

The graphic features a central logo with a blue circle at the top, a green circle at the bottom, and an orange circle with a white flower-like pattern in the center. These are connected by curved lines. To the right is a large, light yellow circle with a white flower-like pattern. Above it is a light blue circle with a handle, resembling a magnifying glass. Below the central logo is a large, light green circle. The word "ODECO" is written in large, bold, blue capital letters across the middle of the graphic.

ODECO

Towards a sustainable Open Data ECOsystem

D3.3

Closing the cycle: Promoting open data users' contributions from a governance perspective



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Abbreviations

D	Deliverable
ESR	Early-Stage Researcher
M	Milestone
NGO	Non-Governmental Organizations
NPO	Non-Profit Organizations
ODECO	Project "Towards a sustainable Open Data ECOsystem"
SMEs	Small and Medium-sized Enterprises
WP	Work Package

Nr	Partner	Partner short name	Country
Beneficiary			
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2	Katholieke Universiteit Leuven	KUL	Belgium
3	Centre National de la Recherche Scientifique	CNRS	France
4	Universidad de Zaragoza	UNIZAR	Spain
5	Panepistimio Aigaiou	UAEGEAN	Greece
6	Aalborg Universitet	AAU	Denmark
7	Università degli Studi di Camerino	UNICAM	Italy
8	Farosnet S.A.	FAROSNET S.A.	Greece
Partner organisations			
1	7eData	7EDATA	Spain
2	Digitaal Vlaanderen	DV	Belgium
3	City of Copenhagen	COP	Denmark
4	City of Rotterdam	RDAM	Netherlands
5	CoC Playful Minds	CoC	Denmark
6	Derilinx	DERI	Ireland
7	ESRI	ESRI	Netherlands
8	Maggioli S.p.A	MAG	Italy
9	National Centre of Geographic Information	CNIG	Spain
10	Open Knowledge Belgium	OKB	Belgium
11	SWECO	SWECO	Netherlands
12	The government lab	GLAB	United States of America
13	Agency for Data Supply and Infrastructure	ADSI	Denmark
14	GFOSS Open Technologies Alliance	GFOSS	Greece
15	Inno3 Consulting	IC	France
16	Regione Marche	RM	Italy
17	Open Data Institute	OCI	United Kingdom

1 Introduction

1.1 Background

The central proposition behind Open Data is that data, information, and knowledge become a shared asset in society, allowing anyone to use it to engage and participate in economic, social, political, and cultural projects (Wessels et al., 2017). Data availability enables the coalition, combination, and enhancement of data through processes and tools (Bichard & Knight, 2012) that allow the use, reuse, redistribution, and merge of available open data with other data sources (Bachtiar, Suhardi & Muhamad, 2020). These processes enable the transformation of data into facts, information, insight, interfaces, new data, or services (Davies, 2010; Sussha, Grönlund, & Janssen, 2015; Purwanto, Zuiderwijk, & Janssen, 2020).

How stakeholders can deliver value back to open data ecosystems is well understood in studies of open government data (see, for example, López Reyes & Magnussen, 2022). The goal of the release of open government data, as an example, is to transform how governments relate to the public by engaging citizens in using the available data (Hossain, Dwivedi, Rana, 2016). The intention is to enable citizens to transform their community or environment; or help local governments solve challenges by benefiting from their knowledge, ideas, and the ability of people to provide surveillance (Bachtiar, Suhardi & Muhamad, 2020). Different effects of this can be expected. Firstly, it can drive social effects by creating or improving solutions to public service provision and creating social value. Secondly, it can improve governance by raising transparency and accountability, increasing citizen trust, and stimulating citizen participation. And thirdly, it can lead to economic effects by driving economic development (Yuan, 2019; Safarov, Meijer, Grimmelikhuijsen, 2017).

Specifically, using datasets related to public services and facilities can increase social value as they offer citizens the opportunity to enhance social life quality (Kalampokis, Hausenblas, Tarabanis, 2011). The use of open government data allows citizens to share information, participate in policing and law enforcement, analyse and monitor social issues as well as government actions, and develop social innovations. It also allows for engagement in the innovation or improvement of public services, generation of wealth through the downstream use of outputs, and, more broadly, enhancement of interactions between government and citizens to solve local problems (Hossain, Dwivedi, Rana, 2016; Safarov, Meijer, Grimmelikhuijsen, 2017).

Despite the efforts to engage citizens in the use of open government data (Huijboom & Van den Broek, 2011) and the rapid advances in information and communication technology (Yuan, 2019), several studies point out that the critical problem of open government data initiatives is their underutilization (Bachtiar, Suhardi & Muhamad, 2020; Safarov, Meijer & Grimmelikhuijsen, 2017). There has been a significant focus in the literature on studying the relationship between the utilization of open government data and the social and technical conditions enabling or disabling its use (Bachtiar, Suhardi & Muhamad, 2020; Safarov, Meijer & Grimmelikhuijsen, 2017; de Azambuja, 2021; Neto, 2018). Scholars have identified various barriers and conditions that affect the use of open government data. These include data quality issues, such as metadata and readability, legislative concerns, such as policy and privacy, user-related challenges, such as lack of knowledge, skills, or interest, infrastructure barriers, such as interoperability, availability, and security, and economic challenges (Bachtiar, Suhardi & Muhamad, 2020; Safarov, Meijer & Grimmelikhuijsen, 2017; de Azambuja, 2021; Neto, 2018).

More recent studies have concentrated on the barriers and conditions of using open government data by focusing on specific types and users' motivations (Safarov, Meijer, Grimmelikhuijsen, 2017). For example, Purwanto et al. (Purwanto, Zuiderwijk, & Janssen, 2020) focused on the individual citizens' drivers and inhibitors for engaging with the use of open government data. However, to

allow more rigorous empirical research to assess if the estimated effects of open government data are measurable, there is a need to investigate the link between the types of users and the potential type of effects (Safarov, Meijer & Grimmelikhuijsen, 2017).

1.2 Problem definition

From an open data ecosystem perspective, open data users should not only make use of the data for their purposes, but also deliver value back to the open data ecosystems, which can be defined as contributing to the open data ecosystem in a manner that improve the system, content or interactions e.g. by sharing the outcome of their work and analysis as new open data, or by correcting or extending the open data – thus closing the circle and contributing to creating a true circular open data ecosystem.

Tasks 3.3 explores ways to sustainably establish the contribution of open data users to open data ecosystems. Task 3.3 thus addresses the following question: What motivations for delivering value back to open data ecosystems do the different open data stakeholder groups have? With this knowledge, Task 3.3 will provide the next iteration of the commons-based governance model for open data ecosystems from Deliverable 2.3 by considering the motivations to deliver value back to the open data ecosystem (see Cazacu et al., 2024).

Motivations of the following stakeholders will be identified: (non-expert users, journalists, users in education, NGOs, local government users and central/regional government users, commercial users, and intermediaries. Together the identified motivations will contribute to the next iteration of the commons-based governance model for open data ecosystems from Deliverable 2.3 by considering the motivations to deliver value back to the open data ecosystem (see Cazacu et al., 2024).

1.3 Role of this deliverable in the ODECO project

In ODECO's deliverable 3.3 (D3.3), we aim to understand the **motivations** of various stakeholder groups for delivering value back to open data ecosystems and to explore the effect of these contributions from a government perspective.

The relation to the other deliverables in WP3 is as follows.

- **Deliverable 3.1.** "Understanding potential contributions of open government data users to the open data ecosystem" mapped the potential contributions of the open government data user by researching and analysing the different kinds of stakeholders and the various ways they (could) contribute to the "life" of the ecosystem by producing, consuming or producing and consuming at the same time open government data. The results of deliverable 3.1 forms a starting point for deliverable 3.2 by mapping the types of potential contributions different stakeholder may make to the open data ecosystem (see Ktistakis et al., 2023).
- **Deliverable 3.2** "Closing the cycle: Promoting open data users' contribution from a technical perspective" introduced the technical means that should make it easy to deliver value back to the open data ecosystem by applying the principles of circularity. This included four components: (1) designing user interfaces for open data portals where stakeholders can readily materially add value to the ecosystem, (2) researching appropriate feedback tools, (3) assessing the tools and technologies used for the analysis of different kinds of open government data and non-government dataset analysis, and (4) assessing the technical requirements of artificial and collective intelligence systems to directly interact with the open data ecosystem. The results of deliverable 3.2 shows how to support open data users in to delivering value back to the open data ecosystem from a technical perspective (see Polini et al., 2024).

Task 3.3 completes this by studying what can motivate the stakeholder groups to deliver value back to open data ecosystems and what effect this would have in a government perspective. Additionally, this task will explore ways to sustainably establish the contribution of open data users to open data ecosystems. Motivations to deliver value back to the open data ecosystem will be investigated for the following stakeholder groups:

- Journalists
- Students
- NGOs
- Local government users
- Central/regional government users
- Commercial users
- Intermediaries
- Non-expert data users

With this knowledge, Task 3.3 will provide the next iteration of the model from ODECO's deliverable 2.3 (D2.3 – see Cazacu et al., 2024) by incorporating the motivations of stakeholders for delivering value back to the open data ecosystem.

1.4 Structure

Chapter 2 details the theoretical approach adopted in task 3.3, encompassing theoretical foundations and definitions and descriptions of motivational theories. Chapters 3 – 9 presents data on and analyse motivation of actors in open data ecosystems. This includes presentation of results and analysis of Journalists, Students, NGOs, Local government users, Central/regional government users, Commercial users' and Intermediaries' motivation for contributing with value to open data ecosystems. Chapter 11 contains a discussion of what the results from the previous chapters imply for open data ecosystems and provides a next iteration of the governance model of ODECO's deliverable 2.3 (Cazacu et al., 2024) by considering the motivation of users to deliver value back to the open data ecosystems. Finally, we conclude this deliverable by summarizing the insights gained for the ODECO project.

2 Motivation Theory

2.1 Introduction

The analysis of stakeholder motivation has been conducted by applying several theoretical perspectives to the empirical data from the different open data research contexts of the ODECO research cases. The analyses of stakeholder motivation in the different research contexts specifically draws on theories of motivation and learning: **Self Determination Theory** (Ryan & Deci, 2000a), and the theory of **Communities of Practice** (Wenger, 1998). This chapter presents a brief overview of these theoretical perspectives.

2.2 Self Determination Theory

Self Determination Theory is a theory of human motivation and personality that pertains to the motivation behind people's choices in the absence of external influences and distractions. Self Determination Theory focuses on the degree to which human behaviour is self-motivated and self-determined. Self Determination Theory define motivation in the following way:

“To be motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated.” (Ryan & Deci, 2000a, p. 54)

Self Determination Theory thus focuses on the extent to which a person's behaviour is self-motivated and self-determined. Ryan and Deci define motivation as a form - rather than a quantity - and investigate the various forms of motivation and what people are motivated by. They define the starting point for human motivation from three different needs: 1. the need to feel competent, 2. The need to have autonomy, and 3. the need to Feel connected with others.

Self Determination Theory pinpoints two forms of motivation: 1. Intrinsic motivation and 2. Extrinsic motivation. Intrinsic motivation is defined by the motivation where a person initiates an activity for its own sake because it is interesting and satisfying and provides the person with inner rewards. An example can be students who are motivated to study by interest in the subject itself, curiosity, and an inner drive to understand an academic field. Contrary to this extrinsic motivation defines the form of motivation where a person performs an activity to achieve a goal or reward which is external to the activity. An example can be a student who study to get good grades or appraisal from the teacher. External motivation is connected to the motivation initiated by achievement of rewards external to the activity itself (Ryan & Deci, 2000a).

Self Determination Theory also talk about the concept of internalisation which is defined as the active attempt to transform an external motive into personally approved values. Through internalization externally motivated activities can thus be internalised. An example is a student, who study to achieve rewards external to the activity such as good grades, who in the process becomes interested in the study subject itself and therefore motivated to study by the need of achieving inner rewards such as gaining knowledge about, and understand, an academic field. Intrinsic motivation can also be externalised and become external motivation if an intrinsic motivated person receives external rewards and focus thus switches to doing the activity to achieve external rewards instead of because of the enjoyment of the activity itself.

2.3 Communities of Practice

Communities of practice is defined as a social learning theory. The primary focus of Wenger's is on learning as social participation - the individual as an active participant in the practices of social communities, and in the construction of their identity through these communities (Wenger,

McDermott & Snyder 2002). In this context, a community of practice is a group of individuals participating in communal activity and experiencing/continuously creating their shared identity through engaging in and contributing to the practices of their communities. Wenger defines communities of practice the following way:

“Groups of people who share a concern or a passion for something they do and learn how to do by interacting regularly” (Wenger, 1998)

The theory defines knowledge as built in complex social learning systems. Participants in these systems learn through gradual involvement in the community of practice. As an example, Wenger has studied midwives and how they gradually learn the professional practices of the midwife community through participation in the social learning systems of the profession (Lave & Wenger, 1991). In communities of practice knowing is to exhibit skills defined in practice communities in conjunction with personal experience and personal experiences can therefore also challenge competencies defined in a community of practice. Learning is thus an interaction between social competence and personal experience (Wenger, 1998).

According to Wenger communities of practice consist of three central elements: 1. The domain, 2. The community, and 3. The practice (Wenger, 2000). The domain is the domain of interest that members of the community share e.g. role-play, physics. The members are brought together and motivated by their interest in the domain and a learning need they share. Learning can thus be their motivation for coming together or a by-product of it as they learn about the practice and the community by being together. The Community is defined through the members and bond between them. Members of a specific domain engage in joint activities and their collective learning becomes a bond among them over time. They build relationships that enable them to learn from each other. The third element is the practice. In communities of practice there needs to be a practice and not just an interest in a domain e.g. role-playing camps or conferences. Interactions in communities produce resources which affects both practices in the community and learning and motivation.

Wenger also defines boundary processes and objects which refers to boundaries of communities of practices and objects that connects different communities (Wenger, 2000). Boundaries of communities of practice are fluid. In boundary interaction members of one community can learn by being exposed to foreign competences possessed in other communities. Boundary objects are defined as objects connecting different communities:

“An entity (artifact, document, vocabulary) that can help people from different communities build a shared understanding. Boundary objects will be interpreted differently by the different communities, and it is an acknowledgement and discussion of these differences that enables a shared understanding to be formed” (Star & Griesemer, 1989).

Examples of boundary objects can be physical objects such as manuals facilitating learning for different professions, or it can be digital tools facilitating open data collaboration for different citizen or professional groups.

2.4 Application of motivation and learning theories to open data studies

Motivation and learning theories can be applied to analysis of open data stakeholders' value contribution in various ways dependent on the types of stakeholders and the context. Self-determination theory talk about aspects of the individual motivation of stakeholders. Stakeholders such as individual journalists or citizens can be either internally motivated by the data processes itself or externally motivated by the goal of applying data or knowledge from data analysis to their

context such as writing articles or helping to improve city spaces in the neighbourhood they live in as citizens.

Community of Practice address the community perspective and can be applied to analyse communities of stakeholders such as NGO's or government representatives. The theory can be applied to analyse values and practices of specific communities and how open data either is part of this or how community practices can become part of open data ecosystems. The theory also talks about the individual members interplay with the community and how members can influence the development of practices which can also be relevant in an open data context. Finally, the boundary object concept can be applied to analyse how it is possible to develop technology which can connect practices of different open data user communities.

