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Orchestrating distributed data governance in open social innovation

Thomas Gegenhuber [a,c,*], Johanna Mair [b], René Lührsen [c], Laura Thäter [a]

[a] Johannes Kepler University Linz, Austria
[b] Hertie School, Germany; Stanford University, USA
[c] Leuphana University Lüneburg, Germany

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ABSTRACT

Open Social Innovation (OSI) involves the collaboration of multiple stakeholders to generate ideas, and develop and scale solutions to make progress on societal challenges. In an OSI project, stakeholders share data and information, utilize it to better understand a problem, and combine data with digital technologies to create digitally-enabled solutions. Consequently, data governance is essential for orchestrating an OSI project to facilitate the coordination of innovation. Because OSI brings multiple stakeholders together, and each stakeholder participates voluntarily, data governance in OSI has a distributed nature. In this essay we put forward a framework consisting of three dimensions allowing an inquiry into the effectiveness of such distributed data governance: (1) openness (i.e., freely sharing data and information), (2) accountability (i.e., willingness to be held responsible and provide justifications for one's conduct) and (3) power (i.e., resourceful actors' ability to impact other stakeholder's actions). We apply this framework to reflect on the OSI project #WirVsVirus ("We versus virus" in English), to illustrate the challenges in organizing effective distributed data governance, and derive implications for research and practice.

1. Introduction

Addressing complex societal challenges, such as inequality, the public health crisis, and the lack of social and economic progress in many parts of the world requires new approaches in research and practice. Notwithstanding research across management (e.g., George, Howard-Grenville, Joshi, & Tihanyi, 2016) and information systems fields (Becker, Vom Brocke, Heddier, & Seidel, 2015; Majchrzak, Lynne Markus, & Wareham, 2016) exposing a broad range of challenges considered 'Grand Challenges', researchers have made little progress in developing a practical, useful theory regarding efforts and approaches to tackle these challenges (see Seelos, Mair, & Traeger, 2022 for a review). In this essay, we focus on a new approach to tackle complex societal challenges: open social innovation (OSI).

OSI refers to a participatory approach and process involving multiple stakeholders (citizens, organized civil society, and the public and private sectors) in the idea generation process of developing and scaling solutions to make progress on such challenges (Mair & Gegenhuber, 2021). In an OSI process, challenges are identified, problems are specified, and solutions are created collectively. The

Abbreviations: OSI, Open Social Innovation.

* Corresponding author.
E-mail addresses: thomas.gegenhuber@leuphana.de (T. Gegenhuber), mair@hertie-school.org (J. Mair).

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assumption that complex societal challenges are 'wicked problems', and defy 'simple', scalable problem-solving approaches is central to OSI.

Organization scholars have examined OSI as a concept in relation to digital platforms like OpenIDEO and, in the context of social innovation projects initiated in response to the pandemic, such as #WirVsVirus and #EUvsVirus (Bertello, Bogers, & De Bernardi, 2021; Fayard, n.d., forthcoming; Mair & Gegenhuber, 2021). For example, the virtual #WirVsVirus hackathon and its follow-up implementation program supported digitally-enabled solutions, such as fostering social connections despite lockdown, building a contact registration app for restaurants, organizing online school tutoring, or digitalizing the communication of religious communities that became particularly salient during the pandemic.

These examples underscore the importance of digital technologies and data for OSI (Gegenhuber, 2020). In OSI projects people share, produce, and collect data, make use of data to understand social problems and, if applicable, develop digitally-enabled solutions. Hence, data governance is essential for orchestrating OSI. Orchestration in this paper refers to the organizing activities bringing together multiple stakeholders to tackle societal challenges (Mair, Gegenhuber, Thäter, & Lührsen, 2023). Data governance is central to orchestration as it encompasses values, rules, practices, and infrastructure that enable or constrain the storing, sharing, and processing of data (Abraham, Schneider, & vom Brocke, 2019; Winter & Davidson, 2017). Hence, data governance is crucial to coordinate innovation in an OSI project.

Coordinated innovation in the OSI context refers to matching interaction and collaboration of the various stakeholders, with problems and ideas for solutions. Digital tools such as Slack, Zoom, GitHub, Wordpress, Google Docs, Dropbox, and others enable actors to meet and collaborate online to freely share problem and solution information and data (Barrett, Oborn, & Orlikowski, 2016; Leonardi & Vaast, 2016; Nonaka, Von Krogh, & Voelpel, 2006). Digital technologies can enhance or amplify data exchange in social innovation (Huang, Henfridsson, Liu, & Newell, 2017; Yoo, Henfridsson, & Lyytinen, 2010). Open data and open source repositories, digital platforms, cloud technologies, 3D printers, and AI services allow actors to rapidly design, test and deploy applications, websites, chatbots or other (digital) products and services (Johnson & Robinson, 2014; Lifshitz-Assaf, Lebovitz, & Zalmanson, 2021; Nambisan, Lyytinen, & Song, 2017; Yoo et al., 2010; Yoo, Boland, Lyytinen, & Majchrzak, 2012). Moreover, digitally-enabled solutions have the potential to scale up quickly (e.g., serving more people) due to the digital goods' low variable cost structure (Henfridsson, Nandhakumar, Scarbrough, & Panourgias, 2018; Huang et al., 2017; Lakhani, Lifshitz-Assaf, & Tushman, 2013).

