2023

Diversity in Digital platform ecosystems: Purposes, Governance, and Outcomes

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DIVERSITY IN DIGITAL PLATFORM ECOSYSTEMS: PURPOSES, GOVERNANCE, AND OUTCOMES

Research full-length paper

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Abstract

In this paper we investigate digital platform ecosystems from an organizational and managerial perspective. We conceptualize digital ecosystems as a distinct organizational form, which presents new challenges for governance. Our main interest is to understand why digital platform ecosystems are established, as well as which governance mechanisms are used, and which out-comes can be identified in commercial and non-commercial (collaborative) ecosystems. In this paper we present some preliminary results from an exploratory quantitative study. First, we find that there is a great diversity; ecosystems are created for many purposes, both for commercial interests, problem solving, data sharing and other purposes. Second, we find that there is a distinctive difference between commercial and non-commercial ecosystems, both regarding the governance mechanisms used and the outcomes of the ecosystems. Overall, we offer an extend-ed and nuanced view of digital platform ecosystems, highlighting that digital platform ecosystems can generate value beyond economic ones and prove beneficial to a larger audience.

Keywords: Digital platform ecosystem, digital platform, ecosystem, governance mechanisms

1 Introduction

Digital platform ecosystems—an organizational form relying on actors' interactions to create value—have changed the world economy by providing digital structures that enable and coordinate interactions among multiple actors (Parker et al., 2016). The growing dominance of digital platform ecosystems as an organizational form has inspired a large body of research, on various issues, such as business innovation (Parker et al., 2016), technical structures (Tiwana, 2014), and conceptual frameworks (Hein et al., 2020). Most of the literature to date has focused on commercial digital platform ecosystems, that is, those that are dominated by a platform owner aiming to maximize profits (e.g., Croitor & Werner, 2021; Hein et al., 2020). As a result, researchers have often taken the perspective of the platform owner, seeking to understand, for instance, various strategies that the platform owner can deploy to monetize the network effects of the ecosystem (Parker et al., 2016). Others have focused on governance mechanisms enforced by the platform owner for the ecosystem to arise and evolve (e.g., Halckenassauer et al., 2020; Jacobides et al., 2018; Schreieck et al., 2016).

While commercial ecosystems are increasingly challenging traditional pipeline businesses (Parker et al., 2016), we also observe a rapid development of non-commercial digital platform ecosystems in

several industries, which we refer to as collaborative digital platform ecosystems. Here, the aim is seldom to maximize profits. Rather, aims are directed towards collaboration to solve some problem that cannot be resolved by one actor alone (Costabile et al., 2022; Iden et al., 2021). Moreover, collaborative digital platform ecosystems are not governed by one central platform owner; governance is instead distributed or shared among participating actors (Costabile et al., 2022; Iden et al., 2021). Hence, there is a need to move beyond the platform owner perspective (Schreieck et al., 2016) and to understand the varied and complex nature of digital platform ecosystems as an organizational form. In this study, we take a broad perspective to understand why digital platform ecosystems are established, governed, and how they create value. This leads us to our research question: *Which purposes, governance mechanisms, and outcomes can we identify for digital platform ecosystems?*

Most studies of digital ecosystems are case studies or conceptual works. Although there exist some quantitative studies on platform ecosystems, these studies usually take a rather narrow perspective, for instance by investigating specific governance mechanisms (e.g., pricing or control) or their impacts on specific actors (e.g., Goldbach & Benlian, 2015; Yu & Chen, 2022). In our study, we take an organizational and managerial perspective. To the best of our knowledge, there are few, if any, quantitative studies of ecosystems as an organizational form. The reason is probably that there are no catalogues from public sources over ecosystems available. We chose a quantitative approach because we aimed for new organizational insights from a broad population. Such a broad perspective is important to capture the increasingly complex and varied nature of digital platform ecosystems and enables us to better understand how actors beyond the central platform owners (Schreieck et al., 2016) might benefit from this organizational form.

In preparing for the study, we identified approximately 250 active digital platform ecosystems in Norway. We developed a survey instrument to better understand which governance mechanisms are used and the outcomes of different types of digital platform ecosystems. Representatives from 83 of the identified digital platform ecosystems responded to our survey, 64 of whose responses were considered valid and used for further analysis. We intend to investigate possible correlations in more detail in the future; however, for the purpose of this paper we conducted descriptive analysis to present some preliminary findings from our study.

This paper continues as follows. First, we present relevant literature on digital platform ecosystems and governance. We then present the methods used to investigate our research question before we present some preliminary, descriptive findings. Then, we discuss our findings, limitations, and directions for future research, before we conclude the paper.

2 Relevant literature

In this section we first present literature on digital ecosystems as an organizational form, then we assess the literature on digital ecosystems governance.