3 Journalist open data value motivation

3.1 Introduction

The use of data in journalism is not a novel innovation. The first case of data released in a paper to support the objectivity of an article is dated back to the 19th century when a leaked data set in the form of a table for the state of schools in Manchester was published in the Manchester Guardian newspaper in 182 (Rogers, 2011). Furthermore, the use of computers in journalism to analyse data was popularized by Philip Meyer in the 1960s when he used a mainframe computer to analyse data from the Detroit riots, thereby establishing the practice of computer-assisted reporting (Gray et al., 2012). The next innovation came in 2008 when The Guardian first used the term 'data journalism' (Rogers, 2008). Compared with the existing trend of computer-assisted reporting, this approach is more focused on the utilization of data rather than on its discovery and collection (Veglis & Bratsas, 2017). This shift in mentality coincided with the launch of data.gov by the U.S. government in 2009, which helped to popularize the open data movement.

Although data journalism is well-documented and studied in academic literature, the use of open data by journalists is not. Only one literature review on the matter has been published (Papageorgiou et al., 2023), defining the term 'open data journalism' to distinguish it from the well-established field of data journalism. As identified in the literature, the main challenges journalists face in using open data include a lack of relevant skills to utilize them. This becomes prominent, as the majority of publications reviewed are technical tools designed to assist journalists. Additionally, other significant categories include data literacy, skill development, and collaboration with other professionals. Most publications in these categories aim to address the issue of journalists' digital skills.

Although the use of data in journalism, and particularly the use of open data, is not a widespread practice, journalists can play several roles in an open data ecosystem. While the role of the consumer is the most prominent, they can also act as data providers, as pioneered by the Guardian (Evans, 2011). Furthermore, journalists are pivotal to the overall ecosystem, even when assuming the mantle of data consumers since they can make data easily understandable to the public. Moreover, they can contribute technological innovations for the use of open data, and, finally, by assuming the role of producers, they can publish their data as open datasets. While these contributions are observed in practice and the literature, they are not common in the journalistic profession and often remain on the fringes of everyday practice. Furthermore, as depicted in Deliverable 3.1 of the ODECO project (Ktistakis et al., 2023), journalists have potential additional contributions to the open data ecosystem. They could potentially serve as intermediaries in two-way communication between the providers and consumers of open data, leading to direct communication that could immensely and swiftly improve the quality of the released data.

Understanding journalists' motivations for using open data, as this is their main way to provide value back to the ecosystem as communicators of open data to the wider public, is crucial. Recognizing their contributions and their motivation to do so can lead to the development of inclusive, circular, skill-based, and user-driven open data ecosystems.

3.2 Methodology

For the research examining journalists' motivations to contribute value to the open data ecosystem, three distinct research methodologies were employed: a review of literature related to open data and journalism, in-depth interviews with journalists, and analysis of findings from action research.

As mentioned in the introduction, there is only one literature review publication on the topic of open data and journalism (Papageorgiou et al., 2023), or 'open data journalism.' However, the literature does not focus on identifying journalists' motivations for contributing value back to the open data ecosystem. Therefore, another examination of this bibliography was conducted to determine journalists' motivations for returning value to the open data ecosystem. In-depth, semi-structured interviews were conducted with four journalists from three media organizations within the European Union. The main objective was to evaluate and unravel their methods of working with open data.

The action research is ongoing and is being conducted at Farosnet S.A, a media organization in Greece, where a researcher from the ODECO consortium is placed. The organization has hired a data analyst to collaborate with the chief editor and the researcher, aiming to explore how open data can be utilized in creating news articles. Additionally, the team has developed a user-friendly tool designed to monitor fluctuations in food prices (Papageorgiou, Lamprinidis & Loukis, n.d.) and extract insights from open data sources. Through this research, they have gained valuable insights into the quality and accessibility of open data.

3.3 Results

3.3.1 Literature

In the literature, no paper directly mentioned the motivations of journalists to contribute and provide value to open data ecosystems, although indirect motivations were observed. In all three publications, the primary objective of the journalists was to increase public engagement by creating a more democratic and transparent culture (Handler & Ferrer Conill, 2016; Martin, Camaj & Lanosga, 2022; Palomo, Teruel & Blanco-Castilla, 2019). They were also advocating for the release of more open data sources (Martin et al., 2022; Palomo et al., 2019). From this, we can deduce that the journalists' motivation behind these initiatives is to gain access to more data sources, thereby enhancing their capabilities to produce better-quality articles.

3.3.2 Interviews

As mentioned in the literature, it was also echoed in the interviews that one of the main reasons journalists use open data is to promote democratic values and transparency in society. Another motivation for using open data in their articles is that with proper citation of open data sources, they can increase the credibility of their work and propagate the importance of open data to the public.

In terms of being data providers, journalists were asked in the interviews if they would be interested in distributing their data sources as open data. The response was that monetary compensation would be required, as their service was intensive and the work on compiling that particular dataset took years of research. This approach excludes this particular dataset from the realm of open data since it requires financial compensation. Therefore, it becomes crucial to develop alternative models for the use of open data in a corporate environment that can provide other types of value to media organizations if it does not prohibit the use of their datasets as open data.

3.3.3 Action research

In the action research involving constant collaboration, daily conversations, and semi-structured interviews with journalists, data analysts, and upper management of the organization, a distinct difference in their motivations was observed.

From the journalist's perspective, the main motivation was the enhancement of the quality of their work. With data, they can provide higher quality articles for the media organization (singed as newsroom) and for themselves personally. This not only increases the credibility of the media

organization they work for but also can solidify their personal credibility, professionalism, and recognition—attributes that are valued even outside of their current media organization. Furthermore, verifying an opinion or incident through any means (including the use of open data, though not limited to it) is considered a best practice in the profession, as the spread of incorrect or fake news can severely impact their credibility, both personally and for the organization. Therefore, the motivation to use open data for fact-checking, when possible, can provide the value of trustworthy news to the public.

Journalists are also keen on publishing their datasets as open data, which can further demonstrate their skills and increase their recognition among their peers. However, this is a point that upper management may object to on several occasions. The management's main objective, as expected, is to increase the monetary value of the organization. Therefore, they differentiate between cases where some datasets or tools are to be released and potentially used by competitors (a requirement for this release is proper attribution to the organization) and cases where some assets are to be kept internal as they are considered strategic resources.

3.3.4 Classifying the motivations

Using the self-determination theory (Ryan & Deci, 2000b) to examine the motivations of journalists, their motivations were classified into two groups: intrinsic and extrinsic motivation – see Table 1.

Table 1. Classification of the motivations of journalists for contributing to a circular open data ecosystem.

Intrinsic Motivations	Extrinsic Motivations
Promoting the quality of their work.	Access to more open data
Promoting democratic values and transparency.	Credibility and recognition
	Financial compensation

It is also important to note that management, although not strictly journalists, is more interested in extrinsic motivations such as credibility and financial compensation. Additionally, they focus on the acquisition of strategic resources for the organization that can boost their competitiveness compared to their competitors.

3.4 Conclusions

In conclusion, journalists' motivation to contribute to the open data ecosystem reveals a complex interplay of intrinsic and extrinsic factors, heavily influenced by their dual role as both consumers and potential providers of open data. Journalists uphold high standards regarding the quality of their work and their traditional role as guardians of transparency and democratic values, which can be enhanced by their active involvement and contributions to the open data ecosystem. Additionally, journalists are driven to contribute to the ecosystem because its expansion and improvement provide them with access to more data, enhancing their reporting and thereby boosting their credibility, making them esteemed professionals in their field. One challenge encountered in several instances during my research is that the data collected and analysed from journalists, combined with open data sources, are considered strategic resources by their organizations and therefore they are not keen to release them into the open data ecosystem. This finding highlights the need for further research into the impact that alternative business models can have on businesses utilizing open data, especially media organizations, so they can reap benefits from the data they have collected that are not directly monetary gains.

4 Elementary school students open data value motivation

4.1 Introduction

Students in different educational levels from elementary school to graduate education have been at the centre of a wide range of open data initiatives (Celis Vargas et al., 2023). Overall, these open data initiatives in education look for equipping students with the essential skills needed for the current fast changing and data-driven society (Cook et al., 2018). open data learning activities have ranged from using open data in regular school subjects such as chemistry and geography (Pence et al., 2015), engage with local problems and data in undergraduate courses about open data (Palova & Vejicka, 2022), and extracurricular activities such as public hackathons (Davis & Shneyer, 2020). Students could be seen as part of the large percentage of citizens without technical backgrounds, often called non-specialists, non-data experts or lay audiences (Boyles, 2020; Concilio & Mulder, 2018). In the open data movement students have been seen as relevant actors in the long-term sustainability of open data ecosystems mainly to enlarge the percentage of citizens that can use and benefit from open data.

Despite the integration of open data in schools has been defined as a key strategy for achieving inclusion and fairness in open data ecosystems (International Open Data charter, 2015), according to Celis Vargas et al. (2023) current open data initiatives in education have been focused on higher education. The fewer initiatives in basic school education have highlighted the potentials of using open data mainly as two, firstly related to the connection of classroom activities to real facts, and secondly, to increasing teacher's and student's motivation (Coughlan, 2020). Furthermore, experiments of Saddiqa et al. (2019, 2021) highlight that the use of open data from students' own municipalities increased their interest in everyday life problems and fostered discussions in the classroom which not just develops digital capabilities, but also increases their civic awareness and the authenticity of their learning activities. Research by Pellegrino & Antelmi (2023) has shown that open data initiatives at the school level primarily are focused on the use of open datasets or Data exploitation rather than on the production of them. This could be seen as a barrier for fully achieving the potential of elementary school students as contributors in open data ecosystems. In inclusive and circular open data ecosystems, students should also be seen as active contributors and active citizens.

Although the research relevance of open data education is increasing, and several initiatives can be seen in different educational levels, it is still a novel perspective to see elementary school students as active contributors in open data ecosystems. Current open data systems in education are mainly exclusive and mostly linear as it was analysed in the case of Danish schools (Van Loenen et al., 2021). Current open data literacy initiatives are often top-down which respond to governmental, school or teachers' interest rather than to students or youngsters' interests and skills. This linear perspective limits the role of young pupils to in-training future actors in open data ecosystems rather than active current actors. Ongoing research is advancing on developing learning designs that support elementary school students in an active role as contributors in inclusive, circular, skill-based and user driven open data ecosystems. Previous research has identified potential value-contributions of elementary school students to open data ecosystems (Ktistakis et al., 2023). Four potential values were uncovered by identifying the potential contributions. Firstly, a potential value contribution may be in the creation of local datasets, visualizations, and data stories, to contribute with local or contextual understanding of local issues. Secondly, students may increase community knowledge as the result of training open data skills in the school community. Thirdly, students may enhance the quality of open government datasets and metadata while using them in learning activities. Finally, they may bring social value to the open data ecosystem by raising the voice of local communities and creating networks and dialogue among actors in the school ecosystem. Actors in open data ecosystems can adopt different roles as producer, users, or intermediaries in extensive interactions among stakeholders

in local and global environments. In this way, elementary school students as relevant open data actors might not just use open datasets in school learning activities but also potentially produce tangible and intangible contributions such as local open datasets, visualization, data stories, dialogue, local knowledge, among others. However, understanding their motivation for delivering value back to the open data ecosystem is key to further developing the mechanisms and tools to support them.

4.2 Methodology

This study is aimed at identifying the elementary school student's motivations for delivering value back to open data ecosystems. Considering that current literature has been firstly focused on open data initiatives in higher education and secondly on students as only users of open data, exploratory qualitative research was conducted to gain knowledge about elementary school student's motivations for delivering value back to open data ecosystems. Although this study is focused on students, different research methods targeted students and teachers with the aim of gaining depth on students' insights and reducing possible biases. Methods such as observation, qualitative interviews and survey were held targeting elementary school students in the age range of 14 and 18 years old. In-depth interviews with teachers were conducted to gain knowledge about their perspectives on students' insights. The following table summarizes the methods conducted and the participants.

Table 2. Methods and participants - school case.

Method	Participants	Description
Workshop and survey	39 school students aged 15-16 years old in 9th grade.	Workshop (open data learning activity). The first part proposed individual data exploration and the second part focused on group work on a Data story with visualizations. At the end of the workshop, students answered a brief survey. Duration: 2h
Group Interview	15 school students (3 groups of 5 students) aged 15-16 years old in 9th grade	Informal interviews were conducted with a group of students after the workshop. Duration: 20 min
Nonparticipant observation	50 children aged 14-18 years old from different nationalities	Nonparticipant observation during the co-creation workshops conducted by the partner organization CoC Playful Minds during the Children's General Assembly CGA 2022. Duration: one week
In-depth interview	5 elementary school teachers	Semi-structured interview. Duration: 60 minutes

Sessions were recorded and transcribed for analysis. Data collected was analysed at the same time following a thematic network analysis approach (Attride-Stirling, 2001). Firstly, potential students' motivations were coded keeping the participant wording as much as possible. Secondly, categories were made to show different motivations of students to potentially deliver value back

to open data ecosystems. Finally global themes were identified to create a map of student's motivations.

4.3 Results and analysis of actor's motivation

Seven different motivations of elementary school students were identified through the collection of qualitative research methods and a thematic network analysis. These motivations could lead students to deliver value back to open data ecosystems supported by learning designs. The following table shows the motivations, and a quote exemplifies the student's perspective.

Table 3. Student's motivations for delivering value back.

Motivations	Quote
Being proud of their work	"Sharing our student's work with the outside" "They stand up a little straighter and they are prouder because it is not just presenting for Mom and Dad" Teacher
Not listen but do it themselves	"We learn more by doing that" "You did not have to listen to a lot but do most yourself" Student in group interview
Use in real-world what they do in school	"If I'm sharing it, and it could be used afterwards, students are more proud and actually more engaged to make it right because they know that it's likely to be used for something meaningful afterwards" Teacher
Their ideas being heard	"Children's voice as important as others" Student in CGA 2022
Engage with something that is relevant for them	"Became relevant for the student because is something that the like and do in day life" "For the students in a project many times it is more interesting to have something concrete, something they can see, something that is close to them" Teacher
Help the community around the school	"The school could be part of the local community by creating better data" "I think local problems could be more fun because students can do something" Teacher
Making the world a better place	"How is this going to create a better world?" Student in CGA 2022
Pass the exams	"If you work with 9th graders, they have exams, and they have to learn a topic from different angles" Teacher

Motivational theory is used to gain depth on the analysis of student's motivations. According to self-determination theory (Ryan & Deci, 2000a), student's motivations could be classified in two groups, if they are intrinsic and extrinsic motivation:

1. **Intrinsic motivations:** it relates to the personal satisfaction of doing something. (i) Being proud of their work (ii) Not listen but do it themselves, (iii) Use in real-world what they do in school, (iv) Their ideas being heard, (v) Engage with something that is relevant for them. These motivations are personal and according to teachers could also be related to the age range of students who are in their teenage years (14-18 years old).
2. **Extrinsic motivations:** motivations in this group want to satisfy an external demand such as (v) Help the community around the school, this motivation is promoted by teachers and the school. It wants to position the school as a relevant actor in the local community. (vi) Making the world a better place, this motivation answers an external interest for educating responsible and active world-citizens in the 21st century. (vii) Pass the exams, this motivation responds to the expectations of the educational system. Even though the three motivations are external, according to Ryan & Deci (2000), motivations such as help the community around the school and making the world a better place could be related to an autonomous style called

identification where the motivation does not create a contrast or tension to the intrinsic motivation, instead it reinforces it.

4.4 Conclusions regarding motivations of students

Several motivations of students could drive their role as active contributor in open data ecosystems. For example, their motivation of being heard could underpin a provider or intermediary educator role between local government and local communities. Nevertheless, learning designs and governance mechanisms are needed to enable the potential contributions to occur and explode the motivation of students.

Limitation of the current results could be associated with the context of Danish schools where the interviews and workshops were conducted. This study is the first study addressing the research question, further research is needed to deepen and generalize on these outcomes.