In the OSI multi-stakeholder context where actors participate voluntarily, data governance is distributed – no single actor commands entirely the data governance. This raises several questions: how stakeholders share data, who is accountable for what and to whom, and how power imbalances among actors affect data governance? Exploring these issues addresses the recent literature, which highlights the need to investigate data governance beyond single organizations and the corporate sphere (e.g., Micheli, Ponti, Craglia, & Berti Suman, 2020).

From this vantage point we set out to clarify distributed data governance's role in orchestrating OSI. We draw on our research on #WirVsVirus, an OSI project, to tackle complex societal challenges that emerged in light of the COVID pandemic in Germany.

Digital technologies and data played a major role in coordinating #WirVsVirus innovation: all involved stakeholders met and collaborated online, and many citizen innovators worked on digitally-enabled solutions. Thus, the case of #WirVsVirus allows us to expose data governance challenges, and advance the understanding of effective data governance in the OSI context. In this article, we refer to data governance as effective if it assists stakeholders to make progress on resolving societal challenges. Thereby, our data governance exploration builds on several contributions to this special issue (Hillebrand et al., this issue; Jarvenpaa and Essén, this issue; Paparova et al., this issue), which began to show that data governance emerges as a societal question as well – with broad implications beyond the corporate sphere.

We first reflect on the use of digital technologies and data to develop solutions for social problems. We elaborate on moving from civic hackathons to OSI, and provide more details on #WirVsVirus. Reflecting on OSI as a multi-stakeholder phenomenon, we devise a conceptual framework consisting of three dimensions for assessing the effectiveness of distributed data governance in OSI: openness focuses on actors sharing data and information, accountability clarifies who is responsible for what and to whom, and power recognizes that some stakeholders possess more resources than others, which impacts actions, interactions and OSI process dynamics. We then apply this framework to selected examples to illustrate the distributed data governance challenges in #WirVsVirus. We close our essay with implications for research and practice on data governance and OSI at the intersection of information systems research and organization studies.

2. Digital technologies and data for addressing societal challenges: Moving from civic hackathons to open social innovation

Open data, a prominent concept, explores how data sharing and digital technologies use can assist in addressing societal challenges (Splitter, Dobusch, Von Krogh, Whittington, & Walgenbach, 2023). Open data emphasizes the availability of public datasets in machine-readable format for free use. Civil society and (social) entrepreneurs, in turn, can use these data sets for public value creation through digital innovation. Creating public value implies that a digital innovation is beneficial for society (Heimstädt & Reischauer, 2019; Linders, 2012; Noveck, 2009). Examples of solutions based on open data applications include transparency apps that track politicians' voting records in legislatures, or the use of geo-spatial data to understand and visualize urban planning and transportation challenges (Loutas, Varitimou, Peristeras, & Galway, 2012; Open Geospatial Consortium, 2021). In a similar vein, the literature on peer production, user innovation, open source, and open science suggests that freely sharing data is essential for coordination and innovation to create public value context (Benkler, 2016; Browder, Aldrich, & Bradley, 2019; Leone, Mantere, & Faraj, 2021; von Hippel, 2005, 2017). For instance, open source software and open datasets are vital for the climate research community (e.g., Hartin, Patel,

Schwarber, Link, & Bond-Lamberty, 2015; Wolkovich, Regetz, & O'Connor, 2012).

In addition, prolific literature emphasizes the importance of mobilizing people to harness the digital technologies and data potential for solving societal problems (Browder et al., 2019; Robinson & Johnson, 2016), and cites hackathons as a commonly used case for such mobilization (e.g., Irani, 2015; Johnson & Robinson, 2014; Lifshitz-Assaf et al., 2021).

In civic hackathons, an organizer makes an open call to action to the general public to solve a problem. Hackathons often take place on weekends to create time for focused work on a problem. The participants sign up for the hackathon, meeting up virtually, or at a specific location, form teams to work on particular challenges, and develop solutions, usually prototypes, concepts or designs. At the end of the hackathon the teams present their solutions (e.g., pitch or video), and a jury (or a public voting) selects winners. Clearly, hackathons are an intensive, time-compressed event where people invest much energy, where participants experience the thrill and fun of solving a challenge together, and also network with and learn from other like-minded people. Moreover, hackathons celebrate participants' entrepreneurial spirit, and empower participants by showing that they can fix social problems through action (Endrissat & Islam, 2022; Falk-Olesen & Halskov, 2020; Irani, 2015; Zukin & Papadantonakis, 2017).