2.1 Digital platform ecosystems as an organizational form

We define a digital platform ecosystem as an open, adaptive, self-organizing, not fully hierarchically controlled, meta-organization where the actors' interactions and activities are coordinated by social-technical structures (Iden et al., 2021; Jacobides et al., 2018; Nachira, et al., 2007). In broad terms, a digital platform ecosystem can be understood as consisting of three main structural elements: activities, actors, and architecture (Adner, 2017; Hein et al., 2019). Activities refer to the behavior, actions, and interactions that lead to value co-creation. Actors refer to various stakeholders who undertake the activities, such as producers who offer products and services and consumers who benefit from these offerings. Architecture refers to the technical infrastructures that enable activities to take place and coordinate interactions and exchange between and among actors (Iden et al., 2021). This also includes the digital platform at the core of the ecosystem (Tiwana, 2014) and its boundary resources, such as

application programming interfaces (APIs) (Ghazawneh & Henfridsson, 2013). The most important attribute of digital platform ecosystems is that they are *digital;* it is the digital structure that provides their power and scalability (Tiwana, 2014), enabling and coordinating interactions among multiple groups of actors (Parker et al., 2016). The interactions between and among actors enables the digital platform ecosystem to grow and create value (Parker et al., 2016; Hein et al., 2020).

The primary focus in information systems (IS) research to date has been on commercial digital platform ecosystems (e.g., Croitor & Werner, 2021; Ghazawaneh & Henfridsson, 2010; Hein et al., 2020), such as those that facilitate economic marketplaces that connect buyers and sellers (e.g., Amazon), marketplaces for sharing services (e.g., Uber), technology marketplaces where sellers can upload their digital components for sale (e.g., Google play), or social channels where users can connect and interact, and advertisers reach a particular audience (e.g., Facebook). These commercial ecosystems usually have one dominating platform owner aiming to maximize profits through network effects (Parker et al., 2016).

Interestingly, digital platform ecosystems as an organizational form have evolved far beyond commercial purposes, denominated as *collaborative* digital platform ecosystems. Collaborative digital platform ecosystems have no dominant actor (one central platform owner), rather the ownership is usually shared or distributed among participating (and often competing) actors (Iden et al., 2021). The aim of these ecosystems is not to maximize profits but to resolve problems that cannot be solved by one actor in isolation. For instance, TerraVera is a digital platform ecosystem in Norway coordinating interactions and activities between researchers and businesses to share data, insight, and build models to measure sustainability (Iden et al., 2021).

In general, digital platform ecosystems as an organizational form holds attractive characteristics, in that they reduce transaction costs, support development of complementary services and products, create network effects, and create value by leveraging a large heterogeneous set of users (i.e., generativity) (Asadullah et al., 2018). However, as the landscape of digital platform ecosystems continues to evolve and increase in variety and complexity, there is a need for more empirical evidence to better understand this landscape and how value is created and distributed among various ecosystem actors (Hein et al., 2020; Parker et al., 2016).

2.2 Governing digital platform ecosystems

Considering the multiple actors and variety of interests that need to be balanced in a digital platform ecosystem, governance is challenging (de Reuver et al., 2018; Tiwana, 2014). Governance mechanisms are broadly defined 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 (Simons, 1994). Key variables identified for commercial digital platform ecosystem governance include platform ownership, platform access, fairness, and trust (Iden et al., 2021).

Platform ownership is related to the division of power among actors and indicates who can decide about a platform's use and development (Tiwana, 2014). In centralized platforms, ownership is in the hands of the platform owner alone. In more decentralized platforms, ownership is in the hands of a consortium of companies or of a peer-to-peer community (Hein et al., 2020; Perscheid et al., 2020). Platform access regards which actors can participate and use the platform (Boudreau, 2010). There are platform ecosystems that are open for everyone, those that allow members through invitations, and others that are closed i.e., accessible only for certain actors. Fairness relates to whether actors perceive decisions to be fair, for instance related to pricing, revenue sharing, and requirements (e.g., Croitor & Werner, 2021). Trust refers to actors' confidence in the digital platform as well as in the integrity of other actors (Hurni & Huber, 2014; Schreieck et al., 2016).

For commercial digital platform ecosystems, the governance mechanisms are usually established by the platform owner to orchestrate their ecosystem (Costabile et al., 2022). For collaborative digital

platform ecosystems, however; governance is considered a collective endeavor (de Reuver et al., 2018; Costabile et al., 2022), referred to as *collaborative governanc*e (Ansell & Gash, 2008; Furr & Shipiolov, 2018). In these cases, governance mechanisms are established and implemented differently, following a bottom-up approach, with a strong focus on learning and communication among ecosystem actors (Constantinides & Barrett, 2014). Moreover, while some of the key governance mechanisms found for commercial digital platform ecosystems also may be relevant for collaborative governance, new issues emerge that need to be considered (Iden et al., 2021).

Iden and colleagues (2021) found that there are several governance challenges that need to be addressed in collaborative digital platform ecosystems. Without one dominating central owner, participating actors must come to an agreement on which standards (both technical and social) should apply and how the roles are to be distributed among them, already when establishing the ecosystem. Moreover, all participating actors must demonstrate the capabilities and engagement to commit to a shared vision for the platform to continue to evolve. Once established, collaborative digital platform ecosystems meet additional challenges, e.g., related to maintaining the actors' participation, ensuring value creation, and securing financial viability for producers (Iden et al., 2021). In sum, challenges like these are likely to require different governance mechanisms than what has typically been found as key for commercial digital platform ecosystems (Chen et al., 2021). Therefore, we need to better understand how governance mechanisms varies for different forms of digital platform ecosystems.

