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Towards an integrated Digital Platform Governance approach

An exploration of drivers, holism and temporality in Digital Platform Governance

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Towards an integrated Digital Platform Governance approach

An exploration of drivers, holism and temporality in Digital Platform Governance

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1 Summary

Digital platforms are extremely complex and dynamic phenomena. Over the course of the last decade, literature on digital platforms, their ecosystems and governance approached has quickly gained a lot of traction. Considering their enormous importance in today's society, their presence is not expected to change anytime soon. 7 of the 10 most valuable companies are platforms companies, and the amount of platform initiatives is growing by the day. Despite their huge popularity, a great deal of platform initiatives does not make it to success (Abdelkafi et al., 2019). Research on digital platforms is therefore more relevant than ever before.

A key challenge in launching successful platforms is that of platform governance (Foerderer et al., 2018). It is commonly referred to as the sum of activities carried out by platform owners that seek to influence the behaviour and outcomes of complementors (Halckenhäusser et al., 2020). Platform governance literature has received attention from a wide array of disciplines. The different perspectives these disciplines offer have resulted in scattered platform governance literature landscape, each with a different view on platform governance practices. Following a plethora of calls from extant literature (Carnahan et al., 2010a; CUSUMANO et al., 2020; De Reuver et al., 2018; Gilsing et al., 2020; Jacobides et al., 2018), there is a need to integrate these perspectives, in an attempt to holistically approach platform governance. Another aspect of platform governance that might be uncovered by a more holistic approach towards platforms and their ecosystems are the generative mechanisms that lead to change (De Reuver et al., 2018; Ahmad Ghazawneh & Henfridsson, 2013). To address these research gaps, this research asks the following research questions:

RQ1: 'What are the main drivers of platform governance?'

RQ2: 'How can platform governance be approached holistically?'

RQ3: "What happens to platform governance overtime?"

Extant literature on digital platforms, their ecosystems and governance highlights the multiple perspectives that influenced theory development on platform governance practices. Literature on digital platforms indicates that it has primarily benefitted from an economic and technical perspective (Rysman, 2009; Tiwana, 2014). The economic perspective is especially concerned with network effects and finds its origin in theory of two-sided markets. The technical perspective is concerned with the technical core of the platform, and deals with topics such as the provision of the resources that enable complementors to add complementarities to the core (Ahmad; Ghazawneh & Henfridsson, 2010). A perspective that bridges these perspectives is found in the

socio-technical perspective. This perspective is concerned with the interplay of social and technical aspects of the system and considers platform in relation to actors activities in their ecosystems. Research on ecosystems sees similar issues. Multiple disciplines have shined their light on what it is that makes ecosystems emerge. However, the orchestration of different actors is not always at the centre of attention. In an attempt to work towards an integrative approach of ecosystems, Hein et al. (2020) offer an conceptualization of digital platform ecosystems which regards them in relation to platform ownership, value creating mechanisms and complementor autonomy. The process of orchestrating these facets of the ecosystem revolves around the practice of platform governance. As mentioned earlier, platform governance is seen as one of the key challenges in launching a digital platform. There are many theories on how a platform should be governed. However, again, a lack of general consensus on what platform governance entails makes it hard to integrate these different findings in a comprehensive strategy.

In order to answer the research questions, this research conducts a structured literature review following the grounded theory (GT) methodology as proposed by Wolfswinkel et al., (2013). They propose a 5 step process approach in reviewing literature, consisting of the stages: Definition, search, selection, analysis and presentation of findings. In contrary to the classical approach to GT, this research follows the analytical approach as formulated by Matavire & Brown (2013b). This approach differs in a sense that the main goal is not about theory building, but about the identification of important themes and categories, and explaining the relation between them. The carefully selected corpus of extant literature is screened to identify the current drivers of platform governance. A coding process, using content analysis, helps in formulating how and if platform governance can be approached more holistically and if the drivers of platform governance can be related to a temporal dimension. The categories that are the result of this coding process serve as a foundation for discussion on the matter.

The results of this research give insight in a few of the main drivers of platform governance. In contrary to extant literature, openness was identified as the most relevant driver, as it shows interesting dynamics with the other identified drivers. Openness is not just relevant in the context of software architecture, but can be experienced on multiple levels throughout the platform ecosystem. A particularly interesting dynamic is that between openness and control. Control, in a platform governance context, entails more than just the (in)formal mechanisms deployed to exert control. Platform control dynamics involve careful decisions on themes such as power distribution, platform ownership and centralization. Platform owners should carefully balance between opening up their ecosystem on multiple levels and giving up control, in order to

achieve goals such as user growth or maintaining their innovative capabilities. At the core of platform governance activities we find the platform itself. Architectural decisions on the allocation of boundary resources or the modularity of the platform enable or restrict decision and participation rights and are at the heart of the emergence of surrounding ecosystem.

This research indicated no solid attempts at integrating the multiple perspectives on platform governance. However, a few of the identified categories can lead to fruitful discussion. In order to achieve a holistic platform approach, researchers must adopt an integrative conceptualization of platform governance. One that does not ground itself in one of the many perspectives on platform governance and does not overlook the importance of actor interaction. As long as platform governance research finds its origin in different foundational premises, an holistic view will be hard to achieve. An interesting research avenue, to further advance platform governance theory, is looking into the possibilities of building on openness, while taking value (co)-creation through an S-D logic lens (Vargo & Lusch, 2004) as the central theme of governance activities. This approach would deal with many of the underlying issues in holistically approaching platform governance, such as the existence of multiple perspectives and theoretical foundations, as it drifts focus away from specific aspects of the platform ecosystem to a more general goal.

Lastly, the results show early indication of temporal views on platform governance. For example by adopting an ecosystem lifecycle approach or maturity model. However, these practices are still in a very early stage and research is a long way from explaining platform behavior in a temporal manner. Extant research continues to view platforms as static entities or focusses on very specific timeframes of the platform lifecycle. This can be partially explained by the speed at which platform companies have emerged. As more and more platforms start reaching maturity phases, the amount of cases through which the temporal dimensions of platform governance research can develop will grow. Research should stick to one approach, such as the ecosystem lifecycle approach, to explain the dynamic behavior that platforms exhibit. Trischler & Meier, (2021) make a first attempt at this by relating the strategic decisions involved in ecosystem development to the platform's lifecycle and serve as an example of how this research could progress.

2 Introduction

Digital platforms are shaping our economy in ways never seen before. Platform businesses have quickly enabled and facilitated digital interactions and transaction between a large variety of previously unconnected actors (Carnahan et al., 2010a; De Reuver et al., 2018) leading to a wide array of previously unimaginable initiatives. The rise of the 'platform economy' is at the heart of new economic revolution, disrupting our lives, the economy, businesses and labour markets in ways not seen since the industrial revolution (Kenney & Zysman, 2016). Platforms play an enormous role in our society with 7 of the 10 most valuable companies being platform companies (Schenker, 2019), and the amount of platform initiatives increasing by the day. Businesses all over the world are trying to get a piece of the 'platform pie'. Economists suggest every firm should consider organizing as a platform. Those who do not, risk being disrupted by the aggressive expansion of existing platforms into new markets and sectors (Parker et al., 2016). Interestingly enough, despite the fact that many businesses are currently opting for platform business models, only a small percentage actually make it to success (Abdelkafi et al., 2019). Inarguably, there still is a lot to be gained from understanding (digital) platforms, the way they operate and what it is, that makes them succeed.

A key challenges in launching successful platforms is that of platform governance (Foerderer et al., 2018). It is commonly is referred to as the sum of activities carried out by platform owners that seek to influence the behaviour and outcomes of complementors (Halckenhäusser et al., 2020). Prior research takes an extensive look at the orchestration of platforms and their ecosystems through the scope of various disciplines such as economics, organizational change, technology management and information systems. While these disciplines offer interesting perspectives, the academic advancements on platform governance remain too isolated (Halckenhäusser et al., 2020). This segregated approach towards platform governance research has resulted in theories that developed under a slightly different understanding of the phenomenon, often with a focus on specific attributes of the platform, such as the technical design (Tiwana et al., 2010) or resourcing (Ahmad Ghazawneh & Henfridsson, 2010). In order to unveil whether the advancements on platform governance share similarities, there is a need to identify the drivers of platform governance that are offered throughout the disciplines. This leads to the following research question:

RQ1: 'What are the main drivers of platform governance?'