5 NGO open data value motivation

5.1 Introduction

Non-Governmental Organisations (NGOs), also interchangeably called Non-Profit Organisations (NPOs) in this chapter, take up an intermediary role in the open data ecosystem, where they bridge the gap between open data providers and users (Gonzalez-Zapata & Heeks, 2015). NPOs are unique as intermediaries as there are specific communities of the users, they are focusing on to address a social issue (Enaholo, 2017), while also not seeking to gain any profits out of it (Salamon & Anheier, 1992). For example, an NPO may focus on making a city more accessible to people with disabilities or aim to improve governmental services for the citizens. NGOs are also well positioned to bridge the gap between public policy and its implementation through the involvement in public-private partnerships and the creation of space for the collaboration of other actors in an open data ecosystem (Mendel, 2013). Historically, NPOs pushed for data openness, developed the open data research field, and resolved the practicalities of open data use. There are many ways in which NGOs contribute to the open data ecosystem. For example, they create tools and applications or write reports to make open data accessible and understandable for the users. Moreover, they can produce additional open data to enhance the open data they use and re-share it. In this chapter, we discuss the motivations of the NGOs to bring value back to the open data ecosystem, given their organisational nature and the variety of ways they can create value.

5.2 Methodology

The case studies were used to collect the data and look into the motivations of the NPOs/NGOs to bring the value they derived from the open data back into the open data ecosystem. The selection criteria for the case studies were:

1. Non-profit organisations should have different missions/focuses/aims.
2. Each case should have more than one type of open data activity being performed.
3. The cases work on different levels, i.e., municipal/regional/national.
4. The cases involve organisations and people who are willing and ready to cooperate in the research and to share information that is required to conduct this research.

The two cases we have focused on are NPOs: Open Knowledge Belgium and CityLAB Berlin. Three semi-structured interviews were conducted per case, and the information from their websites was collected. For the analysis of the qualitative data, we used a deductive approach with the codes based on Ryan & Deci's (2000) self-determination theory, which focuses on the distinction between intrinsic and extrinsic motivations.

5.3 Results and analysis of actor's motivation

5.3.1 Intrinsic motivation

Intrinsic motivation is coming from the interest and enjoyment, inherent satisfaction that a person experiences when doing a task (Ryan & Deci, 2000a). For my analysis, I describe these motivational feelings as belonging to the group of people, employees, who represent and work at NPOs. There are shared motivations that bring people in such organisations to create value from open data and bring it back to the ecosystem. The work structure of NGO/NPO can have less bureaucracy and more flexibility with projects, especially in smaller organisations. The employees can pitch their own ideas and pursue projects of interest to them. Moreover, there is space for experimentation with the technical aspects of the projects. That creates space for internal motivation as employees do projects, they are passionate about. For example, one of the interviewees pointed out their "from the heart" project, which is signified by the developers coming back to the website in their spare time to update the coding behind the visualisation. During this project development, the

employees tried a new approach that was sophisticated at the time and needed to be kept updated. There's also a desire to do something about causes that are personal for the employee as well as social issues, topics they are invested in, for example, climate change and how it affects their city.

5.3.2 Extrinsic motivation

Extrinsic motivation in the form of profits does not directly exist for the NGOs due to them being non-profit (Salamon & Anheier, 1992). They seek to be seen as a neutral trusted advisor rather than a private company seeking further investment or maximising profits from their projects. However, NGOs might need to have projects that are more commercially oriented as the funding is not always sufficient to maintain their projects or to start new ones. Moreover, NPO pushing for open data can create new business opportunities for private companies, which can be a motivation for NPO's board members.

Introjected regulation can also play a part. For example, the attention and approval of others, in these cases, project supervisors or people from the open data community, motivates NPO's employees to pursue the project, continue with value creation, and share it back into the ecosystem with the actors whose attention it caught. One of the interviewees gave an example of a project about parking spaces in the city. The public administration does not track this data, which means that NPO is taking it upon itself to create new or merge the existing datasets on the topic to share with the users.

Regulation through identification for the NPO employees comes from their desire to do what is perceived by them and others as impactful work for a political purpose, to empower people. By adding value back into the ecosystem, they can meet the needs of the group they target. They aim to work for the end goal of public good (Enaholo, 2017). That is why their projects mostly exist as open source and provide open data. They can also speak for the public and for their organisation's vision through, for example, lobbying the government to release high-value datasets or by showing the usefulness of open data to the public employees responsible for its provision. If employees feel that they have identified a genuine need of a community they target or a potential way for technology to address a problem, they are motivated to create and release a project (Yoon, Copeland & McNally, 2018).

Integrated regulation is present when employees mention personal beliefs that make them want to contribute. They believe that open data is a foundation for democracy and transparency, which motivates them to, for example, buy and re-publish government data as open. One employee mentions a personal belief that motivates them to be part of the organisation – that there should be a levelled playing field for companies' innovation through access to open data. Moreover, the personal belief that using open government data to learn from it rather than for the data to "sit on the shelf" has also been mentioned.

5.4 Conclusion

The motivations of NGOs to contribute open data value back into the open data ecosystem come from both intrinsic and extrinsic types of motivation as per Ryan and Deci's (2000a) self-determination theory. They are summarised in Table 4 below.

Table 4. Classification of the motivations of NGOs for contributing to a circular open data ecosystem.

Intrinsic Motivations	Extrinsic Motivations
Personal interest and enjoyment	Getting funding
Belonging to the group of people with shared motivations of social impact and openness	Creating opportunities for other stakeholders
	Attention or support of the open data community
	Impactful political work in the eyes of other stakeholders
	Personal belief in openness

The intrinsic motivation come from the personal interest and enjoyment of employees when it comes to creating value-producing projects using open data. As an employee has more freedom to propose and pursue their own topic of interest, they are motivated to have a variety in open data and approaches they choose towards value creation and sharing. The variety of regulations under the extrinsic motivations are also pushing NGOs to bring open data value back into the ecosystem. From creation of profit opportunities for other actors in the ecosystem to focusing on the projects that gain attention of the open data community for addressing their needs, the NGOs' collaboration and attention to other actors is a factor adding to the value sharing. Their desire for a politically impactful work and belief in the pursuit of the transparency and democracy is also a contributing factor to their sharing behaviour.

6 Local government users open data value motivation

6.1 Introduction

The publication of open data is enforced by national and European policies obliging governmental bodies to make non-private data publicly available. In that context, local governments play a pivotal role in harnessing the value of open data, acting as key players in operationalising open government initiatives on a local or municipal scale (Davies & Perini, 2016). In the broader context of public administration, local governments represent the foundational level (Goldsmith, 1992), fostering political identity, promoting economic development, providing social welfare, and governing the community (Stoker, 2011).

Local government users can be any local public officer from the different governmental institutions tasked to operationalise the state's goals on a local or municipal scale. Examples of their role in the open data ecosystem include collecting, augmenting, using, demanding and/or maintaining open data to meet the evolving needs of their communities. Moreover, local governments utilise open data to accomplish their public tasks, repurpose existing data for new initiatives, conduct research and analysis, and collaborate with external intermediaries to process and integrate data from various sources to develop solutions or input for policymaking (Ktistakis et al., 2023).

The potential contributions of local governments in the open data ecosystem include identify local issues that data can help address, coordinating efforts to ensure access to data, offer domain expertise, enhancing data legitimacy, championing data openness, and sharing, and incorporating new data-based technologies such as predictive knowledge into decision-making activities (Ktistakis et al., 2023). This chapter explores the value motivations of local government users to contribute to the open data ecosystem, drawing insights from a multiple exploratory case study on the uses of voluntary geographical open government datasets in the Danish context.

6.2 Methodology

We conducted a multiple-case study that include seven different use cases to gain insights on how local governments in Denmark utilise voluntary geographical open government repository. The voluntary geographical open government datasets are a project that resulted from a collaboration between the national institution in charge of data supply and an association of local governments in the country. The study aimed to explore the different aspects of using open government data, with a focus on the involvement of local governments on creating value through its use. We conducted seven semi-structured interviews with various stakeholders, including representatives from national ministries, government associations, non-profit organisations, and private entities.

Our analysis is based on the theory of Communities of Practice by Wenger (2000). Wenger describes communities of practice as the basic building blocks of a social learning system. They are the social 'containers' of the competencies that make up such systems, and these competencies are defined by combining three dimensions: enterprise, mutuality, and repertoire. Wenger identifies three forms of participation as modes of belonging to social learning systems: engagement, imagination, and alignment, which are affected by the competence dimensions. Using these modes of belonging and the three competencies' dimensions, Wenger developed the Community Dimensions conceptual framework (Table 5), which we used to formulate our analysis. In the following section, we present the results of our analysis.

Table 5. Community Dimensions by Wenger (2000).

	Enterprise: learning energy	Mutuality: social capital	Repertoire: self-awareness
Engagement	What are the opportunities to negotiate a joint inquiry and important questions? Do members identify gaps in their knowledge and work together to address them?	What events and interactions weave the community and develop trust? Does this result in an ability to raise troubling issues during discussions?	To what extent have shared experience, language, artefacts, histories, and methods accumulated over time, and with what potential for further interactions and new meanings?
Imagination	What visions of the potential of the community are guiding the thought leaders, inspiring participation, and defining a learning agenda? And what picture of the world serves as a context for such vision?	What do people know about each other and about the meanings that participation in the community takes in their lives more broadly?	Are there self-representations that would allow the community to see itself in new ways? Is there a language to talk about the community in a reflective mode?
Alignment	Have members articulated a shared purpose? How widely do they subscribe to it? How accountable do they feel to it? And how distributed is leadership?	What definitions of roles, norms, codes of behaviour, shared principles, and negotiated commitments and expectations hold the community together?	What traditions, methods, standards, routines, and frameworks define the practice? Who upholds them? To what extent are they codified? How are they transmitted to new generations?

6.3 Results and analysis of user's motivations

The case study under analysis focuses on an open government geographical data repository project that is based in Denmark. This data is voluntarily made available by the municipalities across Denmark in standard exchange formats, and it is free of charge. This makes it easily accessible to anyone who needs it. The users of this data can be considered a community of practice, as they all share an interest in the domain of opening geographical information that is essential for public administration. They are interested in making use of the data repository, which contains specific data for various purposes, such as outdoor tourism, roads and cycles, school planning, and mobility.

Within this community, there are various actors, like public authorities, businesses, NGOs, and citizens, that come together, driven by their common interest in the datasets provided and the learning need associated with harnessing the potential. The motivation for their collaboration stems from shared learning objectives of effectively using the data repository for different purposes. Whether making available data on specific municipal infrastructure or using it to access meaningful information through municipal web solutions, the community converges on the repository as a valuable resource. The practice aspect of the community emphasises the need for the open government geographical data repository to be more than just a shared interest and

function as a resource influencing the daily practices of its users. Interactions within this community produce resources that impact its members' practices, learning, and motivation of the members. To understand the specific motivations of local government users on effectively using the open data repository for different purposes, we used the Community Dimensions conceptual framework by Wenger (2000) (Table 5).

In relation to the enterprise dimension, local government officials may engage with open government geographical information because it can help them learn about infrastructure needs, gather user preferences, and promote inclusiveness. For example, by considering the needs of people with disabilities when augmenting data on outdoor facilities, local public officers could understand what infrastructure was missing and collect the necessary data. This has the potential to ensure that outdoor spaces cater to the diverse needs of all visitors. Furthermore, collaboration with local businesses presents a fruitful ground for negotiation and joint inquiry. By exploring ways to collect and share data across sectors, stakeholders can improve planning, marketing, and decision-making in sectors such as tourism. This contributes to the collective learning energy of the community and help addressing knowledge gaps. Overall, collaboration is a key factor for opening public geographical information and engaging the community in learning and contributing to the shared domain.

In the imagination mode of belonging, the enterprise dimension is centred around the visions that guide leaders, inspire participation, and define a learning agenda. In the case study, these visions recognize the value and potential of data in various domains, such as mobility, leisure, sports, and environmental management. The goal is to make data easily accessible, user-friendly, and valuable to different stakeholders, fostering collaboration, innovation, and evidence-based decision-making across sectors. Some examples are to use open data to streamline local government planning processes, prioritise projects, identify gaps in infrastructure; or integrate recreational data into comprehensive databases and collect information on accessible facilities to promote inclusive outdoor recreation; or analysing data on sports participation, demographics, and social factors to bridge the gap between participants and non-participants; and finally, integrating data on environmental issues, climate change, and sustainability into planning processes to facilitate collaboration among stakeholders working on environmental issues.

In relation to the alignment mode of belonging and the enterprise dimension, the community of practice demonstrates a shared purpose among data users across various domains, such as cycling infrastructure, leisure activities, outdoor facilities, and inclusive outdoor experiences. The articulated purpose centres around improving accessibility, promoting health and well-being, enhancing environmental sustainability, and supporting decision-making processes. Although users have varying degrees of commitment towards the shared purpose, those who actively work towards its realization value the importance of open data in addressing societal challenges. However, some individuals or organizations may not be as engaged due to lack of resources, competing priorities, or insufficient understanding of the benefits of data-driven approaches, including some local government officials. Regarding accountability, the community inspires a sense of responsibility among users to contribute to the shared purpose. This means that municipalities are encouraged to update and maintain databases, highlighting their commitment to accountability and ensuring the quality of data used in various applications. Despite the absence of an explicit leadership structure, the involvement of multiple stakeholders suggests a collaborative and decentralized approach to leadership. Different actors contribute their expertise and resources to achieve the shared purpose.

The mutuality dimension is about the events and interactions that bring a community together and foster trust. By integrating different types of data, sharing and collaborating across different sectors, and ensuring that interfaces are user-friendly and accessible, local government officials

may engage with the community and build a sense of shared purpose. When different types of data are integrated, it can provide them with an understanding of infrastructure needs and priorities. Sharing and collaboration across different sectors and stakeholders in areas such as cycling infrastructure planning and tourism can help build trust and a sense of shared purpose. By ensuring that data is easily accessible and user-friendly, social capital can be strengthened. Open data initiatives, such as having real-time data, can promote innovation and collaboration within the community. By acknowledging the importance of data maintenance and updates, the collective responsibility of local public officials towards the community is emphasised. However, data fragmentation, maintenance and usability challenges are required to be addressed collectively. Finally, potential data applications in data-driven decision-making and data visualizations can contribute to local governments engagement by fostering a culture of informed decision-making that can create a foundation for trust and collaboration.

In relation to the imagination mode of belonging and the dimension of mutuality, local governments using data can gain knowledge about each other, other participants, and the meanings that participation in the community holds in their broader lives. This knowledge can be acquired through various means: (i) data sharing to gaining insights into each other's activities, behaviours, and preferences to identifying patterns, trends, and correlations between participants. (ii) By analysing collected data, so that participants uncover information about interactions between themselves and others. Common usage patterns, areas of collaboration, and dependencies are identified through this analysis. (iii) local government officials may obtain feedback and engage in communication channels where they share experiences and observations about the impact of their interactions. Furthermore, in terms of the alignment mode of belonging, the community exhibits roles, norms, codes of behaviour, shared principles, and negotiated commitments and expectations in utilizing data, such as continuous improvement, open data collaboration across sectors, the desire for a centralized platforms, promoting local development, commitment towards ensuring accessibility to public facilities, and recognizing the positive impact of for example the nature on mental-health well-being.

The third dimension of the repertoire involves the accumulation of shared experiences, language, artifacts, histories, and methods over time, and their potential for further interactions and new meanings. In the researched case, the open government geographical data repository is considered relevant for planning connections and improving access to data. Furthermore, the data openness provides a solid foundation for addressing societal issues such as climate change and enable collaboration across sectors. For instance, integrating open geographical data, such as recreational data, with different domains of data, such as transportation data, can help create a comprehensive open data ecosystem for local planners and provide a complete picture of the infrastructure, functions, and user needs, contributing to the local government officials' awareness of the need for holistic perspectives in their engagements. Collaboration and partnerships between national and local governments and different stakeholders are crucial elements of the community's repertoire. The potential for making data easy to use, demonstrating its relevance and benefits, and integrating it into existing systems is highlighted, contributing to the community's evolving repertoire. Furthermore, the potential for data on accessibility to improve experiences and remove barriers is recognized, adding to the community's evolving self-awareness.

