian, and Matrix

In order to analyse the different rights which are part of the broader governance (and not linked to copyright-related rights over the access or use of the digital resource), we focused on texts that have been issued by three collective organisations that develop three different Digital Commons: **Open Food Facts (OFF), Matrix, and Debian**.

We selected them for diversity and convergence between projects of different *geographical scope*, *size*, *organisations*, and *type of resource*.

OFF is a "food products database made by everyone, for everyone. You can use it to make better food choices, and as it is open data, anyone can re-use it for any purpose." (*Open Food Facts Website, 2025*).

Matrix is "an open protocol for decentralised, secure communications." (*About Matrix, 2025*).

Debian is "a community of people" and a "complete Free Operating System" (*Debian − The Universal Operating System, 2025*).

We also chose those projects because they belong to the very big and successful projects among the DC/IC, and have not been studied as much as Linux and Wikipedia.

We restricted our research to texts that were public on the projects' websites, although some of them are not widely shared, sometimes because they still are in development. In digital ethnography, the analysis of written texts is not enough to study governance and should be completed by observation of discussions and interviews. We completed this analysis by contacting active people to get more information.

Below are the titles of all the texts we studied for this analysis:

OpenFoodFacts

- By laws
- Terms of use
- Trademark policy
- Code of conduct
- Administrators guide (semi-public and in ongoing development)
- Communication Guidelines
- The Open Food Facts representatives' charter

Debian

- Constitution
- Trademark rules
- Debian Code of conduct

- DebConf Code of conduct
- Debian social contract & Debian Free Software Guidelines

We did not consider by-laws of the Software in the Public Interest, Inc which is a separate entity managing one Debian bank account.

Matrix

- Articles of Association (Community interest company)
- Rules
- Code of conduct
- Matrix Manifesto

2.2 DEFINING A RIGHTS-BASED GOVERNANCE

This conceptual work to define governance based on rights draws from Schweik methodology and the way he described open source software commons using Ostrom's seven rule classes (*Frischmann et al., 2014 chapt. 7*). Ostrom's typology of rules is summarised in Table 2. Schweik uses this set of rule classes in order to analyse the way open source institutions work. We performed similar work to analyse the rules that were to be found in the documents listed above.

TABLE 2: TYPOLOGY OF RULES ADAPTED FROM OSTROM BY SCHWEIK, 2014

Typology of rules adapted from Ostrom	
Position rules	Articulate what roles people play in the project
Boundary rules	Define who is eligible for a position, the process of how he or she is assigned to that position, and rules related to how the person leaves that position
Choice rules	Define actions that can, cannot, or must be done
Aggregation rules	Articulate the process for how conflict should be resolved Within this category, there are three sub-classes: symmetric (e.g., unanimity), non-symmetric (where a leader can make decisions for a group) and lack-of-agreement rules.
Information rules	Specify how and what kind of information flows between project members and other interested parties, as well as how information is archived through the project life cycle.
Payoff rules	Assign some kind of reward or sanction to specific actions
Scope rules	Specify which outcomes may, must or must not be affected or produced in a given situation.

We organised the rights we found in the different texts under four clusters:

I. Produce and Monitor

II. Lead

III. Communicate and Represent

IV. Care

We then categorised the rights based on the adaptation of Ostrom by Schweik typology of rules presented in Table 2. Into brackets after the rights we propose are the category according to Table 2.

2.2.1 Produce & Monitor

This type of production is a matter of construction. As a reminder, in the Governing Knowledge Commons first footnote of the first chapter of the first book of the collection (*Frischmann et al., 2014*), authors reiterate that knowledge commons are not found in nature but "built by human agency".

Consult, use, modify *[position rules, choice rules]*

These rights are of course defined by the licences, but underlying values (why one may consult, use, modify freely) which led the collective to choose one license among others are often explained outside of the licenses in charters or manifestos, which explicit the techno-political values which support the vision behind those rights. Those values and vision are strongly related to early Internet culture (*Cardon, 2019*).

- **Debian:** The social contract guarantees that the project will remain 100% free, which is further defined in *The Debian Free Software Guidelines*. Bugs, standards, licenses and nested community are also addressed.
- **Matrix:** In the values of Matrix Rules ("openness rather than proprietary lock-in") and Manifesto (no centralisation, neutrality, standards, own our own communications, access, interoperability, no patent, safe communications).
- **OFF:** In the terms of use on OFF's website ("*Terms of use, modification, re-use*") as OFF provides online services to access and modify the database. Guidelines require to respect facts and accuracy, adopt a neutral point of view (like Wikipedia), refrain from health advice or activism.

Edit, validate and cancel changes *[choice rules, aggregation rules]*

Large projects do not necessarily let any contributor make changes directly without preliminary validation. This is akin to the right to authorise contributions and modifications.

- **OFF:** Does not have a preliminary validation, but a rather long segment of their *Terms of Use* on modification and reuse mentions that there is no guarantee over the data (and how to correct a mistake if one spots one).
- **Debian:** Organised with technical committees, groups of developers that are appointed and can rule against a developer's decision, but requiring a 3:1 majority. (*Debian constitution* section 6-4).

- **Matrix:** Has a specifications (spec) core team, whose role includes reviewing and contributing to spec proposals and their implementations. (*Matrix Rules* 3.4.7), commit access given to "if they have proved themselves a valuable long-term contributor, uphold the Guiding Principles and Objects of the Foundation, and have proved themselves able to collaborate constructively with the existing Code Core Team". (*Matrix Rules* 3.7.3).

2.2.2 Lead

Leading is not understood in a despotic way, but as the role the founder of a project often endorses, to be a driving force to engage the community to fulfill the other roles. Such prerogatives are not specific to DC, but generic organisational skills to be found also in tangible commons. Leading a DC project requires distinctive features from generic leadership in non commons-based organisation, where leadership is hierarchical and centralised. However, to the best of our knowledge, there is no literature in the scholarly discourse on DC on this precise topic, unlike literature on leadership and benevolent dictature in FLOSS, which is widely available.

Propose, initiate and launch new projects and change the project's direction *[position rules]*

This is the fundamental political right to determine a project's direction and redirection: who has the power to creatively lead? This is to be distinguished from administrative powers which will be developed below — under Govern.

- **Debian:** Developers (i.e each contributor) can issue, supersede and withdraw non-technical policy documents and statements. These include documents describing the goals of the project, its relationship with other free software entities, and non-technical policies such as the free software licence terms that Debian software must meet. (*Constitution* 4.1.5)
- **OFF:** No written references were to be found, this prerogative seems to be shared between the board and the staff.
- **Matrix:** The contents and direction of the Matrix specification is governed by the Spec Core Team (*Rules*, 3.4.1). The Guardians are responsible for the management of the Foundation's business, and set the strategic direction of the Foundation (*Rules*, 3.1.2)

Comment or take part to discussions about the project *[position rules, information rules]*

The right to comment or take part in discussions can be open to everyone. The implementation of this feature can be quite specific to DC.

- **Debian:** Individual developers (i.e every contributor) (*Debian Constitution* 3.1)
- **OFF:** unfound (implicitly everyone?)
- **Matrix:** unfound (implicitly everyone?)

Steward, shepherd and organise collaboration *[position rules, boundary rules]*

The animation of the work of the community is a different leadership role.

- **Debian:** "The Project Leader should attempt to participate in discussions amongst the Developers in a helpful way which seeks to bring the discussion to bear on the key issues at hand" (*Debian Constitution* 5.1)

- **OFF:** Unfound.
- **Matrix:** "The Spec Core team […] [r]esponsabilities include […] shepherding MSC [Matrix Specification Change] on behalf of authors where needed *(Matrix rules* 3.4.7).

***Govern** [position rules, choice rules, boundary rules]*

Within the very broad "governance", we choose to restrict the use of the right to "govern" to roles, powers and procedures defined in the constitutional by-laws and legal structures, corresponding to self-governance in Ostrom (*2015 pp. 29-55*) and endogenous governance mechanisms in the GKC framework (*Madison et al., 2010 p. 34*), akin to constitutional rights.