It is clear that platform governance research could benefit from a more inter-disciplinary approach. Scholars have repeatedly called for an integrative approach towards the research of platform ecosystems (Carnahan et al., 2010a; CUSUMANO et al., 2020; De Reuver et al., 2018; Ege Adali et al., 2021; Jacobides et al., 2018), in an attempt to combine the different perspectives each of the disciplines provide. However, due to the extensive scope, complexity and distributed nature of digital platforms, it can be hard to provide a holistic view on the emergent behaviour that platforms exhibit (Hanseth & Lyytinen, 2010). This research follows the plethora of calls from extant research into aggregating insights and asks:

RQ2: 'How can platform governance be approached holistically?'

Another important aspect of platform research that might be uncovered by a more holistic approach towards platforms ecosystems are the generative mechanisms that lead to change (De Reuver et al., 2018; Henfridsson & Bygstad, 2013). Due to the inherent dynamic behaviour of digital platforms, it is logical for platform governance practices to shift over time (Tiwana, 2014). While some research addresses platform science by adopting a lifecycle view (Ahmad; Ghazawneh & Henfridsson, 2010; Otto & Jarke, 2019), most of these evolutionary approaches find their origin in their respective disciplines (Eisenmann, 2008; Teece, 2017) and are not directly applicable to other platform approaches. This limited temporal view on platform governance is for example noted by Gawer (2020) & Trischler et al. (2021) who find that most platform research approaches platforms as static entities and focusses on early design decisions. A better understanding of how and when to shift governance practices in order to reach specific goals, will help platform owners in successfully controlling their platforms. This leads to the following research question:

RQ3: "What happens to platform governance overtime?"

Together, these research questions help in exploring the temporal dimension of digital platform governance and address the earlier mentioned research gaps.

To answer the research questions, this research will conduct a structured literature review following the grounded theory (GT) methodology as proposed by Wolfswinkel et al., (2013). A carefully selected corpus of extant literature is screened to identify the current drivers of platform governance. A coding process will help formulating how and if platform governance can be approached more holistically and if the drivers of platform governance can be related to a temporal dimension. The categories that are the result of this coding process serve as a foundation for discussion on the matter.

This thesis is structured as follows. In section 2, a brief look is given at relevant platform research. An overview of the key perspectives that platform research has taken and the key contributions that followed from it is given. Furthermore, platforms, their ecosystems and governance are conceptualized. In section 3, methodology, the chosen research approach, consisting of a literature review following the grounded theory methodology, is explained. Next to that, the tools that were used for data selection and data coding are elaborated upon. The result section, section 4, consists of a lower and a higher level interpretation of the data. Next to that, a synthesis of the results in the form of a conceptual model is presented and an explanation is given on how these results should be interpreted. A discussion on the results explains how these findings can be used as a foundation for future research. Finally, in the last section, section 4, a conclusion is presented in which the implications of the results, a future work scenario and the limitations of the research are highlighted.

3 Related Research & Theoretical Background

In this chapter, the most important insights that were the result of a literature review will be highlighted in order to gain a deeper understanding of platforms, their ecosystems and the way these are currently governed. The main goal of these sections is to gain insight into why extant research has progressed to the state it is currently found in. A thorough understanding of the motivation behind the developments that drive this research will help and guide the search for new insights in platform governance literature.

3.1 Digital Platforms

Research into digital platforms has benefitted from a wide stream of academic focus. Depending on the unit of analysis, the manner in which platforms are conceptualized and approached differ. This section briefly dives into the history of research into (digital) platforms after which it continues to explore the different ways in which digital platforms have been conceptualized. The aim of this section is to gain a deeper understanding of the phenomenon of digital platforms by highlighting key contributions made through different perspectives.

3.1.1 (Digital) Platform Perspectives

Research into platforms did not always consider them tightly coupled to complex technological artifacts as is the case within most IS research. Industrial Economics research into concepts similar to the digital platforms as we know them today began in the early 2000s with for example the research of Rochet et al. (2006) into two-sided markets. At the time, they were roughly

defined as 'markets in which a platform enables the interaction between end-users and get two sides 'on board' by appropriately charging them' (J. C. Rochet & Tirole, 2014). Conceptually, the theory on two-sided markets is related to the theory of network externalities, which poses that the utility a user derives from the consumption of a good increases with the number of other agents consuming the good (Katz & Shapiro, 1985). From this theory it borrows the notion that there are non internalized externalities among end-users (A. J. Rochet et al., 2006), which can be mediated through the use of platforms. In these cases the (economic) platforms are not necessarily the central unit of analysis, but seen as intermediaries between the distinct user groups on which network effects occur.

The fact that network effects have been central to economics literature into platforms is, amongst others, noted by Rysman (2009), who states that 'In a technical sense, the literature on two-sided markets could be seen as a subset of the literature on network effects'. The literature on multi-sided platforms (MSPs), which is tightly related to research on multi-sided markets (and thus to that of two-sided markets), addresses the many challenges that MSPs have to face during MSP implementation (Armstrong & Wright, 2007). Many of these challenges are the result of dealing with platform adoption issues. This can also be noticed in the theories derived from further advancements in economic platform research. Some famous examples include the 'winner-take-all' effect, that suggests that the platform with the most users will tip the markets in its favour (Carnahan et al., 2010b) and the 'Chicken-and-egg' problem, which is about getting one side of the market to join without other sides being present yet (Caillaud & Jullien, 2003). So, while economics research into platforms has progressively advanced and greatly benefits our knowledge on pricing strategies and the financial dynamics of platforms, it does not necessarily help with the further conceptualization of platforms. The overarching focus of their view is how economic forces render multi-sided markets different from other market arrangements (Reuver et al., 2018).

Another very common perspective taken in platform research is the technical perspective. In contrary to the earlier mentioned theories stemming from economics research, the technical perspective on platforms regards them as purely technical artifacts. From this view a platform can be regarded as an extensible codebase that provides core functionality, supplemented by modular services (Tilson et al., 2010; Tiwana et al., 2010). Ghazawneh & Henfridsson (2015) build on the idea of modularity and extend their conceptualization by defining platforms as 'the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with it and the interface through which they interoperate'. This in

itself poses new questions to the concept of platforms. Viewing platforms as modular systems does for example raise the question on how complementors of platforms are expected to extend platform functionality. Bianco et al., (2014) and Ghazawneh & Henfridsson, (2010) address this question by looking at a platforms' boundary resources. These resources enable complementors of platforms to develop complements and extend platform functionality. Some well known examples include Software Development Kits (SDKs), that platform owners can provide and Application Programming Interfaces (APIs), the standardized interfaces used to integrate new modules (Ahmad Ghazawneh & Henfridsson, 2013). Henfridsson & Bygstad (2013) argue that in order to get a better understanding of the dynamic processes that drive platform evolution, the core unit of analysis should be their boundary resources. Eaton et al. (2015) extend this view by conceptualizing platform dynamics in terms of distributed actors that collectively tune boundary resources.

It is clear that the scope of platform research extends that of traditional technological artifacts or digital technologies. In order to fully grasp the phenomenon, platforms have to be considered in relation to their ecosystems and build on the interplay of the platform and its actors. This 'socio-technical perspective' focusses on how platform owners integrate and govern an ecosystem of actors (De Reuver et al., 2018; Hein et al., 2020). Here, platforms do not only encompass technical elements, but also the associated organizational processes and standards (Tilson et al., 2010). As the name suggest, the socio-technical perspective is thus mainly concerned with the interrelatedness of the social and technical aspects of platforms. This gives rise to a particular set of questions about the design and governance of platforms, but also to that of their ecosystems.

3.2 Platform Ecosystems

From what we have seen on the literature on platforms, they are closely related to their ecosystems (De Reuver et al., 2018). Scholars go a long way in defining ecosystems, but, similar to platform research, different perspectives seem to limit the scope of analysis. As the calls for an inter-perspective view on ecosystems continue (Carnahan et al., 2010a; CUSUMANO et al., 2020; De Reuver et al., 2018; Hein et al., 2020; Jacobides et al., 2018), the following sections will highlight the most important commonalities amongst ecosystem research, and show that there is a common ground among researchers. It will also show that, while platform ecosystem research relies heavily on the interdependencies of the actors involved in the ecosystems, most research takes the platform initiator's perspective without considering complementors (Schrieck et al., 2016).