In terms of imagination and the repertoire dimension, the community gains insights into its own behaviours, preferences, and patterns through data analysis and visualisation. This self-reflection leads to a better understanding of its needs, interests, and capabilities. For instance, in the context of cycling infrastructure planning, data on user behaviour and preferences helps individuals and communities understand their current usage patterns and areas for improvement. This information empowers them to advocate for better infrastructure and make informed decisions

about transportation choices. Similarly, in outdoor recreation, data on accessibility and usage patterns helps local governments facilitate individuals with disabilities find accessible nature spots and engage in activities previously deemed impossible. The community's self-representations through data provide valuable insights and perspectives, enabling members to reimagine their roles and potentials in various domains. To talk about the use of data in a reflective mode, we should discuss and analyse data in a way that promotes critical thinking, self-reflection, and deeper understanding. Key elements of this language include data literacy, contextualization, interpretation, reflection, and effective communication. Local governments' practices in utilizing data are influenced by various traditions, methods, standards, routines, and frameworks, which shape their alignment and repertoire dimension. For instance, they employ different methods such as surveys, data analysis, and mapping to gather information on specific activities and infrastructure planning. They adhere to certain standards, for example, to ensure that outdoor spaces and nature areas are accessible for individuals with disabilities. They follow routines in the process of collecting, maintaining, and updating data.

6.4 Conclusion

In conclusion, the role of local government users in the open data ecosystem is important for harnessing the value of open data. This chapter has explored the motivations of local government users to contribute to the open data ecosystem, drawing insights from multiple exploratory case studies on the uses of voluntary geographical open government datasets in the Danish context. By understanding the local government users belonging to the open data ecosystem as a community of practice, we see that they are motivated to participate through (i) engagement because they see it to promote transparency, improve service delivery, and support innovation and economic growth in their communities; (ii) by imagination as they envision new possibilities for how open data can be utilised to improve their communities; and by (iii) alignment as they align their values and goals, adopt similar practices, and recognise the benefits of participating in the community. They are driven by the (i) enterprise dimension, which refers to the common purpose and objectives of the community; (ii) the mutuality dimension, which refers to the collaboration with external intermediaries to process and integrate data; and (iii) repertoire dimension which includes the shared resources used to achieve goals (see Table 6 below for an overview). Overall, this chapter provides valuable insights into the motivations of local government users to participate in the community of practice around the utilisation of voluntary local government geographical open data and highlights the importance of their contributions to the open data ecosystem.

Table 6. Classification of the motivations of local government users for contributing to a circular open data ecosystem.

	Enterprise: learning energy	Mutuality: social capital	Repertoire: self-awareness
Engagement	Local government officials can understand infrastructure needs and gather user preferences. Collaboration with local businesses can improve planning, marketing, and decision-making in sectors such as tourism and urban planning. Overall, collaboration is crucial in engaging the community in learning and addressing knowledge gaps.	By integrating different data, sharing and collaborating across sectors, and ensuring user-friendly interfaces, local government officials can engage with the community and build a sense of shared purpose. Potential data applications in decision-making and visualizations can contribute to local government engagement, creating a foundation for trust and collaboration.	Improve data access and planning, enable collaboration, and address societal issues. Integrating data domains creates a comprehensive picture for local planners and promotes holistic perspectives. Collaboration and partnerships make data easy to use and relevant contributing to the community's evolving repertoire. Recognizing the potential for data on accessibility to improve experiences in the localities they represent.
Imagination	The goal is to make data accessible, user-friendly, and valuable to different stakeholders, fostering collaboration, innovation, and evidence-based decision-making in domains such as mobility, leisure, sports, and environmental management.	Local governments can use data to gain knowledge about each other and community participation. This can be done through data sharing, analysing collected data, and obtaining feedback.	Data analysis and visualization provides insights into behaviours, preferences, and patterns, leading to self-reflection and a better understanding of needs, interests, and capabilities. To promote critical thinking and deeper understanding, effective communication and data literacy are key.

	Enterprise: learning energy	Mutuality: social capital	Repertoire: self-awareness
Alignment	<p>The community of practice shares a purpose of improving accessibility, promoting health and well-being, enhancing environmental sustainability, and supporting decision-making processes. Domains such as cycling infrastructure, leisure activities, outdoor facilities, and inclusive outdoor experiences are among the areas where the community demonstrates its shared purpose.</p>	<p>The alignment mode of belonging includes pursuing continuous improvement, collaborating openly, desiring a centralized platform, promoting local development, ensuring accessibility to public facilities, and recognizing nature's positive impact on mental health.</p>	<p>Local governments use different methods, standards, routines, and frameworks to align their use of data. They may use surveys, data analysis, and mapping to gather information about activities and planning. They follow standards to ensure accessibility for individuals with disabilities and have routines for collecting, maintaining, and updating data.</p>

7 Regional/National government users open data value motivation

7.1 Introduction

Regional and national governments play different roles in the open data ecosystem. Regional and national governments act as regulators of open government data policies to stimulate their use and adoption in areas where cooperation is crucial like health or transportation. Governments can also act as demanders of open government data from different institutions and other open data ecosystem users. In this way, they can understand the needs of other users and facilitate efficient resource allocation and integration of various data sources. They can enforce the adoption of specific data formats and metadata to enhance interoperability across different sectors of the government but also between other user groups of the open data ecosystem. Governments can take action to safeguard privacy and security by striking a balance between openness and the protection of individual rights.

This chapter explores the value motivations of national and regional government users to contribute to the open data ecosystem, drawing insights from a multiple-case study on the governance of open data during the Covid-19 pandemic. It is important to note that in the conceptualisation of the study that served as basis for this chapter, the government is conceived as both provider and user of open data. Deliverable 4.3 will focus exclusively on the government as user of open data.

7.2 Methodology

We conducted a multiple-case study to gain insights on how national governments in France and Ireland shared open data during Covid-19 pandemic. The study uses a multi-method approach involving both interviews with experts, identified through purposive sampling, and secondary sources for triangulation purposes. The study aimed to explore the governance of open data with a focus on different governance modes (i.e., hierarchy, network, and market). Based on the multiple-case study we investigated the motivations of national governments to contribute to the open data ecosystems. While the interviews or the documents analysed did not openly describe motivations for open data sharing, we were able to identify common patterns of both intrinsic and extrinsic incentives for contributing value to the open data ecosystem.

7.3 Results and analysis of user's motivations

Governments are primarily motivated by legal mandates for open data sharing and, therefore, are driven by the need of fulfilling legal obligations. For example, both France and Ireland are characterized by a strong legal framework for open data sharing. In France, since 2016 public administration data are to be open by default (Loi Pour Une République Numérique (France) No. 2016/1321, 2016)

This tenet dates to the Declaration of Human Rights of 1789 (Interview 2, France). In the same way, Ireland also relied on a clear legal framework for open data sharing in the context of the pandemic that was the result of a combination of legislation, memorandum of understandings, and arrangements (Interview 1, Ireland).

Governmental agencies, such as Etalab in France, can be motivated by desire of sharing information to provide factual information to citizens and policymakers (Document provided by Interviewee 2, France). Indeed, In France, in the context of the pandemic, Etalab and the Public Health Agency were actively involved in meeting and coaching teams of re-users composed of citizens and journalists who created dashboards for news outlets (Interview 2, France). In the case of Ireland, Information exchange was channelled mainly through the comment sections of the

open government data portal and through an intensive work of adapting the FAQs of the Covid-19 open data hub (Interview 1, Ireland). Feedback and suggestions were elaborated based on the e-mails received by OSI through the Covid-19 open data hub. Thousands of queries sent through the open data portal translated into a comprehensive set of answers that provided a clear guidance on relevant aspects of the data strategy (Interview 1, Ireland).

Another motivation for governments to share open data is the need to satisfy the demand for open data. In France requests coming from citizens on the open government data portal, as well as on the social platforms (e.g., Twitter) were considered greatly by the governmental agency in charge of the national open data portal (Interview 1, France). Therefore, citizens played an indirect role in setting the open data collection agenda.

Another motivation for data sharing is the need to fill data gaps. In the context of the Covid-19 pandemic, France heavily relied on private actors to provide data on the stock of vaccines available and vaccine appointments (Interview 2, France). To fill data gaps, the Ministry of Solidarity and Health started a collaboration with the vaccine producers to provide data on the stock and the logistics of Covid-19 vaccines (Interview 2, France). Also, the Ministry of Health and Solidarity entered a partnership with Doctolib - a private company market leader in managing medical appointments, allowing the company to host, and collect, vaccination appointment data (Bothorel et al., 2020). Finally, governments can also be motivated by the willingness to collaborate to projects initiated by other actors. In France, Etalab worked in coordination with a civil society initiative called "Open COVID19", which built a dashboard aimed at Covid-19 data visualization (Interview 1, France). The Government's Communication and Information Service partnered with the project so that all citizens could access information through the dashboard made available on the French government's website in March 2020 (Interview 1, France). It must also be noted that some countries have mandatory feedback provision mechanisms to correct errors. For example, in the Netherlands government users of the base registries (*basisregistraties*) are by law required to report errors in the data. The data providers are obliged to research these errors, report back to the user and if necessary, fix the error.

7.4 Conclusions

Governments can be motivated by both intrinsic and extrinsic motivations to contribute value to open data ecosystems as summarize in Table 7. Extrinsic motivations include legal mandates, the need to provide factual information to citizens and policymakers, and the need of filling data gaps. Intrinsic motivations encompass the willingness to collaborate and to satisfy the demand for open data.

Table 7. Extrinsic and intrinsic motivations for open data sharing for central governments.

Extrinsic Motivations	Intrinsic Motivations
Legal mandate	Willingness to collaborate
Legal obligation	
Provide factual information to citizens and policymakers	Satisfy the demand for open data
Fill data gaps	

8 Commercial users open data value motivation

8.1 Introduction

Commercial users are defined as those whose goal is to make an economic profit. This is illustrated in contrast to users who intend non-commercial use, which Creative Commons (Creative Commons, 2023) defines as “means not primarily intended for or directed towards commercial advantage or monetary compensation.” Commercial users may have different motivations to contribute to open data ecosystems, depending on their field and own necessities. In this case we are focusing on the specific example of Geospatial open data ecosystems, and in particular on the OpenStreetMap ecosystem. OpenStreetMap is a community-led (Park et al., 2020) platform, where commercial users also take a producer role as part of the broader community (Anderson et al., 2019 and OpenStreetMap Foundation, 2023). OpenStreetMap can be classified as a successful initiative where stakeholders of different types all use its data and contribute to the ecosystem e.g. collecting, maintaining, and updating data. Additionally, they utilize frameworks such as a centralized database or platform. Additionally, they utilize frameworks such as a centralized database or platform.

8.2 Methodology

A qualitative semi-structured interview was conducted with commercial users, to figure out the motivation and barriers to contribution to the OpenStreetMap ecosystem. Employees in 25 companies were interviewed, including 7 big corporations and 18 SMEs (according to the European Commission (2003), SMEs are those companies with less than 250 employees). Keywords were extracted from the answers and aggregated into different motivations, which allowed the qualitative data to be measured in a quantitative way. The motivations are then classified according to the self determination theory, explained in chapter 2, into intrinsic and extrinsic motivations.

8.3 Results and analysis

The interviews discovered that not all actors contribute just with data, but also with funding of OpenStreetMap-related events and/or the OpenStreetMap Foundation, contributing to the development of tools that handle OpenStreetMap data, and with community-building initiatives. It was revealed that big corporations contribute on several or all fronts, possibly because of their bigger pool of resources, both human and financial. SMEs on the other hand, prefer to concentrate their contributions on one or two fronts, depending on what is more beneficial to their business, and the personal motivations of the workers, who are usually quite familiar with OpenStreetMap on a personal level. The motivations to contribute to each of the fronts are found to be similar between big corporations and SMEs.

Regarding the motivations for contributing data to the project, most interviewees of organizations who contribute data mentioned improving the data quality as the biggest motivation, as they use OpenStreetMap as a source dataset for their own projects. Other mentioned motivations were the alignment of OpenStreetMap to their own private dataset, standardization of the schema in OpenStreetMap, community building, and being grateful to the project and wanting to give back. Most of the motivations are therefore found to be extrinsic, that is to achieve an external reward (Ryan & Deci, 2000a), which in the case of OpenStreetMap is improved data, which commercial users can improve their services with. This is logical, considering commercial users' aim of maximizing economic profit.

Table 8. Classification of the motivations of commercial users for contributing to a circular open data ecosystem.

Intrinsic Motivations	Extrinsic Motivations
Alignment of OSM to their dataset	Improving the data quality (as OSM is used by the organization)
	Community building (in a topic/domain the commercial user is interested in)
	Standardization of the OSM schema
	Being grateful and wanting to give back

Some of them also found barriers in contributing data to OpenStreetMap, with the most mentioned being the license, as all sources must comply with it. Other mentioned barriers were the restrictive importing guidelines, the difficulty of integrating with their own datasets and lack of tooling for that case, lack of manpower or funding, and lack of ground truth about the produced dataset. In the case of SMEs, present barriers meant that they preferred to either direct their clients with suggested data improvements directly to OpenStreetMap so they become contributors, as they have the ground truth for their proposed changes, or to focus their resources on contributing on non-data fronts. Big corporations, meanwhile, decided to launch a new platform called Overture Maps, where they overcome some of the barriers imposed by OpenStreetMap, as well as some deficits like data heterogeneity of OpenStreetMap. In Overture Maps they can release data in a more permissive Community Data License Agreement license, together with more loose importing guidelines, adapting better to the big corporations' data pipelines, as well as data in homogeneous schemes and with unique identifiers. This platform is supposed to be complementary to OpenStreetMap, being also OpenStreetMap one of the data sources of the project, and more directed to solve software developers' problems with OpenStreetMap data quality and standardization but has sparked critique on the OpenStreetMap community for possible affections it could have to the OpenStreetMap project, and lack of communication between the Overture Maps and OpenStreetMap communities (Zverik, 2023).

About non-data contributions to the OpenStreetMap ecosystem, most mentioned community building as the main driving force, with tool improvement -including tools the commercial users utilize-, brand visibility, and achieving less push from the community towards corporate users as other motivations to contribute to non-data fronts. The non-data contributions therefore also show extrinsic motivations as the main moving force.

It is relevant to mention that all the interviewed commercial organizations have employees with strong software development skills, both SMEs and big corporations. That could indicate a barrier of entry to use and contribute to OpenStreetMap from non-tech-savvy commercial users.

8.4 Conclusion

The open nature of OSM as a digital data common has allowed turning commercial users' self-motivations (e.g. to improve data quality in a source the company uses) into public value (better quality and up-to-date data quality for all users). This governance mechanism has managed to create a platform where non-governmental actors feel comfortable to share their data, a role previously mostly reserved for governmental actors.

However, problems can arise. Commercial users still see barriers to the contribution: legal, other stakeholders' attitudes, lack of resources, and technical. This has resulted in big corporations creating the Overture Maps platform to fit their unresolved needs.

OSM has to ensure its sustainability by continuing to be a welcoming platform to all stakeholder types, and work on resolving the still existing barriers, while not falling at the same time in the tragedy of the commons, maintaining a critical user base and ensuring no actor dominates the landscape.

Further research could be done on how to motivate non-technologically proficient commercial users to participate in the OSM Ecosystem, to achieve a more diverse commercial stakeholder landscape, as well as how to maintain the Overture Maps and OSM communities connected. Another relevant research would be to compare the motivations of non-commercial and commercial users to contribute to the project.