3 Research methodology

We conducted an exploratory quantitative study (Hallingberg et al., 2018; Hair et al., 2019), with the aim to become more familiar with digital platform ecosystems as an organizational form; a phenomenon that has not been widely studied earlier. A survey instrument was constructed, building on the context-mechanism-outcome scheme (Pawson et al., 1997) and variables operationalized from the literature related to the purpose, governance mechanisms, and outcomes of the digital platform ecosystems. By purpose, we here refer to the background for why the ecosystem was established, including variables such as the main purpose of the ecosystem (Hein et al., 2020; Iden et al., 2021) and the primary value unit being exchanged (Parker et al., 2016). By governance mechanisms, we refer to the structures, processes, and tools applied to manage the forming and sustained use of the digital platform ecosystem. Based on Iden et al. (2021), we included variables related to platform ownership, trust, platform access, pricing, and visibility. As for outcomes, we draw on Teece (2018) and Parker and colleagues (2016), and included variables related to the benefits users have experienced from participating on the digital platform ecosystem, as well as how value is distributed among different actors (i.e., which actor groups have benefitted from the ecosystem). The variables and variable items we applied in our study are summarized in Table 1.

Topic	Variable	Variable items	Sources
Purpose	Main purpose of ecosystem	Transactions (purchase, sale, rental), Data sharing, Problem solving, Innovation, Connecting people, Solving tasks, Addressing sustainability issues	Hein et al., 2020; Iden et al., 2021
	Value unit exchanged	Goods, Services, Data	Parker et al., 2016
Governance mechanisms	Platform ownership	Decisions made by one central owner, Decisions made collectively	Hein et al., 2020; Tiwana, 2014; Perscheid et al., 2020
	Institutional trust	Stable operations, Access control, Equal treatment of actors, Good data policy,	Hurni & Huber, 2014; Schreieck et al., 2016

		Clear contracts	
	Actor trust	Rating, Content visibility, Ability to communicate	Hurni & Huber, 2014; Schreieck et al., 2016
	Platform access	Open for all, By invitation only, Open for all that fulfill criteria	Boudreau, 2010; Perscheid et al., 2020
	Pricing	Per transaction, License, Subscription, Sharing of expenses	Springer & Petrik, 2021
	Visibility	Social media, Traditional media, Events, Search engine indexing	Lohrenz et al., 2021
Outcomes	Benefit for users	Financial gain, Solution to an individual problem, Solution to a common problem, Better resource utilization, Increased competency, Innovation	Teece, 2018; Parker et al., 2016
	Value distribution	Platform owner, Producers, Consumers, 3rd party technology providers, Authorities, Researchers, Society	Teece, 2018; Parker et al., 2016

Table 1. Variables included in the study.

To identify a population of digital platform ecosystems, we scanned the internet for possible candidates in Norway, using search engines and a variety of databases (e.g., registers of start-up accelerators and public funding organizations). The inclusion criteria were, (i) that the ecosystem had a presence (or description) as such on the Internet, (ii) that it satisfied the basic definitions (digital platform and n-sided interactions), and (iii) that the ecosystem was in production. We identified 250 such objects and documented email addresses for contact.

We created a survey on Qualtrics. The survey instrument was tested on representatives from a selection of digital platform ecosystems and revised based on their feedback. We distributed the survey to contact persons from all identified digital platform ecosystems. The distribution was done in several ways. For some of the contacts, we personally sent an invitation by email with an anonymous link generated through Qualtrics. For most of the contacts, we sent an invitation directly through Qualtrics with a personal link, which allowed us to send reminders only to those who did not finish the survey. We also sent the survey invitation through LinkedIn for a few contacts. After two rounds of reminders, we closed the survey. Respondents from 83 of the 250 ecosystems responded to our survey, of which 64 responses were considered valid.

We analyzed the data through descriptive analysis. First, we analyzed the overall frequencies to document the general attributes. Then, we analyzed two subsets: the commercial and the collaborative (non-commercial) digital platform ecosystems.

The survey data was analyzed using SPSS version 28. The initial screening of our empirical data revealed that some respondents had more than 50% of missing data. These were removed from further analyses, leaving us with useful data from 64 respondents. We then investigated the data distribution of variables including the central tendency of variables, frequency distribution of responses in groups of respondents including users and platform owners belonging to commercial and collaborative ecosystems. Our analysis of the two subsets—commercial and collaborative digital platform ecosystems—was guided by the overarching topics of our survey, as presented in table 1: purpose, governance mechanisms, and outcomes. In section 4, we present our findings, based on descriptive statistics and graphical illustrations from our analysis. Our findings are used exploratively, as empirically based input for potential explanations for guiding further theory development.