One of the earliest mentions of the term 'ecosystem' in the field of business can be found in work of Moore (1993), who suggests that a company should not be viewed as a member of a single industry, but as part of a business ecosystem that crosses a variety of industries. In these 'business ecosystems' companies 'co-evolve capabilities around a new innovation' and 'work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations.' In his analogy to biological ecosystems, he emphasizes the idea that ecosystems move from a collection of random element to a gradually more structured community and thus stresses the dynamic character of ecosystems. He also introduces four stages through which ecosystems go and develop: Birth, expansion, leadership, and self-renewal. The fact that the dynamic nature of ecosystems has mostly been neglected in contemporary research (Gawer, 2020) is strange considering the early introduction of these stages.

Since the introduction of the term 'ecosystem' there have been many definitions that emphasize different aspects of the ecosystems. Reuver et al. (2018), for example, offer two distinct definitions of ecosystems: One adopting a technical view; *'A collection of complements (apps) to the core technical platform, mostly supplied by third-party'*, the other one adopting a organisational view; *'Collection of firms interacting with a contribution to the complements.'* The emphasis in these definitions lies heavily on the interaction between the core (often a platform) and the contributors to the platform (complementors). A different approach to defining ecosystems is that of Jacobides et al. (2018), who focus on the nature of complementarities between ecosystem participants and the value of their investments into the ecosystem. They define: *'An ecosystem is a set of actors with varying degrees of multilateral, non-generic complementarities that are not fully hierarchically controlled'*. While this definition shares the idea of complementarities with that of Reuver et al. (2018), there is a lot more to it. First of all, they pose that part of the uniqueness of an ecosystem comes from the *non-generic* complementarities. These complementarities are therefor particular to a certain ecosystem. Secondly, they pose the existence of multilateral complementarities at the level of the 'groups of actors' that link the different parties together. This implies that ecosystem relationships can be described at the level of 'groups of actors', in contrary to the usual dyadic description of actor relationships. Finally, they suggest that ecosystems are not unilaterally hierarchically controlled. This is based on the assumption that actors (or groups of actors) can always remain partial control over their complements.

While the definitions of ecosystems progressively get more comprehensive as research continues. There are aspects of ecosystems, relevant to this thesis, that would be expected in the

definition of ecosystems, especially considering their relatedness with platforms. Those aspects can be found in the definition proposed by Hein et al. (2020). They propose: *'A digital platform ecosystem comprises a platform owner that implements governance mechanisms to facilitate value-creating mechanisms on a digital platform between platform owner and an ecosystem of autonomous complementors and consumers'*. While the essence of the interplay between the various actors in the ecosystem remains, this definition also adds the notion of a governing party, in this case the platform owner, that deliberately makes decisions to facilitate value creation amongst the ecosystem actors. Furthermore they conclude on three building blocks that can be used to characterize digital platform ecosystems: Status of platform ownership, value-creating mechanisms in the ecosystem & autonomy of complementors.

3.2.1 Platform ownership

Platform ownership is a well debated topic in ecosystem literature (Schrieck et al., 2016). The existence of a broad scale of different types of platforms (Gawer, 2020) implies that there are many different types of ownership structures. One of the most crucial distinctions that is made here, is the fact that platform ownership does not only relate to the legal entity that owns the platform, but that ownership relates to power distribution within the entire platform ecosystem (Hein et al., 2020). A platform ecosystem can for example have multiple governing parties, each with distinct power features. Schrieck et al. (2016) refer to these parties with the concept of 'roles'. In their concept definition, roles does not only entail power distribution and ownership, but also the amount of sides involved in the ecosystem and relation to stakeholders. A great way to describe the power distribution within an ecosystem is in terms of its centrality. Within the business environment, organizational structures are mostly described as either centralized or decentralized. Centralized business structures have one entity that is in complete charge of the ecosystem, while decentralized structures distribute power over the actors in the system. In between we find a wide array of structures with a different *degree of centralization*. Examples include platform formed through consortia or strategic alliance, in which a group of actors work together to reach a common goal and in which power is mostly distributed amongst the actors.

3.2.2 Value-creating mechanisms

Another feature of successful digital platform ecosystems is their ability to facilitate and stimulate value-creating mechanisms. Hein et al. (2020) identify two building blocks of value-creating mechanisms. The first one is the facilitation of transactions (Tiwana, 2014). Transactions do not limit themselves to financial transactions and can be regarded in a somewhat broader sense. The essence of the facilitation of transactions is that these transactions are mutually-

beneficial. In other words, if actors in an ecosystem are connected through the transaction mechanisms provided by the ecosystem, it are these mechanisms that facilitated value creation. The second building block is that of innovation capabilities. Successful platforms provide the digital affordances that are needed for complementors to develop value-adding complements. Digital affordances refer to more than just the technologies available to develop platform components such as the earlier discussed boundary resources, but can be seen as value creation *enablers*. Majchrzak & Markus (2012) refer to them as 'an action potential, that is, to what an individual or organization with a particular purpose can do with a technology or information system'.

A highly influential conceptual lens that discusses value-creation in a more holistic manner is that of the service ecosystems view (Vargo & Lusch, 2011). This view is based on service-dominant (S-D) logic, an alternative to goods-dominant (G-D) logic, which was introduced as an alternative way of articulating value creation and exchange in markets (Vargo & Lusch, 2004). One of the basic premises of S-D logic is that value is always co-creation among multiple stakeholders. This builds on the idea that value is always determined by a service beneficiary, through the use of any given resource, in a specific context (Akaka & Vargo, 2014), which is more commonly referred to as 'value-in-context'. Value is thus contextually derived and can be evaluated differently based on the perspective that is taken by different actors. In contrary to the earlier mentioned building blocks of value creation that find their origin in specific disciplines, the service ecosystems view does a greater job at explaining value creation mechanisms at a more holistic level and can more generally be applied in ecosystem contexts.

3.2.3 Complementor autonomy

Complementor autonomy describes the freedom complementors have when co-creating value. Autonomy is often talked about in terms of how much control platform owners exert on platform complementors. The usual goal of control within organizations is to 'direct attention, motivate, and encourage organizational members to act according to organizational goals and objectives (Wiesche et al., 2011). However, in platform ecosystems, control can better be understood as *how* platform owners govern the processes within the ecosystem (Tiwana, 2014). To do so, platform owners may make use of certain control mechanisms, which will be further elaborated upon in section 2.3.2.

3.3 Platform Governance

One of the key challenges for platform centred initiatives is platform governance (Halckenhäusser et al., 2020). Literature on platforms and their ecosystems recognizes the

complex and dynamic environment they are subject to. The socio-technical perspective that is leading in this thesis emphasizes the interplay of the technical and social aspects of such systems. Platform governance, in this perspective, is mainly focussed on the orchestration of platform actors and the tools equipped to do so. This section takes a closer look at the governance mechanisms that are commonly deployed by platform initiators to facilitate this orchestration.

3.3.1 Defining platform governance

The literature on platform governance is indicative of a newly emerging stream of research. While the governance of platforms is seen as a key challenge to platform success, research on the topic is scattered all over the place, and it is hard to find an all encompassing definition of platform governance. To fully understand platform governance, research must take a look at the mechanisms that are deployed when governing platforms. To do so, Tiwana et al., (2010) ask: 'Who is governed?', 'What is governed?' and 'How is it governed?'. Perscheid et al., (2020) conclude that these questions still remain partly unanswered, and that the emergence of new forms of platform-based business models challenge previous conceptualizations of platform governance. So, where do current conceptualizations of platform governance bring us? Tiwana et al. (2010) define platform governance as '*Who makes what decisions about a platform*'. In their notion of platform governance, a platform owner must balance control over the platform's module developers in order to encourage innovation while ensuring integrity of the platform (Tiwana et al., 2010). Parker & Van Alstyne (2018) argue that, in contrary to the classical pipeline of innovation in which firms closely coordinate value creating processes, platform ecosystems can be viewed as micro-economies in which the platform initiator is concerned with the coordination of the platform's actors. Halckenhäusser et al. (2020) build on this and refer to platform governance as '*The sum of activities carried out by platform owners that seek to influence the behaviour and outcomes of complementors*'. Here, platform ownership should be understood similar to how it was discussed in section 2.2.1.