9 Open data intermediaries' open data value motivation

9.1 Introduction

Open data intermediaries are instrumental in addressing barriers to value generation from open data. They are "third-party actors who provide specialised resources and capabilities to (i) enhance the supply, flow, and/or use of open data and/or (ii) strengthen the relationships among various open data stakeholders" (Shaharudin et al., 2023). Examples are developers who process and include open data in apps/software, crowdsourcing platforms that gather and publish data as open data, and organisations that transform open data into easily digestible information such as visual forms. Open data intermediaries can be in various shapes and forms, such as public organisations, companies, civil society organisations, and research organisations.

Open data intermediaries carry out various tasks depending on their specialised resources and capabilities and, thus, deliver value to open data ecosystems through various contributions (as presented in Ktistakis et al. (2023)). Several existing contributions of open data intermediaries as users of open government data, as captured in the literature, include developing open government data-based applications, providing advisory services for the implementation of open government data, initiating or leading engagement and interaction between open government data stakeholders, and providing open government data-based contextual materials to citizens such as articles and visualisations. In addition to their existing contributions, some potential contributions of open data intermediaries that could be explored (as suggested in Ktistakis et al. (2023)) include developing open-source software with in-built pre-processed open government data, offering open government data platforms based on federated architecture especially for cross-domains interoperability, transforming open government data into specific industry standards, integrating a formal feedback mechanism on software/platform, showcasing more use cases of open government data via various means, and running open government data-based incubator programmes.

9.2 Methodology

We interviewed open data intermediaries, providers, and users to explore the (potential) motivations for open data intermediaries to deliver value back to open data ecosystems. The table below summarises the method employed. These motivations may not be explicitly referred to as "motivations" by the interviewees, but they are implied based on the incentives currently in place or the benefits for open data intermediaries to contribute in certain ways in open data ecosystems. Beyond analysing how these motivations may drive open data intermediaries to carry out existing contributions, we also explore how they may be shaped to drive open data intermediaries to carry out potential contributions for the benefit of the whole ecosystem.

Table 9. Methods and participants in the intermediaries case.

Method	Participants	Description
Semi-structured interviews: Questions around the business models, challenges, and expectations from open data intermediaries	Interview groups: Open data intermediaries, open data providers, and open data users No. of interviews: 48	Mode: Online Period: April 2023 - August 2023 & December 2023 - February 2024

9.3 Results

Open data intermediaries can be motivated by intrinsic or extrinsic motivations in contributing value to open data ecosystems. Certain open data intermediaries may be driven by profit generation. These open data intermediaries would typically provide web/mobile applications based on open government data, contextual materials such as news content, consultancy services, or data platforms customised for specific audiences/domains. They obtain monetary returns from providing these products and services by charging end-users directly or creating an appeal to their core product that is supplemented with open government data-based features or functionalities. Some open data intermediaries may also run (civic) technology incubator programmes and invest in other open data-based companies, collecting some share of the profit as those companies grow.

Some open data intermediaries may also be motivated by potential self-learning and capacity-building through the use of open government data. By processing open government data, they learn by doing and gain knowledge about open government data over time, which is used to improve their product to fit open government data use and to provide consultation to their customers in using open government data. As noted by one of the open data intermediaries interviewed, by using open government data themselves, they use their product "as if [they] are the customers [themselves]". This motivation, although it does not necessarily bring monetary returns immediately, is a way for open data intermediaries to strengthen their position as the go-to experts in the open data ecosystem.

Open data intermediaries focusing on social goals such as media transparency, public sector accountability, and environmental monitoring may be motivated by altruism in doing good for their community and society. They may likely be non-profit organisations that contribute contextual materials and advisory services related to issues of their concern using open government data. They may also be open data advocates, showcasing the use cases of open government data, or open source advocates, developing open source software that facilitates the use of open government data, especially for organisations that cannot afford proprietary software.

Certain open data intermediaries may contribute to open data ecosystems to fulfil legal obligations. For example, an open data intermediary within the public sector may develop and maintain a data platform based on federated architecture to facilitate open data publication by different agencies within the public sector that are obligated to implement open data. Legal obligations may also be considered to drive open data intermediaries to carry out tasks they may not otherwise have incentives, such as delivering pre-processed open data in open standards and licenses where possible.

Some open data intermediaries may be driven by visibility enhancement, where they consider contributing to open data ecosystems, such as by showing how they use open government data in their work or disseminating open government data that they have pre-processed, may increase their visibility. By connecting and relating to the open data community, such as by presenting in open data events or by joining open data user groups, they may be able to promote their organisation and products even though they do not necessarily gain immediate benefits from using open government data.

Open data intermediaries may also be incentivised to contribute to open data ecosystems through collaborations initiated by other stakeholders. For example, public agencies that provide open government data may invite certain open data intermediaries to carry out open government data-based projects or initiatives, such as developing civic apps/platforms and organising hackathons or civic tech incubator programmes. These open data intermediaries may be compensated

monetarily, such as through direct payment or shares in the companies under the incubator programme, or they may be invited as sponsors, giving them visibility in return.

9.4 Conclusion

In summary, the motivations for open data intermediaries to contribute value to open data ecosystems can be grouped into intrinsic and extrinsic motivations, following the self-determination theory, as shown in the table below.

Table 10. Identified motivations of intermediaries.

Intrinsic motivations	Extrinsic motivations
Profit generation	Fulfil legal obligations
Potential self-learning and capacity building	Collaborations initiated by other stakeholders
Altruism for their community and society	
Visibility enhancement	

10 Non-expert users' open data value motivations

10.1 Introduction

In analysing the motivations of non-expert users to participate in open data ecosystems, we focus on a particular setting of participation: open data hackathons. We focus on open data hackathons because they have shifted from being tech-focused events designed around software development, to more open get-togethers welcoming the contributions of non-expert users (Endrissat & Islam, 2022). Previous research found that the main value of hackathons is in creating communities, rather than in the technical solutions produced (Endrissat & Islam, 2022). Hackathon participants not only build and test new solutions, but also test new ways of collaborating around shared ideas (Briscoe & Mulligan, 2014). Jaskiewicz et al. (2019) similarly found that open data hackathons can contribute to community capacity building, with participants developing shared mental models around common issues. These previous findings show that hackathons can contribute the goal of more inclusive open data ecosystems and is why we choose hackathons as the focus of our research. Open data hackathons are events lasting 1-3 days where the objective is to reuse open datasets to solve a challenge. The hackathon (hacking marathons) audience is shifting from an exclusively technical one, to a more balanced mix of expert and non-expert users. Hackathon priorities are not anymore to only develop impressive technical solutions, but also to develop useful solutions, which address real world challenges, hence the need for "non-expert" user participation. We define non-expert users as citizens who are not data professionals (i.e. employed as data analysts, offering commercial services which rely on open data, etc.), but who may possess domain expertise.

This chapter presents a systematic literature review on the motivation of open data hackathons attendees. We apply the taxonomy by Ryan & Deci (2000a) of extrinsic and intrinsic motivations and reveal a variety of motivating factors. In the next chapter, we explain the methodology used to find, filter, and analyse the papers, we then show the results of the research, and, finally, summarize our conclusions.

10.2 Methodology

We conducted a systematic literature review. We searched for the terms "open data" AND "hackathon" in the title and abstract of articles in the following databases: Scopus (46 records), Web of Science (26 records), IEE Explore (12 records). Some articles were present in multiple databases, so we filtered 57 unique records. We then removed irrelevant articles by looking at the title and abstract. We removed articles clearly unrelated to open data hackathons. For example, some papers describe open data solutions developed during a hackathon, but not the hackathon itself, and therefore do not contain information on participants' motivation to attend. We removed records clearly unrelated to non-expert or citizen user participation (for example journalism hackathons, or academic hackathons). We also removed short tutorials and reviews. After the filtering based on title and abstract, we obtained 31 records. In the last step of filtering, we scanned the papers' full text, and removed articles that did not discuss participants' motivation to attend. Only 9 items were included in the analysis, from the initial 56 unique records. For each of these unique records, we searched the text for insights on the motivations of participants and classified them according to the taxonomy by Ryan & Deci (2000a).

10.3 Results

Anslow et al. (2016) performed a case study of a hackathon driven by social good organizations (SGOs) and argued that "The SGO also brings their mission and values, encouraging participants who might not be motivated by other factors (e.g., prizes, experience)" (Anslow et al., 2016, p. 617). In the case of a hackathon involving community members (older adults) working on local water quality data, Carroll & Beck (2019, p. 67) observed that "seem eager to share their

experiences and personally motivated to expand the model of their groups more generally throughout the community". In a survey of participants of three hackathons, the top motivations were "learning and developing new skills", "performing teamwork", and "engaging in the resolution of civil problems" (Gama, 2017). This is convergent with the findings of Jaskiewicz et al. (2019), where the top motivations of hackathon participants were "to promote bottom-up emergence of innovations", "to integrate my organization in an existing partnership" and "to explore the potential of open data in a certain domain". Organizers often use prizes such as opportunities to travel abroad and compete in further events, and venture capital (Kitsios & Kamariotou, 2019). Kitsios & Kamariotou (2022, p. 11) argues that while prizes and rewards are significant motivators, other factors are ignored "such as networking, new knowledge, training, fun, and support for the creation of startups". It is also important to note that using prizes as motivational tools will "influence both the types of participants who sign up for the contest and their ability to persevere throughout the contest's duration" (Kitsios & Kamariotou, 2023, p. 4). In an earlier study Kitsios & Kamariotou (2018) also noted that the support to further develop the solution further after the hackathon is a significant motivator, though this mostly applies to software developers. In an adjacent systematic review of the engagement factors for open data hackathons, Purwanto et al. (2018) found two intrinsic motivations ("fun and enjoyment" and "intellectual challenge") as well as three extrinsic motivations ("performance expectancy/relative advantage", "learning and developing new skills", and "networking"). Another interesting facet of participant motivation is the type of artifact that they are invited to create. In the hackathon described by Temiz (2021, p. 7): "for each challenge category the "concepts" track is included to motivate non-technical people to participate". This is similar to the "intellectual challenge" mentioned by (Purwanto et al., 2018).

Table 11. Summary of the motivations of non-expert user found in the literature.

Extrinsic Motivations	Intrinsic Motivations
Networking and teamwork (Carroll & Beck, 2019; Gama, 2017; Jaskiewicz et al., 2019; Kitsios & Kamariotou, 2018, 2022, 2023; Purwanto et al., 2018)	Learning (Gama, 2017; Jaskiewicz et al., 2019; Kitsios & Kamariotou, 2018, 2022, 2023; Purwanto et al., 2018)
Business development support (Jaskiewicz et al., 2019; Kitsios & Kamariotou, 2018, 2019, 2022, 2023)	Hackathon challenge (Anslow et al., 2016; Gama, 2017; Jaskiewicz et al., 2019; Kitsios & Kamariotou, 2018; Temiz, 2021)
	Fun (Kitsios & Kamariotou, 2018, 2022, 2023; Purwanto et al., 2018)

10.4 Conclusions

With adequate scaffolding, hackathons can welcome non-expert user participation and act as an interface to open data ecosystems. In this study we investigate attendees' motivations to participate in open data hackathons, finding two extrinsic motivations (networking and teamwork, business development support) and three intrinsic ones (learning, hackathon challenge, and fun). The validity of this structured literature review is limited by the narrow set of papers reviewed, and the limited data available on participants' motivations. We tried to exclude studies describing highly technical hackathons. But we also acknowledge that, in a hackathon context, it is hard to distinguish between "non-expert" and "expert" users. Open data hackathon organizers should take into consideration the motivating factors for non-expert users and design the scaffolding of the event accordingly.

11 Next iteration of D2.3 with focus on users' motivation

11.1 Introduction

The focus in this chapter is to provide the next iteration of the commons-based governance model for open data Ecosystems from Deliverable 2.3 with focus on user motivation (see Cazacu et al., 2024).

The first version of the model was generated in Task 2.3 and is based on the combination of the literature review and the empirical data obtained from the various ODECO partners and a translation of the commons-based design principles into six action principles concerning:

1. Boundary-making in relation to open data ecosystems,
2. Supporting communities of open data ecosystems,
3. Encouraging participation and shared decision-making,
4. Considering appropriate legal mechanisms,
5. Designing an ecology of interoperable projects, and
6. Ensuring sustainability of open data ecosystems.

In this report, we seek to enter the next iteration of the development of the model based on the analysis of user motivation presented in the previous chapters. The sections below thus contain analysis of Action Principle 1 – 6 from the perspective of user motivation in the various research cases described in the previous chapters.

Note that not all action principles are relevant to all research cases, and that some research cases (e.g. journalists) therefore do not have a substantial contribution to the next iteration of every action principle.

11.2 Developing the next iteration of Action Principle 1

Action principle 1 concerns the making of boundaries in relation to open data ecosystems.

Action Principle 1: Boundary-making in relation to open data Ecosystems

"To define the boundaries of an open data ecosystem, actors should be aware of the socio-technical conditions where their interactions with other actors take place. These conditions refer on one hand to social components such as historical, geographical aspects, social and cultural norms, organization norms and community affiliations, as well as practices, traditions, personal motivations and values. On the other hand, the technical aspects include soft and hard data infrastructures, interoperability practices, standards, laws and regulations. Ecosystem mapping can be done using tools from the discipline of design thinking and theoretical principles from the discipline of information visualization and communication." (Cazacu et al., 2024, p. 38)

11.2.1 Next iteration of Action Principle 1

In several of the described research cases user motivations relate to the boundary making in action principle 1.

Students have the motivation of integrating in the local context firstly by "helping the community around the school" and secondly by sharing their work and "being proud of their work". This could support the collaboration and organic development of the ecosystem. In this dynamic, students could adopt distinct roles as consumers, providers, and intermediaries of open data according to different learning objectives. Although the school can serve as a physical platform for interaction, there is a weakness in relation to the technical conditions where data interaction take place.

Currently the schools, students and teachers lack awareness on the tools for data management and sharing, also lack the skills for using them.

NGOs are motivated, among other things, by doing impactful work that contributes to socio-political issues and by personal beliefs in openness and transparency. Thus, they are interested in a level of open data ecosystem boundary-making to recognise social and technical components of their interactions with the communities they target and data providers. However, as NGOs are not motivated by profits as an external motivator, they may lack the resources to implement this action principle. Moreover, given how new social issues, technological changes, or regulation changes can rapidly arise, NGOs should reflect these changes in their understanding of open data ecosystem. That may require the boundary-making to be flexible and open to changes while also considering the limited resources of NGOs.

As depicted in action principle 1, defining the boundaries of an open data ecosystem can help **local government officials** create a framework for joint inquiries related to open data needs. Local government officials can work with intermediaries, such as those belonging to the open government geographical data repository initiative, other governmental administration levels or departments within the municipality, and citizens on their territories to determine data needs. This can also help identify knowledge gaps, for example, when collaborating with neighbouring municipalities in development projects. Clearly defining boundaries can contribute to building trust within the community. For example, transparency about the local government's responsibilities can help enhance mutual understanding when working with NGOs and citizens. This is also true when local governments partner with intermediaries or regional and national governmental levels to make open data available. Defining boundaries can also facilitate events and interactions that strengthen community bonds, such as meetings to share best practices related to open data. This principle can also be used to materialise visions within the community. For instance, in one of the collaborations facilitated by open government geographical data repository initiative, the vision was to create data to improve accessibility in outdoor facilities for people with disabilities. Participants in that collaboration had to define the project's boundaries and scope and support articulating a shared purpose.