Governments and NGOs use civic and open data hackathons to encourage civil society and entrepreneurs to utilize available data sets, and recombine the data in innovative ways to extract public value (Mergel, 2015; Yuan & Gasco-Hernandez, 2021). Recently, hackathons played a key role in bringing a variety of actors together to address the COVID-19 pandemic challenges (Bertello et al., 2021; Happonen, Tikka, & Usmani, 2021; Mendes et al., 2021). This essay focuses on an OSI project, #WirVsVirus that integrated a hackathon as part of an OSI process (Mair & Gegenhuber, 2021).

We studied #WirVsVirus as an independent research team, but in close interaction with its organizers and #WirVsVirus participants over a 12 month period (from March 2020 until February 2021). Our learning partnership approach (Mair, Gegenhuber, Lührsen, & Thäter, 2022) can be considered an engaged scholarship variant (Hoffman, 2021; Van de Ven, 2007).[1] #WirVsVirus emerged in response to the COVID-19 pandemic. A civil society organizations consortium organized the hackathon, which took place on the first lockdown weekend. The German federal government agreed to serve as the event's patron, and within a week they mobilized 26,581 participants from all societal sectors. Over the course of 48 h, citizen innovators gathered in teams and generated a total of 1494 project ideas. After the hackathon the organizers set up a six-month implementation program, from April 2020 to September 2020, to support 130 teams to further develop, integrate, and scale up their ideas. This program consisted of several elements, such as mentoring (e.g., weekly mentorship meetings), skill training (e.g., how to pitch ideas to stakeholders), networking opportunities (e.g., bringing citizen innovators in touch with possible scaling partners), and resource access (e.g., opportunities to apply for stipends, access to pro-bono resources). The federal government and private foundations provided funds for operating this program.

#WirVsVirus is an interesting case for two reasons. First, the virtual hackathon, intended as one design element in the OSI process, became an integral part of a process, rather than a stand-alone event. This allows hackathons to, not only bring together, and energize people to work on a solution (Endrissat & Islam, 2022; Zukin & Papadantonakis, 2017), but also to ensure the continuation of momentum and progress made during the hackathon (Falk-Olesen & Halskov, 2020). Second, we observed the data governance's impact on digitally-enabled solutions' effectiveness in OSI. For instance, by providing digital infrastructure or open source support and open data solutions, OSI shaped the way actors coordinated innovation. Our OSI concept is based on our analysis of this phenomenon and key insight from the open and user innovation literature, namely that although ideas and capabilities for developing potential solutions might exist, they are unevenly distributed in society, and need to be mobilized (Mair et al., 2023; Mair & Gegenhuber, 2021). The open call to rally people serves as an incentive to act and helps to put 'idle' resources to productive use (Bauer & Gegenhuber, 2015; Jeppesen & Lakhani, 2010; McGahan, Bogers, Chesbrough, & Holgersson, 2020; von Hippel, 2005, 2017). OSI requires orchestration and encompasses four phases: mobilizing, bundling, curating and scaling (Mair & Gegenhuber, 2021): Mobilizing refers to rallying stakeholders to take action; bundling creates a space for stakeholders to explore problems and co-create, develop, exchange and assemble ideas for solutions; curating helps to sort out unsuitable solutions and channel support for promising solutions, lastly, scaling links innovation to impact by delivering solutions to more people, and/or improving their efficiency and effectiveness over time (Mair et al., 2023; Mair & Gegenhuber, 2021; Seelos & Mair, 2017; Seelos & Mair, 2020).

In summary, #WirVsVirus, as an OSI project, depended heavily on data and digital technologies to generate ideas, develop solutions, and make progress on societal challenges. In order to evaluate distributed data governance's effectiveness in OSI, in the next step we present a conceptual framework.

3. Distributed data governance in open social innovation: Openness, accountability and power

Because much of the existing research on data governance tends to focus on the corporate perspective, and views data as a valuable asset (Khatri & Brown, 2010), this literature often addresses issues such as data strategy, data quality, and data security (Abraham et al., 2019; Alhassan, Sammon, & Daly, 2016; Khatri & Brown, 2010; Micheli et al., 2020). However, recent studies have started to consider data governance's role in multi-stakeholder ecosystems (Abraham et al., 2019; Jernite et al., 2022; Lis & Otto, 2021), and the importance of data governance beyond just the corporate realm (Hillebrand et al., this issue; Jarvenpaa and Essén, this issue; Paparova

[1] We observed the projects' activities in real-time. We conducted semi-structured interviews with all relevant stakeholders (teams, organizers, supporters, as well as political and civil society organizations), analyzed documents (e.g., media articles) and online data (e.g., the collaboration platform Slack). Overall, we conducted 200 interviews and engaged in 650 h of real-time participant observation. In our role as learning partners, we created a respectful, collaborative environment for joint learning with all actors and institutions involved in addition to regular exchange with the organizers.

et al., this issue). We build on these recent insights following an OSI project. We theorize that a multi-stakeholder phenomenon, such as OSI, where several stakeholders come together voluntarily, requires distributed data governance.

