Digital Platform Ecosystem Governance: Preliminary Findings and Research Agenda

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Abstract. This paper explores collaborative governance in digital platform ecosystems and the governance challenges that may occur in such environments. We analyze three different digital platform ecosystems and identify six unresolved key governance issues that we believe are central to the type of digital platform ecosystems we address. This paper has three contributions. First, we add to the literature on digital platform ecosystems by revealing a set of governance challenges regarding ecosystem forming and sustainability. Second, our findings may serve as recommendations for organizations that are planning to establish or that are already running an ecosystem based on a digital platform. Third, we contribute to digital platform ecosystem research by proposing an agenda for future research in this area.

Keywords: Digital Platform Ecosystem, Collaborative Governance, Governance Challenges, Research Agenda.

1 Introduction

This paper explores *collaborative governance* in digital platform ecosystems. Examples of successful digital platforms and their ecosystems are social media platforms such as Facebook, media sharing platforms such as YouTube, and service-oriented platforms such as Uber. Common for these examples is that they are governed by one focal actor, the platform owner. This paper speaks to another type, as we address settings in which formerly independent companies in a business sector come together and collaborate to establish a digital platform and an accompanying ecosystem for mutual benefits [5]. Our unit of analysis is the digital platform ecosystem. As we have an organizational perspective, *we define a digital platform ecosystem as an open, adaptive, self-organizing, not fully hierarchical controlled, meta-organization where the actors' activities are coordinated by social-technical structures, such as a digital platform and governance mechanisms* [22, 26, 17].

The forming and sustained use of these digital platform ecosystems face a few additional challenges compared to those of traditionally centralized governed ecosystems. For example, it usually involves experimentation and engineering efforts from various actors to establish the digital ecosystem and to create some complex joint value

proposition. Some of the key governance issues for digital platform ecosystems identified in the literature are value creation, platform ownership, platform access, fairness, regulations, data management, and trust. *Value creation* is the principal factor because without it, the ecosystem will erode [18]. The actors must experience that the ecosystem solves their objectives and needs in an effective way. *Platform ownership* relates to the distribution of power and relationships among the ecosystem's stakeholders [18, 36]. Three ownership models have been identified in the literature: centralized, consortia, and decentralized. Collaborative governance is essential for the consortia model, in which the involved actors jointly decide, implement, and maintain the governance mechanisms [5]. *Platform access* refers to any restrictions on the forming and use of a digital platform [9]. It may be open to everyone who complies with its rules and regulations, or access may be limited to those belonging to a particular community or organization [29]. *Fairness* is about establishing a governance model that balances the various actors' interests and encompasses fair financing (cost distribution), fair pricing, and revenue sharing (revenue distribution) [29, 34]. *Regulations* regard regulatory authorities that may want to regulate the design and use of the platform [29]. *Data management* including data privacy and security, refers to how data should be collected, stored, shared, accessed, and monetized [2]. *Trust* is the glue in every digital platform ecosystem [21]; actors should trust the platform owner and the platform's governance mechanisms. As trust is based on knowledge, transparency is crucial in a digital platform ecosystem.

In line with the literature [35], we broadly define governance mechanisms as the roles, structures, processes, and technologies that are necessary for the forming and sustained use of a digital platform ecosystem to serve its purpose. *Ecosystem forming* refers to the actors' collective act of developing the digital platform, its boundary resources, and other resources necessary to establish an ecosystem that promotes its intended use. *Ecosystem sustainability* refers to the actors' and other stakeholders' application and continuous enhancement of the digital platform ecosystem. While forming and sustaining a digital platform ecosystem may be straightforward for environments where ownership and governance are centralized, we argue that this is far more challenging for collaborative governance, which leads us to our research question: ***What are the key challenges for collaborative governance in digital platform ecosystems?***

To answer the research question, we set out to analyze three cases. The first is a digital platform ecosystem in the aquaculture sector, AquaCloud, which was established jointly by seven companies in the aquaculture industry as a measure to fight salmon lice. Our second case, TerraVera, is an ecosystem for measuring sustainability developed by a non-profit foundation. The third case, Health South-East, is an ecosystem in the Norwegian health sector established to allow for the use of lightweight technologies and connect these technologies to central systems.