Defining the boundaries of open data ecosystems is a good strategy to materialize the benefits of open data at the **national and regional government levels**. More specifically, national and regional governments officials can work in the direction of understanding data needs and data gaps through ecosystem mapping that answer questions such as: (1) What relevant datasets are we missing? (2) How can we collect such data? (3) Are there any (social) norms that prevent us from collecting or sharing such datasets? (4) Which actors have ownership or rights related to such datasets? (5) What kind of collaboration we need to put in place in order to collect and share such data? (6) what are the technical aspects that we need to take into account?

It is important to highlight that National and Regional governments, as summarized in ODECO Task 3.1, have an important and peculiar role as regulators of open data ecosystems. Therefore, ecosystem mapping can also take place through the institutional role they have in the open data ecosystem.

Regarding the challenges, it may be difficult to define boundaries without a clear leadership structure that can help in decision-making processes and coordination. Local governments may also face challenges on relation to human power or the lack of skills within their organisational structures to deal with data-related topics. A suggestion for developing this principle would be to integrate a clear leadership structure.

Commercial users should be aware of the socio-technical conditions where their interactions take place, with other commercial users and with non-commercial stakeholders. OpenStreetMap is an infrastructure co-created with diverse stakeholders (individuals, governments, non-profit organizations, commercial users, and research stakeholders). The challenge can be that the commercial user trying to enter an ecosystem and not being aware of the socio-technical conditions of an already established community and facing backlash for it.

Defining the boundaries of an open data ecosystem beforehand is challenging in research and practice. In the research on **open data Intermediaries**, a definition of open data ecosystem by (Csáki, 2019, p. 19) was suggested, which is the “way of looking at how participating actors and groups create shared meaning and generate value around open data and how the structural properties of their interactions shape this process, which in turn enables or constrains the growth and health of the ecosystem itself”. This definition resonates with the conceptualization of the Actor-Network Theory. From that perspective, the open data ecosystem can be considered a specific application of the Actor-Network Theory. Drawing insights from the Actor-Network Theory, Latour (2005, p. 29) asserted that “social aggregates are not the object of ostensive definition—like mugs and cats and chairs that can be pointed at by the index finger—but only of a performative definition” (p. 34). Latour emphasized tracing connections “instead of being constantly bogged down in the impossible task of deciding once and for all what is the right unit of analysis” (p. 34). In other words, for a specific assessment, investigation, or intervention in the open data ecosystem, one should identify the actors and trace their interactions based on the specific purpose. This will involve making and remaking boundaries.

Non-expert users: In defining the boundaries of an open data hackathon ecosystem, we need to consider the history of the community, the geographical reach of the event, and the practices and motivations of participants. We also need to consider technical aspects of the data provided to participants at the beginning of the event. In the context of open data hackathons, this action principle is useful to define an outreach strategy and understand which actors can be engaged and to provide data and support for the event. Possible actors are local government, businesses, innovation centres, and citizen activists. The action principle is also useful to define the dataset's technical specifications and infrastructure used to share them.

A central challenge is that different communities might come from the same place, have similar history and cultural norms, but subscribe to different community affiliations, or different practices and technical standards. The action principle assumes that open data is non-rivalrous. However, this is not always the case. The action principle remains vague on how to map boundaries between open data communities which have similar components, but do not feel part of one group. Open data hackathon organisers might struggle with engaging different communities that are odds with each other.

Next iteration: It is important to emphasise that action principle 1 is not about creating boundaries which would be against the principles of open data which is open by its very nature. Open data should be open for use by anyone from anywhere for various purposes, but it is central that actors in open data ecosystems are aware of the boundaries to other communities of users with other practices and values. If different open data communities understand each others values and practices these can be addressed in settings of collaboration and strengthen the understanding of different user types motivations. This might be specified even more in the next iteration of the development of action principle 1. A second focus point related to this, which emerged from the analysis of motivations, is that open data can have a rivalrous nature. When different communities collaborate in an open data ecosystem its members can belong to several communities which can affect awareness of boundaries both in a positive and challenging manner; positive because knowledge and awareness of other practices will be shared between members

across boundaries of different communities, negative because members not always are aware or recognize that they are part of different communities that have different practices or power relations in relation to open data use. This should be addressed more clearly in the next iteration of the model.

11.3 Developing the next iteration of Action Principle 2

Action principle 2 concerns the support of the various communities in open data ecosystems.

Action principle 2: "To support the formation of communities around the use of open data, actors of the open data Ecosystem should be knowledgeable of the purposes and practices that can be affected by open data. Shared purposes typically revolve around public and/ or local concerns, therefore they directly affect citizens, local communities or digital communities. Communities of practice typically form when experts, practitioners and academics explore societal problems by developing knowledge, tools, practices that address those problems. Research done in the field of participatory design focuses on empowering communities of shared purpose, while disciplines such as data science and engineering, engineering design, computer science typically form communities of practice around open data." (Cazacu et al., 2024, p. 38)

11.3.1 Next iteration of Action Principle 2

Action principle 2 is connected to several factors of user motivation in the different research cases.

The key to this action principle for **journalists** is the formation of communities that share the same principles, mainly transparency and accountability. The collaboration of these communities, for example, between civic hackers, data analysts, and programmers who are interested in open data and the journalists, can bridge the technological gap that many journalists face and lag in the use of open data.

This action principle is one of the most relevant in the context of **elementary school students** since both communities of shared purpose and communities of practice can take place. This principle might not just support a novel community of practice around open data students, teachers, and schools, but also, local communities where students actively engage. Experts can support the formation of communities around the management of open data, meanwhile, the motivations of "use in real-world what they do in school" and "engage with something that is relevant for them" inspire the formation of different communities around the use of open data for solving local issues. Communities of practice could engage different schools, students, teacher, and experts. Meanwhile, communities of shared purpose could form around solving local problems involving the school, students, local community, and non-profit organisations.

This action principle is of direct concern for **NGOs** and reflects their motivations to contribute to the open data ecosystem. They are motivated by doing impactful work, which is also supported by the community they are addressing and by creating opportunities for other stakeholders through data access. Thus, they are invested in forming both communities of practice and of shared purpose that use open data and support NGOs' projects. However, communities that lack skills or knowledge might be prioritised to receive NGO's support, for inclusion and to have access to their expertise.

Regarding action principle 2, supporting the formation of communities around open data is beneficial for **local government officials** as it allows them to gather insights about infrastructure needs and user preferences. These communities are formed to improve their knowledge about topics related to their localities, such as tourism, planning, strategy, and decision-making. This can also help local governments streamline processes, prioritise projects, and identify data needs at

their territories. The formation of communities can also support incorporating local government's aspirations, such as environmental considerations or inclusion, into their public tasks. Local government officials can also join communities of practice with participants from other municipalities, within municipalities across departments, or with organisations and individuals belonging to other sectors, such as NGOs, intermediaries, or businesses concerning data practices or societal challenges. This can also facilitate data maintenance or management activities. However, forming communities around open data can also have challenges, such as fragmentation within organisations, technical infrastructure, or data, hindering the community's ability to derive meaningful insights and impacting effectiveness of open data initiatives. They may also face engagement issues due to resource limitations, competing priorities, or insufficient understanding of the benefits of data-driven approaches. Therefore, ensuring a shared understanding of data and its applications is important. They may also face issues with a decentralised leadership approach regarding coordination and decision-making.

The challenges related to this principle could be the lack of data literacy and understanding, as some local government officials may face challenges in understanding and effectively utilising data, limiting their capacity to be involved in communities around open data. These limitations could also come from the lack of resources within municipalities to support data-driven efforts or competing priorities. This principle should address the challenges related to fragmentation within organisations by fostering a shared understanding of data and its applications.

Supporting the formation of communities around open data can be valuable for **national and regional governments**. As demonstrated in the case of Covid-19 pandemic, the existence of communities that were 'craving data' helped to give impetus to the governmental strategy for open data collection and sharing practices.

It is important, however, to consider possible challenges regarding communities' formation, such as resources, accessibility for less privileged and tech-savvy contexts. To solve these potential challenges, governments can actively contribute through financing and stimulating activities.

Commercial users are already applying this principle, by developing software/tools in a community around a common use case of OpenStreetMap data. The challenge in application can be that there are different goals and motivations of the users who form the community. and A suggestion to a further development can be to include not only communities of use, but also communities of contribution to/production of open data.

In the **open data intermediaries** research there are several challenges in application of the principle. First it is unclear how "communities" in the action principle differ from "ecosystem" and if they are the same?

That being said, the ecosystem metaphor emphasizes a self-organizing environment (Oliveira & Lóscio, 2018). Hence, communities (if it is synonymous with ecosystems), to some extent, form and evolve organically as various actors connect with others based on their aligned interests. For example, Esri (an open data intermediary) provides pre-processed open data on its software, ArcGIS. ArcGIS users use the software to do spatial analysis and can also use the pre-processed data in the software. This relationship is organically formed because users have their needs (initially, software to do spatial analysis), and Esri provides the software with pre-processed open data built-in (hence, some ArcGIS users also become open data users).

This action principle that calls for open data ecosystem actors to "be knowledgeable of the purposes and practices that can be affected by open data" is rather abstract. It is unclear what is meant by purposes that can be affected by open data: Are they (social/economic/other) purposes/

practices that can be achieved through open data? Or are they (social/economic/other) purposes/practices inadvertently/indirectly affected by open data?

Most (if not all) open data intermediaries have limited resources. Consequently, they likely support communities that are aligned with their organizational interests. Likewise, they also have bounded knowledge of open data practices based on their locus of interest. For example, Esri organizes an annual user conference at the international and local levels, where ArcGIS users are informed about the latest technology of ArcGIS and share each other's experiences in using ArcGIS.

Open data intermediaries may organize regular events to connect with other actors in their network and gain insights to improve their open data intermediation activities. They may also contribute to providing training and education.

The action principle should be rephrased to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize internal and external capacity building.

Non-expert users: In the context of open data hackathons, communities are formed before, during, and after the event around the datasets shared and solutions developed during the hackathon. Being knowledgeable of the purposes and practices that can be affected by open data is indeed essential to achieve the intended hackathon outcomes and avoid building shiny technological concepts which serve no purpose.

In the context of open data hackathons, the two communities of practice need to collaborate to identify societal challenges and use open data to address them. Facilitating the collaboration of different communities of practice during an open data hackathon is challenging and requires a specific event design and methodology. Engineering experts are usually motivated by the opportunity to produce a technical prototype and use a specific technical jargon. Problem owners and activists are motivated by the need to address a societal issue and might find it difficult to explain its relevance and urgency to engineering experts.

Next iteration: The next iteration of developing action principle 2 should be with focus on rephrasing descriptions of the central concepts to be less abstract and avoid using terms that may have to be further defined. It is thus unclear how "communities" in the action principle differ from "ecosystem" and if they are the same, and what is meant by "purposes that can be affected by open data". Another challenge is that forming communities around open data can cause fragmentation within organisations. The next iteration should address the challenges related to fragmentation within organisations by fostering a shared understanding of data and its applications.

11.4 Developing the next iteration of Action Principle 3

Action principle 3 concerns participation and shared decision making in open data Ecosystems and how it is central to encourage collaborative decision-making for operational decisions and some collective choice-decision,

Action Principle 3: "To encourage polycentricity through participation and collaborative decision making in the open data Ecosystem, actors with more power such as institutions, organizations, communities that represent the status quo should ensure that those typically with less power such as citizens, students, research participants as well as less represented and disadvantaged groups are being actively encouraged to communicate their feedback, needs and concerns, as a first step. Moreover, they should be empowered to actively contribute to the creation of strategies and plans, practices and assessments, products and services. The discipline of (critical) data studies provide tools, approaches and theoretical concepts that challenge existing power structures and propose more just and equitable alternatives." (Cazacu et al., 2024, p. 40)

11.4.1 Next iteration of Action Principle 3

Action principle 3 relates to users' motivation in several of the research cases.

This action principle is important for **journalists** as they often provide a voice to less powerful groups, and open data can be a tool to understand their problems through means other than the traditional ones (interviews, field research, etc.). Furthermore, journalists can reach out to their audience to participate in open data research initiatives. As jack of all trades by profession, they require input from experts in several cases to understand and analyse open data; this phenomenon is documented in the literature, but it also became evident through the action research.

This action principle is also aligned with the **student's motivation** of "getting their ideas being heard". Students in elementary school are motivated for having the autonomy of shaping their own learning activities. They seek for freedom and ownership. As they mentioned, they are also motivated for "not listen but do it themselves". These motivations can support a more participative involvement of students in decision making; however, a threat is ensuring the spaces for their participation. Active educational approaches such as Project based learning (PBL) might support the creation of spaces for reflection and participation. In PBL, students have more opportunity to decide on their own learning process. According to the interviews with teachers, they described their role as a guide, meanwhile the students take more protagonism on defining the knowledge they need for succeed in a project. Also, teachers reflected on co-creation scenarios where they could design the learning activities with the students. Students involved in PBL activities have shown being motivated to reflect on their learning process and engagement in learning activities, however, to enhance this motivation to shared decision-making, teachers emphasised on the need of creating a language and skill for both teachers and students regarding co-creation.

NGOs are meant to represent groups of actors with less power in the ecosystem and are motivated by it. They often create a space for feedback and concerns or proactively seek them from the communities, given that community support is one of the motivational aspects of their projects. Moreover, NGOs are motivated by doing politically and socially impactful work, so they challenge powerful actors in the ecosystem to consider the perspectives of those with less power. However, the engagement of communities should consider the limitations of resources of NGOs to contribute to it, and the possible clash of priorities.

Based on action principle 3, **local governments** would benefit from encouraging polycentricity through participation and collaborative decision-making in open data ecosystem as part of their activities to harness the potential of open data and engage in collaborative decision-making. A polycentric approach would be beneficial to foster shared learning objectives, allowing officials to gain insights into citizens' needs, such as accessibility to public services or infrastructure needs. These learnings could permeate within governmental levels or outside the governmental structure across sectors. Furthermore, this approach could also help them to prioritise projects and bridge

gaps by addressing the needs of the less represented groups. It can also enable the emergence of collective responsibility that could inspire and motivate municipalities to update and maintain data. The collaborations emerging from considering a polycentric approach could also contribute to an evolving data repertoire. However, while a collaborative and decentralised approach to leadership might be valuable, the absence of an explicit leadership structure may pose challenges in relation to decision-making and coordination. This can lead to challenges on data maintenance and fragmentation.

A polycentric approach to open data sharing is fundamental to correct the imbalances between resourceful actors such as **regional and national governments** who actively participate to the open data ecosystem and those who are left out due to various reasons. Indeed, it is important to carefully design governance mechanisms fit for guaranteeing the participation of the less privileged to the open data ecosystems. We are currently working on the design of solutions for encouraging polycentricity that encompass: (1) fostering participation of underrepresented population to open data policies design and governance; (2) understanding how the financing of open data initiatives impact disadvantaged groups; (3) evaluate how the outcome of open data programs benefit differently the various actors of open data ecosystems.

The application of action principle 3 should ensure that **commercial voices** are heard in the governance of ODECOs. The challenge can be that when commercial users are given power in decision-making, the bigger corporations hold all the power, and the SMEs have no voice. Inside a given stakeholder group, power struggles can happen too. There should be focus on who represents the commercial users who represents the citizens. A suggestion for developing the next iteration can be to ensure mitigations for intra-stakeholder type power struggle.

Open data intermediaries: The concept and application of polycentricity has been long debated, but one of the definitions of polycentricity is a "social system of many decision centres having limited and autonomous prerogatives and operating under an overarching set of rules" (Aligica & Tarko, 2012). So, it is not apparent from the description of the action principle how participation and collaborative decision making can encourage "polycentricity". How do limited and autonomous prerogatives emerge? What is the overarching set of rules? Ultimately, it is unclear why "polycentricity" is considered one of the action principles.

