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A 3D approach on European data cooperative as an intermediation service

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Abstract
Data has become a valuable resource due to the rapid growth of technology. Nevertheless, data has little value when held by its "collectors". The true value of data unfolds through its reuse, necessitating the role of data intermediaries to facilitate this process. From the data intermediation services, as employed in the Data Governance Act (DGA), we are going to discuss the data intermediaries organized in data cooperatives, which ensure the technical, legal, and logistical support for data transactions, according to the European framework. The aim of this paper is to analyze the role of the cooperative as a data-sharing intermediary within the European context. We will adopt a threefold approach, examining the topic from legal, psychological, and technical perspectives to achieve a comprehensive understanding. To accomplish our objectives, we will conduct a thorough literature review. The DGA does not specify whether data cooperatives are cooperative societies, whose primary function is to facilitate the reuse of data, or whether they are a form of cooperation between data subjects and one-person undertakings or SMEs (small and medium-sized enterprises), on the one hand, and potential data users, on the other. Therefore, we will consider both interpretations and make an effort to clarify the following: What type of organization is the data cooperative? What are the primary goals of the data cooperative as stated by DGA? What are the trigger issues and drawbacks associated with participating in a data cooperative from the legal and psychological perspective of a data subject and from the small entrepreneurs' point of view? Finally, we will briefly go over the technical solutions that will enable the data cooperative to operate as a cooperative society and, more broadly, as a data space across Europe.

Keywords: data, data cooperative, data intermediation service, DGA, data spaces

Introduction

With the rapid advancement of technology, data has turned into a valuable resource (König, 2022) for the "acquisition" and "governance" that not only private entities are "fighting" for, but also states or even continents (Ciuriak, 2021, p. 12). As such, data and data governance have taken on a geopolitical significance (König, 2022, p. 486).

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Although access to resources, regardless of their nature (oil, diamonds, minerals, etc.), is based on the ownership over them, when it comes to data, ownership is, at least legally speaking, taboo (Ungureanu, 2023). The *right of access* and the *right of control* over data are the two main legal bases for access to data under European rules, including the Regulation 2022/868 on European data governance aka Data Governance Act (DGA). The EU is more concerned with the big picture than with details, such data ownership. And the big picture is sovereignty over data, since data is the foundation for everything. To achieve this objective, it acts on several levels, both by adopting normative rules with broad applicability [such as, Regulation 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data aka GDPR, Regulation 2018/1807 on a framework for the free flow of non-personal data in the European Union, Directive 2019/1024 on open data and the re-use of public sector information aka Open Data Directive] or rules aimed at specific economic sectors (for instance, for alternative tourism, the Regulation 2024/1028 on data collection and sharing relating to short-term accommodation rental services; for health, Proposal for a Regulation on the European Health Data Space (European Commission, 2022)), which have extraterritorial effects and influence data circulation globally, as well as by financing projects meant to facilitate the establishment of an appropriate infrastructure.

Regarding infrastructure, the European Commission's plan to establish a Common European Data Space since 2018 is a step toward gaining sovereignty over data by building a single data market, which will guarantee Europe's competitiveness in the global market and counterbalance the practices of the Big Tech platforms, which currently hold data supremacy due to their economic strength and ability to exert market control over vast volumes of data (European Commission, 2024).

An important part of the action to conquer global data sovereignty is the creation of data spaces. And Data Spaces "can be understood as intermediaries and data sharing service providers" (Otto, 2022, p. 8), subject to the rules of the DGA.

1. Who is the data intermediary in European law?

In the DGA (art. 2.11) the *data intermediation service* is seen as a service provider, which establishes commercial relations "for the purposes of data sharing between an undetermined number of data subjects and data holders on the one hand and data users on the other, through technical, legal or other means, including for the purpose of exercising the rights of data subjects in relation to personal data (…)".

1.1. Conceptual boundaries

For clarity, we will first define the terms used by the European legislator in the DGA, which concern the data intermediary. The data is shared between the data holder and the data subject, on the one hand, and the data user, on the other.

Who is the data holder?

The data holder is considered to be "a legal person, including public sector bodies and international organisations, or a natural person who is not a data subject with respect to the specific data in question, which, in accordance with applicable Union or national law, has the right to grant access to or to share certain personal data or non-personal data" (art. 2.8. DGA). This means that the data subjects (in the meaning of the GDPR, natural persons, called data subjects - art. 4(1)), are not considered data holders regarding their own personal data or, in other words, regarding the data "produced" by them.