There seems to be a lack of conceptual consensus on the governance of platform ecosystems. This lack of conceptual consensus could stem from the fact that platform ecosystems are extremely complex systems and that it is hard to approach them holistically, as there are simply too many aspects to platform governance (Hanseth & Lyytinen, 2010). Another explanation for this could be that the different aspects of platform governance have evolved under different notions of platforms. This was for example highlighted by the different perspectives that have been taken in platform research (See section 2.1.1). Another thing that is apparent in platform

governance research is the fact that the design of platforms goes hand in hand with its governance. For example, the theories built around the technical core of ecosystems, taken in the technical perspective on platforms, often involve architectural decisions that may very well impact the way in which platforms are governed (Baldwin & Woodard, 2009; Henfridsson & Bygstad, 2013; Thomas et al., 2014; Tiwana et al., 2010).

3.3.2 Governance mechanisms and approaches

Despite the lack of clear conceptual consensus on the definition of platform governance, there are plenty of studies into the mechanisms that are deployed to govern ecosystems.

Halckenhäusser et al. (2020) for example distinguish four broad categories of platform governance mechanisms: (1) Cooperation, (2) Resourcing, (3) Control and (4) Market. *Cooperation* is defined as the establishment of inter-firm relationships with or among complementors. This category builds on the idea that the coordination of cooperation between platform actors allows for the joint creation of value (Ceccagnoli et al., 2012). *Resourcing* is defined as the provision of resources at the boundary that third-parties can use to co-create value. The earlier highlighted studies into the provision of boundary resources (see section 2.1.1) serve as a great example of how resourcing can act as a governance mechanism. *Control* is defined as the enforcements of rules and exertion of power to reduce undesirable behaviour. Control involves making decisions on which control mechanisms are deployed, such as formal control mechanisms (e.g. output control) and informal control mechanisms (e.g. clan control) (Tiwana, 2014). One particularly well studied topic within the control category is openness. The openness studied here finds its origin in software science and has been researched in terms of software openness. Research on openness has however extended itself to the point where it is not just about software, but about the overall platform stack (Teixeira, 2015). Parker & Van Alstyne, (2018) find that an increased use of control leads to decreased platform openness. *Market* is defined as the regulation of supply or demand through market measures. Extant literature focusses on pricing dynamics, consequences of platform entry, competitive strategies and competition.

3.4 Concluding

Literature on digital platforms, platform ecosystems and platform governance has benefitted from a wide array of contributions following different perspectives. The academic advancements that lead to the current conceptualizations on these matters show that they have developed in their respective disciplines and have developed under a segregated understanding of these phenomena. Literature shows that digital platform research has predominantly benefitted from an economic perspective, through which they are viewed as markets on which network effects

occur, and a technical perspective, through which the technical artifact that drives the platform is seen as the main unit of analysis. A third perspective, the socio-technical perspective, is concerned with the interplay of the platform and its actors, fuelling a broader discussion on platforms. This perspective considers platforms in relation to the ecosystem of actors surrounding it. Here, platform research is not only about the components that drive successful platforms, but also about how to successfully orchestrate and coordinate these actors in order to drive value creation. The consideration of the entirety of the ecosystem surrounding platforms raises questions on issues like distributed ownership, the continuous facilitation of value creating mechanisms and complementor autonomy. While ecosystem research goes a long way in finding answers to these questions, it fails to explain the dynamic behaviour that platforms exhibit.

4 Research methodology

The main goal of this study identify the key concepts that are relevant for exploring the drivers, holism and temporal dimension of platform governance and synthesizing evidence from existing literature. To achieve the aim of the study, a structured literature review was conducted using the grounded theory method. The grounded theory approach that is taken in this thesis adopts the ‘analytical approach’ as formulated by Matavire & Brown (2013). This analytical approach to GT differs from the classic approach in a sense that this approach is not necessarily used for theory development, but can also be used for the identification of concepts and themes.

To conduct the structured literature review, this research followed much of the guidance that is offered by Wolfswinkel et al. (2013). They offer a five-step approach to conduct a thorough search process and guide the data selection process. Their approach includes the following steps: (1) Defining the scope of the review, (2) Search of literature, (3) Selection of final data sample, (4) Analysis of data using content analysis and (5) presentation of findings. This section will focus on the methodological part of the study. The results of the analysis and the presentation of the findings will be presented in the results chapter.

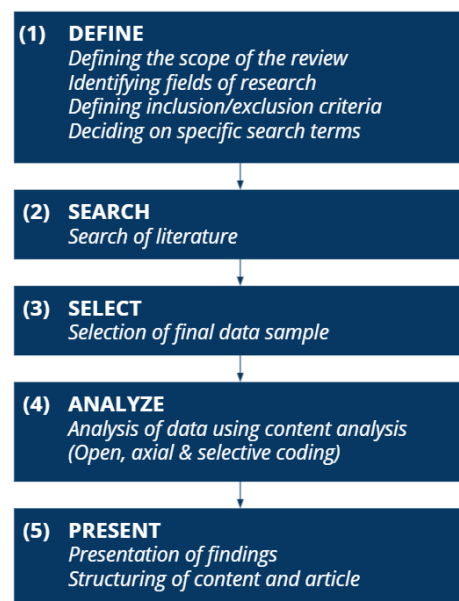


Figure 1: Five-step approach for data selection

The first three phases compromise the defining of the scope of the review and the actual selection of the data. This includes defining the criteria for inclusion and exclusion of relevant sources. To yield an approachable and fitting set of papers a few criteria were introduced. First of all, the choice was made to only include results published after 2010, as platform governance only became relevant recently. Secondly, as this research aims to take a holistic perspective, there are no exclusion criteria based on 'relevant fields'. Thirdly, the choice was made to only include English articles. Fourthly, the search was limited to articles and conference papers. Finally, the search was performed using two prominent databases: Scopus and Web of Science, as these trusted databases provide a very large coverage. The formulation of the research terms was done with the aim of covering the entire scope of the chosen research area, this resulted in the following query: "Platform governance" OR "digital platform ecosystem".

Table 1 shows an overview of the paper selection process. The initial search in the titles and abstracts yielded 300 results. After scanning for duplicates, 229 results remained. The titles and abstracts of all articles were screened to check for relevance to platform governance. This procedure resulted in 14 results. A significant part of the omitted papers focussed on online content moderation in digital platforms, such as hateful content on social media or content aimed at having political influence. Hereafter followed the procedure of forward and backward citation to find other relevant sources through which 4 more results, that were not already part of the initial set, were added to initial set. After expert consolidation the choice was made to drop 4 papers resulting in an initial set of 13 papers.

Table 1: Paper set selection process

Steps	Action	Number of papers
Define	Period: 2010 – today Relevant fields: No exclusion Limit to: Article / Conference papers Limit to: English Repositories: Scopus, Web of Science Keywords: "Platform governance" OR "digital platform ecosystem".	N/a
Search	Initial search	229
Select	Selection by titles	73
	Selection by abstracts	24
	Selection by reviewing texts	14
	Forward and backward citation	18
	Expert Consultation	13
Total		13

For the coding process the tool MAXQDA was used. This tool is designed with the idea of helping researchers process qualitative data. The coding process consisted of a three part process: (1) Open coding: the analytical process of generating higher-abstraction level type categories from sets of concepts', (2) Axial coding: 'The further development of categories and relating them to their possible sub-categories', and (3) Selective coding: The integration and refinement of categories (Wolfswinkel, 2011). A characteristic of the analytical approach to GT (Matavire & Brown, 2013a) is that not all coding stages have to be completed in order to reach satisfying results.

Coding was done using the constant comparative method, this method is used by researcher to simultaneously develop concepts from the data while analysing the data (Kolb, 2012). In other words, the emergence of new concepts during the data coding process often leads to the need to revisit already coded data to check for the newly emerged concepts. The coding process is not considered a sequential process. Often, higher level categories emerge while making mental connections between data. Therefore, parts of the three part process might show overlap. Next to that, the open coding process was done through incident-by-incident coding (Charmaz, 2015) as line-by-line coding often results in over-conceptualization of data incidents (Matavire & Brown, 2013a).