Who are the stakeholders in OSI? We cluster the *core stakeholders* according to their roles: the *organizer, participating teams, supporters* and *patrons*. The organizer, which can be a public sector organization, NGO, (social) enterprise, or a consortium, orchestrates the OSI process with the goal of progressing on societal problems (Battilana & Kimsey, 2017; Diriker, Porter, & Tuertscher, 2023; Mair et al., 2023). Participating teams are typically composed of citizen innovators with various professional backgrounds who volunteer their resources to address societal problems (Gregg, 2015). Supporters are usually donors, NGOs, private sector organizations, or universities. For example, supporters contribute resources to assist teams in their efforts by mentoring teams or serving as scaling partners. A patron is an actor with considerable resources and prestige. Patronage attracts other stakeholders, lends legitimacy to an OSI project and may lead to monetary support for organizers and participating teams. Through their participation in OSI, these core stakeholders interact with concerned stakeholders, which include clients utilizing solutions, media, and other communities (e.g., activist groups).

We suggest that three dimensions determine effective distributed data governance, namely *openness, accountability* and *power*. In what follows we define each dimension and elaborate on how each dimension matters for distributed governance (see Table 1 for an overview).

First, *openness* involves freely sharing data and information, and is important because it removes barriers to coordination and innovation among multiple stakeholders. Building on openness literature (open government, open data, open source and open science) we suggest that openness in data governance can manifest in several ways: open data, API automating data exchange among several actors, data cooperatives or data sharing pools enabling data exchange among previously unconnected actors (Janssen, Charalabidis, & Zuiderwijk, 2012; Linders, 2012; Mergel, 2015; Micheli et al., 2020; Noveck, 2009; von Hippel, 2017). Open data governance may also include supporting open-source software development, which fits to the values of openness because such software is a contribution to the commons (Benkler, 2016). Openness in data governance supports coordination and digital innovation (Barrett et al., 2016; Henfridsson et al., 2018; Wessel, Baiyere, Ologeanu-Taddei, Cha, & Blegind Jensen, 2021; Yoo et al., 2010): it eases data sharing and collaborative data creation (e.g., to better understand a problem), and makes it more likely to recombine, reuse and reprogram existing resources. Such openness contrasts sharply with a 'closed' data governance, which favors centralized control, ownership, and secrecy. Closed data approaches likely foster data silos, cementing the status quo, and are instrumentalized to protect existing power positions (cf. Lee, Zhu, & Jeffery, 2018).

Second, *accountability* implies that actors provide explanations or justifications for their actions (i.e., willingness to be held responsible; Ebrahim, 2010; Ebrahim & Weisband, 2007; March & Olsen, 1995). Accountability is relevant in a multi-stakeholder setting because it allows for scrutiny of the actors' conduct in terms of for *what* and to *whom* they are accountable (Ebrahim, Battilana, & Mair, 2014). Literature on data governance and digital responsibility suggests that actors are accountable for issues such as data quality, data security and IT infrastructure. This includes weighing the consequences and appropriateness associated with data-driven solutions in terms of security, privacy, or other forms of potential harm (Abraham et al., 2019; Micheli et al., 2020; Trittin-Ulbrich & Böckel, 2022; Yallop & Aliasghar, 2020). OSI creates a dense network of responsibilities: from organizers to participating teams and supporting actors, media, or other interest groups, from participating teams to organizer and prospective clients, from supporting actors to organizer, teams and media. Behn (2004, p. 63) suggests that in complex multi-stakeholder relationships, it makes sense to think of "mutual and collective responsibility" and devise an "accountability arrangement that binds these people together as partners, so they feel responsible to each other".

Third, we adopt a relational perspective to *power* and define it in terms of to what degree one actor (A) can influence the decisions and another actor's conduct (B) because A controls resources that B desires (Battilana & Casciaro, 2021; Emerson, 1962; Pfeffer & Salancik, 1978). Recent work highlights that power is a neglected dimension in studying multi-stakeholder and cross-sectoral phenomena, although it has considerable impact in shaping collaboration dynamics (Gray, Purdy, & Ansari, 2022). Some actors have more say in distributed data governance because of their role in orchestrating social innovation, and their available resources. For example, organizers bring all stakeholders together and, thus typically, set the overall strategic direction of data governance (Diriker et al., 2023; Mair et al., 2023). Decision-rights determining ownership and control over data can affect coordination and innovation (Splitter et al., 2023). For example, governments controlling data sets may be reluctant to share data with the public (Sieber & Johnson, 2015).