- **Debian** (Constitution)
  - Appointment to the various roles (delegate, leader, committees secretary...), power to make or override decisions, to delegate, list of trusted organisations authorised to hold assets in trust.
  - Voting, election and decision rules, with distinctions among the type of decisions: urgent, technical policy (this could also be assimilated to project's direction) and work design (this could also be assimilated to shepherding)
- **OFF** (*Bylaws*)
  - Different rules and prerogatives for the board, members, General Assembly, financial resources management, liability, and representation.
- **Matrix** (Articles of Association)
  - Roles are divided among team, guardians and members (vs users, developers, administrators, maintainers, companies, moderators)
  - Management of daily activities mechanisms, of conflict of interests

2.2.3 Communicate & Represent

These competencies are not specific to DC projects, as they are important parts of any project organisation.

***Represent** [position rules, information rules]*

The right of representation includes the right to act as a moral person, to speak on behalf and negotiate in the name of the project, to organise events, to talk to journalists, to determine how to pitch the project.

- **Debian:** not found, everybody?
- **OFF:**
  - Board (*By-laws*, art. 13)
  - Every participant according to the *Communication Guidelines*
  - OFF defines the role of ambassador (*representatives charter*) to campaign and support common good and social value, following the brand guidelines on how to pitch.
- **Matrix:** The Foundation is expected to be "[e]nsuring that Matrix promotion is happening" without further clarification on who is responsible and who may or may not communicate (art. 4.1 *Rules*)

Use the trademark *[information rules]*

This includes the right to use the logo, the domain name, to link to the website.

- **Debian:** No confusion or implication of affiliation or endorsement or approbation should occur, the use of the logo or the trademark should be requested.
- **OFF:** Misrepresentation, guidelines of ok/not ok to use the trademark, distinguish we-you, permission needed for some uses.
- **Matrix:** The foundation is expected to "own and take responsibility for the Matrix.org domain, branding and marketing" without further clarification on who is responsible and can use it (art. 4.1 *CIC Rules*).

2.2.4 Care

This category includes responsibilities toward the development and the well-being of both the communities and the infrastructure supporting the commons.

Support and care for the community *[position rules, pay-off rules]*

Code of conducts set up values, sanctions and procedure (to report misconducts) in order to protect community members, staff and contributors against harassment and discrimination and enforce (though sanctions such as exclusion or blocking) core fundamental human rights, such as diversity, equity and inclusion, ethics and respect. Alongside the feminist literature (Singh et al., 2022) on codes of conduct, we hypothesise that these documents constitute mere virtue signalling if they are not supported by sanctions. These directions are often orthogonal to constitutions or articles of association, in the sense that they rarely directly impact other inner-workings of a project.

- **Debian:** The Constitution contains dispute adjudication mechanisms.
- **OFF:** People with bad behaviour can be blocked, reported (code of conduct).
- **Matrix:** The Code of Conduct "sets expectations for participants within the Matrix community, as well as steps for reporting unacceptable behaviour […]. Anyone who violates this code of conduct may be banned from the community."

Support and care for the resource and its infrastructure *[position rules]*

After caring about the people, this prerogative is about the care for the infrastructure of DC, since it is necessary to store data, code, contents, procedure and paralegal documents. This infrastructure provision and maintenance responsibility must be ensured in a permanent manner.

- **Debian:** Unfound.
- **OFF:** The non-profit (without further precision about responsibilities) is granted the right to fundraise, request subsidies, answer to tenders, and any other legal way of financing the activity (*By-laws* Art. 10*)*
- **Matrix:** The use of Github as infrastructure for the project is (implicitly) assessed in the Rules (3.7.1.): "The Code Core Team shall be a group of individuals with access to commit code to the public (https://github.com/matrix-org) repositories, and either working on the Foundation's reference implementations or the specification itself."

The different rights, prerogatives and clusters or categories of rights we were able to identify during this case study are summarised in Table 3. This list is not aiming to be exhaustive for all DC, but to assist scholars and practitioners to think about DC governance models thanks to a first attempt at a bundle of rights related to governance.

TABLE 3: A RIGHTS-BASED GOVERNANCE WITH FOUR FAMILIES OF RIGHTS (BY THE AUTHORS)

I. Produce and monitor	II. Lead	III. Communicate and Represent	IV. Care
Consult, use, modify *[position rules, choice rules]*	**Propose, initiate and launch new projects and change the project's direction** *[position rules]*	**Represent** [*position rules, information rules*]	**Support and care for the community** [*position rules, pay-off rules*]
Edit, validate and cancel changes *[choice rules, aggregation rules]*	***Comment or take part to discussions about the project*** *[position rules, information rules]*	**Use the trademark** [information rules]	**Support and care for the resource and its infrastructure** [*position rules*]
	Govern [position rules, choice rules, boundary rules]		

2.3 VIRTUES AND LIMITS TO THE BUNDLE OF RIGHTS BEYOND LICENSES

The previous section has been exploring a bundle of rights of governance beyond licensing. The bundle of rights as it has been presented here is a construct from the analysis of the texts available online for these three cases. Although we hypothesise that it could fit most DC projects, it does not aim to be exhaustive.

Even if the point is neither to evaluate the individual projects nor to make generalisations or recommendations, we may draw a few partial conclusions:

DC licensing cannot be the sole source of rights, and the translation of the bundle of rights to copyright only is not enough to understand how rules are developed.

This does not really come as a surprise, it is also something we had started to investigate in a previous report (*Guillier & Dulong de Rosnay, 2025*) and which can also be found in a more recent report by OKFN (*Litta & Bihr, 2025*).

There is a clear structure of rights in these successful projects, linked with mandates, which are associated with requirements of transparency and accountability.

The structure of roles around those rights ranges from user to administrator (technical and/or legal). We also perceive that texts defining the different rights within this bundle seem to relate to either the resource, the community, or the organisation (understood as the legal framework within which the resource and the community develop, which can be a non-profit, a company, a foundation, etc.)

Ethics and values for the communities, when existing, have been formalised in codes of conducts, which are almost not referred to in the other texts. Our hypothesis is that in

the cases we studied, codes of conducts do not include sanctions explicitly, which would have made it rules rather than “suggestions” and would likely have necessitated these codes of conducts to be mentioned in other texts. The care section mostly relates to the communities, but other projects consider the need for care for the infrastructure (*Denis & Pontille, 2022*), for example when facing AI crawlers (*Bort, 2025; Chandrasekhar, 2025; Noroozian et al., 2025*).

The responsibility of steering the project is not always clarified in texts and could be a blind spot in rather young projects. In our three cases, we assume some people have the status and reach to steer the projects, but we note that these powers are not always explicit. This would likely require further sociological or ethnographical studies to understand the dynamics of powers (and how humans might use and oppose these texts in general). The implicit dimension of the projects’ steering could make these structures more fragile in case of a crisis, when these rules become increasingly important.

3 THREE INTRICATE LEVELS OF GOVERNANCE

From the previous section, we understand governance is a bundle of rights (also understood as powers, or prerogatives). We identified that these rights and obligations exist at three separate levels, based on the texts that are defining rules for projects: the *resource*, the *community*, the *organisation*. We propose to change perspective and to look at these levels of governance in the three subsections of this third part of the report.

While some approaches of the commons define them as a resource, a community, and a set of rules the community has chosen for themselves (*VECAM, 2011, p. 27, see also David Bollier*), we want to suggest another framing, based on the study of European Digital Commons we conducted within a previous report (*Guillier & Dulong de Rosnay, 2025*), where there would be a governance (i.e rules) of the resource, a governance of the "communities", and a governance of the organisations. The latter includes all forms of collective gathering, whether formal, informal, with or without legal basis. These three levels of governance are overlapping and are often not as distinct as the boundaries that we created for the sake of clarity of the analysis.

This report does not aim to establish a list of existing nor possible governance models. The task would very likely be in vain, because governance has been proven to work better when tailored to the needs of the people changing it and to the diversity of the organisations and also because of the difficulty to normatively induce what a "good governance" is.

This section relies on interviews which were conducted in the context of a previous report D1.1, and a few extra interviews which were conducted specifically for this report. We are also using every document which can be found online relating to governance. We therefore mostly study the governance as it is told and written, we do not study the rules-in-use, which would require longer and more detailed analysis of one or two cases with multiple periods of observation. The most obvious governance is that of the resource itself – whether it be code, data, blueprint for hardware, cultural productions. The resources can be many in a single project (in the case of an open data project, this might include the databases, the code of different dedicated software components to modify, control and assess the quality of the data, the documentations of these different entities, and the Intellectual Property, usually the brand name and the graphic identity design). Governing the resource implies two different aspects: the ownership of the resource (which we wanted to surpass) and the governance of the production of the resource.