That being said, in terms of practicality, this action principle may be more feasible to public institutions and civil society organizations as social expectations towards them exist. On the contrary, most businesses are primarily driven by profit. For businesses to "ensure that those typically with less power [...] being actively encouraged to communicate their feedback, needs and concerns", there may need to be an extrinsic motivation (e.g., laws and regulations) requiring them to do so unless doing so is aligned with their business interests (e.g., to offer better products). It is difficult to imagine reasons for businesses to empower the less represented and disadvantaged groups "to actively contribute to the creation of strategies and plans, practices and assessments, products and services" since these are internal business decisions.

Open data intermediaries may facilitate feedback between actors in the open data ecosystem, for example, by putting feedback features in their software/platform or collecting and communicating feedback on behalf of others directly to the relevant parties. They may also initiate multistakeholder collaborations that are aligned with their interests.

The next iteration of the action principle should be rephrased to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize feedback and collaboration.

Non-expert users: Open data hackathons can be used as an interface to understand citizens' needs and concerns. The discussions and concepts developed by participants can serve as indication of the community's priorities and needs.

If not designed appropriately, hackathons can give the impression that complex societal problems can be resolved with simple technical solutions. It can also happen that, during an open data hackathon, participants discover the need for more or different open datasets, which are not yet available. To enable participation, institutions that support the hackathon process should be available to share more data during or after the event.

Next iteration: The next iteration of action principle 3 needs to consider structures for decision-making and coordination. In this chapter it has been suggested to encourage polycentricity through participation and collaborative decision-making in open data ecosystem. This is to foster shared learning objectives, allowing officials to gain insights into citizens' needs. A polycentric approach however needs explicit leadership structures to strengthen decision-making and coordination and meet challenges on data maintenance and fragmentation. Leadership structures for creating collaborative decision-making therefore needs to be explicitly addressed in the next iteration of action principle 3.

11.5 Developing the next iteration of Action Principle 4

Action principle concerns the legal mechanisms in open data Ecosystems.

Action principle 4: "To encourage the use of open licenses – including open data licenses for databases, Creative Commons licenses for content, and open source software licenses for software code and other software artefacts. Licenses have been central to the creation and continuation of knowledge, information and data commons. Where the data in question does not relate to any personal or sensitive information, broad licenses should be used that impose little to no restriction on reuse. Further, governments should, to the extent possible and subject to security concerns, procure open source infrastructures for open data technologies. Here, the open licenses also serve to instil a culture of communiting." (Cazacu et al., 2024, p. 41)

11.5.1 Next iteration of Action Principle 4

Action principle 4 does relates to user motivation in some of the research cases and less to others.

NGOs are often motivated by the belief in the benefits of openness and transparency, so they promote, support, and push for appropriate legal mechanisms for open data. However, the contribution of NGOs is limited to the influence they have over other stakeholders. The best practices may not be implemented or promoted if there is insufficient power distribution between actors in the ecosystem.

The action principles 4 and 5 (Considering appropriate legal mechanisms and designing an ecology of interoperable projects) are more difficult to relate to the motivations mapped in **elementary school students**. In general, the awareness and knowledge about open data in school is low therefore connecting to these two principles is more complex. Perhaps, these could be addressed considering school administration and educational policies.

Regarding action principle four, encouraging the use of open licenses, including open data licenses for databases, in the context of **local open government** geographical data repositories presents several motivations for local governments. For example, local government officials engage with open data to learn about infrastructure needs, gather user preferences, and promote inclusiveness. Collaboration with businesses and other stakeholders helps improve tourism

planning, strategy, and decision-making. They also create communities that share purposes across domains, such as cycling infrastructure, leisure activities, outdoor facilities, and inclusive outdoor experiences. In those contexts, they need to integrate different types of data, share across sectors, ensure user-friendly interfaces, and promote data accessibility, which contributes to building trust within collaborative partnerships. Open licenses could be a tool to leverage those collaborations, enabling access to new ways of sharing data, such as real-time data. Open licensing could also enable the integration of open geographical data with different domains, creating a comprehensive open data ecosystem that addresses societal issues like climate change and facilitates collaboration across sectors.

The challenges related to this principle could be the lack of data literacy and understanding, as some local government officials may face challenges in understanding and effectively utilising data, limiting their capacity to address data-driven initiatives within the municipalities; they may also face resource constraints to prioritise these efforts, or they may face competing priorities within the local governments. Data literacy and awareness are needed for this principle.

Regional and national governments can be 'locked-in' the use of commercial software due to various reasons, such as convenience, data literacy, etc. While it is important to encourage the use of open source software, the application of action principle 4 needs a strategical approach on how to effectively encourage governments to transition to open source software.

In regard to application with **commercial users**, the principle is already applied in OpenStreetMap by using an open license (ODbL) which has a share-alike clause, and allows commercial use. The challenge of application of the principle can be that unclear licensing of databases may set a barrier to use or contribution to it. Another challenge is diverse opinions of the involved stakeholders in which license to use, and whether to include share-alike and commercial use. A suggestion to development of the principle can be that OpenStreetMap is switched from a Creative Commons license in 2012 to an Open Database License (ODbL). Creative Commons licenses are thought for artistic works more than databases. It is suggested to rephrase the action principle to add specific database licensing.

Open data intermediaries: Many (if not most) open data intermediaries rely on making their products (e.g., augmented data, software, platform) under proprietary license to generate profit from their open data intermediation activities unless those open data intermediaries are sponsored by public or private funders. Therefore, while this action principle may sound ideal on paper, the challenge is, what are sustainable business models for open data intermediaries where they do not have to rely on sponsorship and simultaneously use open licenses for their products? For instance, Esri pre-processes open data from various sources and puts them in their proprietary software. They enhance the use of open data while gaining profit by selling their software. How can the software generate profit if it has to be under open license? Likewise, if the pre-processed open data is provided under an open license, and everyone else can use it without using Esri's software, why would Esri pre-process the data in the first place since there is no business case for it?

Where possible, open data intermediaries could provide their products under open licenses if it is not affecting their business model.

This action principle may negatively impact the sustainability of some open data intermediaries' business models and, ultimately, the sustainability of the open data ecosystem. Hence, the necessity of this action principle should be reconsidered.

Non-expert users: Open data shared before or at the beginning of the hackathon event should be shared with a CC license.

Commercial and institutional partners might not be willing to share their data and solutions under a CC license. Sometimes this is also true of hackathon participants who might want to develop commercial solutions. Open data hackathons need to acknowledge the need to protect commercial interests of some of the actors involved.

Next iteration: The next iteration of the development of action principle 4 should address two challenges. First the next iteration needs to address challenges related to lack of data literacy and understanding of licensing, as some local government officials may face challenges in understanding and effectively utilising data, limiting their capacity to address data-driven initiatives within the municipalities. Second the future development needs to address the challenge on what types of sustainable business models there are for open data intermediaries where they do not have to rely on sponsorship and simultaneously use open licenses for their products. The action principle may negatively impact the sustainability of some open data intermediaries' business models and, ultimately, the sustainability of the open data ecosystem and it could therefore be necessary to reconsider the necessity of this action principle.

11.6 Developing the next iteration of Action Principle 5

Action principle 5 concerns the design and ecology of interoperational projects. Boundaries of an (open) data ecosystem are fluid and contextual and there are overlaps between various open data Ecosystems as well as relationships between these ecosystems and collaborations between actors across different open data Ecosystems. The principle thus concerns how governance frameworks can encourage cross-collaborations and cross-interactions among different actors.

Action Principle 5: "To focus on interoperability and data portability, and have a broad understanding of these concepts. In particular, efforts for interoperability should encompass technical interoperability (through, for example, semantic and syntactic interoperability of open data systems/portals and through standardised formats for (open) data, as also noted in the empirical data collected) as well as generative interoperability (through adoption of policies aimed at nurturing public spaces for decision-making in relation to open data needs and challenges). Support should be provided to regulatory measures aimed at broad interoperability and portability, through advocacy and political action." (Cazacu et al., 2024, p. 41)

11.6.1 Next iteration of Action Principle 5

The principle on designing and ecology of inter-operational projects are highly relevant to several of the cases of user motivation but - as described above - not to others.

As **NGOs'** motivation also comes from personal interest and enjoyment, if their employees are active in the open data movement, they already advocate for improved interoperability. However, the limited resources of the NGOs should be considered as to how they can be supported in their implementation and push for better interoperability.

In relation to action principle 5, focusing on interoperability and data portability would facilitate more effective collaboration between **government officials**, businesses, NGOs, and citizens. It would allow for a seamless data exchange and joint inquiry, fostering innovation in tourism planning, strategy, and decision-making. Interoperability also facilitates the integration of diverse datasets, providing a comprehensive view to local government officials. This contributes to evidence-based decision-making, helping in areas like local government planning processes, project prioritisation, and identifying infrastructure gaps. For example, combining recreational and

transportation data creates a more complete open data ecosystem for planners. Data portability ensures that data is easily accessible and user-friendly. This strengthens social value within the community, as users can access and use data across different interfaces seamlessly. Finally, interoperability helps address knowledge gaps within collaborations of local governments with different participants on open data ecosystem, and the ability to integrate different data types and share information across sectors contributes to a more comprehensive understanding of infrastructure needs and priorities. For example, integrating data on cycling infrastructure planning and tourism can lead to a better understanding of shared purposes and collaboration. Regarding the challenges, local governments may face resource constraints in prioritising interoperability, particularly due to the challenges of data maintenance or the competing priorities within their organisations. Local governments may be reluctant to integrate interoperability practices due to the lack of standardised practices and protocols or because they follow varied methods, standards, and frameworks. It may also be difficult to face security and privacy concerns related to data portability.

This principle needs to consider resources constrains and guidelines for data security and privacy.

Regional and regional governments: Interoperability and data portability are two fundamental pillars of value creation through open data. Indeed, data combination allows to conduct fine-grained analysis and to mitigate potential data bias. Interoperability and data portability are also at the centre of the EU agenda (e.g., EU Data Act). However, governments face budget constraints and do not always prioritize data curation and the correct implementation of interoperability standards. It is therefore important to raise awareness on the relevance of interoperability and data portability through: (1) ad hoc trainings for governmental officials; (2) simple and accessible step-by-step guides for governmental officials and citizens on interoperability; (3) designing governance strategies that take into account organizational interoperability challenges.

Interoperability is not greatly applied in OpenStreetMap, causing barriers to its data use by **commercial users**, as shown in the interviews. OpenStreetMap data can be ambiguous in its meaning, and the same real-world scenario could be represented in various ways on the data. The challenge in the application could be an increased barrier to non-technical users to contribute data to a given ecosystem, if user-friendly tools for it don't exist. A suggestion to the development of the action principle could be to mention that the implementation must be simple enough to not cause future barriers to stakeholders.

Open data intermediaries: What does data portability mean here? According to the OECD, data portability refers to "the ability (sometimes described as a right) of a natural or legal person to request that a data holder transfer to the person, or to a specific third party, data concerning that person in a structured, commonly used and machine-readable format on an ad-hoc or continuous basis" (OECD, 2021). It is unclear how data portability applies to open data since open data should not include personal data. Hence, more clarity on what data portability means (in practice) concerning open data is necessary.

What does generative interoperability mean in practice for open data? For example, are Web Standards (<https://www.w3.org/standards/>) or Open Geospatial Consortium standards (<https://www.ogc.org/>) considered generative interoperability? Does "generative interoperability", as a term, have a distinctive application in practice, different than other known types of interoperability [see (Interoperable Europe, n.d.)], or is it a buzzword?

Open data intermediaries who have long established and transferred data in specific formats may be reluctant to adopt new interoperable formats because other stakeholders within their ecosystem may already be familiar with the proprietary formats. For instance, most Esri users are

more familiar with the shapefile format even though it is not an interoperable format. Merely as an illustration: more people are sharing word processing documents in .doc format instead of .odt, even though the former is a proprietary format, while the latter is an interoperable format.

Open data intermediaries could provide data in diverse formats, including interoperable formats, where possible.

Rephrase the action principle to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize the adoption of interoperable formats/standards.

Non-expert users: This action principle has limited application to open data hackathons. Data shared by partners before and during the hackathon should follow interoperability standards.

Next iteration: There are several challenges that needs to be addressed in the future development of the action principle. First the principle needs to be rephrased to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize the adoption of interoperable formats/standards. Secondly this principle also needs to consider resources, constrains and guidelines for data security and privacy. Thirdly it is important to raise awareness on the relevance of interoperability and data portability through: (1) ad hoc trainings for governmental officials; (2) simple and accessible step-by-step guides for governmental officials and citizens on interoperability; (3) designing governance strategies that take into account organizational interoperability challenges. Lastly, the future development of the principle needs to address the challenge of an increased barrier to non-technical users to contribute data to a given ecosystem, if user-friendly tools for it don't exist. It is suggested to mention that the implementation must be simple enough to not cause future barriers to stakeholders.

11.7 Developing the next iteration of Action Principle 6

Action principle 6 concerns ensuring sustainability of open data ecosystems to maintenance of data infrastructures. The principle speaks of both economic sustainability as well as social support to ensure the sustainability of open data ecosystems.

Action Principle 6: "In terms of economic sustainability of open data Ecosystems, advocacy for availability of public funds can be accompanied with insights from economic and business models of digital commons/information commons/data commons projects, in particular from collaborative peer production. Contributions to social sustainability can be ensured through the adoption of critically situated approaches to participation from critical data studies." (Cazacu et al., 2024, p. 42)

11.7.1 Next iteration of Action Principle 6

Economic and social sustainability is central in several of the research cases.

Ecosystems economic sustainability is pivotal for **journalists'** use of open data. It is clear that open data have been used either by very large media organizations that have the resources to organize and run data journalism departments or by small, independent journalistic teams that rely on EU or governmental subsidies to be funded. This significant discrepancy needs to be corrected if journalists are to have a central role in the open data ecosystem. The exploration and utilization of different financial models for media organizations is needed so journalists can have the resources (money and time) to work with open data.

The "motivation of making the world a better place" could also lead to the long-term sustainability of open data ecosystems involving **students**, schools, and local communities. Building the networks and forming communities around the use of open data to solve real problems contribute to social sustainability.

NGOs are not motivated by profit, but they are motivated by the work they do and by how it can help others. Thus, the funding is of concern for them. This action principle implementation would support NGOs to be motivated to contribute back to the open data ecosystem. However, funding can create biases in the motivations of NGOs as to which projects to prioritise and how to contribute back. Thus, the action principle should be approached cautiously, and mechanisms for this issue should be considered.

In relation to action principle 6, it is crucial for **local governments** involved in open data initiatives to advocate for economic sustainability and the availability of funds. This will encourage the development of open data ecosystems, which attract businesses, entrepreneurs, and investors who see economic potential in leveraging the available data. For example, local businesses could use local open government data for tourism planning and marketing, contributing to economic growth. Public funds should be advocated for to encourage collaboration with the private sector. Economic sustainability can ensure a stable source of funds for maintaining and expanding open data ecosystems. By securing public-private partnerships, local governments can leverage combined resources to mobilise funds to support infrastructure needs, data maintenance, and future enhancements for sustaining and expanding open data ecosystems. Resources could be allocated for technology upgrades, data quality assurance, and user-friendly interfaces. A sustainable open data ecosystem could also lead to job creation and economic impact as businesses and startups thrive on open data, contributing to employment opportunities and economic benefits for their territories.

However, securing public funds for open data initiatives may be challenging, especially when local governments have limited budgets. Competing priorities for public spending could result in inadequate financial support for sustaining open data initiatives. Local governments may face challenges at demonstrating the direct economic returns of open data initiatives. Quantifying economic impact and benefits to justify public spending can be complex. Striking a balance between public and private interests in open data initiatives can be challenging and ensuring that private sector involvement aligns with public goals and benefits the entire community requires careful consideration. They may need to develop a sustainable funding model for open data ecosystems, which requires careful planning. Local governments may face challenges in creating a long-term strategy that addresses ongoing operational costs and future expansion needs, and economic sustainability efforts should ensure that open data remains accessible to a diverse set of users, including those with limited resources. Exclusionary economic models may hinder the overall inclusivity of open data ecosystem. The strategies should also consider the need to stay updated and allocate resources for technological advancements.