4. Distributed data governance in action: Reflecting on #WirVsVirus

Data governance was not fully formulated at the start of #WirVsVirus. After all, it was a rapid strategic response to the COVID-19

Table 1
Distributed data governance framework.

Dimension	Definition	Relevance for Data Governance in OSI	Key sources
Openness	Data sharing enables coordinating and innovating across sectors among multiple stakeholders	Fostering data sharing and collaborative data creation makes it more likely to recombine, reuse and reprogram existing resources	Benkler, 2016, von Hippel, 2017
Accountability	Providing explanations or justification for one's conduct	Clarifies who is accountable for what and to whom	Ebrahim, 2010; Ebrahim et al., 2014
Power	Degree to which one actor can influence decisions and other actors' conduct	Captures that in multi-stakeholder settings some stakeholders are more powerful than others	Battilana & Casciaro, 2021; Gray et al., 2022

crisis, and entered a new territory of multiple stakeholders who come together to address a societal challenge. Therefore, we see this as an excellent opportunity to understand how the #WirVsVirus stakeholders improvised with, and exerted distributed data governance. In what follows, we will briefly reflect on selected data governance examples using our framework. We demonstrate how these examples reveal opportunities, challenges, and implications for orchestrating distributed data governance in OSI.

4.1. Openness: Data and information sharing to facilitate coordinating innovation

#WirvsVirus exemplifies the role of openness in two ways. First, supporting data and information sharing among all involved stakeholders through deploying widely known and easy-to-use digital tools to quickly bring various stakeholders together. Second, rallying supporters to provide resources to participating teams.

Coming together during the hackathon and in the subsequent implementation program in virtual spaces was vital to facilitate data and information sharing. Before the hackathon all stakeholders collectively identified and collected (new) challenges arising from the COVID-19 pandemic (e.g., challenges dealing with loneliness, digitalizing health services, etc.). The organizers curated about 1700 submissions (e.g., merging similar entries), and published 809 on a publicly available Airtable list. This virtual list enabled everyone to spot pandemic-induced problems, and facilitated the subsequent matching process by bringing people together to work on these challenges. Moreover, the organizers asked all stakeholders to pool existing solutions to pandemic-induced problems in a Google spreadsheet to prevent citizen innovators from duplicating solutions, and facilitate mergers among teams working on similar problems. During the hackathon #WirVsVirus relied on tools such as Zoom, Slack, GoogleDrive, Devpost, and Youtube to create a shared space for all participants. Participants met and discussed issues via Slack and Zoom. Participating teams used Google Forms during the hackathon to collect data from other participants by conducting surveys regarding a potential solution's viability, or used other forms of data collection (e.g., crowdsourcing data tasks to other participants). At the end of the hackathon, participating teams submitted their solutions to Devpost and Youtube (in form of a publicly available pitch video). Finally, Slack and Zoom were pivotal to facilitate the subsequent implementation program bringing the community together, and enabling information exchange.

This widespread adoption of digital tools illustrates how the organizers sought to imprint openness in data governance and how other actors, such as citizen innovators, embraced this openness. Freely sharing data and information enabled matching and collaboration and supported a collective understanding of the pandemic-related challenges. At the same time, we observed that the vast amount of information available to participants resulted in information overload. Particularly during the hackathon, the sheer volume of data and information spreading across several virtual spaces was difficult to process.

To engage in social innovation, citizens require resources. A pivotal decision to foster openness in data governance, through providing resources, occurred while curating the implementation program. Whether a solution was based on open data or used open source was a criterion affecting whether teams could participate in the implementation program. Moreover, the #WirVsVirus organizers secured government funds dedicated to open-source development. 34 teams received each up to 47,500 euros from an existing funding instrument for open-source software innovations; the Open Knowledge Foundation's Prototype Fund. The organizers also collaborated with private sector organizations to provide IT infrastructure for citizen innovators. For example, the organizers secured support from Amazon Web Services (AWS) and Microsoft Azure to provide vouchers for cloud storage. The organizers provided 300 vouchers, for 500 USD each for AWS cloud storage. This initial support assisted many teams when setting up their own website and database, especially in the beginning. In addition, an AWS consultancy supported the cloud service implementation.

These examples demonstrate the various ways that data governance can foster openness. Receiving resources can serve as an incentive to embrace openness (e.g., developing open-source software instead of proprietary code). However, the approach of providing resources highlights also the interesting boundary crossing between promoting openness in use, and bringing in private players whose business models often depend on closed data (on which we will elaborate in more detail below).

4.2. Accountability: Providing explanations and distributed monitoring of innovation

Moreover, #WirVsVirus illustrates the enactment of stakeholders' accountability by mainly two aspects: first, some stakeholders, such as scaling partners, explained their data-related conduct to citizens innovators in #WirVsVirus, second, we observed how concerned stakeholders engaged in ‘distributed monitoring’ of the core stakeholders' activities.