3.1 GOVERNING THE RESOURCE

3.1.1 Ownership: Role and limits of free licenses

Even if free and open source licenses can't be assimilated to the commons, they are an important tool to collectively manage the ownership of a resource. In most of the cases, the ownership of a digital resource relies on a type of intellectual property (copyright, *sui generis* database rights, trademark for the brand name and the graphic identity design). FLOSS licenses use the rights granted under copyright law to turn them around and allow some uses for free under specific conditions. As open licensing is based on copyright law, it is a tool for collective ownership rather than a tool of governance strictly speaking. However, clarifying the ownership is part of the governance of the resource as free and open licenses are meant to protect the project against enclosures.

The choice of licensing is very often a choice made early on by the founder(s) of a specific project: it can be a single person, a few people or a company. Changing licenses can be difficult once the project has received many contributions, since the agreement of all contributors

should theoretically be requested, and thus occurs rarely. Yet, large projects like the Wikimedia foundation did it in 2009 after a vote[2] and OpenStreetMaps did it in 2010[3]. Other projects, like Element (a company producing the eponym software, with a server and a client implementing the Matrix protocol), decided to change the license after a competitor took their (openly licenced) work, modified it and did not contribute back to the project, for a more restrictive AGPL license (forcing other actors to share under the same conditions the modified versions they run of their own servers) (interview with Vincent, Element).

That said, in most cases, changing licenses is rare, and becomes too complex once multiple authors are involved. In that sense, the license is rarely debated among the producers and while there is a rule in use, there can be considered to be governance over the ownership rules only in the cases where a system is in place to allow people to take part in the discussion of these rules.

Custom and new licenses have been used, which is often referred to as a "bad practice" among the FLOSS community, as it does not support interoperability or compatibility under resources shared under different licenses. While it is sound not to reinvent the wheel (while generating potential incompatibility issues preventing to mix different resources), few licences created in the last twenty years have had the purpose of redressing the growing unbalance between individual producers and large companies in the process of "sharing", specifically regarding value realisation, data protection and reuse in specific contexts (*Benhamou & Dulong de Rosnay, 2025*). This concern of many authors has been reinforced since crawlers gathering data in order to train AI have spread all over the Internet and original open licenses were not addressing this use case.

Free licenses are evaluated and considered "conform" by two institutions: the Free Software Foundation (FSF) and the Open Source Initiative (OSI). The first one evaluates the compatibility with GNU licenses using their four freedoms criteria, while the second has a set of criteria which forbids any discrimination toward specific groups (art. 5) or uses (art. 6).

Coopcycle, a cooperative of bike-delivery workers, has been created to offer an alternative to the giant US-based start-ups (becoming giant corporations) like Uber – which were not fair with workers' labour rights. Coopcycle founders wanted to offer a system, where bike-delivery workers could own their tool of production; in this case, it is mostly the dispatch platform (and associated decision and valorisation algorithms). They decided to develop their own, but did not want any company to use it. Therefore they created a reciprocity licence called coopyleft — with two Os — requiring any user of the software to be a cooperative worker. This licensing clause is based on a previous idea from Kleiner (*2010*). In these cases, the protection of the community and of the resource against extractivism relies on discrimination toward certain groups, based on the socio-economic organisation models they rely on (and of course not on ethnicity, gender, race or other individual characteristics).

The choice of a license, specifically a license that is not broadly recognised among the other stakeholders might have an effect on participation, although not necessarily in the expected way (*Medappa & Srivastava, 2017*). Collective ownership may require an infrastructure to operationalise licenses through trusts, similar to collective societies of authors in the creative industries (*Benhamou & Dulong de Rosnay, 2025*).

3.1.2 Organising the production of the resource

Organising the production of the resource is also subject to forms of self-organisation. This governance is often, but not always, embedded or entangled in the technical toolchain used to produce the resource. One of the most studied examples is the governance of free and open

[2] https://en.wikipedia.org/wiki/Wikipedia:Licensing_update

[3] https://osmfoundation.org/wiki/Licence/Historic/We_Are_Changing_The_License#Why_do_we_have_a_license

source software production. The Git repository[4], and often the online services hosting Git repositories and providing social functions are at the heart of the governance of the production of the resource: who is owner of the repository, who is member of the project, who has commit rights are part of this governance.

Similarly, the need for three authorised reviewers to validate a pull request can for example be embedded in the processes of these online services. There are also spaces for discussions and conflict resolution (the discussion under each issue or pull request). Many recommendations about "having a governance for your free and open source project" are suggesting to add a contributing.md and sometimes a governance.md file in the repository, which ought to be explicit about rules, conflict resolution and rights of different users (*Gaughan et al., 2025; Noori et al., 2025; Schneider et al., 2021*). Yet, few of these files (and recommendations to create them) include processes for governance revision, making it implicitly the privilege of the project owner to do so.

Moreover, the online service hosting Git repositories of choice for many FLOSS projects is GitHub – a platform providing services for free, but there is no control over the governance of the platform. When GitHub is bought by Microsoft, and later decides to train an AI with the users' code, no one can opt out. The only possible strategy is to leave the platform. Although it is hosting many DC/IC, GitHub itself is not a DC. Knowledge does not exist outside artifacts (and the code is no exception) which rarely exist outside of infrastructures. Not governing the infrastructures is a key limit to the governance of the resource (*we reached a similar conclusion for Cultural Commons in Guillier, 2023*).

3.1.2.1 Forks and Knives

Commons are defined by Ostrom and Hess as "subject to social dilemmas" (2011, p. 3) and governance of the resource is part of these social dilemmas. Many in the FLOSS world have argued that as with any issue on any project, anyone can just "fork" the project if they disagree with choices that are made. A "fork" is a copy of the original project, under the terms allowed by the license, taking another direction. This perspective is contractually correct. Open and free licenses allow users to take the code and try to gather communities elsewhere. If there are rare cases of forked projects merging, in most of the cases, one of the projects keeps or attracts most contributors and the other is weakened, as is for example the case with Apache OpenOffice since LibreOffice has successfully forked.

However, one could argue that exiting should be a last resort in trying to solve social dilemmas. Using Albert O. Hirschman's distinction between the signals of "exit" and "voice" in organisational life, Nathan Schneider (*2022*) offers a perspective on the fork as a response; Drawing on this economic literature comparing change from within and quitting a job or shopping with a competitor, Schneider makes his Hirshchman's argument:

> *[W]hile exit-based organizational logic excels in producing variety, choice, and innovation, voice-based logic confers greater commitment and stability. In their study of the GameCenter online community, for instance, McEwan and Gutwin (2017) observed that when the platform's "benevolent dictator" became less active over time, subgroups developed unexpected resilience. (Schneider, 2022)*

Exit should be the only alternative for the governance to be healthy, even in cases where the governance is non-deliberative (the case of benevolent dictators, which is central in Schneider's argument being one paradigmatic case).

[4] Git is a free software initially developed for the management of decentralised development processes which helps managing asynchronous multiple changes of the same part of a file. It is now the most popular versioning software in the world.

One example of governance of resource production can be found at Blender. The software is developed in multiple teams called modules. Each module has a regular (online) meeting (most of which anyone can attend). In these meetings, the discussion focuses on what has been done, the potential urgent issues, the roadmap and potential conflicts or interaction needed with other modules. The discussion is moderated by the module owners (whose appointment is made based on their merit, but not with a clear procedure). This governance is separated from the governance of the whole project (to which each module owner takes part) and of the governance of the organisation and other communities (interview of Willem, Blender).

Governing the resource goes beyond what the sole free and open licenses cover. We can distinguish two aspects of governance, namely ownership (which is mostly intellectual property, but goes beyond open and free licenses) and governance of the resource production (which infrastructure, which organisation of the work, and how they are entangled with the technical tools). While governing the resource was, for the purpose of this analysis, separated from the governance of the communities, the community of producers was already mentioned, and needs to be further developed.