The data holder has the right to grant access to the data, which leads to the idea of *control* over the data, an idea repeatedly mentioned in the recitals (5, 22, 23, and 30) of the DGA.

Both the data holder and the data subject (who is not a data holder) can share the data. "Data sharing" means, according to art. 2.10. DGA, "the provision of data by a data subject or a data holder to a data user for the purpose of the joint or individual use of such data, based on voluntary agreements or Union or national law, directly or through an intermediary, for example, under open or commercial licences subject to a fee or free of charge".

The data user is "a natural or legal person who has lawful access to certain personal or non-personal data and has the right, including under Regulation 2016/679 in the case of personal data, to use that data for commercial or non-commercial purposes" (art. 2.9 DGA). The user can "obtain" the data directly from the holder/data subject or through an intermediary.

1.2. The profile of the European data intermediary

Data has little value when held by its "collectors". It becomes increasingly valuable through reuse. "What sets data apart from many other resources is their re-usability" (von Ditfurth & Lienemann, 2022, p. 272). Since they are non-rival goods (Caramidariu, 2022, p. 161; Podszun, 2017, p. 36), many data users can take advantage of the same data simultaneously or successively, without their value being diminished in any way (Custers & Bachlechner, 2017). "When a good is non rival, one person's consumption of the good does not diminish anyone else's benefit from consuming it" (Mazor, 2012, p. 2).

Data intermediaries have the role of facilitating the reuse of data. Data intermediaries "function as trustworthy organizers of data sharing or pooling within the common European data spaces" (European Commission, 2024). "A data space is

a distributed data integration concept" (Otto, 2022, p. 8). This means that there is actually no central data space per se, where the data is stored and from where data users can access and/or retrieve the data they need, but the data exchange takes place directly between the data holder and the data user (Otto, 2022, p. 8). The intermediary only provides the technical, legal or other means for the exchange to take place.

What are these technical, legal or other means?

Technical means refer to the infrastructure necessary to facilitate the meeting of data holders/data subjects with data users. This infrastructure may differ depending on the type of data intermediary, but usually involves the use of cloud computing technology (Bradshaw et al., 2011; Michels et al., 2023). According to recital 28 DGA, data intermediaries are, for example, data marketplaces, common European data spaces, data pools. In the DGA these notions are not defined.

In the legal literature, *data marketplaces* have been considered as two-sided matching platforms (von Ditfurth & Lienemann, 2022, p. 274). For instance, Dawex Global Data Marketplace[1], based in France, which is a kind of "a mixture of eBay, Amazon and Airbnb for data" (European Commission, 2017, p. 9), is a marketplace where an unlimited number of data holders and data users could meet with the purpose of commercial data sharing. Dawex does not only play the role of matchmaker, but also offers other services such as anonymization of data sets (from the category of "other means") and standard license agreements (which falls under the category of legal means provided by the intermediary), which, from an economic point of view, reduces the costs of concluding contracts between partners (von Ditfurth & Lienemann, 2022, p. 274).

Common European data spaces are *data infrastructures and governance frameworks, which facilitate data pooling, access and sharing* (European Commission, 2024), with specific key features.

Data pools mean the organizational structure where two or more data holders combine data sets and provide each other with access to the data in the pools, through an infrastructure (possibly, a cloud one). From a legal point of view, the intermediary could offer boilerplate clauses and standard contracts, which are to be concluded between the participants of the data pools (Wernick et al., 2020, p. 74). For instance, a data pool is provided by Jelbi[2], Berlin's comprehensive public transportation and sharing system (bus, train, e-moped, e-scooter, cycle, vehicle, and taxi).

Data intermediaries facilitate the sharing of data within the EU, having a key role in the "circulation" of data.

The DGA puts tight operating conditions on European data intermediaries, based on neutrality and trust, to prevent them from abusing their role and utilizing the data they have access to at the expense of data holders and users (as is the case

[1] Dawex Global Data Marketplace (https://www.dawex.com/en/legal/).
[2] Jelbi (https://www.jelbi.de/en/home/).

with Big Tech platforms). Art. 12 DGA, from (a) to (o), contains these (fifteen) conditions.

Bottom line, the data intermediary may not use the data in its own interest, and if it also provides other services, the provision of data intermediation service may not be dependent upon the use of these other services by the data holder or the data user. The data intermediary ensures access to the intermediation service in a fair, transparent and non-discriminatory manner for both data subjects/data holders and data users, including with regard to the service prices and conditions. The European data intermediary is bound to keep a log record of its data intermediation activity. Before starting the activity, the data intermediary must notify the competent authority regarding the data intermediation activity (art. 11, 13 DGA).