4 Findings

In this section, we present our findings related to the purposes, governance mechanisms, and outcomes of the digital platform ecosystems. Based on the reported main purpose of the digital platform ecosystem, we differentiate between commercial and collaborative (non-commercial) ecosystems when presenting our findings on governance mechanisms (section 4.2) and outcomes (section 4.3). In section 5, we discuss the potential implications of our findings in further detail.

4.1 Purpose

While the literature to date has primarily focused on commercial digital platform ecosystems, we find the picture is much broader. Of the 64 digital platform ecosystems included in our study, less than one third of the digital platform ecosystems were established for commercial purposes (i.e., purchase, sale, rental). Figure 1 illustrates the main purpose of the digital platform ecosystems distributed in percentage. The majority (70.3%) of the digital platform ecosystems have non-commercial purposes, including data sharing, problem solving, innovation, connecting people, solving tasks, and addressing sustainability issues. The purpose of the digital platform ecosystems was also verified through additional survey questions related to the aim of the owner(s) in establishing the ecosystem and the motives of users for participating in the ecosystem.

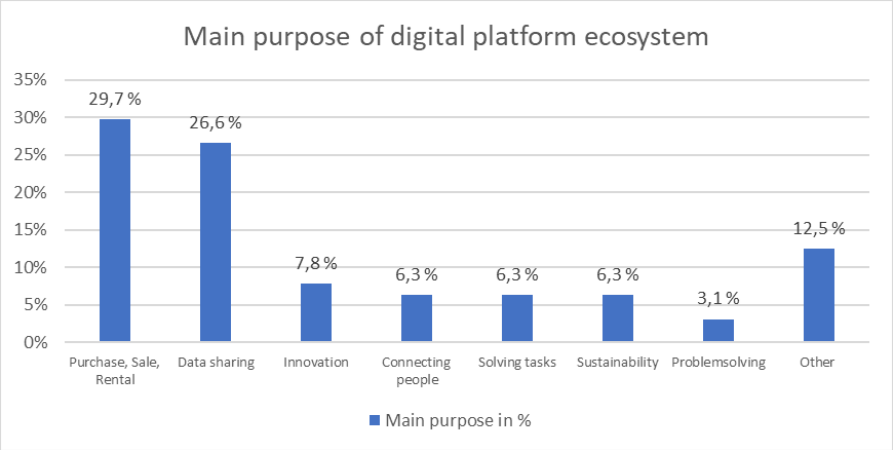

Figure 1. Main purpose digital platform ecosystem.

12.5% of the respondents answered "other" to the question of the main purpose of the respective digital platform ecosystem and were then asked to specify their purpose in free text. When investigating their answers, we found that their primary purposes were closely related to what we would characterize as data sharing (e.g., documenting competencies), problem-solving (e.g., skill-training), and connecting people (e.g., sharing services).

In the remainder of this paper, we differentiate between two forms of ecosystems. Ecosystems that were reported to have a primary purpose to facilitate purchase, sale, or rental, are categorized as commercial. Collaborative ecosystems represent those reported to have any other primary purpose (i.e., data sharing, problem solving, innovation, connecting people, solving tasks, or sustainability). 19 (29.7%) of the ecosystems are characterized as commercial, and 45 (70.3%) as collaborative (i.e., non-commercial).

4.1.1 Value unit being exchanged

We observe that the most common value unit exchanged on commercial digital platforms is services, followed by goods (Figure 2). Here, only one ecosystem reported to exchange data as primary value unit. This is opposed to collaborative digital platforms, where data was most frequently reported as the

primary value-unit, followed by services. Here, goods are more seldom the primary value-unit exchanged over the platform.

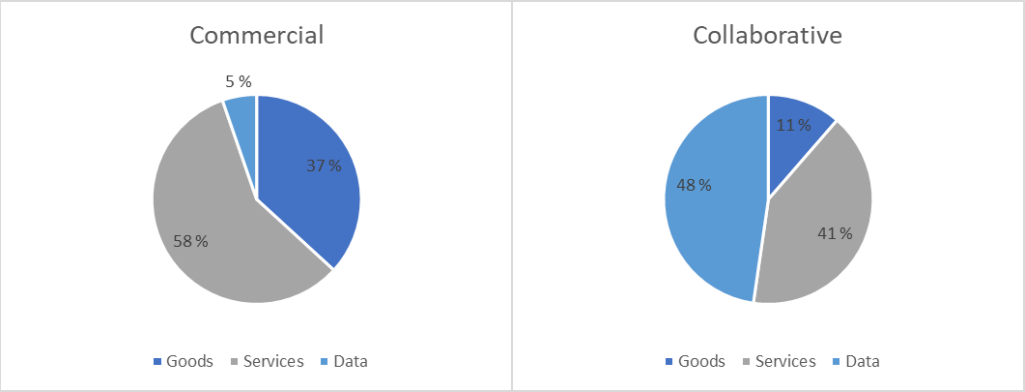

Figure 2. Primary value-unit exchanged on the digital platforms.

4.2 Governance mechanisms

In this section, we will compare insights regarding governance mechanisms used in the different forms of digital platform ecosystems (commercial and collaborative). This includes mechanisms related to platform ownership, trust, platform access, pricing, and visibility.