3.2 GOVERNING COMMUNITIES

3.2.1 From community to communities

Communities in Digital Commons are often assimilated to a single entity. However, in many projects, there are multiple groups, all of which can take part in some part of the project. If we step away from software to get to academic publishing, there can be multiple distinct roles (Dulong de Rosnay, 2021).

While studying commons beyond open access science, Samuel A. Moore decides to focus on scholar-led publishing. He refutes the term 'community', quoting Raymond Williams about the fact that the term community "seem never to be used unfavourably, and never to be given any positive opposing or distinguishing term" (Moore, 2025, p. 100). We agree that "communities" don't mean much if they are not specified, and not related to the practice of self-governance. We use it as a general term, but to specifically circumvent the people active in governance.

For example, in the case of Blender modules, there are modules meeting associating developers and artists. As the tool is intended to be used by artists, they are closely associated during the development of the software. This is facilitated by the organisation of Blender, where Blender studios (dedicated to content creation) co-locate with Blender Institute (the company that develops Blender), both under the umbrella of the Blender Foundation. These two communities take part to the governance of the resource, even if during an interview Willem argues that:

> *Blender never had that distinction between developers and artists. It's always one community, one conference, one big intermingling of ideas. And that I think is very much worth keeping around and protecting.* (*Willem, Blender*)

Of course the community of developers organised in modules should be analysed as polycentric, in the sense given by Ostrom (*2005, p. 281 sqq.),* as they are multiple self organised, and local communities in the sense that Moore gives, that is for example sharing a discipline practices (while not being necessarily geographically close). Each module being developed independently, specifically in the way the people improving it self-organise, but having to coordinate to produce a coherent and working software, according to a goal they have set together.

3.2.2 Self-governance

As already mentioned, communities only make sense when they are defined by the fact they self-govern themselves. However, many of the groups are just not governed, or at least not in a deliberative way. What is meant by deliberative governance is a way for the people concerned with rules to have a place to debate in order to make changes they would like to see happen to these rules. Do-ocracy (*Dulong de Rosnay, 2014*) and the benevolent dictatorship for life (the qualification applied to the leadership of open source projects) are modes of governance where there is no deliberative self-governance of the communities.

Rather than to give a blueprint for a theoretical "good governance" or to decide whether projects are "good commons" or not, in this report we conceptualise commons as an objective (of self-governing communities through deliberative processes) toward which project can tend, or from which they can drift away. In that sense, the shift from founder-led to collectively led projects (referring to themselves as benevolent dictators or not) is a move towards more commoning, possibly a sign of institutional maturity, which mapping was an objective of the NGI Commons project under T1.1. That is for example, in the cases we studied, a process that started years ago at Blender, and what is ahead for Software Heritage, for example.

This self-governance can take place in the same tools as the development of the resource as is the case with some projects like Python, where PEP (Python Enhancement Proposals, mainly used to push for improvements in the language) have been used to discuss, amend and choose a governance system once the founder left the project (*Noori et al., 2025*). This mode of resource governance, inspired by the system of Request for Comment (RFC) introduced within the Internet Engineering Task Force (IETF) for defining and negotiating standards. The principle is that a person (or a small group) can make a suggestion for change (In the way the software/protocol works or in some cases, on the way the production of the resource is governed), which can then be discussed and improved, following a more or less well-defined process, leading to a decision (which form can vary) to adopt or reject the final proposition produced during the process.

There is however a need to distinguish between the tool used for organising a process and a tool-based process. As Kittur & Kraut (*2010*) evoke when researching governance of Wikipedia, "[j]ust because two wikis are based on the same technical platform does not mean that they are similar in other ways". Similarly, as governance of the community is partly embedded in the governance of the organisation (by-laws for example), such tools are sometimes insufficient to change the governance.

3.2.3 Codes of conduct

One aspect of governance of communities, which have been massively developed in the last decade, is the *code of conduct*. The codes of conduct seem to appear at the beginning of the 2010s. Frluckaj and Howison (*2024*) present the Contributor's Covenant proposed in 2014 by Coraline Ada Ehmke as a major step toward realisation that there could be a need for codes of conduct in the Open Source world. The same year, Debian adopted their first version of the code of conduct. The authors also emphatically explain how this fight against "toxic behavior" generated an outcry:

> *To OSS traditionalists, this was interpreted as a threat to free speech. To increasingly diverse contributors, it was a needed provision of protections and accountability. The introduction of the CC thus began the first major, and ongoing, socio-cultural war of OSS. (Frluckaj & Howison, 2024, pp. 295–296)*

Yet, in most projects, the statistics aren't looking good. In many projects, gender is either not a question, or when it is, the result is worse than in the rest of the software development industry. The situation is not far better in Wikipedia, where biographies of female historical

figures are still underdeveloped or lacking despite internal efforts to Mind the Gap and external projects such as Les sans pagEs to write such biographies. While there are few statistics on race or sexual orientations, it is fair to assume that there is a lack of diversity on this side as well across DC. Singh points out that it is (also) a matter of quality, as the Wikimedia Foundation has long tried to "mind the gap" of gender and geographic diversity.

> *"Diversity and inclusion are known to improve productivity and innovation in teams. Diverse teams lead to product development that is responsive to the needs of diverse groups and hence is better for all the users. Diverse teams are smarter, challenge people to think outside the box, and improve overall performance" (Singh et al., 2022)*

In this context, codes of conduct appears to be the tool through which many DC have chosen to show commitment toward more diversity and sometimes to actually work to try and achieve this goal. Some codes of conduct seem weak (when they are not mere displays of virtue) as they only encourage people not to engage within harmful behaviors towards others, offer no way to actually complain and/or no explicit sanction for these behaviours.

To summarise, codes of conduct shouldn't just be adopted as is, but should be developed by and with the producers of the resource, in order for the reflection and discussion to be open and public, and most of all, shared among the members of the communities. Singh also points out that these codes *per se* are not enough:

> *There may be several different ethical reasons informing a [Code of Conduct], but making these reasons explicit allows the community members to cite them whenever they have to address confict or have to fag out a violation of the code. A combination of women-focused spaces and community rules that explicitly include women will create a positive and welcoming environment for newcomers and veteran women members of the community. (Singh et al., 2022)*

In this section, we have explored what can be understood when there are discussions about governing the community. We first pointed out that communities can be diverse, even within a project, and that their goal might be different. We also emphasized that there is no "good governance", reminding that commons' theory states that self-governance is central to the very concept. Finally we considered codes of conducts as a way, when produced by the community, for themselves, to address the gender inequality situation, which has been evaluated worse in the open source software than in the rest of the software industry.

Codes of conduct are mere governance products, and in that sense, less interesting *per se* as the process that led the communities to have them discussed, amended and published. Resources and communities don't float in the void of the Internet. They gather and organise, and people often create organisations to organise the development and the sustainability of the resource and the communities.

When it comes to governing communities, we argued that one should always consider the diversity of the communities around DC, beyond the initial producer-consumer utopia. We then moved to the importance of self-governance and showed that some forms of self-governance are more democratic than others and that (digital) commons supposed self-organisation in a collective and deliberative way. Finally, we discussed the role of codes and limits of the codes of conduct, which are considered necessary tools to improve diversity in the communities, but also the need for them to be properly implemented in order to be effective.

3.3 GOVERNING THE ORGANISATION(S)

Governing organisations is first and foremost organising the governance: as we saw in the first section, organisations have by-laws, sometimes rules but also constitute another aspect that also needs to be governed. Organisations include foundations (although many which are called "foundation" for the Digital Commons do not necessarily have foundations' by-laws and status), either dedicated to a single project (like the Blender Foundation, or the Matrix Foundation) or hosting multiple projects (like the KDE foundation or Linux Foundation). But, other statuses exist, including for profit companies, non-profit organisations and the intermediary scope of cooperatives and social and solidary enterprises. Some public bodies are also developing and supporting resources they call Digital Commons. The relationship between public bodies and the commons shall be explored in a future NGI Commons report D3.6 due end of 2026.

3.3.1 Sustainability

One of the roles of these organisations is to provide support for a sustainable path forward to the Digital Commons they are supporting. The interviews for a previous report (*Guillier et al., 2025*) and for this report show that there are two important aspects involved: autonomy and independence.