The imposition of such strict rules may have deterred potential data intermediaries. On January 24, 2024, only one European data intermediary, Dataspace Europe OY- Tritom[3], based in Finland (a limited liability company), was registered in the EU register of data intermediation services, as a requirement of the DGA (European Commission, 2024). In June, 2024, four new data intermediaries were added to the register (European Commission, 2024): NIDHAS[4] from Hungary, a limited liability company, and other three data intermediaries from France, all three organized as simplified joint stock companies: AGDATAHUB[5] (which acts in the agricultural and agri-food sector); Hub One Data Trust[6] (an airport data exchange platform); M-ITRUST[7] (which provides data intermediation services to customers in France, Germany and the Netherlands, in financial services, real estate, supplier compliance and online betting sites).

Three categories of European data intermediaries can be inferred from Article 10 DGA:

- data intermediaries that facilitate commercial relations between legal entities, i.e. between data holders and data users;
- data intermediaries that connect natural persons, whether they are data subjects or who make available their non-personal data, with potential data users;
- data intermediaries organized in the form of data cooperatives.

Next, we will focus on data cooperatives.

2. The data cooperative, as an intermediary according to the DGA

The idea of the data cooperative, as a means of counterbalancing the dominance of online platforms over users' personal data, came from one of the "tech-

[3] Dataspace Europe OY (https://www.dataspace.fi/en/homepage).
[4] NIDHAS (https://www.nidhas.eu/rolunk).
[5] AGDATAHUB (https://agdatahub.eu/en/mentions-legales/).
[6] Hub One Data Trust (https://www.hubone-datatrust.fr/en/).
[7] M-ITRUST (https://www.mitrust.eu/).

architects" of the GDPR, the American professor at MIT (Massachusetts Institute of Technology), Alex Pentland (Scholz & Calzada, 2021, p. 6). The systemic appropriation and capitalization of personal data by such corporations has managed to effectively marginalize the role and the potential remuneration of individuals in this new economic paradigm (Bühler et al., 2023; Scholz & Calzada, 2021). Against this backdrop, the emergence of data cooperatives can be compared to the emergence of labour unions in their aim to empower individuals and communities in managing and monetizing their personal data (Hardjono & Pentland, 2020).

However, it is not clear from the European regulation (DGA) whether "data cooperatives" is based on the Pentland idea of a cooperative with the structure of an enterprise or a cooperative society, which has as its main activity the facilitation of data reuse, or concerns a form of cooperation between data subjects and one-person undertakings or SMEs (small and medium-sized enterprises), on the one hand, and potential data users, on the other. Therefore, we will take into consideration both possible interpretations.

2.1. What is the data cooperative?

As an enterprise, the cooperative (Ungureanu, 2022) falls into the category of social enterprises. "A social enterprise is a company that seeks to do *well* (financially) while doing *good* (socially)" (Yockey, 2015, pp. 767-769).

According to art. 2(15) DGA, data cooperative is an organisational structure constituted by data subjects, one-person undertakings or SMEs who are members of that structure.

The DGA gives no information about the structure of the data cooperative and makes no mention of the European Cooperative Society (SCE) – under the Council Regulation No 1435/2003 of 22 July 2003 on the Statute for a European Cooperative Society-, traditional cooperatives, or their guiding principles. The term "organizational structure" is the sole one used in the DGA and gives no indication as to the legal structure or the goal (profit or non-profit) of the data cooperative. The data cooperative does, however, have a profit-making purpose, which is doubled by the social purpose that the very notion of cooperative implies (if we consider the cooperative as a society/an enterprise). This is because data cooperatives offer data intermediation services, and under art. 2.11 DGA, the data intermediary is seen as a service provider, which establishes *commercial* relations between data holders/data subjects and data users.

One of the data intermediaries registered in the EU, Tritom, Finland, declares in its activity notification (European Commission, 2024) that it includes, among the categories of intermediation services offered, services of data cooperatives. However, no information about a data cooperative, as a society/enterprise, could be found on the Tritom website. Tritom is described as an ecosystem and integration platform, which is a meeting place for developers of data-based services and data

holders, where data can be exchanged according to the rules agreed upon by the ecosystem. This could suggest that the term "data cooperative" was originally intended to refer to data cooperation and collaboration (Baloup et al., 2021) rather than data cooperative as a society.