5 Results

This chapter elaborates on the findings that were the result of the literature review as the last two steps of Wolfswinkel et al.'s (2013b) five-staged approach suggests (See section 3: Methodology). The fourth step of this approach is concerned with analysing the literature using open, axial and selective coding. By highlighting all the relevant insights and findings, the open coding process gave rise to an initial set of categories with a specific focus on platform governance, governance mechanisms and the connection to temporal dimensions. These concepts have later been aggregated into sub categories and where possible integrated to refine the evolved categories. As mentioned in section 3, the methodology, the coding stage is not necessarily sequential. Higher level categories can be identified while elements of yet unidentified categories are still emerging. It is therefore essential to revisit papers when new interesting insights have been gained. While the coding process did not result in the emergence of new theory, which is considered the main aspiration of GT, the identification of categories and sub-categories serve as relevant findings.

5.1 Findings

An overview of the findings can be found in appendix 7.3. This index presents the final results of the coding process and thus does not contain omitted elements or categories before they were aggregated. Not all the categories that were identified are relevant for answering the research questions. However, they should be considered in the discussion on platform governance as they might serve as a foundation for future research, they were therefore not omitted from the final table. Appendix 7.4 provides detailed insight in the emergence of categories and the connections that were made during the coding process.

The final results describe the categories as elements of 'digital platform ecosystems', as this can be considered an umbrella term under which all the data in the ecosystem context can be placed. There are two main categories, 'value (co-) creation in digital platforms (+ecosystems)' and 'Digital platforms' that are central to the discussion on platform governance. They will be discussed in further details in the following sections. The data was analysed by keeping broad questions such as *'How can platform governance be understood through these papers?'* and *'How are platforms governed?'* in mind. These questions were deliberately kept broad and generic to remain an open attitude to the data in an attempt to decrease the influence of earlier gained knowledge on the coding process. There are 4 sub-categories to the 'value (co-) creation in digital platforms (+ecosystems)': Value capturing, value creating mechanisms, co-creation of platform value and value conceptualization. Together they describe which conditions lead to favourable value co-creation outcomes and which mechanism can be deployed to reach value co-creation. Such mechanism include the enablement of complementors or the facilitation of development tools. The second main category 'Digital Platforms' was introduced to umbrella everything related to the platform ecosystem itself. It includes 9 sub categories: Platform network effects, platform generativity, democratic organisation governance, ecosystem (/platform) architecture, platform governance mechanism, platform governance, types, building blocks and platform resources. The most relevant category out of these 9 is the 'platform governance' category, as it contains the answers to the research questions.

Platform governance consists of the sub-categories: Values, resource allocation, control dynamics, platform openness, centrality, platform regulation and temporality. To provide deeper insight into the rise of these categories, a closer look will be taken at the emergence of one the sub-categories: control dynamics. A graphical representation of this process can be found in figure 2. The axis represents the boundary between concepts that are emerging from the analysis and the concepts that were established as important in previous papers. Control

dynamics was the most coded category with almost all papers touching upon the subject, this was surprising considering the limit amount of attention control had received in extant literature (See section 2.3.2). The first paper that was analysed is that of Martin et al., (2017). It touches upon a shift to a more democratic form of platform governance. It highlights informal and formal control mechanisms as governance decisions. These incidents were both separately highlighted, at the same level of platform governance. It also speaks of power inequalities in the realm of platform ownership, which was also separately coded as 'power limitations'. The paper of Hein et al., (2020) gave rise to two new concepts covering platform governance; centrality and platform ownership. They discuss the trade-off a platform owner makes when choosing for a centralized or decentralized ownership structure. Here, platform ownership is seen as a governance mechanisms, as it involved deliberate decisions on the power structure within a platform ecosystem. It also discusses openness in the context of governance decisions; a platform owner can 'open up' his platform by giving away control. Control in this context is more than just deploying mechanisms, it is seen as a subset of governance. How can a platform owner use control to govern a platform? In the paper of Fenwick et al. (2019) we again find emphasis on power distribution in the control dimension. Control keeps arising in the discussions on platform governance. An aggregated term 'Control Dynamics' best describes the effects control has in driving platform governance and can be used to iteratively process the analysed papers for even more control-aspects of platform governance.

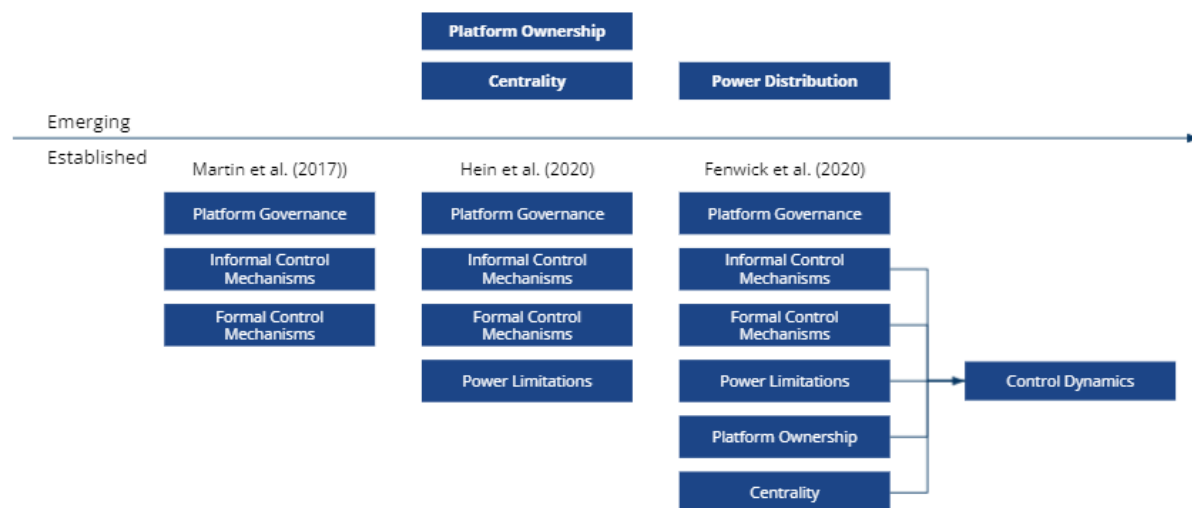


Figure 2: Example of connections made during coding process

Sections 4.1.1 tot 4.1.3 represent answers to the research questions that were posed earlier. It will further elaborate on what constitutes the main categories, how they should be interpreted and which trends could be identified to further fuel discussion on the topic.

5.1.1 Platform governance

Figure 3 provides a graphical representation of the drivers of platform governance and their related categories. The size of the bubbles suggests their importance, where importance is not only a function of how many times the concept was mentioned, but also of its relevance in generating a total understanding of platform governance. This figure is not a 1-to-1 representation of all the coded categories. It does for example not include the 'temporality' category, that can be seen in appendix 7.3 as a driver of platform governance, because 'temporality' category was used in answering a different research question. As can be seen from the figure, the architectural components of platform governance enable other platform governance drivers. The attitude container on the left suggest an attitude that should be taken towards the governance process. Both of these concept will be further elaborated upon in the following sections.