3.3.1.1 Independence

Independence can be understood as a way for the Digital Commons to not be influenced. An interviewee from the Matrix foundation explains it for the Matrix protocol:

> *Matrix is the ecosystem responsible for maintaining the protocol and maintaining the ecosystem around that protocol whereas Element is a for-profit venture to basically make sure that the core team can be paid because back in the days when Matrix was originally created, the core team was looking to basically make sure that they could sustain both themselves but also the project. So they made sure the protocol itself was kept safe from any for-profit venture, not just themselves, but also wanted to make sure that they had an avenue to actually be able to pay themselves and make a living day-to-day because that's pretty important. (Andrew, Matrix Foundation)*

Here, the two organisations have separate objectives, and the people who created Element and Matrix decided to split, so that the Matrix protocol could be used by other organisations (and therefore guarantee *their* independence when they use the protocol).

Another conception of independence and self-organisation is to be seen in Gaia-X and many other projects, where governance is open to organisations only, paying a fee to be part of the governance. In a talk given in August 2025 on "Copyleft as Labour Organising", Christopher Neugebauer, a python developer who has also been active in Python Foundation governance, explains this is also the way Kubernetes is organised. He demonstrates that companies who were interested in self-governance and paying for maintenance of the resource, found ways to fund so. The Cloud Native Computing Foundation, which acts as the hub of organisation for Kubernetes, is registered as a Business league, or Trade organisation (also known as a 501(c)(6) organisation), a non-profit organisation within which they "do work that improve the conditions within all of them trade", according to Neugebauer.

During his talk, Neugebauer argues that companies have found ways to self-organise and guarantee their independence. He also argues that open licensing gives an unfair advantage to the producer against competitors who have no obligation to pay for the resource, nor to contribute to it, except when governance is reserved to the companies which accept to pay. However, this is getting away from the commons and closer to toll goods. Also Neugebauer

argues that it does not apply to small project managers, who wouldn't dare to put any restriction on their open project, putting them in a difficult position to guarantee their independence.

3.3.1.2 Autonomy

The aim of any organisation is to sustain itself and the project over time. Autonomy is multi-faceted: financial, administrative, technical, etc. Multiple choices can be made to achieve these goals: for the financial autonomy, some project choose to start a company selling goods and services, to ask for sponsorship from the industry when they rely on the Digital Commons you produce, to ask for sponsoring to the individual users or to search for public funding.

While some Digital Commons, like the Blender Foundation, seek all three, others are choosing to focus only on one. The economic model for autonomy can be in conflict with the deliberative aspects of the governance of the resource as stated above: for example, many single-owner FLOSS companies, because they want autonomy and control over their business model, extend this control to the resource itself.

This tension is the main reason why, in another type of DC, namely Open Science, Moore suggests that if Digital Commons are compatible with market activities, these come second in his definition of the commons, whose deliberative self-managed and care aspects are central (*Moore, 2025*). Other aspects of autonomy are also important, like administrative autonomy. Many Digital Commons do not refer to a specific country, as their communities are spread across the world. For example, the Software Heritage project is working towards a structure that could guarantee its long term autonomy:

> *Right now, we are thinking about the creation of an autonomous structure, on which one needs to take the time, because you won't transition twice. […]. Therefore you need lawyers, strategic advice, you need to understand what direction you want to take. Do you want a multi-state structure? Do you want to avoid states being part of it? In this case, you end up with an organisation, which is not international, but national. You see all these foundations claiming to be international, they are not. Linux foundation is US based under American law, Eclipse, is now a foundation, under Belgian law […]. On the other hand, in Europe, for research you have ERIC, European Research Infrastructure Consortiums, EDIC, European Digital Infrastructure Consortium, which approximately have an international organisation status, but only at the European level. (Alessandro, Software Heritage)*

In this case, autonomy is always a tradeoff because being truly independent from national and international political politics and having a non-profit status recognised by multiple countries seems hard to achieve.

Autonomy and independence are important components of sustainability, which is part of the governance of organisations. Sometimes, tradeoffs are considered necessary by the actors depending on which aspects they think autonomy or independence should be. Technical autonomy is also important, and related specific developments are in the subsection below.

3.3.2 Infrastructure

One of the reasons organisations exist is also to provide technical support for the activities of the Digital Commons they are responsible for. All Digital Commons projects rely on digital infrastructure. Some projects host their services directly, administrating bare-metal servers, that is directly specific physical machines, while many others rely on one or many layers of services (cloud and other services without complete control of the machines, but also with less technical work to do). Infrastructure is essential to the Digital Commons projects. This is specifically true for foundations, which infrastructure sometimes hosts multiple projects essential to many actors. For example, the Rust Foundation is responsible for the stewardship

for the package repository crates.io, which is “the repository for all of the Rust code that is relied on by companies all over the world”. According to the same Rust Foundation interview:

> *[The technical employees of the Rust foundation] are focused primarily on infrastructure, engineering, so ensuring that the infrastructure works and that it is as efficient as it can be. Security, so making sure that the crates.io ecosystem is again as secure as that can be. And we've got a couple of people working on specific kinds of security tooling.*

This infrastructural work is even clearer in the case of foundations, but is to be done everywhere. The way the infrastructure is administered is not often an object of deliberation, yet it can also be collectively managed. As a member of the board of KDE e.V. explained:

> *[w]e have a sysadmin working group. So they will work with the maintainers of that incoming project to identify what the infrastructure needs. You need some special server, you need some extra storage, what is it. And they will work with the maintainer to make sure that it's up to our quality standards. They will also make sure that it's compliant to the manifesto. So that obligation page of the manifesto, that is the one sort of hard rule set. For example, that all of the infrastructure used by it has in fact to be under the control of the KDE community, meaning software cannot rely, for example, on some external server that we don't have access to because then we wouldn't be able to ensure that people are protected nor that the thing continues when the maintainer gets hit by a bus and things like that.*

And even the understanding of it is interesting: when explicitly asked whether people moving their project into KDE are surrendering some level of control over, the answer couldn’t be more direct:

> *No, that's the opposite. The question was how the project is managed. Is it something that you are concerned about or that you're not as an organisation?*

Infrastructure at KDE is considered a collective responsibility. Sysadmins work for the whole community, and can intervene, provide support and speak up if there is any issue. The collective management is not understood as an individual surrender of control, but as a collective empowerment, from the control over the infrastructure and security perspectives, but also from the values perspective. The governing of an organisation also implies sharing and discussing values. How these values are governed is going to be explored in the following subsection.

3.3.3 Values

Organisations are governed by rules written in the by-laws, which often include the definition of a board. Usually, their role is first and foremost to make sure the organisation can continue its activities, and pass on the spirit and the values of the project. The values are mostly put forward by interviewees within non for profit endeavours. We also observe that the clarification of values (often to formalise them in a statement) can lead to a debate among the participants, which might be more important than the statement itself. For example, a member of KDE e.V.’s board explains how the KDE manifesto came to existence, as the KDE 4 development saw new generations gathering around the project:

> *[The KDE 4 project] was very successful in recruiting new contributors and making the community in fact much larger to contribute to the community. But that also meant that the older generation felt a little bit the need to write down and catch the actual values of the organization and to some extent sort of enshrine them and give them forward to the next generation, but actually also do that in an active dialogue with that new generation*

> *so that it wouldn't just be, you know, the old generation telling you what to do, but rather arrive at some kind of hybrid. […] The manifesto specifically came from that idea to write down some of our values that we believe, that we felt, make the KDE community distinct from maybe some others.*

In the same way there is no "good governance" template, there is no template for "good values" of Digital Commons. The process of involving the active people in working on the values for the participants to feel good about is more important than the values themselves. However, if there are no "good" values, there are a few bad values that clearly go against the values of the commons. In another type of commons (social centers in Italy), there has been an ongoing discussion about the possibility for neo-fascists to create a common: they constitute a (well-defined) community, they have rules, sanctions for those who don't respect it, sometimes even some form of deliberative process among their members. However, quoting constitutionalist and commons specialist S. Rodotà, I. Favero explains that these neo-fascists values cannot be considered a commons, because:

> *[a]ccess, understood as a fundamental human right, is essential as a necessary link between rights and goods. […] one could not think of a commons whose access is based, like in [the case of the neo-fascist social center] on social, economic or cultural discrimination" (Favero, 2017)*

At a time when many of the biggest companies based in the US producing digital devices and services retract their DEI (Diversity Equity and Inclusion) measures and display a tendency for non-egalitarian and fascist ideologies (masculinism, racism, discriminations toward LGBTQI+ people, etc.), and given the European Declaration on Digital Rights and Principles for the Digital Decade, which emphasises from the first article the direct link between digital rights and human rights, it seems self-evident that no collective endeavours which would not comply to basic human rights can ever be considered a (digital) common.