4.2.1 Platform ownership

From the literature, we would expect to find that decisions are mainly taken by one dominating actor (platform owner) in commercial ecosystems, and that for collaborative digital platform ecosystems, decisions are taken collectively. Our findings support the first, where 68% of the commercial ecosystems report decisions are mainly made by the platform owner alone (Figure 3).

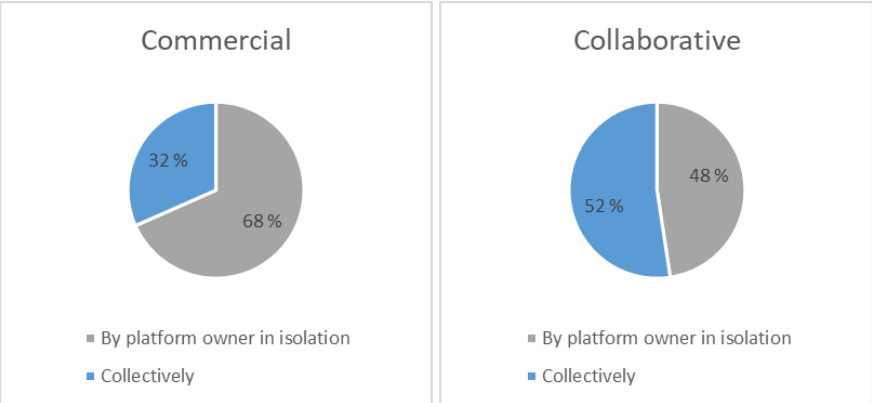

Figure 3. Decision making in digital platform ecosystems.

For collaborative ecosystems, we found an almost equal divide between decisions being taken collectively and by the platform owner(s) in isolation.

4.2.2 Trust

We distinguish between institutional trust, which relates to the actors' trust in the digital platform, and actor trust, which refers to the actors' trust in each other. To understand which tools were applied to ensure institutional trust, we asked the respondents to which extent stable operations, access control, equal treatment of actors, good data policy, and clear contract were applied. We did not find any dif-

ferences between commercial and collaborative ecosystems; in both types of ecosystems, stable operations was reported as the most important tool, whereas equal treatment of actors as the least important.

To understand which tools are important to ensure actor trust, we asked the respondents to rate their application of a variety of tools on a scale from 1 (to a very little extent) to 5 (to a very large extent).

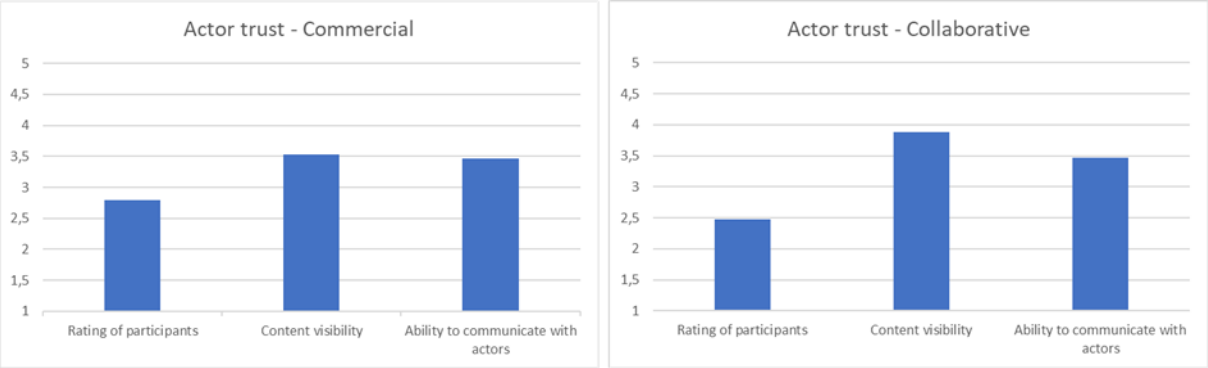

Figure 4. Actor trust (means) - commercial and collaborative.

As Figure 4 illustrates, actors' visibility into the content on the platform was reported as the most important tool to ensure actor trust for both commercial and collaborative platform ecosystems and rating of participants the least important. These tendencies were stronger for collaborative ecosystems. The ability for actors to communicate with each other was deemed equally important for both forms of ecosystems.

4.2.3 Platform access

As for platform access, we found that both commercial and collaborative ecosystems are mostly open for everyone that meet the access requirements (47,4% and 59,1%, respectively) (Figure 5). However, around 30% of commercial platforms are open for everyone (31,6%), whereas collaborative ones are accessible only with invitation (27,3%).