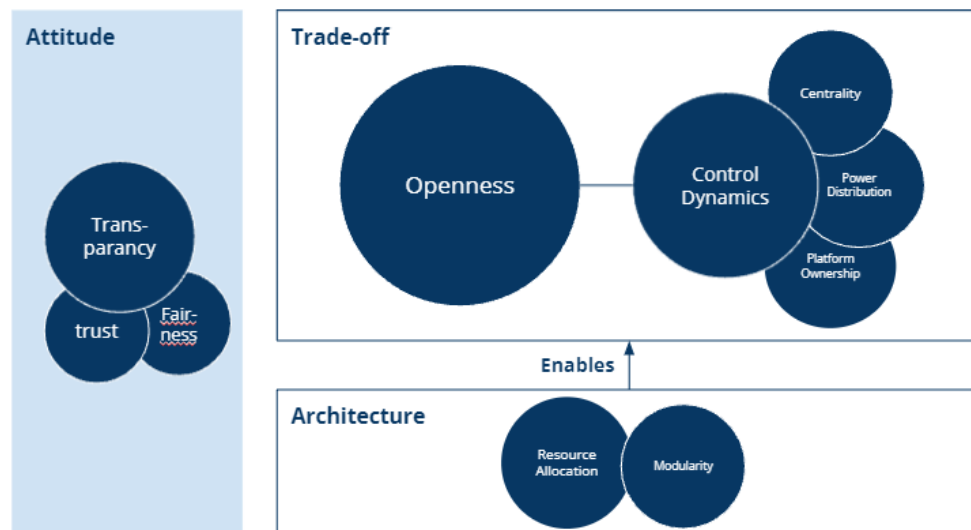


Figure 3: Main drivers & categories of platform governance

Openness: Openness was identified as the main driver of platform governance. Openness is mainly discussed in terms of 'How open should a platform be?'. Otto & Jarke (2019) suggest that openness can be observed on three levels: The provider level, the technology level and the user level. At the provider level openness entails the freedom that providers of complimentary services experience in joining the platform. At the technology level, openness refers to accessibility of the technical core of the platform, and the interoperability of the platform with other platforms using different technologies. At the user level, openness is discussed in terms of the accessibility of users to the platform. Governance of a platform entails making decision on the levels of openness in each of these categories. An important characteristic of openness in

platform governance literature is its interplay with the other dimensions of the ecosystem that were identified during this research. Almost all the categories that were identified can somehow be related to openness, it was therefore also identified as the 'main driver' of platform governance. For example, Perscheid et al. (2020) make the interesting observation that in order for a platform to succeed, governance practices must be transparent to all actors of the platform. In that sense, openness on governance policies can be regarded as a governance practice in itself. Fenwick et al. (2019) suggest that in order for a platform to keep its innovative capabilities, it must express an open attitude towards insiders and outsiders. This attitude greatly expands the type of actors responsible for guiding the direction of the platform. Such an observation is also found by Hein et al. (2020), who claim that opening an ecosystem is an opportunity to take advantage of the innovative capabilities of external complementors. Good governance practices thus revolve around opening up an ecosystem to make use of the innovativeness of actors. The observations with regards to openness seem to point in the direction of complete platform openness. However, opening up a platform certainly comes at a cost, as it pointed out by Teece (2017). He emphasizes that while openness adds to the power of alliances, it often reduces the opportunity for capturing value through direct means. Hein & Schrieck (2016) add to this by noticing how openness leads to a rapid growth of the platform, but reduces the amount of control a platform exerts. In contrary to what was highlighted in section 2.3.2, openness is about much more than just controlling platforms. There are interesting dynamics between the openness and other aspects of the platform ecosystem that can not be ignored when considering openness as a governance practice.

Control Dynamics: The next driver of platform governance is control dynamics. Control is discussed in terms of enforcement of the mechanisms that are implemented by platform owners to encourage desirable behaviours. The emergence of this category was not unexpected considering the way it is discussed in platform ecosystem and governance literature (see sect. 2.3.2. & 2.2.3). The term dynamics was added because this driver extends the notion of control in a sense that control is not just be about the enforcement of control mechanisms, but should also be about dynamically adjusting these controls to promote certain behaviours at the desirable moments. An example of this can be found in the partitioning of decision rights, which is one of the mechanisms of control. More simply put it entails: What decisions need to be made and who is involved in making them. Hein et al. (2020) notice a delicate balance between decision rights and complementor autonomy based on the archetype of ownership. This relates to the concept of *Centrality*, another identified driver of platform governance. Perscheid et al. (2020) express governance in terms of centrality types. They distinguish three types of centrality: (1) centralized,

in which all power is held by a single authority, (2) decentralized, where everyone who is interacting with the platform, is a member of the platform and therefore has authority rights and (3) Autonomous, which emphasizes the autonomy of the entire organization as a single entity. Centrality in platform governance is mainly concerned with the *power distribution* amongst the actors in the ecosystem. Considering the range of platform types there is no one-fits-all strategy when it comes to determining the degree of centrality of a platform (see 2.2.1). Platform regulators should be aware of the impact that different ways of power distribution can have on the behaviour of the ecosystem. Decentralized platforms give up control to stimulate user growth and innovative capabilities, centralized platforms risk being regarded as closed, which might make complementors hesitant in complementing to a platform. Another example is given by Otto & Jarke (2019) who observe how alliance-driven platforms (in which power is distributed amongst the driving organizations from an early design stage) have to deal with regulating a more complex, socially oriented, ecosystem where reaching consensus guides development. Keystone-driven (centralized), in comparison, deal with this to a lesser extent and can focus on the development of the platform core.

Platform architecture: The emergence of this category was to be expected considering the importance of the technical core in the functioning of the ecosystem. Findings indicate that the technical architecture in itself should be considered as a governance mechanism as it enables or restricts decision and participation rights (Fürstenau et al., 2019). Architectural decision on the design of the platform core does for example enable the emergence of the surrounding ecosystem. This can be deliberately designed to facilitate complementor facilitation. The design of the platform architecture is strongly related to two other identified categories: *modularity & resource allocation*. In order for ecosystems to emerge, platforms should be designed taking modularity into account. Correct provision of resources, such as boundary resources, enables complementors to develop complements which add value to the platform. Jacobides et al. (2018) state that technological modularity will allow complementors to produce interdependent components, without the need for strong coordination. Platform architecture should thus not only be regarded in a sense of designing a technical system, its design in itself can be used to govern the coordination of complementors.

Transparency: Transparency was identified as an indirect driver of platform governance. A transparent process allows the ecosystem's actor to understand a platform's governance and adapt to it. Together with trust and fairness, transparency represents an attitude taken to the governance process. They can be seen as values that should be considered when engaging in the

governance process. In contrary to for example power distribution, which entails much more deliberate and measurable action. Transparency allows actors to understand how a platform is governed and why it is governed that way. A fair governance structure keeps actors engaged with the platform and gives them incentive to contribute to it.

5.1.2 Integrating perspectives

As evident from extant platform governance research, theory on platform governance developed through isolated perspectives. Following calls from researchers to address platform governance holistically, the literature was scanned for ways to integrate these perspectives. While no clear integrative approach could be identified through the literature review, there were a few observations which spark an interesting discussion.

Platform research currently still happens through the perspectives that were highlighted in the theoretical background. The relatively young corpus of papers that was selected for this research gave no indication of solid attempts made at integrating platform perspectives. The theories in these papers were still developed while taking either a market or a technical perspective. The coding process did however indicate the emergence of new types of platforms and governance styles such as the democratic governance approach that was theorized by Martin et al., (2017). They conceptualize a way in which platform governance can be approached to promote social and environmental values alongside the instrumental values of the capitalist economy to promote sustainability. Examples of democratic governance models include governmental platforms or platforms used in the sharing economy. Considering the importance of platforms in today's society, it is very likely that new types of platforms and governance styles will keep emerging. The size, complexity and dynamic nature of platform ecosystems make them easy subject for theory building to a wide range of disciplines. Theories, that eventually will lead to a better understanding of how to govern platforms. To stimulate integrative thinking, researchers must actively aim at finding commonalities between the multiple approaches to platform governance and build on these commonalities.

The perspectives that were highlighted in the theoretical background are not the only scopes that are taken to study platform governance. The categories that were developed during this research were mainly the result from addressing platform governance from the platform owner's perspective. To holistically address platform governance, researchers must be aware of all actors in the entire ecosystem. This does for example also include complements and end users. Considering complementors and how they interact with platforms will provide insights in how to favourably tune their behaviour.

5.1.3 Temporal dimensions

In order to find out whether platform governance practices can be related to some kind of temporal dimension, the literature was reviewed for temporal behaviour of platforms. The coding process gave rise to a few practices that could serve as a foundation for future research. While certain aspects of platform governance can be expressed in terms of temporality, the results were not sufficient enough to express the all the earlier identified drivers of governance to these practices.

In his research on dynamic capabilities, Teece, (2017) adopts the four phase ecosystem lifecycle that was earlier introduced (see sect 2.2): Birth, expansion, leadership and self-renewal. In his research, platform governance is discussed in terms of openness/control during the second stage of the lifecycle, but no clear direction on how these should be shaped. This lifecycle view is the only temporal expression that could be identified which considers the entire lifecycle of a platform. Trischler et al. (2021) make a first attempt at relating governance to these dimensions, but consider governance in terms of 'setting and enforcing rules on the platform', and thereby ignore a great deal of governance practices. Their model does indicate the need to tighten rules during the leadership face, which can be understood in terms of exerting more control on the platform.