2 Literature

2.1 Digital Platforms and Ecosystems

Digital platforms are infrastructures that mediate interactions and value exchanges between multiple user groups [11, 29]. A digital platform may serve, for example, as an economic marketplace that connects buyers and sellers (e.g., Finn.no), as a technology marketplace where sellers can upload their digital components for sale (e.g., Google Play), or as a social media channel where users can interact and share experiences and opinions (e.g., Facebook). In sum, digital platforms have some key attractive characteristics: they reduce transaction costs, they support the coordination of the development of complementary services and products, they create new value by leveraging a large and heterogeneous set of users (i.e., generativity), and they create network effects [4].

The digital platform and the stakeholders interacting on the platform constitute the platform's ecosystem [16]. Three structural elements are essential: activities, actors, and architecture [1, 19]. Activities determine how value is co-created and include the development of applications and services. The actors are the various stakeholders, such as complementors and consumers, who undertake the activities. Complementors contribute to the value proposition of the platform by providing products and services, while consumers refer to those who benefit from the products and services the platform offers. Architecture refers to the technological interactions, such as boundary resources, that coordinate the exchange between the complementors and consumers in the ecosystem. We consider the digital platform ecosystem a socio-technical system encompassing both technological elements (e.g., software, hardware, and architecture) and social elements (e.g., activities, actors, processes, rules, and standards) [31, 6]. A key issue of this perspective is how the platform's ecosystem is best governed [11, 18], particularly considering the multiple and different interests that need to be balanced among the set of (previously unrelated) actors [11, 25, 38].

2.2 Collaborative Governance

Historically, digital platform ecosystems have been centrally governed by one principal actor who controls the central database and the boundary resources—the rules and interfaces with which the ecosystem's actors must comply. More recently, a new instance of digital platform ecosystems is emerging. This is a type of ecosystem in which formerly independent companies come together and, as a joint effort, develop a platform and an accompanying ecosystem for mutual benefits. The development and use of these types of ecosystems face additional challenges compared to those of centralized governed ecosystems, rendering collaborative governance strategies more appropriate [14]. Theory on collaborative governance was developed in political science [3] to deal with how public and private stakeholders engage together in consensus-oriented decision-making. Another stream of research is Elinor Ostrom's work on governing the commons in the context of scarce resources, such as water [28]. She developed a theory of polycentric governance—a complex form of governance with multiple centers of

decision-making, each of which operates with some degree of autonomy. Here, trust is key and is typically developed from the bottom up.

In IS research, a few contributions have addressed collaborative ecosystem governance. Constantinides and Barrett [10] investigated collaborative governance by building on Ostrom's approach [28]. They found that governance mechanisms are implemented differently for nonprofit platform ecosystems than for commercial platform ecosystems in terms of governance structure, accessibility and control, trust, and boundary resources. They showed that community communication and learning are pivotal. Some IS researchers have also proposed that ecosystems are managed by collective consciousness, which results from learning in the logic of practice distributed in the ecosystem [23]. Most general ecosystem governance principles, such as value creation, data management, and trust, also apply to collaborative governance. However, several new issues also emerge. As there is no dominant actor, the formation process would be quite different, requiring more bottom-up consensus building on democratic principles [8, 34]. In addition, while centrally governed ecosystems aim to minimize risk, collaborative ecosystems must provide conflict resolution mechanisms. Usually, collaborative ecosystems continually adapt to new entrants and struggle to remain financially sustainable. To understand these issues in more depth, we conducted a case study.

3 Method

In addition to the literature review summarized in the previous section, this paper is based on an interpretive case study approach. We chose to conduct a qualitative case study, as these are appropriate for exploring a phenomenon within a context where there is a need for in-depth knowledge [13]. The context of the present work involves three digital ecosystems, each of which was established based on a digital platform.

3.1 Data Collection

We used a strategic approach to select our cases [30] and chose three cases based on three criteria. First, in line with our research question, the digital ecosystem should be characterized by a decentralized structure and collaborative governance. Second, the ecosystem should have noticeable potential for innovation. For instance, all three ecosystems have emerged in sectors in which digital maturity has traditionally been low but also in which actors have more recently realized the value of data and the urgent need for increased collaboration for innovation. Third, the actors of the digital ecosystem should be positive to our investigations to gain access to a valid data set. When talking to actors within all three cases, there has been general agreement on the importance of improving our understanding of the collaborative governance of digital platform ecosystems.

The main data collection was conducted between 2019 and 2021. For cases 1 and 3, we already had a rich data set that suited our purpose, while for case 2, data was collected solely for the purpose of this study (hence the lower number of interviews for case 2).