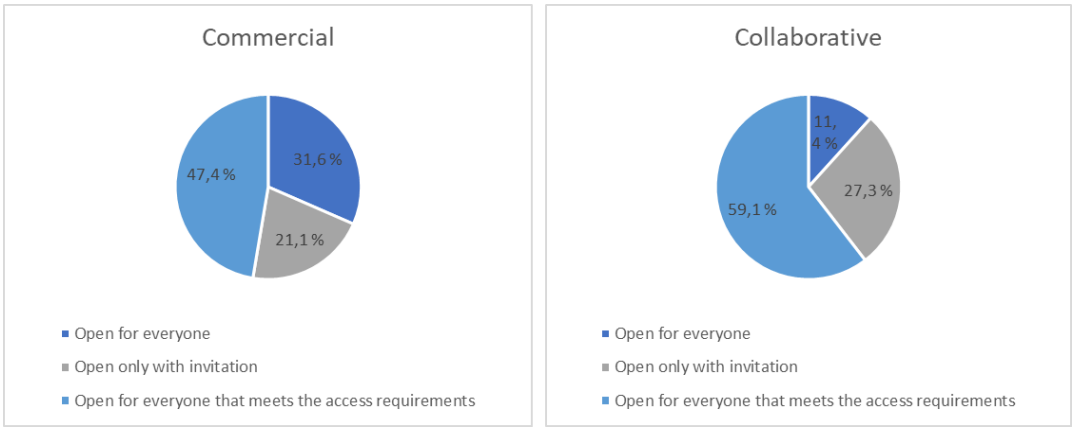

Figure 5. Platform access - commercial and collaborative.

4.2.4 Pricing

Regarding pricing, we asked informants to report how the ecosystem is financed. They could choose one or more alternatives. As shown in Figure 6, commercial ecosystems are mainly financed per transaction, followed by subscription, licenses and sharing expenses. Collaborative ecosystems are mainly financed through shared expenses and rarely per transaction.

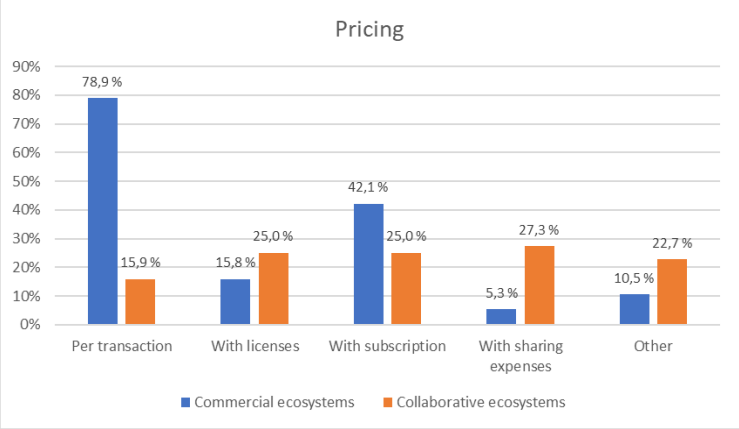

Figure 6. Pricing options.

As for "other" ways of pricing, respondents used this alternative to specify their specific financing models. The responses varied in nature, including for instance financing from sponsorships and governmental initiatives. It is also worth mentioning that some respondents also used this alternative to select two of the pre-defined alternatives, even if this would have been possible when filling out the survey.

4.2.5 Visibility

Regarding visibility, we asked the respondents to which extent they used different channels to increase the visibility of the digital platform ecosystem, from 1 (to a very small extent) to 5 (to a very large extent). As illustrated in Figure 7, we found that commercial digital platform ecosystems use indexation on search engines and social media as their main channels for increasing the visibility of the ecosystem. 79% of the commercial ecosystems use search engine indexing to a large or very large extent to increase visibility, and 74% of them use social media for this purpose.

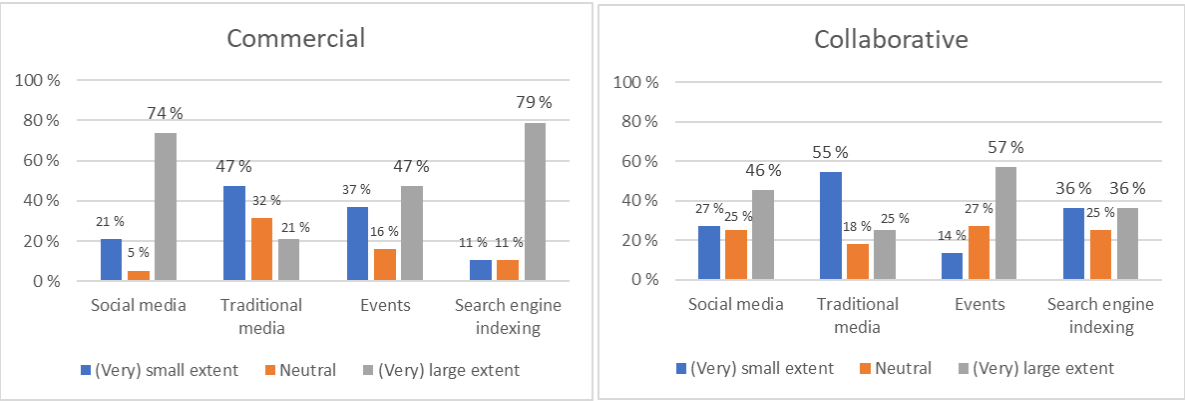

Figure 7. Visibility - Commercial and collaborative.