To unleash their full potential many citizen innovators sought to find support from governmental scaling partners. In these interactions, we observed that a scaling partner explained to teams why certain forms of exchanging data is unfeasible. Consider the UDO and the German Federal Work agency example. The UDO chatbot made it easier for small- and medium-sized enterprises to apply for work subsidy funds.[2] The German Federal Work Agency linked to UDO on their website to send traffic to the UDO chatbot. Companies entering the information via the chatbot received a completed subsidy form as a PDF file, which the companies could then submit to the German Federal Work Agency for data processing. Companies using UDO made fewer errors in their applications, which increased the agency's speed in processing work subsidy fund applications. Despite this success, the agency refrained from developing an API due to data security concerns.

From an openness perspective, the agency's decision limits the UDO's solution potential. But taking into account to whom and for

[2] The work subsidy fund (or short-time allowance, in German called “Kurzarbeitergeld”) was a German Federal Government program supporting companies to keep workers on their payroll. The idea was that workers would work reduced hours, and the government would take over a significant share of the payroll costs.

what the agency is accountable provides a plausible explanation for this decision. The German Federal Work Agency administers highly sensitive personal data and, hence, data security for its clients is a high priority. From this viewpoint, developing a new API, which may create an entry point for potential hackers, constitutes a valid concern.

Another accountability aspect concerns when stakeholders engage in 'distributed monitoring'. One team came up with the idea to assist homeless people with their financial difficulties by means of a digital terminal, which would offer micro jobs, such as sweeping the street with a digital broom. This digital broom would track the work progress, and offer pay upon completion. The #WirVsVirus jury panel accepted an early-stage version of this project for the implementation program. The project also received support initially from a large foundation of a private international tech company. However, activists on Twitter mobilized against this solution, criticizing the demeaning use of technology. As a result, the organizers apologized, and the foundation removed its visible support for the project on the web page (without an explanation).

This example highlights how openness regarding all relevant output of the hackathon and the implementation program is critical for accountability – it enabled everyone who has a stake in OSI to monitor others' actions. In this case, it permitted activists to voice their criticism, creating a hyperlink to the criticized solution (which backs the claim) and demand a response. Indeed, the organizers needed to respond, and the foundation passively removed their support.

4.3. Power: Constraining innovation and unintended side effects

In #WirVsVirus, we observed how the power dimension affected the OSI process and its outcomes. First, the power dimension illuminates that some actors use their resources to constrain other stakeholders' innovation efforts. Second, the power dimension helps assess the unintended consequences of certain data governance decisions.

The federal government's decision to act as a patron served as a door opener for many teams. However, some stakeholders perceived that many governmental actors unjustifiably constrained innovation. The reason was that key data providers were reluctant to share more data or unable to provide sufficient support. For example, consider the interactions between the initiative Coronavis and a German health association: Coronavis participated in #WirVsVirus hackathon and in the implementation program. The Coronavis team works at the data analytics group at the University of Constanz. Their tool provides broader audiences a real-time visualization on intensive care unit availability in Germany. The data comes from a health association, which daily publishes machine-readable data on ICU availability (a csv.-file), which Coronavis then combines with an OpenStreetMap of Germany to create an easily understood visualization. However, the health association has more data than it shares publicly. Accessing this data would allow Coronavis to further improve their solution into an early warning system for overcrowding in ICU. A second and related example is the INOEG alliance, whose members worked on projects such as registration apps for restaurants (while also safeguarding user privacy), or creating modules for the open-source SORMAS application for local health offices. Because, local healthcare agencies have jurisdiction over decisions about what software they use, this was one of the reasons why the Ministry for Health could not effectively support a systemic rollout of the SORMAS software.

The first example demonstrates the negative aspects of a power imbalance. In Coronavis' case, a mainly government-funded healthcare association has sufficient power to remain in control over data and restrict access by an initiative from a government-funded German university. But it is worth noting that governments and their arm's-length agencies or funded associations are interwoven in a complex set of relationships and jurisdiction – particularly in a federally organized political system like Germany (with federal and numerous state governments). This means the federal government's power to command state or local bodies is limited, as the SORMAS example reminds us. Nevertheless, some participating teams and related media coverage pointed out that all levels of government could have done more to proactively support citizen solutions. Some stakeholders, particularly those associated with the civic-tech community, sought to hold the organizers accountable, and expected organizers to publicly criticize the lack of governmental action. However, the organizers adhered to their 'broker' role, believing they could more effectively lobby behind the scenes to improve the interface between established institutions and civil society.