Interviews served as our main data source. In total, we conducted 33 interviews: 13 for case 1, 5 for case 2, and 15 for case 3. Some interview respondents were interviewed more than once. The interviews were conducted either in person or digitally (e.g., using MS Teams or Zoom), depending on when the interviews were scheduled and any Covid-19 restrictions at the time. Each interview lasted between 30 and 60 minutes, and most of them were recorded and transcribed (with the respondents' consent). In the interviews, and for each digital platform ecosystem, we focused on the following topics: purpose, innovation, ownership, establishment and timeline, boundary resources, financing/investments/procurement/cost-allocation, decision bodies and decision processes, contractual issues, standards and standardization, and capabilities and competencies.

In addition to the interviews, we also conducted document studies in which we collected and analyzed relevant documents related to the digital platform ecosystems under study to crosscheck insights from the interview data and gather additional information. We also attended conferences and presentations related to the different digital platform ecosystems and their sectors to learn more about both the sector in which they operate and the reasoning for and aims driving their formation and sustainability.

3.2 Data Analysis

Through our data collection and transcription, we familiarized ourselves with the data [30]. We used an abductive approach [32], by which we combined and alternated between searching the data material for known topics (see list in section 3.1) and new topics that could emerge from the data. The analysis was performed in three steps.

First, the interview transcripts and relevant documents were analyzed with the aim of capturing the essence and organization of the digital platform ecosystem for each case. Second, we compared the analyses for each of the three cases, with the aim of identifying similarities and differences in the ways in which the digital platform ecosystems were governed, both during the formation of the ecosystem and its sustained use. Third, driven by our research question and building on the ideas of collaborative governance, we used the insights gained from the first two data analysis steps to identify the challenges each case faced while forming and sustaining the digital platform ecosystem. Then, we synthesized these findings to identify and discuss key challenges of collaborative governance in digital platform ecosystems on a more general level, thereby also providing a research agenda for further research.

4 Findings

In this section, we present the three cases (AquaCloud, TerraVera, and Health South-East), emphasizing why the digital platforms were formed and highlighting key governance issues.

4.1 Case 1: AquaCloud

Formation of the Digital Platform Ecosystem
Aquaculture is a valuable industry; it employs 8,000 people and produces fish worth 70 billion NOK each year [12]. However, the industry is plagued by several environmental concerns, among which salmon lice is the most severe. The parasite causes fish death, production losses, and pollution due to the use of chemical treatments. Moreover, as salmon is produced in open cages at sea, salmon lice spread easily to neighboring farms and affects wild fish as well. Historically, farmers were not informing each other about sea lice outbreaks. However, at the North Atlantic Seafood Forum (NASF) conference in 2016, four leading agriculture companies agreed to share data to address this problem. Consequently, facilitated by the NCE Seafood Innovation Cluster, they decided to collaborate on building a jointly managed digital platform for sharing data about salmon lice outbreaks.

The digital platform ecosystem was built around a core data platform that could analyze data coming from the farmers' cages and produce salmon lice forecasts for two weeks ahead. At first, the data were entered manually and later automatically through Application Programming Interfaces (APIs). More farmers, as well as other stakeholders, such as researchers and governmental authorities who saw the value of the derived data for their own purposes, subsequently joined the initiative. From a small initiative involving only a few farmers, the digital platform ecosystem is now developing into a data platform for the aquaculture sector.

Governance
The development of a data platform at the industry level was hampered by a lack of standards and data quality, which reduced confidence in the produced forecasts. The problem was the actors' use of different IT vendors and their proprietary systems and data formats, which made it difficult to compare, integrate, and aggregate data, even across the facilities of a single farmer. Moreover, divergent practices for collecting data were also affecting data quality and compatibility. To address these issues, the consortium launched an open, industry-wide standardization program. The goal was to engage and leverage the competences of a broad set of actors, including farmers, IT vendors, researchers, and national standardization bodies, and to account for their diverse interests.

Moreover, data security, confidentiality, and trust have been key concerns for AquaCloud from the start. Although farmers are collaborating in the fight against salmon lice, they are also competitors. Sensitive and commercial data should not be shared, which has implications for the digital platform's architecture and its boundary resources.

4.2 Case 2: TerraVera

Formation of the Digital Platform Ecosystem
TerraVera is a collaborative digital platform ecosystem established by the TERRAVERA Foundation, a non-profit organization established in early 2020.

TerraVera is a response to the United Nations' (UN) call for action to eliminate poverty, fight inequality, and stop climate change by 2030 [37], building on the UN's 17 Sustainable Development Goals (SDGs). The purpose of the platform is to enable academia, organizations, and volunteers to collaborate and unify knowledge and competence on sustainability. The intention is that, through the TerraVera platform, knowledge will be shared and presented based on models, data, indicators, and scores, thereby providing easy and free insight for anyone to utilize.