At the same time, a platform called European Data Cooperative[8], "the most comprehensive database of European private equity and venture capital statistics", could lead to the same idea or just add ambiguity to the understanding of data cooperative, quite equivocal, already. The Health Data Cooperative[9], a European project based on a cooperative approach and not a cooperative society (Tanwar et al., 2021), has a similar approach.

2.2. What is the role of the data cooperative according to the DGA?

The data cooperative provides data intermediation services whose main objectives are:

- *supporting their members* in exercising their rights regarding certain data; the support consists, as well, in assisting the cooperative members to make informed decisions before they consent to data processing;
- *the exchange of views* on the purposes and conditions of data processing, which would best represent the interests of their members with regard to their data, and
- *negotiating terms and conditions* for data processing on behalf of their members, before giving permission to process non-personal data or before they consent to the processing of their personal data.

By including the data cooperative in the category of data intermediation service providers, an expected result would have been that of (direct) intermediation of data sharing. But the data cooperative does not, in any way, middle the transmission of data from data subjects or data holders to data users. According to DGA, the "mission" of the data cooperative is "located" in the pre-contractual stage, before any data are transmitted or exchanged between the data subject or data holder and the data user.

The only intermediation activity seems to be the negotiation of the terms and conditions for data processing on behalf of its members, even if this is more a representative action than an act of intermediation. In art. 12 DGA, dealing with the conditions for providing data intermediation services, no reference is made to the negotiation services. Only at point (m), it is mentioned that a provider of intermediation services for data subjects has to act in the data subjects' best interest, by informing and, where appropriate, advising data subjects in a concise, transparent, intelligible and easily accessible manner about intended data uses by data users and

[8]European Data Cooperative (https://www.investeurope.eu/research/about-research/data-collection/).
[9] Health Data Cooperative (https://digitalhealtheurope.eu/glossary/health-data-cooperative/).

standard terms and conditions attached to such uses before data subjects give consent. But informing and advising about the terms and conditions do not equal the negotiation, anyway. Beyond that, the task of negotiation could have an increased degree of difficulty if the potential data users are in an economic, financial or other superior position relative to the data cooperative. The negotiating role of the data cooperative may be less utilized simply because e-commerce is based on adhesion contracts rather than on negotiated ones. However, in the negotiation hypothesis, the cooperative would have a clearly superior bargaining power (Knapp et al., 2023) compared to that of each individual cooperative member (who would probably not even be able to initiate the negotiation procedure but would be obliged to adhere to the *take-it or leave-it* contract).

3. Data cooperative, as a cooperative society - beyond legal issues

In data cooperatives, "producers" of data get together to collectively pursue a social objective that may also yield profit. For example, cooperative members may seek to have their personal health data used for the purpose of research into treatments for various diseases. They may, also, allow access to their data sets to pharmaceutical companies for a fee. Another example could be a data cooperative in the gig economy service providers, like Driver's Seat[10], which collects gig workers' data through an app, stores it in its own database, and then sells it to the municipality or transport services, for the benefit of cooperative members. Driver's Seat is, however, an American cooperative, which does not operate in the EU.

What is the situation of data cooperatives in the EU?

The scientific literature is scarcely existent on this subject. Anyway, it seems that most of the data cooperatives are "in exploratory stages and few of the organizations exist beyond the concept" (Burmann et al., 2023, p. 6251). In practice, "data cooperatives have hardly played a role so far" (Knapp et al., 2023). There could be multiple reasons for this, including the funding of data cooperatives (Blasimme et al., 2018), the lack of commitment and confidence from individuals, who should first be convinced to organize themselves into cooperatives, and then actively contribute to their proper functioning. Another factor that can hinder the success of data cooperatives is the difficulty of "managing" data by cooperative members, especially from a technical point of view. When cooperative members belong to the category of one-member enterprise or small and medium-sized enterprises, data sharing can also cause risks regarding market competition.

[10] Driver's Seat (https://driversseat.co/).

3.1. Trigger issues and drawbacks in engaging into a data cooperative

Incentives and disadvantages seem to be different to individuals and one-member enterprise or SMEs.

The individual's or the data subject's standing in relation to the data cooperative

Through their online interactions, social media posts, gaming platforms, usage of smart devices (IoT), etc., the individuals "produce" a lot of data. Why "leave" the ease of usage of the major platforms like Google, Samsung, Apple, etc., which gather personal health data from users of their apps installed on smartphones, wearables, and other electronic devices (like Google Fit, Sami, and HealthKit) (Tanwar et al., 2021) and form or join data cooperatives that ask them to break out of their passivity?