The power dimension sheds light on unexpected side effects of data governance. The citizen innovators appreciated getting free access to IT infrastructure, such as the aforementioned AWS. However, after the free AWS vouchers expired, some teams were unsure how to move on: should they start to cover the costs or consider moving their data to another infrastructure? The organizers felt responsible to organize as many resources as possible for citizen innovators in a relatively short time. Fixing problems under time pressure likely led to neglecting potential unintended long-term side effects, namely locking-in citizen innovators to specific infrastructures. Relatedly, a few participants criticized the reliance on tools that tech giants provide more generally, due to data privacy concerns, and that such use reinforces the tech corporations' power. The organizers acknowledged these concerns, and provided an account for their action: the use of major tech corporations' tools is justified by the urgency of all sectors working together rapidly in times of crisis, and that existing commercial tools, in contrast to many alternatives, are more accessible for a less tech-affine audience. Ultimately, it shows that data governance decisions are associated with trade-offs, in this case fostering openness in use, and feeling responsible to act swiftly, may lead to reinforcing major tech corporations' power.

5. Discussion

In this essay, we explore data governance as central to orchestrating OSI. We put forward a conceptual framework consisting of three dimensions: namely, openness facilitating data and information sharing, accountability highlighting who is responsible to whom for what, and power capturing; who holds or gains control over data and can affect other actors' conduct, which allowed us to assess the effectiveness of distributed data governance. We now turn to the implications for research, practice and policymaking.

5.1. Implications for research

Our framework serves as a guidepost for future research on data governance and orchestrating an OSI project. We briefly reflect on the implications of openness, accountability, and power as data governance's key dimensions, and the interplay among these dimensions.

In line with prior literature, our essay suggests that *openness* has an epistemic value to enable stakeholders to understand the problem better, and freely shared data is a valuable resource for digital innovations (e.g., Barrett et al., 2016; Yoo et al., 2010). However, our essay also renews calls for moving away from a one-sided perspective on openness (Dobusch & Dobusch, 2019; Splitter et al., 2023). Indeed, prior research indicates that unstructured openness may lead to information overload. The reason is that freely available, yet massive amounts of, unstructured data and information may increase opacity (Stohl, Stohl, & Leonardi, 2016). Hence, future research may explore how to prevent that level of openness in distributed data governance from overburdening involved stakeholders.

Our essay invites future inquiries on *accountability's* role in distributed data governance. Based on recent research on responsiveness in open government, we suggest that citizen innovators are more likely to accept decisions constraining data access, if the stakeholder at hand provides a reasonable explanation (Schmidthuber, Hilgers, & Randhawa, 2021). However, we need to know more how accountability dynamics play out in OSI, particularly in constraining innovation. This recalls several recent debates. Against the backdrop of the COVID crisis, prior research either celebrated the promise of digital social innovation (e.g., Scheidgen, Gümüsay, Günzel-Jensen, Krlev, & Wolf, 2021) or, as others pointed out, the need to critically reflect on the use of data and digital technologies to tackle a societal challenge (Gkeredakis, Lifshitz-Assaf, & Barrett, 2021; Zilber & Goodman, 2021). Relatedly, there are debates about the potential downsides of relying too heavily on digital technology and data to solve problems; an unwavering belief in the power of digital solutions ('Technological Solutionism') may lead to neglect of other possible solutions or even ultimately, cause more harm than good (Morozov, 2013; Nachtwey & Seidl, 2020; Weinstein, Reich, & Sahami, 2021). We suggest that these debates serve as a guidepost for further explorations of whether and how accountability mechanisms can assist harm reduction in OSI.

Another area for future research concerns the issue of *power* imbalances in OSI. Such power asymmetries endanger multi-stakeholder collaboration (Gray et al., 2022), particularly if they alienate citizen innovators. As we argued above, it makes a difference whether decisions to withhold data resources are justified, or lack an explanation. We particularly would like to highlight the government's role. Governmental actors play a crucial role in OSI by supporting citizen innovators' efforts (Fayard, n.d., forthcoming). In the case of #WirVsVirus, the German government decided within a few days to support this experiment as a patron. Some ministries and agencies may lack the organizational capacity to manage openness, or are skeptical about interacting with citizen innovators lacking a prior track record. Nevertheless, several stakeholders perceived that the German government served by merely signaling or creating participation illusions (Bauer & Gegenhuber, 2015; Gregg, 2015; Irani, 2015). This raises several questions for future research: how can government actors use symbolic and substantive actions to effectively "empower" other actors, particularly citizen innovators, and how do power dynamics play out when different kinds of governmental actors (e.g., local, state, or national) participate in an open social innovation process?

Our essay also invites future inquiry on the interplay of the dimensions of distributed data governance. Consider the interplay between *openness and accountability*: In our case, openness enabled stakeholders to conduct 'distributed monitoring' (Diriker et al., 2023). However, future research needs to explore the difference between appropriate 'distributed monitoring' and inappropriate 'trolling' (i.e., destructive online behavior; Bishop, 2014). Ultimately, trolling may impede or direct resources away from resolving societal problems. It raises the question about what kind of criticism is perceived as (in)appropriate and by whom? How do core stakeholders, such as organizers, respond to criticism?