Despite the unified commitment toward a sustainable future and each SDG being drilled down to targets and indicators, the consequences of individual and collective choices on the world remain obscure: "The public demands a healthy, sustainable future, but when faced with choices on what to buy and how to live, it is unclear which choices lead to a sustainable world" (personal communication, August 28, 2020). Moreover, there is a lack of a unified, transparent way to measure sustainability. This is what TERRAVERA aims to change—to offer a substantial and innovative approach to measure sustainability and thereby empower different actors in society, ranging from individuals to organizations, to act based on facts.

The TerraVera platform is currently under development; hence, although the idea is to make the platform open for all, it is still closed, as the partners are establishing the foundation of the platform. The TERRAVERA Foundation is the platform owner who sets the frames for ecosystem forming and use, while academic partners and voluntary developers contribute to the platform with their knowledge and expertise in different fields. One activity is to develop models to measure sustainability within specific value chains. Business partners contribute with financing, offer specific cases and data for the academics to build upon, and, together with the public at large, are the future users of the digital platform. Regulators and governing actors contribute to the platform directly or indirectly by providing guidelines and regulations.

Governance

To form the ecosystem, the TERRAVERA foundation relies on the contributions of academic and business partners who share the same fervent desire to contribute to a more sustainable world and agree that the way in which sustainability is measured today needs to change. To get these contributors on board, the foundation has actively engaged with academia and businesses to share their vision, illustrate the idea and goals behind the platform, and make visible the benefits for the different actors to participate. Hence, active engagement with potential contributors has been an important forming activity. Through presenting at relevant conferences, holding face-to-face meetings with potential contributors, and discussing with master students, PhD scholars, and researchers, the foundation has managed to get a solid party of trusted partners on board to develop the core of the TerraVera platform, and thus form an ecosystem. Once the platform is up and running, usage will increase as the foundation manages to illustrate the benefits to potential actors. At the same time, with increasing focus on the SDGs, an increasing number of companies are likely to realize the need to measure themselves and their value chain according to sustainability and identify ways to decrease their footprint.

The TerraVera platform is centered on data exchange; hence, solid APIs for data ingestion and export are essential for the functioning and sustainability of the ecosystem and platform. The platform is currently open only to specific contributors—academic and business partners handpicked by the TERRAVERA Foundation based on their experience and qualities. Business partners pay a yearly fee to participate in the ecosystem, whereas academic partners and developers contribute their knowledge, experience, and algorithms on a voluntary basis. Moreover, governing actors are granting research funding, increasing the requirements for companies to deliver their products and services more sustainably.

4.3 Case 3: Health South-East

Formation of the Digital Platform Ecosystem

The secondary care sector (i.e., hospitals) in Norway is organized into four health regions, of which Health South-East is the largest, with a budget of 80 billion NOK and 90,000 employees serving around 2.5 million people.

Forming digital ecosystems in the Norwegian health sector has been challenging. Hospitals have multiple systems; the key solutions are electronic patient journals (EPJs), a chart and medication system, and lab and radiology systems. Health South-East currently runs around 1,100 different systems. Most of the systems are "silo" solutions—that is, they are designed with an integrated architecture, including Graphic User Interfaces (GUIs), business logic, and a database. Although they serve their purpose for specific user groups and are mostly technically stable, challenges have emerged: they are difficult to connect with other systems, and they have a slow innovation speed. Both issues are increasingly problematic in a sector that needs more innovation.

At the same time, several innovative firms have emerged, many of which are organized in the 270-member association Norway HealthTech. These companies typically use mobile and IoT technologies to develop lightweight solutions for clinicians and patients. Ideally, these firms should be allowed to offer their products in ordinary procurement processes, but this has proved to be difficult, partly because the sector is dominated by a few large vendors. In 2016, Østfold Hospital (one of 10 health organizations within Health South-East) chose a lightweight logistics solution from Imatis. To integrate the solution with the large clinical systems, Imatis asked for an API. One of the large vendors replied that "first, we do not offer APIs, and second, there is nowhere stated in our contract that we should allow 3rd party vendors access to our system." Even though the issue was eventually resolved, it illustrated the need for a more active approach to developing the ecosystem. This has gradually improved through various pilot projects, but there is currently no governance regime for an ecosystem in operation in the sector. However, the top managers of Health South-East state that they aim for a working digital ecosystem.