One possible answer would be financial co-interest. Although the DGA provides that data sharing can be done for a fee, it is not clear how the cost of data sharing is determined or who assesses its amount. The solution seems to be contractual in nature, with data holders/data subjects and data users setting the price of data access through contracts. In price negotiation, the cooperative as an organization might have more bargaining power than an individual.

Perhaps the mere "promise" of payment in exchange for access to personal data is not enough to establish and manage a data cooperative. The individuals already receive services in exchange for data from the major platforms without making any additional effort. In order to partake in a personal data cooperative, individuals must furthermore "bring" the data that these platforms have gathered. In this way, they can exercise their right to data portability thanks to the GDPR. In accordance with GDPR Article 20, data subjects are entitled to request that the data controller return their personal data in a format that is structured, widely used, and machine-readable. They also have the right to transfer their data to another controller, such as the data cooperative they have joined.

Participation in data cooperatives allows users beyond the financial gain from the use of their data ("monetize" their data), to *control* their data. Individuals' propensity to share personal data significantly increases when they perceive a high level of control and autonomy over the data-sharing process. To achieve such autonomy, individuals must be able to have decision-making power over several key aspects: (1) their willingness to share any of their personal data. This aspect underscores the foundational right of individuals to choose if they want to partake or not in data sharing activities and is the base layer of autonomy in this context; (2) their ability to choose which specific pieces of information they want to share and the degree of detail they wish to divulge. Individuals must be able to customize the volume of personal data they reveal based upon the specific circumstances of each data-sharing situation and their level of trust in the person or entity receiving the

data; (3) their ability to select which entities are granted permission to access their shared data. This decision should be based on the individuals' own set of criteria, which might include factors such as the entity's reputation, the purpose for data use, or previous experiences with the entity (Hajli & Lin, 2016; Raban & Rafaeli, 2007).

Participation in cooperatives of any kind is heavily influenced by perceived benefits. Belonging to the technology acceptance model, perceived usefulness, was found to be crucial in the way that individuals accept or reject innovation (Ma & Liu, 2004; Schnall et al., 2015), and, in this case, data cooperative participation. Showing potential participants all the benefits they can get, such as financial rewards, new knowledge, or helping the community, can play a key role in increasing data cooperative interest and participation. By making the monetary rewards visible to participants, data cooperatives can tap into the practical consideration of personal gain. Financial incentives have been shown to generally increase the individual's intention to engage in different voluntary behaviour, such as participating in research activities or leaving online reviews (Kelly et al., 2017). In the same vein, another potential motivator could be the emphasis on the community gains resulting from their participation in data cooperatives. Some individuals are more responsive to community gains, drawn either by their role in contributing to the community success (Hoisl et al., 2007), or by the knowledge that their contribution leads to significant impacts within that community (Battistella & Nonino, 2012). For others, collectivism may be an important value, thereby making the communal benefits offered by their involvement in data cooperatives particularly attractive (Batson et al., 2002). Regardless of whether individual or collective, gains are a strong lever that can encourage participation in data cooperatives.

Despite these drivers, there are significant obstacles to the large-scale adoption of data cooperatives by individuals. Aside the technological and legal hurdles, there are some psychological factors that need to be considered. First, there is the issue of trust amongst data cooperative participants and towards the data cooperative as structure. Trust in technology and in technological advances has been shown to be important in their acceptance as well as intention to use (Choi & Ji, 2015; Hansen et al., 2018). Cooperation involves, often, a certain level of vulnerability because, at any given point, the individual, or the community, is at risk of exploitation by other cooperative members. Other cooperative members might contribute less or gain more advantages for the same contribution (Kuipers, 2022), thus creating a disadvantage for the individual. Perceived trustworthiness plays a critical role in both interpersonal and organizational contexts, facilitating cooperation and collaboration across various settings. The absence of trust or perceived trustworthiness significantly hinders the ability to create and maintain strong and healthy relations with the others around, to communicate openly, and to reduce conflicts that can arise in collaborative settings. Perceived trustworthiness is built on ability, benevolence, and integrity (Mayer et al., 1995) and has the potential to reduce perceived risk and increase cooperation.