#WirVsVirus also raises interesting questions at the intersection of *openness and power*. Many large tech corporations' tools enable 'openness in use' – establishing a space where people can rapidly meet, exchange data and information and collaborate (Splitter et al., 2023). In our study, participants were concerned that resolving societal challenges by relying on major tech corporations' tools reinforces their power. Indeed, Zuboff (2022: 1) points out that the major tech corporations exert "oligopolistic control over most digital information and communication spaces, systems, and processes". This means, if one needs to react quickly, it seems almost impossible to avoid using major tech corporations' tools. We suggest future research pays attention to downsides of using major tech corporations' tools in the context of (open) social innovation and how orchestrators experiment with alternatives.

5.2. Implications for practice and policy-making

Our exploration of distributed data governance as part of orchestrating OSI also has implications for practice and policy making. More specifically, we suggest three implications for practice and policy making namely, openness as the defining element of data governance, establishing formal mechanisms for enforcing accountability, and understanding data governance as a form of institutional infrastructure.

#WirVsVirus confirms the fruitful synthesis of openness and accountability. This is in line with literature on open data and accountability (Ebrahim, 2010; Splitter et al., 2023; Zuiderwijk & Janssen, 2014): freely shared data, was not only a source for innovation, but also for increased transparency, permitting public access to the essential output, such as the challenges or all solutions. We think this is an important implication for future OSI projects. Should an OSI project seek to create public value, it seems plausible that the public – be it stakeholders, such as prospective clients, media or activist group – can hold organizers, participating teams, supporters or a patron accountable. Transparency is key to that. This, in turn, implies that these core actors, (a) feel the responsibility to answer and explain their actions and (b) have sufficient resources (e.g., community managers, Reischauer & Mair, 2018) to answer

and respond to requests regarding their conduct.

The second implication draws on Behn's (2004) suggestion that multi-stakeholder relationships benefit from a collective sense of accountability and responsibility to ensure that all involved stakeholders fulfill their commitments. The distributed data governance in the case of #WirVsVirus primarily relied on informal mechanisms due to ad-hoc and improvised organizing. We wonder whether and how formal structures can assist in creating a collective web of accountability and responsibility. Indeed, the data governance literature highlights the formal structure's role in facilitating decisions regarding data governance, and establishing roles such as data stewards and mediators (Abraham et al., 2019; Gregory, Hendriffson, Kaganer, & Kyriakou, 2021; Micheli et al., 2020). An implication for policy and practice considers how formal structures could help OSI distributed data governance, and if so, determine the composition of such a structure (e.g., how to define and include relevant stakeholder groups).

Third, a major implication of our study is conceptualizing distributed data governance as a form of institutional infrastructure. Hinings, Logue, and Zietsma (2017) understand an institutional infrastructure as the "cultural, structural and relational elements that generate the normative, cognitive and regulative forces that reinforce field governance" (p. 163). Scholars at the intersection of organization studies and information systems examined the institutional infrastructures concept in data-driven multi-stakeholder phenomena (Gegenhuber, Logue, Hinings, & Barrett, 2022). Prior scholarship explored institutional infrastructure to study a new governance arrangement for crowd work platforms in Germany (Gegenhuber, Schüßler, Reischauer, & Thäter, 2022) and social mission platforms (Logue & Grimes, 2019). Based on findings outlined in this essay, we suggest that openness, accountability, and power are the essential elements for establishing such an infrastructure: regulating data sharing and resource provision, determining accountability mechanisms and defining mechanisms to reduce power asymmetries. Practitioners and policy-makers should evaluate how each dimension may constrain or enable the outcomes of OSI. It would also be worth discussing whether and how the creation of an infrastructure for OSI independent of major tech corporations is desirable and achievable.[3]

6. Conclusion

In this essay, we introduced open social innovation (OSI) as a new approach to addressing complex societal challenges. We discussed the importance of data governance in OSI and proposed the distributed data governance concept. We identified three dimensions - openness, accountability, and power - that are crucial for enabling coordination for innovation in OSI. Certainly, we need more systematic research to fully understand the challenges of orchestrating distributed data governance in OSI. Nevertheless, we hope our essay provides insights for practitioners and policymakers interested in OSI and inspires researchers to adopt a more societal perspective on data governance.

Declaration of Competing Interest

None.

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[3] This has also implications for future research: an infrastructure's establishment does not mean it is a given. Various actors - ranging from the organizer to supporting actors - may engage in institutional work seeking to alter the institutional infrastructure. This raises several questions: how does institutional infrastructure change over time, and how infrastructure changes affect the (power) relationships among the stakeholders? (Lawrence & Suddaby, 2006; Mair & Reischauer, 2017; Wry, Lounsbury, & Glynn, 2011).

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