Governance

One obvious hindrance to the formation of an ecosystem in the health sector is the strict security and privacy requirements for handling patient data. Secure identification and

access rights must be handled appropriately, and patients must remain confident that their data is not misused. The difficulties of security and privacy are real but should not be overstated. Norway has a strong security infrastructure with appropriate regulations (national and GDPR) and technical services, such as MinID. There is also an established security culture in the health care sector, with specific units monitoring compliance.

A key governance concern is to enable the interaction of systems from different public providers and private vendors in terms of technical solutions, organizational arrangement, and procurement. For small companies, it is essential that these processes are open and transparent. For instance, the procurement routines were designed to deal with large tenders with a few main contractors, not with the continuous offerings of apps from many small vendors. In the same vein, innovation is usually local and close to the users, and therefore hard to plan and budget. Small vendors need a clear governance framework to approach prospective customers, establish development contracts, access various platforms, and deal with practical problems.

5 Discussion

In this paper, we argue that governance is both challenging and crucial for innovating in digital platform ecosystems where there is no central owner. It is useful to regard a digital platform ecosystem as a new organizational form: it has more structure than a pure market but less structure than a supply chain [22]. This leads to several governance challenges because it is neither a hierarchy nor a market [19]. In this study, we dealt with digital platform ecosystems without a central platform owner to understand the specific challenges related to this form.

5.1 Governance Challenges in the Three Cases

Our cases share some key characteristics: they are (i) initiatives for innovative solutions, (ii) collective initiatives without a focal actor, and (iii) struggling to establish and/or sustaining the ecosystem. We identify six unresolved key governance issues in Table 1. We do not claim that these are exhaustive, but we believe that they are central to the type of digital platform ecosystems we address.

Table 1. Governance challenges in the three cases

Ecosystem	Challenges in forming the ecosystem	Challenges in sustaining the ecosystem
AquaCloud	Defining standards	Maintaining participation
TerraVera	Committing to a shared vision	Ensuring value creation and capture
Health South-East	Agreeing on roles	Securing financial viability for complementors

We first focus on the governance challenges in the formation phase and then discuss governance challenges in established ecosystems.

Governance in Forming the Ecosystem

Forming a digital ecosystem is often a chicken-and-egg problem: to offer services, you need complementors, and to recruit complementors, you need services.

Defining Standards: Standards can be understood as consensus among different actors to perform certain activities by complying with agreed-upon rules [27]. Both technical standards and common work practices are key to sustaining the success of digital platform ecosystems [1, 38]. As the AquaCloud example exposes, without standards, the value of the digital platform ecosystem decreased, and it could not fulfill its purpose. A collaborative approach was crucial for the successful forming of the digital platform ecosystem, as well as for its subsequent use and value creation, as it is easier to accept, comply with, and advocate for standards one has contributed to [7, 24, 39]. Collaborative governance requires an open approach to standardization, leveraging the skills and competences of a broad set of actors and stakeholders, and the opportunity for every actor to influence the standards in the making.

Committing to a Shared Vision: Establishing a digital ecosystem characterized by collaborative governance requires that the actors involved in this collaboration need to agree on and work together toward a shared vision [1]. As a non-profit organization, TERRAVERA relied on the voluntary efforts of actors on both sides of the platform to get it up and running. This was possible because the foundation managed to identify and engage actors who shared and could commit to the vision and mission of the platform and ecosystem, which also aligned with the actors' personal or organizational aims. Although there is increasing awareness and engagement toward sustainability in society in general, the establishment of the TerraVera platform relied on finding those specific actors that share the same fervent desire to make sustainability a reality and, at the same time, have the capabilities and engagement needed for the platform to evolve.

Agreeing on Roles: An ecosystem has a set of roles that are essential for its governance [22]. In the Health South-East case, this was a main challenge at various levels. The top issue was to agree on a division of labor between government actors and private firms. From an ecosystem perspective, a reasonable principle would be that public actors (such as Health South-East) should be responsible for the platforms and boundary resources, while private firms should provide user solutions. This was a complicated issue for two reasons: first, many systems from private firms, typically EPR vendors, already included platforms, and second, some public solutions offered a range of user services. This issue was highlighted in the heated public discourse on the Akson solution in 2020 and 2021.

Governing a Sustained Ecosystem

A running digital platform ecosystem meets other challenges related to maintaining participation, ensuring value creation, and securing financial viability for complementors.