A second observation follows from the research of Hein & Schrieck, (2016) Their findings support the idea of a maturity model, where low control in early stages of the platform is used to achieve user growth, and there is more focus on platform control in mature stages of the platform.

5.2 Looking forward

Despite not being able to fully answer the three research questions, the identified categories and their relations could serve as important insights in future research.

In order to progressively advance platform governance research, researchers should start by adopting more general conceptualizations of digital platforms, platform governance and platform ecosystems. As long as the theoretical foundations on which research is based finds its origin in one of the perspectives through which platforms are approached, theoretical advancements will not converge towards a more holistic view, which is evident from the coding process and extensively discussed in extant research. While conceptualizing, researchers should pay specific attention to the dynamic between all the actors of an ecosystem. The results of this research indicate the specific importance of dynamics between openness and control when

addressing platform governance. Almost all drivers that were identified could be related to platform openness, or be discussed in relation to it. This advice can be extended by the earlier given advice to not only study successful platforms and to consider all the actors in the ecosystem and not just the platform owner (Schrieck et al., 2016).

A theme that could be central to studying platform governance is how to continuously facilitate value co-creation. The coding process identified the emergence of theories on value creation and capturing and the mechanisms that are central to value co-creation, such as resource provision (Fenwick et al., 2018) and the facilitation of transactions (Hein et al., 2020). The conceptual lens of S-D logic (see sect 2.2.2) could serve as a great foundation for this approach. The ecosystems view of Akaka & Vargo, (2014) considers ecosystem actors as resource integrators. In this view, value is always co-created amongst these actors through service exchange. An integration of the service ecosystems view in platform governance research could solve many of the underlying issues in explaining governance holistically. Existing literature shows, to the best of my knowledge, no attempt at integrating these views, apart from a call to action from Hein et al. (2020), who call more for research towards understanding how firms can integrate their existing stakeholder network through a service-dominant perspective.

6 Conclusion

Platform literature has quickly gained a lot of traction during the last decade. Considering the importance of platforms in today's society, they are not expected to disappear from the center of attention anytime soon. As businesses, organizations and governments all over the world are currently opting for platform based solutions, the relevance of research into how to successfully manage platforms and their ecosystems seems ever growing. This research follows extant calls from literature into exploring the dynamic behaviour that platforms exert holistically and aims to give answer to the research questions: **"What are the main drivers of platform governance?"**, **"How can platform governance be approached holistically?"** and **'What happens to platform governance overtime?'**.

To achieve the aim of this study, a structured literature review was done following the grounded theory approach formulated by Wolfswinkel et al., (2013a). This research adopts the analytical approach to grounded theory. In contrast to the original approach to grounded theory where theory development is the main goal, this approach can be used for the identification of relevant categories and themes and spelling the links between them. The relatively young corpus of literature that was selected for being aimed at platform governance in an ecosystem setting, was

analysed using content analysis in the search of the trends that are currently driving platform governance research. The categories that emerged following the analysis give rise to an interesting discussion on the future of platform governance research.

The results of this research give insight in a few of the main drivers of platform governance. In contrary to extant literature, openness was identified as the most relevant driver, as it shows interesting dynamics with the other identified drivers. Openness is not just relevant in the context of software architecture, but can be experienced on multiple levels throughout the platform ecosystem. A particularly interesting dynamic is that between openness and control. Control, in a platform governance context, entails more than just the (in)formal mechanisms deployed to exert control. Platform control *dynamics* involve careful decisions on themes such as power distribution, platform ownership and centralization. Platform owners should carefully balance between opening up their ecosystem on multiple levels and giving up control, in order to achieve goals such as user growth or maintaining their innovative capabilities. At the core of platform governance activities we find the platform itself. Architectural decisions on the allocation of boundary resources or the modularity of the platform enable or restrict decision and participation rights and are at the heart of the emergence of surrounding ecosystem.

This research indicated no solid attempts at integrating the multiple perspectives on platform governance. However, a few of the identified categories can lead to fruitful discussion. In order to achieve a holistic platform approach, researchers must adopt an integrative conceptualization of platform governance. One that does not ground itself in one of the many perspectives on platform governance and does not overlook the importance of actor interaction. As long as platform governance research finds its origin in different foundational premises, an holistic view will be hard to achieve. An interesting research avenue, to further advance platform governance theory, is looking into the possibilities of building on openness, while taking value (co)-creation through an S-D logic lens as the central theme of governance activities. This approach would deal with many of the underlying issues in holistically approaching platform governance, such as the existence of multiple perspectives and theoretical foundations, as it drift focus away from specific aspects of the platform ecosystem to a more general goal.

Lastly, the results show early indication of temporal views on platform governance. For example by adopting an ecosystem lifecycle approach or maturity model. However, these practices are still in a very early stage and research is a long way from explaining platform behavior in a temporal manner. Extant research continues to view platforms as static entities or focusses on very specific timeframes of the platform lifecycle. This can be partially explained by the speed at

which platform companies have emerged. As more and more platforms start reaching maturity phases, the amount cases through which the temporal dimensions of platform governance research can develop will grow. Research should stick to one approach, such as the ecosystem lifecycle approach, to explain the dynamic behavior that platforms exhibit. Trischler & Meier, (2021) make a first attempt at this by relating the strategic decisions involved in ecosystem development to the platform's lifecycle and serve as an example of how this research could progress.

There are limitations to this research that should be carefully considered when interpreting the result of this study. The biggest limitation stems from limited resources. Time was a constraining factor in the way this research was set up. The corpus of papers that was selected for the literature review could have been extended to contain more relevant theory on platform governance, and more theory that slightly touches upon the topic. Timonen et al., (2018) recognize the researcher's time as a constraint in developing grounded theory and find that significant progress towards constructing categories, and spelling out links between them to reach greater conceptual clarity, can serve as a sufficient outcome of GT studies. A second, methodological issues, is in the existence of prior knowledge before engaging in the coding process of grounded theory. This is advised against in classical GT approaches. However, Charmaz (2015) states that the idea of a researcher as a blank slate is no realistic proposition. Timonen et al., (2018) agree with this and add that GT can be used to deepen existing theoretical insights as long as the researcher remains open to the 'portrayals of the world'. A second resource that limits the outcome of this study is the researcher's experience in conducting grounded theory research. Timonen et al., (2018) recognize this limitation and acknowledge that more experienced researchers should deliver more in depth and extensive results.

In conclusion, this research provides insight in the trends that are currently driving platform governance research. Firstly, openness was identified as the main driver of platform governance, as it shows interesting dynamics with the other governance drivers and activities. To the best of my knowledge, it has not earlier been put at the center platform governance and can serve as avenue for future research. Secondly, the need to holisitically explain governance activities has not yet been satisfied in existing literature. To progressively advance governance research, research should adopt more general conceptualizations of platform governance, digital platforms and platform ecosystems aimed at explaining actor-to-actor exchanges at all levels of the ecosystem. A promising avenue for future research follows from taking value co-creation as a central theme when studying the orchestration of platforms and their ecosystems as it solves

some of the underlying issues in holistically explaining platform governance. Lastly, In order to advance temporal understanding of platform governance, researchers should adopt a broad model, such as the ecosystems lifecycle approach, and relate governance activities to these stages. The growing amount of maturing platforms serve as great research subjects to advance this understanding.