Collaborative ecosystems rely more on events to promote themselves. 57% of the collaborative ecosystems reported that they use events to increase the visibility of the ecosystem to a large or very large extent. Events seem to be less important for commercial ecosystems, together with traditional media, where the latter also is reported as the least used channel for collaborative ecosystems to increase their visibility.

4.3 Outcomes

In this section, we present findings related to the outcomes of the digital platform ecosystems, both related to the benefits for users participating in the ecosystem and how value is distributed across actor groups.

4.3.1 Benefits for users

We asked the informants to evaluate to what extent they agreed on the users' achieved benefits from participating in the ecosystem, from 1 (totally disagree) to 5 (completely agree).

For commercial ecosystems, Table 2 shows that financial gain was evaluated as the most achieved benefit, followed by solution to an individual problem and better resource utilization. These results are in line with the nature of commercial ecosystems, which aim at fostering transactions and increasing profits.

Benefit	Min	Max	Mean	Std.D.	Var	Count
Financial gain	3	5	4,56	0,69	0,47	18
Solution to an individual problem	2	5	4,22	0,85	0,73	18
Better resource utilization	2	5	4,17	0,90	0,81	18
Solution to a common problem	1	5	3,83	1,07	1,14	18
Innovation	2	5	3,67	0,82	0,67	18
Increased competencies	2	5	3,44	0,76	0,58	18

Table 2. Descriptive statistics: Benefits for users - Commercial ecosystems.

For collaborative ecosystems, Table 3 shows that better resource utilization, solution to a common problem, and innovation are the largest value benefits for users. Financial gain is reportedly the least common benefit for users. These findings align well with the nature of collaborative ecosystems, which are less profit oriented and more interested in solving problems.

Benefit	Min	Max	Mean	Std.D.	Var	Count
Better resource utilization	2	5	4,38	0,79	0,62	42
Solution to a common problem	1	5	4,10	0,95	0,90	42
Innovation	2	5	4,05	0,79	0,62	42
Increased competences	2	5	3,90	0,95	0,90	42
Solution to an individual problem	1	5	3,83	1,07	1,14	42
Financial gain	1	5	3,57	1,16	1,34	42

Table 3. Descriptive statistics: Benefits for users – Collaborative ecosystems.

4.3.2 Value distribution

To understand how value from the digital platform ecosystems is distributed among the actors, we asked the respondents to which extent different actors had experienced some benefit from participating on the ecosystems (from 1 – very little extent, to 5 – very large extent). For each actor group, some respondents also answered that they did not know.

As Figure 8 illustrates, for both forms of ecosystems, the consumers and producers benefit the most from participating in the digital ecosystem. Platform owners and the society as a whole also benefit from the ecosystems, however; platform owners reportedly more so for commercial ecosystems and the society reportedly more so for collaborative ecosystems.

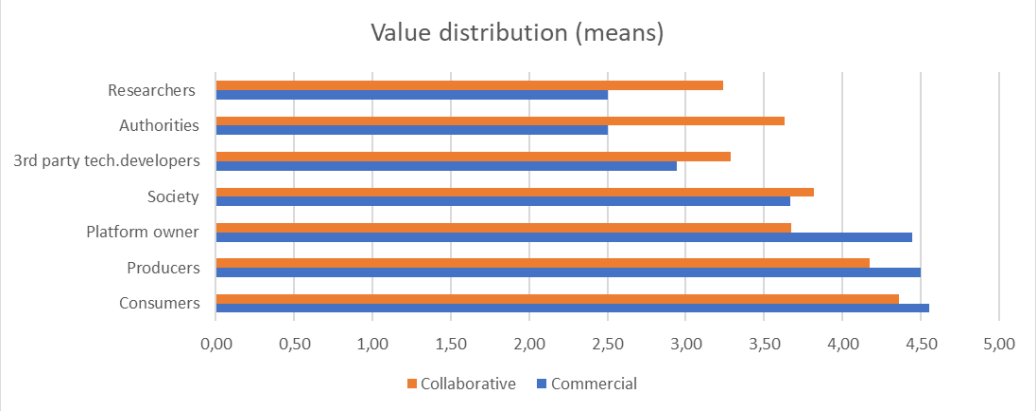

Figure 8. Value distribution (means) - commercial and collaborative.

Authorities and researchers have the least benefit of commercial digital platform ecosystems. For collaborative ecosystems, it is least beneficial for researchers and third-party developers, however; it is more beneficial for these actors here than on commercial ecosystems. In fact, for all actors beyond the platform owner, consumer and producer, collaborative ecosystems are more beneficial. For the platform owners, consumers and producers, commercial ecosystems are reportedly more beneficial.

5 Discussion

In this section we discuss our findings, structured according to the diversities we found among digital platform ecosystems regarding their purposes, governance mechanisms used, and their outcomes.