To conclude this section, we have shown that in our study, the governance of Digital Commons organisations is a matter of sustainability, infrastructures and values. Sustainability can here be understood as independence and autonomy. We had already shown that DCs always have material informational aspects. Therefore they necessarily rely on some form of infrastructure. Governing this infrastructure is a role of the organisation, we have presented the example of KDE e.V. where the management of infrastructure is collectively managed, not as a limit to individual freedom, but as a guarantee to the collective one.

4 CHARACTERISTICS OF THE DIGITAL COMMONS GOVERNANCE MODELS

The previous sections aimed at identifying and classifying empirical observations about governance in the Digital Commons. In this final section, we explore a few ways to define characteristics to sort and to describe the governance of Digital Commons.

4.1 CRITERIA AND GRADIENTS

In this section, we want to put forward further tools that could beyond the bundle of rights be used to map and analyse governance for potential systematic analysis, but also to express explicitly the potential limits and drawbacks of some of these methods.

4.1.1 Ontologies of action situation and explicit governance

The first obvious way of describing characteristics is to develop ontologies of action situations. This is for example a tool that Noori et al. (*2025*) use to try and analyse the governance of open source projects. The idea is to work toward a schematisation using three elements: role, action and deontic (a type of logic relative to permission or obligation). In order to clarify, Noori & al. try for example to express these three aspects on each governance issue:

- Who?
- Must/should/must not/should not?
- Do what?

The use of deontic logic allows forms of formalisation and can help the analysis but has drawbacks. As Noori & al. show in their paper, this type of logic can describe with a logical language what the rule is. Similar models encoding law have existed in the law and AI scholarly community for decades (*ICAIL, Jurix*). There is an important axiom, which is that the logic is coherent: if X is allowed to Z, the rule is clear, and will be applied. It does not take into consideration that Z might not be allowed yet still do it, without formal approval nor disapproval for many possible reasons. The other limit of the analysis we take here as an example is based on written rules (the governance.md files on a software github page) using automated analysis of text to draw general and disputable conclusions. The model of description of the rules can be interesting, but its main purpose is to be used to conduct automated analysis or processes, which have little to do with self-governance.

Another criteria that seems to be important is how explicit the governance is. Most research papers on governance insist on the fact that explicit governance helps to onboard new people (*Izquierdo & Cabot, 2023; Noori et al., 2025*) as we showed above, explicit governance is also a factor of integration of a wider diversity of contributors. Therefore, explicitation of the ontologies of action is a way of analysing rules. The automation of the analysis makes it possible to compare many written rules, but also has limits and can also have limitations related to the non-written parts of the rules. Besides, the next section explores enforcement of these rules and sanctions, which are considered necessary for written rules to be performative.

4.1.2 Levels of constraint and object of governance

Ostrom, with the governance design principles, defined common practices among the commons that were successful. Within these eight principles, one can find the ability to monitor the system, to take proportionate action against users, and the need for local mechanisms to resolve conflicts.

In the digital world, with the rise of user experience design, mechanisms have been put in place to induce, observe and analyse user reaction. One axis of analysis follows a question of how governance can be inducing responses. There seems to be a spectrum from absolute freedom to defined sanctions, via nudging and suggestion. Nudging can here be understood as "the devices of 'choice architecture' that improve our choices by exploiting our mental heuristics and decision-making biases" with an assumption that "improving" means "that nudges promote the nudged agent's interests and/or ends." (*Rozeboom, 2020*).

Full openness is inherited from some free projects, and the do-ocracy conception that sometimes prevails, whereas the sanctioning conception of governance is closer to Ostrom's conception of what governance should be. Whether nudging should be considered an (ethically) acceptable part of governance has been debated (as demonstrated by Rozeboom). Moreover, within the governance elements we found, some were related to collective action, others were related to (individual) behaviors, although we found no direct correlation between the previous spectrum and this dichotomy.

We are able to briefly identify a spectrum of enforcement mechanisms as well as a need for sanctioning. The nudge as a way of pushing users toward good practices can only be considered relevant in the few cases where the communities self-determines their use of it. But this subsection mainly aims to think of DC governance as a process in which monitoring, sanctioning and resolving conflicts are essential. This should also be taken into consideration and evaluated when assessing governance.

4.2 THINKING OF DIGITAL COMMONS AS AN OBJECTIVE

Even if this report cannot offer a 'good governance' blueprint – as it goes against practice and theory of the (digital) commons, this last part is aiming to partially help actors to define their own criteria to further define ways of assessing the governance of the DC, and mostly how open projects evolve. Indeed, we would like to make a first argument and suggest looking at how projects evolve along the different gradients. We note that projects have been bootstrapped as many entrepreneurial endeavours (or side-projects) carried by a single person, without any collective governance and no time nor conscience of the importance it has.

With such a start, we can assume that projects will evolve along one of the following paths:

- Some will live as (more or less successful) open projects and don't aim to become a DC. The existence of two different concepts (open resources and DC) should be an opportunity for better understanding of the differences and choosing what to support and to foster, rather than a new branding of FLOSS (*or commonswashing, see Dulong de Rosnay, 2020*).
- Others will try to evolve in the direction of a more deliberative process, and evolve within the categories and gradients we explored in our analysis, in a direction that is aiming for more self-governance, more democracy, within the project or in the society thanks to it. In that case, evaluating the evolution toward a 'more common' governance might be more relevant than looking at a project at a time and deciding whether it is a (digital) common or not. This idea of taking into account the direction, and not a given status also echoes the defiance toward confusing the tooling and the governance.

The second argument is a call for attention regarding a risk of confusion between tooling or display of values and actual collective processes. Governance always implies to let time for discussions to happen. As explained by a person at the Rust Foundation:

> *There's also a very liberal skewing majority in the Rust. There's a very substantial trans community in Rust that you don't see in other communities. So I think there's already a kind of slightly different approach to democracy, decision making, how you speak to each other, how you deal with each other in the Rust community. […] We want everyone's voice to be heard. We don't want to kind of ride roughshod over people. So they're very consensus driven democratic. Those are processes that they wanted. They wanted it to be, I'd say they were maybe a little bit conflict avoidant. So this kind of decision making… It takes ages, but it means that they will feel heard and valued. And even if decisions go against what they personally want, they have felt ownership over the process.*

Democratic processes take time and are not necessarily efficient, but they have the virtue of being democratic. (Digital) commons, we argue with Moore, are about care for the people, and therefore about building democracy while building a digital resource. In this process, the tooling can help but isn't going to allow, produce or secure democratic processes. Here again, democratic is to understand as an objective to tend toward rather than a binary attribute.

In that sense, and to conclude this section, we can re-interpret the notion of commoning, which was suggested by Bollier. He suggested moving from commons (as a noun) to commoning (as a gerund verb) as a collective activity. We could re-interpret it as commoning as the process or going into the direction of more commons. Commoning in this sense should therefore not only be understood as the action of producing a common ressource, but as collectively producing a more democratic governance to take care of the resource, the communities and the organisations around which the people gather.

5 CONCLUSIONS

Governing Digital Commons is a complex task. This report aims to help provide analytical tools to assess governance and explore it in detail, while trying to avoid a normative perspective on what governance of digital commons should be.

After discussing the concept of governance and acknowledging that this report only focused on Digital Commons governance, we have in the first part discussed the absence of "good governance" blueprints, since governance should be collectively and democratically set and governed by the very definition of commons. This self-governance implies that rules should be set and changed by the actors themselves. However, we tried to discuss the relevance of establishing governance, using three complementary perspectives: actors' rights (part 2), objects of governance (3) and characteristics of governance (4).