Another potential barrier in the participation of individuals to data cooperatives could be the perceived difficulty. Any cognitive system has limited resources and most humans prefer to be conservative in the way they choose to use them (Tomm et al., 2023). Perceived difficulty, therefore, plays a very important role in the decisions individuals make regarding their behaviour. If the desired behaviour is perceived as having low difficulty, the probability of an individual to engage in it increases while if a behaviour is perceived as having a high difficulty level, the willingness and probability to engage decreases significantly (Davis, 1989; Sugandini et al., 2018). Individuals can be incited to engage in behaviours with high-perceived difficulty through financial stimulants or other factors, but regardless of the financial incentives or other factors used to stimulate data cooperative attractiveness, after a certain threshold or period of time, if the perceived difficulty remains high, individuals might become less interested in engaging in the task. Previous findings, linked especially to financial incentives, show that, in medical research, the anticipated adversity of the treatment leads to lower intention to take part in the research (Korn & Hogan, 1992). Other findings highlighted that with the increase of the cognitive difficulty the task, the financial incentives cannot deter poor performance, especially on the long term. Data cooperatives participation require more knowledge and understanding of various aspects linked to personal data such as data storage, data manipulation, and data protection that were not obvious to the average user until now, and from which most users have been shielded. Therefore, the typical user may view the investment required to join a data cooperative as outweighing the potential advantages of membership.

The one-person undertakings or SMEs standing in relation to the data cooperative

The benefits of data cooperatives appear to outweigh the financial gain for small entrepreneurs (individual or organized in SMEs). They might unite behind the idea of leveraging the shared data within the data cooperative in a variety of ways, essentially expanding their business, ensuring market competitiveness, and competing with major players in their industry.

Many domains are suitable for data cooperatives, among which delivery services, urban transport (as in the American Driver's Seat example), agriculture, short-term rentals (Airbnb type) and so on.

In agriculture, farmers already incorporated in cooperatives (or not) could create a data unit of the cooperative as a separate entity, in order to optimize production, soil fertilization, harvesting, etc. (Geminn et al., 2023). In this sector, an American example is worth mentioning, The Grower's Information Service Cooperative (GISC), with its seat in Texas, USA, which "is a farmer owned national data cooperative that provides producers worldwide with digital data tools obtained through strategic partnerships. By being a part of GISC, producers can maximize

their production and efficiency by having access to premier weather and data analytic platforms. Producers can also benchmark their operational data with other members of GISC, allowing them to make the best decisions for their business"[11]. United in data cooperatives, farmers could cope with unforeseen situations by relying on digital data shared within the cooperative, which can provide the necessary infrastructure that farmers are not financially able to develop (Knapp, 2023).

The short-term rental market, which is a component of the sharing economy, is another economic sector where the data cooperative might function well. Although its primary activity is not data intermediation services, Fairbnb[12], an Italian cooperative based in Bologna, may serve as an example of a functional cooperative. When Fairbnb and Airbnb are compared, it is evident that the former is in an inferior market position compared to the latter. While far to a less extent compared to that of the market leader, Fairbnb's selection of short-term rentals is, nonetheless, present. It is probable that the organization of cooperatives of the Fairbnb type will draw attention given the detrimental impacts of mass tourism on local communities (Colomb & Moreira de Souza, 2023) that are promoted by platforms like Airbnb.

Health data can be shared through a medical data cooperative. As a rule, such cooperatives do not allow commercialization of data access, but are part of organizations with altruistic goals (like MiData[13] and Salus[14]).

Small businesses, as data holders, could be part of: cooperatives of data holders competing on the market (rivals); cooperatives with members who are not competitors, because each operates on a different national market; cooperatives where members come from related sectors of activity and put data together for a common purpose; and cooperatives having members from other sectors of activity, but who are partners (Geminn et al., 2023, p. 23). For example, an SME could share data with its suppliers to help them provide services and develop better products, which would also indirectly benefit the SME (Geminn at al., 2023).

The sharing of small business data through cooperative collaboration can also encounter significant challenges, primarily related to market rivalry and partner trust (Bühler et al., 2023).

Even though large corporations are not allowed to become members of data cooperatives under the DGA's requirements (as they are not "constituted by data subjects, one-person undertakings or SMEs"- art. 2.15 DGA), they may be able to access cooperative data as data users. This could leave small businesses exposed in the market. Should corporations be unable to obtain the data in this manner, acquiring a small firm that is already a member of the cooperative would be an additional means of gaining access to all data (Geminn et al., 2023, p. 25).