5.1 Diversity of purposes

During the past decade IS research has produced a large body of knowledge on digital platform ecosystems; including technology perspectives (Tiwana, 2014), business perspectives (Parker et al., 2016), and organizational perspectives (Jacobides et al., 2018). Most of these contributions focus on ecosystems that are dominated by the platform owner, and much of the literature deals with various strategies that the platform owner can deploy to monetize the network effects of the ecosystem (Parker et al., 2016).

Our findings reveal a different overall picture; less than one third of the ecosystems are primarily established for the exchange of goods and services. We explain this as a development of the ecosystem form, where initiators have realized that ecosystems can be used for new purposes. In fact, our overall analysis shows that in general, the most important aim of the platform owners is not financial gain, but to solve some problem, followed by innovation. For instance, West Coast aquaculture companies, who are competitors, have designed a collaborative digital ecosystem to fight salmon lice in the sea. Another example is how large public health care providers have created ecosystems to speed up digital innovation.

5.2 Diversity of governance mechanisms

Since most digital ecosystems are not fully controlled by the platform owner (Jacobides et al., 2018), governance mechanisms have to be more complex than traditional hierarchical governance. Tiwana (2014) suggested *orchestration* as a metaphor for ecosystem governance, and offers a rich overview of mechanisms, such as decision rights, control mechanisms (for instance gatekeeping), and pricing.

Our findings show that, from an overall perspective, in around half of the ecosystems (51,6%) the platform owner takes the decisions, while in the other half decisions are taken collectively. The tendency of collective decisions is less prominent for commercial ecosystems, as expected. Our data confirm a

variety of well-known governance mechanisms, but also reveal that mechanisms such as content visibility and ability to communicate with other actors are considered quite important for actor trust.

We also found that there is a diversity regarding the most commonly used channels for increasing the visibility of the digital platform ecosystems. Our findings reflect that collaborative digital platform ecosystems are more dependent on physical (and digital) events to meet people who share the same problem, interests, or vision, and who might potentially (be invited to) become collaborating actors. Whereas commercial digital platforms, whose primary value units are goods and services, more often resort to those channels where consumers are disposed to personalized advertisement (e.g., social media) and where consumers go to find the products and services that meet their needs (e.g., search engines).

5.3 Diversity of outcomes

Most of the ecosystem research has focused on the outcomes for the platform owner, as a result of a purposeful strategy. For instance, up-and-coming platform entrepreneurs can monetize n-sided networks (Parker et al., 2016) through relying on external resources and presenting products and services that others have to offer (Van Alstyne et al., 2016).

From the literature, we also know that consumers and producers who take part in and interact through the digital platform ecosystem also gain some value (e.g., Rietveld et al., 2019; Selander et al., 2013). Our findings confirm this, as the respondents collectively report that the consumers, producers, and platform owner benefit the most from the digital platform ecosystem. Related to the outcomes for users, there is a difference, as expected, between commercial and collaborative ecosystems. The two highest scores in commercial ecosystems are financial gain and solving an individual problem, while for collaborative ecosystem the two highest are better resource utilization and solution to a common problem. This illustrates that collaborative ecosystems work as collective forums, rather than economic exchanges (Ansell & Gash, 2008).

Our findings also illustrate that digital platform ecosystems can be beneficial for other actors as well, including third-party developers, researchers, and authorities. One surprising finding is that 64% of the respondents consider that society as a whole benefits from the ecosystem. As expected, this response is higher from respondents in collaborative ecosystems than commercial, but the difference is not large. Our data does not reveal more details on this issue, but it illustrates that many different stakeholders benefit from their participation.

5.4 Limitations and avenues for future research

This study presented some preliminary results of a quantitative study; we intend to follow up with a causal analysis of the relationships between purposes, mechanisms, and outcomes. For instance, it would be interesting to learn more about the relationships between purposes, governance mechanisms, and outcomes and seek to understand which governance mechanisms are most appropriate in different forms of digital platform ecosystems. The context of our research was digital platform ecosystems in Norway, and since the Norwegian context has some peculiarities (Bygstad et al., 2017) further research should focus on other contexts as well.

Moreover, we believe that our study opens some other avenues for further research, inspired by the documented diversity of digital platform ecosystems. As de Reuver et al. (2018) argued, the platform debate should also seek to address the broader issue of how digital platform innovation directly relates to issues of societal and global interest.

6 Conclusion

Our survey of digital ecosystems was designed to investigate the phenomenon as an organizational form, not primarily as a business model. Our sample, therefore, was a mix of different types of ecosystems, from purely commercial to e-health and non-profit, illustrating that digital ecosystems can serve several purposes. Overall, we offer an extended and nuanced view of digital platform ecosystems. Our findings first show a rich diversity in purposes, including commercial aims, data sharing, innovation, sustainability, and problem solving. Second, they reveal a variety of governance mechanisms, where half of the ecosystems have collaborative governance. Third, they show that digital ecosystems benefit many stakeholders, ranging from the platform owner, producers, consumers, and third-party developers, but also the society as a whole. This illustrates the complementary aspect of digital ecosystem (Jacobides et al., 2018), i.e., that the structure is constituted by actors with different roles and contributions, creating a working whole.

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