The second section takes the perspective of rights, beyond ownership. In the first subsection, we argue for the relevance of extending the concept of bundle of rights beyond ownership when it comes to Digital Commons. We apply our working methodology to all written texts of three well-established DC projects. Every text specifying rules was studied. We then classified the rights we identified within four categories: Produce & Monitor, Lead, Communicate & Represent, and finally Care. If all these rights were identified, not all were necessarily present in all projects. To end this section, we also discussed the relevance and limits of this right-based analysis of DC governance.

We then turned to what is being governed in the third section. Beside the obvious (the resource itself), we took into consideration the governance of the community, which is lacking in many analyses of the DC governance. We also added the governance of the organisation, which, to our knowledge, has not been taken into account as clearly when working on governance of the DC. Focusing on governing the resource, we found it is mostly about ownership and organising the production. When it comes to communities, we argued they were in most cases to be considered in a plural form as many different roles came into play. We emphasised once again the importance of self-governance in the commons approach to then turn on the main way communities have organised the care: through codes of conducts. Governing the organisation is then analysed in multiple terms. First, we look at sustainability, understood as independence and autonomy. We then turn to infrastructure, which is one of the roles of the DC organisations. Finally, we turn to the values, which often are at the core of many DC organisations whose role is to pass them on and negotiate them regularly.

The last section entails what we describe as characteristics of the governance, and provides more analysis tooling for DC governance. We look at ontologies of action situations and explicit governance, and we focus on how the enforcement and sanctioning is considered relevant for the commons, questioning other ways to enforce governance. We then discuss the very idea of evaluating whether some project is a (digital) Commons, with a binary answer to, in place, suggest that this should be understood as a process toward more democratic and self-governed processes. Here we reiterate some normative ground for democratic processes and fundamental rights, which are central to the concept of commons.

Instead of a blueprint for governance, this report provides analytical tooling to decrypt rights, prerogatives and action situations, and try to evaluate how the governance is going in the direction of more or less Commons, assessing rights, objects of governance and other tools to implement a good governance. At the end of this report, we tend to understand this 'good governance' as the best human-rights and care-based way of organising decision-making, monitoring and conflict-solving processes a project's communities would choose for themselves, while aiming for more deliberative and democratic ones.

6 REFERENCES

[1] Barbe, L., Merzeau, L., & Schafer, V. (2015). *Wikipédia, objet scientifique non identifié*. Presses universitaires de Paris Ouest.

[2] Benhamou, Y., & Dulong de Rosnay, M. (2025). Open Licensing and Data Trust for Personal and Non-Personal Data: A Blueprint to Support the Commons and Privacy. *IIC - International Review of Intellectual Property and Competition Law*, *56*(8), 1553–1589. https://doi.org/10.1007/s40319-025-01636-y

[3] Bort, J. (2025, March 27). Open source devs are fighting AI crawlers with cleverness and vengeance. *TechCrunch*. https://techcrunch.com/2025/03/27/open-source-devs-are-fighting-ai-crawlers-with-cleverness-and-vengeance/

[4] Boyle, J. (2003). The Second Enclosure Movement and the Construction of the Public Domain. *Law and Contemporary Problems*, *66*(1), 33–74.

[5] Broca, S., & Coriat, B. (2015). *Le logiciel libre et les communs.* https://hal.archives-ouvertes.fr/hal-01174746

[6] Cardon, D. (2019). *Culture numérique*. Les presses de SciencesPo.

[7] Carroll, S. R., Garba, I., Figueroa-Rodríguez, O. L., Holbrook, J., Lovett, R., Materechera, S., Parsons, M., Raseroka, K., Rodriguez-Lonebear, D., Rowe, R., Sara, R., Walker, J. D., Anderson, J., & Hudson, M. (2020). The CARE Principles for Indigenous Data Governance. *Data Science Journal*, *19*, 43. https://doi.org/10.5334/dsj-2020-043

[8] Chandrasekhar, R. (2025). *Legal frictions for data openness: Reflections from a case-study on re-use of the open web for AI training* (75 p). Zenodo. https://doi.org/10.5281/zenodo.15097649

[9] De Moor, T. (2011). From common pastures to global commons: A historical perspective on interdisciplinary approaches to commons. *Natures Sciences Sociétés*, *19*(4), 422–431.

[10] Denis, J., & Pontille, D. (2022). *Le soin des choses: Politiques de la maintenance*. la Découverte.

[11] Douglas, D. M. (2011). A bundle of software rights and duties. *Ethics and Information Technology*, *13*(3), 185–197. https://doi.org/10.1007/s10676-010-9229-3

[12] Dulong de Rosnay, M. (2014, July). The digital rights and access to knowledge movements: The rise of a networked do-ocracy. *International Political Science Association Conference 2014*. https://shs.hal.science/halshs-01128129

[13] Dulong de Rosnay, M. (2015). Peer-to-peer as a design principle for law: Distribute the law. *Journal of Peer Production*, *6*. http://peerproduction.net/issues/issue-6-disruption-and-the-law/peer-reviewed-articles/peer-to-peer-as-a-design-principle-for-law-distribute-the-law/

[14] Dulong de Rosnay, M. (2016). Peer to party: Occupy the law. *First Monday*. https://doi.org/10.5210/fm.v21i12.7117

[15] Dulong de Rosnay, M. (2020). Commonswashing – A Political Communication Struggle. *Global Cooperation Research - A Quarterly Magazine*, Vol. 2, No. 3, October 2020, 2 p.ISSN 2628-5142 (print). ISSN 2629-3080 (online). https://hal.archives-ouvertes.fr/hal-02986722

[16] Dulong de Rosnay, M. (2021). Open Access Models, Pirate Libraries and Advocacy Repertoires: Policy Options for Academics to Construct and Govern Knowledge Commons. *Westminster Papers in Communication and Culture*, *16*(1).

https://doi.org/10.16997/wpcc.913

[17] Dulong de Rosnay, M., & De Martin, J. C. (Eds). (2012). *The Digital Public Domain: Foundations for an Open Culture*. Open Book Publishers.

[18] Dulong de Rosnay, M., & Musiani, F. (2020). Alternatives for the Internet: A Journey into Decentralised Network Architectures and Information Commons. *tripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society*, 622–629. https://doi.org/10.31269/triplec.v18i2.1201

[19] Dulong de Rosnay, M., & Stalder, F. (2020). Digital commons. *Internet Policy Review*, *9*(4). https://doi.org/10.14763/2020.4.1530

[20] Dulong de Rosnay, M., Tréguer, F., Antoniadis, P., Apostol, I., Aubrée, V., Burns, A., Michalis, M., Neumann, J., & Roca I Tió, R. (2019). *Telecommunications Reclaimed: A Hands-On Guide to Networking Communities*. ISOC. https://shs.hal.science/halshs-02414439

[21] Elkin-Koren, N. (2005). What Contracts Cannot Do: The Limits of Private Ordering in Facilitating a Creative Commons. *Fordham Law Review*, *74*(2), 375.

[22] European Commission. (2025, October 29). *Commission to launch Digital Commons EDIC to support sovereign European digital infrastructure and technology*. Shaping Europe's Digital Future. https://digital-strategy.ec.europa.eu/en/news/commission-launch-digital-commons-edic-support-sovereign-european-digital-infrastructure-and

[23] Favero, I. (2017). Culture et biens communs: un enjeu de démocratie. Travailler les communs par la culture et la culture par les communs. In I. Favero, L. Bettarini, R. D. Bodt, M. Degrijse, B. D. Reymaeker, S. D. Ville, P. Hemptinne, H. Hiessler, M. L. Corre, B. Minh, N. Parlaku, & J. Vanderdonckt, *Neuf essentiels pour penser la culture en commun(s)*. Culture & démocratie. http://www.cultureetdemocratie.be/documents/Productions/9essentiels/9essentiels_Commun_WEB.pdf

[24] Frischmann, B. M., Madison, M. J., & Strandburg, K. J. (Eds). (2014). *Governing knowledge commons*. Oxford University Press.