[11] Grower's Information Service Cooperative (GISC).
(https://datacollaboratives.org/cases/growers-information-service-cooperative-gisc.html)
[12] Fairbnb (https://fairbnb.coop/terms-of-use/).
[13] MiData (https://www.midata.coop/en/home/).
[14] Salus (https://www.salus.coop/).

3.2. Technical solutions for the data cooperative functioning

According to the DGA, data intermediaries organize the sharing of data by providing the *technical, legal or other means* for the exchange to take place.

Technical means in the case of data cooperative, as a cooperative society

The cooperative may employ data sharing through its own infrastructure, if there is one or, in the absence of an infrastructure, the solution is to use a cloud provider. Cloud computing subjects the datasets of the cooperative members to considerable risks: storing data in multiple data centres by multiplying them; the subcontracting, frequently used in this type of business; storage in data centres located under jurisdictions with regulations that may require data disclosure under certain conditions; the imposition by the cloud provider, usually with great economic power, clearly superior to the cooperative and its cooperative members, of standard contracts of adhesion which the cooperative cannot therefore negotiate, etc. As a result, taking these chances may put cooperative members' data at risk of being acquired by Big Tech and their control being lost, bringing them back to the starting point. In addition, cloud storage also incurs costs.

To overcome the risks of using cloud computing, and especially those regarding the disclosure of data and the transfer of data outside the European space, various European projects have been initiated, such as, for example, the European Cloud Alliance[15] and Gaia X[16], to ensure an infrastructure of a European cloud, a *federated cloud infrastructure*.

Regarding personal data, if it is not the cooperative that manages the data, but the cooperative members, using the technology made available by the cooperative, then the members, as data subjects, can benefit from the protective rules of the GDPR. If, on the contrary, the cooperative manages the data *on behalf* of the cooperative members, then it seems that the only guarantee of the data cooperative when transferring personal or non-personal data to the cloud is the contract with the cloud provider. Beyond the contract, the cooperative cannot benefit from the protection offered by the provisions of the GDPR, as they concern only the "producer" of personal data, a natural person.

An alternative to cloud computing is the blockchain storage, which is also a kind of cloud, but decentralized. Blockchain storage allows the storage of data in a decentralized network, which uses the free/unused space of users' hard drives, where encrypted data sequences are stored and thus spread all over the world (Kanade, 2021). An example of a blockchain storage provider is STORJ - Decentralized Cloud

[15] European Cloud Alliance (https://www.europeancloudalliance.com/).
[16] Gaia X (https://gaia-x.eu/).

Storage[17], which advertises its services: "Don't store your data anywhere. Store it everywhere".

Data sharing can also take place without data storage, directly between data holders/data subjects and data users by using connectors, i.e. software provided by the data intermediation service. For example, TNO Security Gateway, a connector that companies can use to participate in international data spaces, decentral platforms that allow for sovereign and secure data exchange[18]. This connector is used, for instance, by a data space in the Netherlands, the Smart Connected Supplier Network[19].

Data cooperatives as data intermediaries, according to the DGA, do not ensure the actual sharing of data between its members and potential users, but only facilitate their interaction in the pre-contractual stage. Under these circumstances, is an infrastructure really necessary, or can the cooperative members keep their data "in house" and rely only on the cooperative for guidance, recommendations, and assistance with contract negotiations? In any case, the actual data transfer or availability would occur via the use of common European data spaces following the cooperative's role termination.

Technical means for European data spaces

Data intermediaries could be divided into five abstract types: closed data governance models (for non-personal data), single source data governance models (for instance, the case of data from the automotive industry), clearinghouses (a concept borrowed from the financial instruments domain, in which a neutral intermediary or a collective/group facilitates data sharing), data pools, and distributed data governance models (in which "decentralized access may be facilitated by model contractual clauses, which are similar to the Creative Commons copyright license model") (Wernick, 2020, p.70).

Data cooperatives could, at least, fit into the clearinghouse model (*Information Clearinghouse*) (Wernick, 2020, p.72), as, according to DGA, they only facilitate the data sharing in the pre-contractual stage, before any data are transmitted or exchanged.

There are various platforms and applications for sharing personal and non-personal data, both commercial (Ocean Protocol[20]) and non-governmental organizations (like Fair Data Society[21]). From a technical point of view, this type of platforms focuses on data exchange and their integration through dedicated APIs,

[17]STORJ - Decentralized Cloud Storage (https://www.storj.io/).