Maintaining Participation: Attracting and maintaining autonomous actors to work for the digital platform ecosystem's success is not straightforward and cannot follow

traditional governance modes, such as hierarchy or supplier–buyer contracts [15]. This implies that the immediate benefits of participation are not obvious. Which governance mechanisms are needed? A key principle is transparency; it is essential that participants monitor the continuous performance of the digital platform ecosystem [28]. For instance, in the AquaCloud case, all participants should be able to keep up with the information flow in the ecosystem and be confident that other participants comply with the shared rules and that the digital platform ecosystem is creating value as promised.

Ensuring Value Creation and Capture: Once the digital platform ecosystem is up and running, value creation and value capture are essential to ensuring sustained participation [15]. For collaborative digital platform ecosystems, this becomes particularly challenging because of the diversity of the actors involved, all of whom are crucial for the sustainability of the ecosystem. To document the continuous value creation, a set of performance indicators (e.g., transaction or innovation indicators) are needed [18]. These indicators are contingent on the specific ecosystem, and governance mechanisms must be designed to deal with performance problems. For TerraVera, the continuous and shared fervent desire to contribute to a more sustainable world was key. This desire was present for the initiators, developers, academic and business partners, regulators, and governing actors.

Securing Financial Viability for Complementors: In many digital platform ecosystems, the complements are the weak parts, and some researchers have suggested that the peripheral actors in an ecosystem should leverage external resources to innovate, preferably by participating in several ecosystems [33]. In the Health South-East case, this was highlighted by the ambiguity experienced by small vendors; on the one hand, it is difficult to get inside the ecosystem; on the other, if they get in, they risk lock-in by extensive integration and adaptation. Some successful companies, such as Imatis, mitigate this risk by establishing their own platforms inside the ecosystem. This is disliked by both public actors and other vendors because it leads to an IT architecture that gives one company a privileged position in the ecosystem.

5.2 Research Agenda for Collaborative Governance

In this section, we synthesize the findings identified in the previous section, draw on current research contributions, and propose three research streams on the collaborative governance of digital ecosystems.

First, we need to better understand the formation of digital platform ecosystems without a dominant actor. In the formation phase, specific governance principles must emerge in the process. One inspiration may be the work of Elinor Ostrom. In her research on governing the commons (i.e., natural ecosystems with scarce resources, such as fish or water), Ostrom found that bottom-up initiatives could result in polycentric governance structures [28]. The process by which this happens is a salient issue for digital platform ecosystems. An example of a bottom-up process and consensus mechanism from our case studies is the alignment of farmers dealing with salmon lice. The sharing of data through a collaborative digital platform facilitated more knowledge and faster identification of lice problematics. Further, the unification of macro actors striving for sustainability in the TerraVerra case and the alignment of hospitals in the Health

South-East case are examples of robust bottom-up processes that avoid some disadvantages attributed to centrally owned ecosystems.

Second, we need to analyze the relationships between the actors of established digital platform ecosystems to develop a governance framework. The literature offers several frameworks for governance, such as those of Hein and colleagues [20] and Bonina and Eaton [8], which may serve as inspiration. In our cases, the relationships require effective conflict resolution and the ability to ensure continual change. In Table 1, we saw that continued value creation and sustained participation are crucial issues to ensure the governance of digital platform ecosystems. Conflict resolutions require rule-based transparency in terms of activities and rules to facilitate sustained participation [28]. For instance, rules for allowing or refusing new entrants access to the ecosystem are an example of a conflict resolution issue. Allowing or refusing new entrants also makes an impact on the continued value creation.

Third, we need to investigate the contingencies of collaborative governance. Some principles may be universal, but as our cases show, different types of ecosystems require different governance mechanisms. For instance, AquaCloud's management challenges regarding the occurrence of lice are different from Health South-East's continual struggle to secure qualitative health services among and between its hospitals. More specifically, since there is not a one-size-fits-all approach to governance, further research may investigate the reasons that lead to heterogeneous governance arrangements in different ecosystems.

We find that these observations are critical issues to be solved in collaborative digital platform ecosystems. However, many questions remain.

6 Conclusion

In this paper, we ask, "*What are the key challenges for collaborative governance in digital platform ecosystems*"? Our literature review and case studies have revealed that this question is not easily answered. We offer a research agenda to investigate this in more depth. First, we need to better understand the forming of digital ecosystems without a dominant actor. Second, we must analyze the relationships between the actors of established ecosystems to develop a governance framework. Finally, the contingencies of collaborative governance should be investigated. Some principles may be universal, but as our cases show, different types of ecosystems require different governance mechanisms.

7 References

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