[25] Frluckaj, H., & Howison, J. (2024). Codes of Conduct in Open Source. In D. Damian, K. Blincoe, D. Ford, A. Serebrenik, & Z. Masood (Eds), *Equity, Diversity, and Inclusion in Software Engineering* (pp. 295–308). Apress. https://doi.org/10.1007/978-1-4842-9651-6_17

[26] Gaughan, M., Champion, K., Hwang, S., & Shaw, A. (2025). The Introduction of README and CONTRIBUTING Files in Open Source Software Development. *2025 IEEE/ACM 18th International Conference on Cooperative and Human Aspects of Software Engineering (CHASE)*, 191–202. https://doi.org/10.1109/CHASE66643.2025.00030

[27] Guillier, V. (2023). *Cultures en commun. Mutations et réappropriations de la diffusion et de la valorisation des biens symboliques dans l'environnement numérique* [Université Paris 8]. https://theses.fr/s143656?domaine=theses

[28] Guillier, V. (2024). *Au-delà de la propriété, Vers de nouveaux faisceaux de droits pour étudier la gouvernance des communs numériques?* https://doi.org/10.5281/ZENODO.16268336

[29] Guillier, V., & Dulong de Rosnay, M. (2025). *The bundle of rights as analytical framework for digital commons governance*. https://doi.org/10.5281/ZENODO.16278489

[30] Guillier, V., Dulong de Rosnay, M., & Musiani, F. (2025). *Active communities of commoners and relevant commons*. NGI Commons - Horizon Program. https://commons.ngi.eu/download/d1-1-active-communities-of-commoners-and-

relevant-commons/

[31] Hess, C., & Ostrom, E. (2011). *Understanding knowledge as a commons: From theory to practice* (1st edn). MIT Press.

[32] Izquierdo, J. L. C., & Cabot, J. (2023). For a More Transparent Governance of Open Source. *Communications of the ACM*, *66*(8), 32–34. https://doi.org/10.1145/3570635

[33] Jemielniak, D. (2014). *Common knowledge? An ethnography of Wikipedia*. Stanford university press.

[34] Jullien, N. (2012). *What We Know About Wikipedia: A Review of the Literature Analyzing the Project(s)* (SSRN Scholarly Paper No. ID 2053597). Social Science Research Network. https://papers.ssrn.com/abstract=2053597

[35] Kittur, A., & Kraut, R. E. (2010). Beyond Wikipedia: Coordination and conflict in online production groups. *Proceedings of the 2010 ACM Conference on Computer Supported Cooperative Work*, 215–224. https://doi.org/10.1145/1718918.1718959

[36] Kleiner, D. (2010). *The telekommunist manifesto*. Institute of Network Cultures.

[37] Lessig, L. (2003). The Creative Commons. *Florida Law Review*, *55*(3), 763.

[38] Levinson, N. S., & Cogburn, D. L. (2016). The Next "Turn" in Internet Infrastructure Governance. In F. Musiani, D. L. Cogburn, L. DeNardis, & N. S. Levinson (Eds), *The Turn to Infrastructure in Internet Governance* (pp. 219–223). Palgrave Macmillan US. https://doi.org/10.1057/9781137483591_12

[39] Litta, H., & Bihr, P. (2025). *From Software to Society—Openness in a changing world* (37 p.). Open Knowledge Foundation Deutschland. https://okfn.de/files/publikationen/2025-05-From%20Software%20to%20Society.pdf

[40] Madison, M. J., Frischmann, B. M., & Strandburg, K. J. (2010). Constructing Commons in the Cultural Environment. *Cornell Law Review*, *95*. https://papers.ssrn.com/abstract=1265793

[41] Medappa, P. K., & Srivastava, S. C. (2017). License Choice and the Changing Structures of Work in Organization Owned Open Source Projects: [Best Paper Nominee]. *Proceedings of the 2017 ACM SIGMIS Conference on Computers and People Research*, 117–123. https://doi.org/10.1145/3084381.3084410

[42] Medosch, A. (2025). *The rise of the network commons: A history of coummunity infrastructure*. Institute of Network Cultures. https://networkcultures.org/blog/publication/tod-58-the-rise-of-the-network-commons-a-history-of-community-infrastructure/

[43] Moore, S. A. (2025). *Publishing beyond the market: Open access, care, and the commons*. University of Michigan press.

[44] Noori, M., Chakraborti, M., Zhang, A. X., & Frey, S. (2025). *Patterns in the Transition From Founder-Leadership to Community Governance of Open Source* (Version 3). arXiv. https://doi.org/10.48550/ARXIV.2509.16295

[45] Noroozian, A., Aldana, L., Arisi, M., Asghari, H., Avila, R., Bizzaro, P. G., Chandrasekhar, R., Consonni, C., De Angelis, D., De Chiara, F., del Rio-Chanona, M., de Rosnay, M. D., Eriksson, M., Font, F., Gomez, E., Guillier, V., Gutermuth, L., Hartmann, D., Kaffee, L.-A., … Wasielewski, A. (2025). *Generative AI and the Future of the Digital Commons: Five Open Questions and Knowledge Gaps* (Version 1). arXiv. https://doi.org/10.48550/ARXIV.2508.06470

[46] Orsi, F. (2013). Elinor Ostrom et les faisceaux de droits: L'ouverture d'un nouvel espace pour penser la propriété commune. *Revue de la régulation. Capitalisme, institutions, pouvoirs*, *14*. https://doi.org/10.4000/regulation.10471

[47] Orsi, F. (2015). Réhabiliter la propriété comme bundle of rights: Des origines à Elinor Ostrom, et au-delà? *Revue Internationale de Droit Économique*, *t. XXVIII*(3), 371–385. https://doi.org/10.3917/ride.283.0371

[48] Ostrom, E. (2005). *Understanding institutional diversity*. Princeton University Press.

[49] Ostrom, E. (2015). *Governing the commons: The evolution of institutions for collective action*. Cambridge University Press.

[50] Paye, O. (2005). La gouvernance: D'une notion polysémique à un concept politologique. *Études Internationales*, *36*(1), 13–40. https://doi.org/10.7202/010730ar

[51] Pélissier, M. (2021). *Les communs culturels dans l'écosystème numérique* (Vol. 8). ISTE. https://hal.archives-ouvertes.fr/hal-03175075

[52] Rozeboom, G. J. (2020). Nudging for Rationality and Self-Governance. *Ethics*, *131*(1), 107–121. https://doi.org/10.1086/709986

[53] Ruhaak, A., Bloom, G., Angie, R., Liburd Tavernier, W., Siddarth, D., Motz, G., & Dulong de Rosnay, M. (2021). *A Practical Framework for Applying Ostrom's Principles to Data Commons Governance* (Version 1). IUScholarWorks. https://doi.org/10.5967/M3H9-AQ50

[54] Schlager, E., & Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics*, *68*(3), 249–262. https://doi.org/10.2307/3146375

[55] Schneider, N. (2022). Admins, mods, and benevolent dictators for life: The implicit feudalism of online communities. *New Media & Society*, *24*(9), 1965–1985. https://doi.org/10.1177/1461444820986553

[56] Schneider, N., De Filippi, P., Frey, S., Tan, J. Z., & Zhang, A. X. (2021). Modular Politics: Toward a Governance Layer for Online Communities. *Proceedings of the ACM on Human-Computer Interaction*, *5*(CSCW1), 1–26. https://doi.org/10.1145/3449090

[57] Schweik, C. M. (with English, R. C.). (2012). *Internet success: A study of open-source software commons*. MIT Press.

[58] Singh, V., Bongiovanni, B., & Brandon, W. (2022). Codes of conduct in Open Source Software—For warm and fuzzy feelings or equality in community? *Software Quality Journal*, *30*(2), 581–620. https://doi.org/10.1007/s11219-020-09543-w

[59] Tréguer, F., & Dulong de Rosnay, M. (2020). The Political Defence of the Commons: The Case of Community Networks. *tripleC: Communication, Capitalism & Critique. Open Access Journal for a Global Sustainable Information Society*, 560–574. https://doi.org/10.31269/triplec.v18i2.1108

[60] VECAM (Ed.). (2011). *Libres savoirs: Les biens communs de la connaissance: produire collectivement, partager et diffuser les connaissances au XXIe siècle*. C&F éditions. http://cfeditions.com/libresSavoirs/

[61] Zygmuntowski, J. J., Zoboli, L., & Nemitz, P. F. (2021). Embedding European values in data governance: A case for public data commons. *Internet Policy Review*, *10*(3). https://doi.org/10.14763/2021.3.1572

Funded by the European Union