[18]TNO Security Gateway (https://www.tno.nl/en/newsroom/2024/03/data-spaces-certification/?utm_source=linkedin&utm_medium=social&utm_content=ISP&utm_term=TNO+digitaal).

[19] Smart Connected Supplier Network (https://smart-connected.nl/nl).

[20] Ocean Protocol (https://oceanprotocol.com/).

[21] Fair Data Society (https://fairdatasociety.org/).

the storage technology being that of blockchain. Considering that both platforms are open source, they can be taken over and developed by communities interested in data sharing.

In our understanding, the success of the development of data cooperatives is closely related to local or professional communities. Since the access to such data arouses the interest of many companies or organizations that may look for cheap access solutions, at the limit of legality, the organizers and administrators of data cooperatives must ensure advanced mechanisms for the *identification and authentication of members*. Since a person can have multiple virtual identities (different email addresses and social media profiles, access information to services and utility providers, and so forth), in addition to the traditional security and confidentiality measures and the deployment of efficient techniques for authentication and access control, it is necessary to ensure elements for managing members' digital identities and, potentially, a federalization mechanism for access to various platforms.

The storage and the management of data require the implementation of scalable and distributed solutions and, at the same time, in order to preserve the destination value of the data, a high availability of data sharing and access platforms must be ensured by clear access policies and by implementing technical measures of availability.

If authentication and storage technologies are currently mature enough to provide platform stability, we believe that many technical issues can be driven by the *data governance process*. Documentary, it seems quite simple to create a transparent and democratic framework for data-related decision-making, but the practical implementation by defining specific access roles (data holder/data subject, data user) can create problems in the implementation of some mechanisms of access control and auditing, especially in the case of multiple roles (when a community member is, at the same time, a declared user of the data). Last but not least, as specified, it is necessary to ensure compliance with data protection regulations (GDPR) and, in particular, the unauthorized transfer of data to certain entities. Data loss prevention (DLP) technical solutions are still a major challenge for automatic data classification, especially in the context of its diversity. Also, in this context, the cost of these tools is challenging.

The data cooperative should make sure that interoperability protocols are in place to make data sharing and interconnecting as simple as possible in order to maximize the value of the collected data. In order to do this, common protocols and standards for data interchange and storage must be developed, and platform and tool compatibility must be guaranteed. Technically speaking, APIs using JSON or even XML data sets may guarantee data transmission without any issues these days. The challenge lies in characterizing the data to guarantee interoperability. At present, JSON lacks a mechanism of a regulatory scheme akin to XML or XBRL, which is

more focused on financial data and has been embraced by the majority of EU member states.

Solving these technical issues is critical to the success of data cooperatives. Addressing these challenges will require collaborative efforts by software developers, data experts, policy makers, and members of data cooperatives.

Conclusions

The DGA's introduction of the data cooperative in the European space is beset by ambiguities, which will make its application in the data sector in Europe challenging. The term "data cooperative" itself is unclear; it can refer to both a cooperative society and data cooperation inside a data space. Whatever its interpretation, the data cooperative's only function is to facilitate data sharing by providing advice, recommendations and possibly helping to negotiate the contractual clauses of the data sharing agreements. This ambiguity acts on the intentionality of individuals and small entrepreneurs to adhere to such structures, making the implications and the level of effort required in joining a data cooperative rather difficult to understand.

The DGA comes with a plethora of limitations and duties for the European data intermediaries, and with no obvious economic, social, legal or technical incentives to support the creation of data cooperatives, either cooperative societies or cooperation in data sharing. These limitations hamper even further the citizen's and small entrepreneurs' interest in joining data cooperatives, especially due to the high level of difficulty and effort from their part in navigating the conditions needed to be a member. This could also be the reason why only one data intermediary is currently registered in the European register. The scarcity of data intermediaries translates into a lack of awareness among citizens, who might not even know that they could have such control over the use and monetization of their data. As mentioned earlier, the benefits (financial or otherwise) proposed by data cooperative participation must at least surpass those that are already available to citizens (use of services with no effort from their part) in order to make such endeavour attractive.

To guarantee that the EU has a role in global data governance, different legislative and administrative measures are implemented for the construction of data spaces, which act as data intermediaries. In this sense, Gaia X can be seen as the pioneer of a European federated cloud infrastructure and data intermediary.

We leave the practice up for decision in the relatively near future, hoping that the European attempts to acquire data sovereignty would be successful, as this "fight" is indirectly linked to the welfare of European individuals.

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