This principle needs to consider inclusivity and accessibility in economic sustainability efforts and long-term planning capacity.

Regional and regional governments: Economic sustainability of open data ecosystems is often a neglected topic of investigation. Open datasets are often shared without a thorough planning and reflection on how they can contribute (economically or societally) to the open data ecosystem. Since resources allocation is one of the competences that characterize national and regional governments, it is important to involve them and make them aware of the missed opportunities of short-sighted open data financial planning. Nonetheless, governments are often challenged by resource constraints. Therefore, collecting, sharing, and advertising successful business models

from digital commons projects is key to channel resources towards the economic sustainability of open data ecosystems. To this extent, it is also important to map investments from local, regional, and national governments in the open data ecosystems.

As seen in the OpenStreetMap case study, **commercial users** can contribute financially to the sustainability of an open data Ecosystem, as it is also in their interest that the project is kept alive. Stakeholders can contribute too and co-produce ODECOs in several ways: data, social value and economically. All have to be sorted and a good balance of stakeholders has to be achieved for this to happen, as stakeholders may contribute in the way(s) that are in their best interest. The challenge in the application can be an unbalanced sustainability (data and social value but no economic sustain, or any of the other combinations). In the development of the action principle we suggest adding the idea of balance of the different sustainability values.

The action principles defined in D2.3 are derived from the governance of data commons. As OpenStreetMap is considered a data commons, they align correctly with the commercial users' contributions to it. However, the interviews with commercial users can be used to derive a new action principle. While some are motivated by the social value they can give to open data and data commons platforms such as OpenStreetMap, commercial users are primarily motivated by their own interests. This coincides with their goal of being economically profitable. An action principle is proposed, where open data Ecosystems should be governed in such a way that personal or own stakeholder motivations (e.g. commercial users who want to improve the data in their own topic or area, because it directly benefits the data quality in their offered services) can be turned into social values and benefits for the whole community.

Open data intermediaries: This action principle is read as a call for more research and development of the business models in the open data ecosystem. However, it is unclear why "digital commons/information commons/data commons projects, in particular from collaborative peer production" are singled out. Are other types of business models not sustainable?

Open data intermediaries may provide support to other actors in the open data ecosystem to design and implement certain business models, for example, through incubator programs where they provide financial investments and training and networking support.

The next iteration of the action principle can reconsider singling out "digital commons/information commons/data commons projects, in particular from collaborative peer production". It may not be necessary.

Non-expert users: Hackathon events typically rely on public and private funding. Private funding often implies the promotion of commercial solutions for data analysis. Public funding might require time consuming bureaucratic processes.

Challenges: Alternative business models also require significant effort and time to set up and would not provide much additional benefits compared to traditional funding sources. Open data hackathons take a very small budget to organise, so it is unclear whether there is a need for alternative business models.

Feedback: acknowledge the trade-offs of alternative business models, which hold potential for project that struggle to attract traditional funding, but also require significant time and investment.

Next iteration: There are several challenges that needs to be addressed in this action principle. First it is mentioned that the principle needs to consider inclusivity and accessibility in economic

sustainability efforts and long-term planning capacity. Funding can create biases in the motivations of NGOs as to which projects to prioritise and how to contribute back. Thus, the action principle should be approached cautiously, and mechanisms for this issue should be considered. Secondly with commercial users the application can be an unbalanced sustainability (data and social value but no economic sustain, or any of the other combinations). In the development of the future development of the action principle it is suggested to add the idea of balance of the different sustainability values. Thirdly an action principle is proposed as a result of data from interviews with commercial users. While commercial users are motivated by the social value they can give to open data and data commons platforms, commercial users are primarily motivated by their own interests. This coincides with their goal of being economically profitable. Lastly it is suggested to pay attention to different types of business models in the future development of the action principle. It is unclear why "digital commons/information commons/data commons projects, in particular from collaborative peer production" are singled out. It should be considered if other types of business models are sustainable.

11.8 Summary

In a broad perspective, the action principles from deliverable 2.3 (Cazacu et al., 2024) can be applied to many, but not all, use cases of open data users. With a more specific focus on the user motivation of any particular user group, some action principles are more important than others in each case.

This chapter has explored which action principles are relevant and applicable in each case in relation to what may motivate open data users to contribute to the open data ecosystem. In chapter 12 below we summarise the motivations of different user types, and the elements in the action principles that needs to be adapted motive different types of users.

12 Conclusion

Task 3.3 focused on the question: What motivations for delivering value back to open data ecosystems do the different open data stakeholder groups have? The first objective in this report has thus been to answer this research question from the perspective of different user groups. The second objective has been to provide the next iteration of the commons-based governance model for open data Ecosystems from Deliverable 2.3 (Cazacu et al., 2024) with focus on the detected user motivation. In this chapter two tables are presented as concluding answers to the two objectives: Table 12 is a summary of the motivations of different user types, and Table 13 is a summary of elements in the action principles that needs to be adapted to motive different types of users.

The motivation of user groups to deliver value back to open data ecosystems has been analysed in chapter 3 – 10. A summary of this is presented Table 12 below.

Table 12. Types of motivation of different user types

User Types	Intrinsic motivation	Extrinsic motivation	Communities of Practice
Journalists	<ul style="list-style-type: none"> • Promoting the quality of their work • Promoting democratic values and transparency 	<ul style="list-style-type: none"> • Access to more open data • Credibility and recognition • Financial compensation 	
Elementary school students	<ul style="list-style-type: none"> • Being proud of their work • Not listen but do it themselves • Use in real world what they do in school • Their ideas being heard • Engage with something that is relevant for them 	<ul style="list-style-type: none"> • Help the community around the school • Making the world a better place • Pass the exams 	
NGO users	<ul style="list-style-type: none"> • Creating value producing projects using open data • Freedom to propose and pursue own topic of interest • To have a variety in open data and approaches towards value creation and sharing 	<ul style="list-style-type: none"> • Creation of profit opportunities for other actors in the ecosystem • Do politically impactful work • Pursuit of the transparency and democracy 	

User Types	Intrinsic motivation	Extrinsic motivation	Communities of Practice
Local Government users			<ul style="list-style-type: none"> • Engagement to promote transparency, improve service delivery, and support innovation and economic growth in their communities • Envision of new possibilities for how open data can be utilised to improve their communities • Alignment of values and goals, adopt similar practices, and recognise the benefits of participating in the community
Regional/National government users	<ul style="list-style-type: none"> • Willingness to collaborate • Satisfy the demand for open data 	<ul style="list-style-type: none"> • Legal mandate • Provide factual information to Citizens and policymakers • Fill data gaps 	
Commercial users		<ul style="list-style-type: none"> • Commercial users' self motivation is to improve data quality in a source the company uses leads to public value better quality and up-to-date data quality for all users 	
Open data intermediaries	<ul style="list-style-type: none"> • Profit generation • Potential self learning and capacity building • Altruism for their community and society • Visibility enhancement 	<ul style="list-style-type: none"> • Fulfil legal obligations • Collaborations initiated by other stakeholders 	

User Types	Intrinsic motivation	Extrinsic motivation	Communities of Practice
Non-expert users	<ul style="list-style-type: none"> • Learning and developing new skills • Fun and enjoyment • Intellectual challenge 	<ul style="list-style-type: none"> • Networking and teamwork • Business development support 	

It is evident from the table above that there are different types of motivation in the different user groups. The majority of the user groups are both intrinsically and extrinsically motivated, with the exception of local government users who are motivated in connection to aspects of communities.

It is central to take user motivation into consideration in developing the next iteration of the governance model presented in D2.3.

Table 13 below is a summary of the conclusions from chapter 11 on challenges of the governance model D2.3 in the perspective of different types of open data users.

Table 13. Needs for adjustment of action principles

Action Principle	Affected user types and adjustments
1: Boundary-making	<p>Elementary school students Weakness in relation to the technical conditions where data interaction take place - students and teachers lack awareness and skills for using technical open data tools. Skill building should be taken into consideration.</p> <p>NGOs NGOs are not motivated by profits as an external motivator, they may lack the resources to implement this action principle and respond to rapid changes. That may require the boundary-making to be flexible and open to changes while also considering the limited resources of NGOs.</p> <p>Government officials It can be challenging to define boundaries without a clear leadership structure. A suggestion for developing this principle would be to integrate a clear leadership structure.</p> <p>Commercial users It can be challenging for the commercial user to try to enter an ecosystem and not being aware of the socio-technical conditions of an already established community. This action principle may be hard to implement. It is also unclear why defining boundaries is necessary in the open data ecosystem since open data is open by its very nature.</p> <p>Open data intermediaries This action principle may be hard to implement. It is also unclear why defining boundaries is necessary in the open data ecosystem (and being the action principle 1) since open data is open by its very nature. Open data can be used by anyone from anywhere for various purposes.</p>

Action Principle	Affected user types and adjustments
	<p>Non-expert users</p> <p>The action principle assumes that open data is non-rivalrous. However, this is not always the case in non-expert user communities. The next iteration should acknowledge that open data can have a rivalrous nature, and that this will affect the boundaries of open data ecosystems.</p>
<p>2: Formation of communities</p>	<p>Journalists</p> <p>The key to this action principle is the formation of communities that share the same principles, mainly transparency and accountability. The collaboration of these communities can bridge the technological gap that many journalists face and lag in the use of open data.</p> <p>Elementary school students</p> <p>This action principle is one of the most relevant in the context of elementary school students, since it both supports a novel community of practice around open data students, teachers, and schools, and, local communities where students actively engage.</p> <p>NGOs</p> <p>This action principle is of direct concern for NGOs and reflects their motivations to contribute to the open data ecosystem. They are motivated by doing impactful work, which is also supported by the community they are addressing.</p> <p>Local government officials</p> <p>Principle 2 is beneficial for these users as it allows them to gather insights about infrastructure needs and user preferences. The challenges related to this principle could be the lack of data literacy and understanding, as some local government officials may face challenges in understanding and effectively utilising data, limiting their capacity to be involved in communities around open data. The principle should foster a shared understanding of data and its applications.</p> <p>Commercial users</p> <p>The challenge in application with this user group can be that there are different goals and motivations of the users who form the community. A suggestion to a further development can be to include not only communities of use, but also communities of contribution to/production of open data.</p> <p>Open data intermediaries</p> <p>It is challenging that it is unclear how "communities" in the action principle differ from "ecosystem" and if they are the same. Rephrase the action principle to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize internal and external capacity building.</p> <p>Non-expert users</p> <p>It can be challenging, in the context of open data hackathons, for two communities of practice who needs to collaborate to identify societal</p>

Action Principle	Affected user types and adjustments
	<p>challenges and use open data to address them. In the next iteration the opportunity offered by the collaboration of different communities of practice should be explained more clearly.</p>
<p>3: Encouraging polycentricity</p>	<p>Journalists This action principle is important for journalists as they often provide a voice to less powerful groups, and open data can be a tool to understand their problems through means other than the traditional ones.</p> <p>Elementary school students This action principle is also aligned with the student's motivation of "getting their ideas being heard". To enhance this motivation to shared decision-making, the action principle should emphasise on the need of creating a language and skill for both teachers and students regarding co-creation.</p> <p>NGOs NGOs are meant to represent groups of actors with less power in the ecosystem and are motivated by it. However, the engagement of communities should consider the limitations of resources of NGOs to contribute to it, and the possible clash of priorities.</p> <p>Local government officials A polycentric approach would be beneficial to foster shared learning objectives, allowing officials to gain insights into citizens' needs. The absence of a leadership structure may pose challenges in relation to decision-making and coordination. This principle needs to consider structures for decision-making and coordination.</p> <p>Commercial users The challenge can be that when commercial users are given power in decision-making, the bigger corporations hold all the power, and the SMEs have no voice. A suggestion for developing the next iteration can be to ensure mitigations for intra-stakeholder type power struggle.</p> <p>Open data intermediaries Rephrase the action principle to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize feedback and collaboration.</p> <p>Non-expert users Open data hackathons can be used as an interface to understand citizens' needs and concerns. If not designed appropriately, hackathons can give the impression that complex societal problems can be resolved with simple technical solutions. To enable participation, institutions should be available to share more data during or after the event.</p>
<p>4: Encouraging open licenses</p>	<p>NGOs This user group is often motivated by the belief in the benefits of openness and transparency, so they promote, support, and push for appropriate legal mechanisms for open data. The action principle should focus on power distribution between actors in the ecosystem in the licensing process.</p>

Action Principle	Affected user types and adjustments
	<p>Local open government Encouraging the use of open licenses, presents several motivations for local governments. The challenges related to this principle could be the lack of data literacy and understanding, as some local government officials may face challenges in understanding. Data literacy and awareness are needed for this principle.</p> <p>Commercial users The challenge of application of the principle can be that unclear licensing of databases may set a barrier to use or contribution to it. Another challenge is diverse opinions of the involved stakeholders in which license to use, and whether to include share-alike and commercial use.</p> <p>Open data intermediaries This action principle may negatively impact the sustainability of some open data intermediaries' business models and, ultimately, the sustainability of the open data ecosystem. Hence, the necessity of this action principle should be reconsidered.</p> <p>Non-expert users: A challenge can be that commercial and institutional partners might not be willing to share their data and solutions under a CC license. Open data hackathons need to acknowledge the need to protect commercial interests of some of the actors involved.</p>
<p>5: Focusing on interoperability and data portability</p>	<p>NGOs the limited resources of the NGOs should be considered as to how they can be supported in their implementation and push for better interoperability.</p> <p>Local open government This principle needs to consider resources constrains and guidelines for data security and privacy.</p> <p>Commercial users The challenge in the application could be an increased barrier to non-technical users to contribute data to a given ecosystem, if user-friendly tools for it don't exist. A suggestion to the development of the action principle could be to mention that the implementation must be simple enough to not cause future barriers to stakeholders.</p> <p>Open data intermediaries Rephrase the action principle to be less abstract and avoid using terms that may have to be further defined. For example, this action principle can instead emphasize the adoption of interoperable formats/standards.</p>
<p>6: Economic sustainability through availability of public funds accompanied with insights</p>	<p>Journalists The exploration and utilization of different financial models for media organizations is needed so journalists can have the resources (money and time) to work with open data.</p> <p>Students</p>

Action Principle	Affected user types and adjustments
<p>from economic and business models</p>	<p>Building the networks and forming communities around students use of open data to solve real problems contribute to social sustainability.</p> <p>NGOs Funding can create biases in the motivations of NGOs as to which projects to prioritise and how to contribute back. Thus, the action principle should be approached cautiously, and mechanisms for this issue should be considered.</p> <p>Local governments This principle needs to consider inclusivity and accessibility in economic sustainability efforts and long-term planning capacity regarding local governments.</p> <p>Commercial users An action principle is proposed, where open data Ecosystems should be governed in such a way that personal or own stakeholder motivations (e.g. commercial users who want to improve the data in their own topic or area, because it directly benefits the data quality in their offered services) can be turned into social values and benefits for the whole community.</p> <p>Open data intermediaries Reconsider singling out "digital commons/information commons/data commons projects, in particular from collaborative peer production". It may not be necessary.</p> <p>Non-expert users: Alternative business models, which hold potential for project that struggle to attract traditional funding, but also require significant time and investment, should be considered regarding non-expert users.</p>

The presented challenges and suggestions for the development and enactment of the action principles will be considered further in ODECO's Work Packages 4 and 5.

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