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8 Appendix

8.1 Paper set selection process

Steps	No. of papers
(1) Define Period: 2010 – today Relevant fields: No exclusion Limit to: Article / Conference papers Limit to: English Repositories: Scopus, Web of Science Keyword: “Platform governance” OR “digital platform ecosystem”.	n/a
(2) Search Initial search	229
(3) Select Selection by titles Selection by abstracts Selection by reviewing texts Forward and backward citation Expert Consultation	73 24 14 18 13

8.2 Initial paper set (Randomized)

Authors	Title	Year Published
Martin C.J., Upham P., Klapper R.	Democratising platform governance in the sharing economy: An analytical framework and initial empirical insights	2017
Schreieck M., Wiesche M., Krcmar H.	Design and governance of platform ecosystems - Key concepts and issues for future research	2016
Hein A., Schreieck M., Riasanow T., Setzke D.S.,	Digital platform ecosystems	2020

Wiesche M., Böhm M., Krcmar H.		
Perscheid G., Ostern N.K., Moormann J.	Determining platform governance: Framework for classifying governance types	2020
Fenwick M., McCahery J.A., Vermeulen E.P.M.	The End of 'Corporate' Governance: Hello 'Platform' Governance	2019
Otto, B.; Jarke, M.	Designing a multi-sided data platform: findings from the International Data Spaces case	2019
Hein A., Schrieck M., Wiesche M., Krcmar H.	Multiple-case analysis on governance mechanism of multi-sided platforms	2016
Trischler M., Meier P., Trabucchi D.	Digital Platform Tactics: How to Implement Platform Strategy Over Time	2021
Michael G. Jacobides, Carmelo Cennamo, Annabelle Gawer	Towards a theory of ecosystems	2018
Fürstenau D., Auschra C., Klein S., Gersch M.	A process perspective on platform design and management: evidence from a digital platform in health care	2019
Asadullah A., Faik I., Kankanhalli A.	Evolution mechanisms for digital platforms: A review and analysis across platform types	2018
Teixeira J.	On the openness of digital platforms/ecosystems	2015
Teece, David J.	Dynamic capabilities and (digital) platform lifecycles	2018

8.3 Result of coding process (screenshot from coding tool)



8.4 Grounded theory mind map (screenshots from working document)

Grounded theory mind map

1. **Open coding:** Developing categories
What is happening here? (Charmaz, 2015)

A large part of open coding is labelling incidents, which help to begin the theorizing of a process's properties and how it develops, is maintained, and changes (Charmaz, 2015)
 2. **Axial coding:** Procedure for connecting (sub-)categories
 3. **Selective coding:** Procedure for building a story by connecting (sub-)categories
- Using constant comparative approach: Comparing what you've got with others of the same kind
 - Maintaining close connection between categories (codes) and data
 - Compare data coded in the same way (same category) to develop a theoretical elaboration
 - Use memos

Questions to keep in mind:

- 'How are platforms governed?'
- 'How can platform governance be understood in the context of these papers?'
- 'What holistic approach can be identified?'
 - What is holding an integrative approach towards p.g. back?
- 'Which temporal dimensions can be identified?'

Key Terms

Platform Governance

Governance Mechanisms

Platform Ecosystems

Digital Platforms

Platform Generativity

Value Co-creation

(Martin et al., 2017) **Democratising platform governance in the sharing economy: An analytical framework and initial empirical insights**

Insights/takeaways:

- Tiwana’s model of platform governance focuses on dynamics of control within an organisation. This overlooks the dynamics of collaboration between platform owners and users. → shapes decision rights.
- Current control dynamics literature assumes the platform owner to be the leader. Forgets important control dynamic trade-offs with for example users.
- Democratic view on control dynamics.
- Largely talks about how values influence democratic behaviour.

Emerging incidents/themes/categories:

- Control (mechanisms deployed by platform owner to encourage behaviours)
- Social value shift
- Power inequality
- Democratization of platform business model
- Governance includes: Decision rights/control
- Collaboration

(Schreieck et al., 2016a) **Design and governance of platform ecosystems**

Insights/takeaways:

- Suggest two characteristics of ecosystem focus: Internal vs external & Technology vs market oriented. Present a list of concepts critical to platform governance and design based on thematization

Emerging incidents/themes/categories:

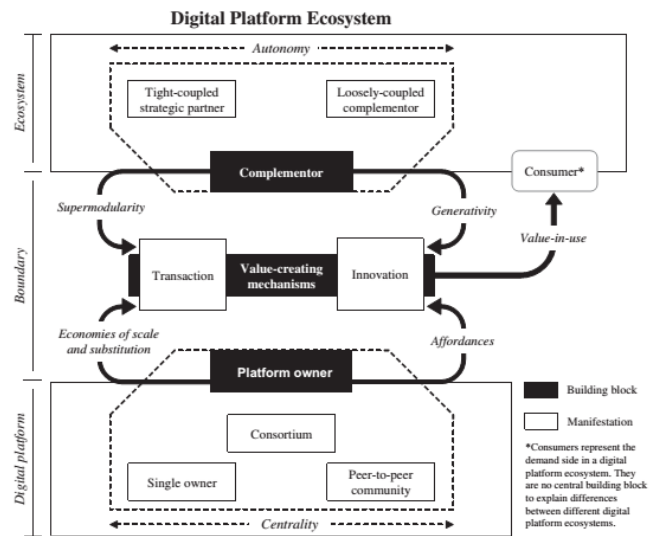
- Pricing tactics
- Value co-creation
- Regulation
- Centrality (Power dynamics)

Concept	Aspects
Roles	<ul style="list-style-type: none"> • Number of sides • Ownership • Distribution of power • Relationship to stakeholders
Pricing and revenue sharing	<ul style="list-style-type: none"> • Achieving network effects • Barriers to market entry • Subsidizing of one or more sides
Boundary resources	<ul style="list-style-type: none"> • Software tools (API, SDK) • Documentation • Data
Openness	<ul style="list-style-type: none"> • Granting access to technology • Giving up control over technology
Control	<ul style="list-style-type: none"> • Informal control mechanisms • Formal control mechanisms
Technical design	<ul style="list-style-type: none"> • Modularity • Interfaces • Compatibility
Competitive strategy	<ul style="list-style-type: none"> • Competition • Co-opetition, collaboration • Single vs. multihoming
Trust	<ul style="list-style-type: none"> • Relationship complementor – platform owner • Relationship end-user – platform

(Hein et al., 2020) Digital Platform Ecosystems

Insights/takeaways:

- Different perspectives to platform literature. Look for holistic approach. How to justify combining perspectives/disciplines
- Digital affordances: an Object's sensory characteristics intuitively implying its functionality and use. i.e. The possibility of an action with an object without thinking too much or reading a user manual¹
- Centralized <-> decentralized trade-off. Archetype of ownership balances control rights against the autonomy of the ecosystem actors.
- In centralized platforms, the owner can gain overwhelming power due to ecosystem growth (temporal)
- Platforms establish a lot economies of scale, orchestration of transactions > two sided markets are created
- Decentralization empowers users to directly influence the future direction of the ecosystem



Emerging incidents/themes/categories

- Complementor enablement (in value co-creation context)
- First integrative approach towards platform science
- Openness in governance context (opening up control)
- Centrality (trade-offs?)
- Relationship

(Perscheid & Ostern, n.d.) Determining platform governance

Insights/takeaways:

- Three main types of platforms. Five general governance dimensions which differ per type
 - Centralized platform governance is a governance type where all power is held by a single authority
 - Decentralized platform governance represents an approach where everyone, who is interacting with the platform, is a member of the platform and, therefore, has authority rights
 - Autonomous platform governance emphasizes the autonomy of the organization as a single entity.

¹ <https://bimbowande.medium.com/digital-affordance-f60ddd487aaa>

Emerging incidents/themes/categories:

- Transparency gives insight in governance process
- How are decisions taken?
- Centrality (more than decentralized/centralized)

(Fenwick et al., 2019) **The End of “ Corporate ” Governance (Hello “ Platform ” Governance)**

Insights/takeaways:

- Evidence points towards the platform of the future being an ‘open, flat and non hierarchical one’. Openness of platforms (Open communication fosters a powerful feeling of participations amongst platform complementors.)
- Open communication > innovative capabilities
- Scale of examples in this studies doesn’t compare to the scale of other digital platforms.
- Successful platforms build on an open/flat culture

Emerging incidents/themes/categories:

- Innovation capabilities
- Information as governance resource

(Otto & Jarke, 2019) **Designing a multi-sided data platform: findings from the International Data Spaces**

Insights/takeaways

- Distinguish 4 project phases (at early design stage of platform):
 - Rationale and requirements
 - Institutionalization and use cases
 - Architecture design
 - Ecosystem design
- *Platform adoption lesser of a problem than organizing the innovation problem within an alliance. Consequence: Design activities follow Early adoption and innovation.*
- Alliance driven MSP’s more easily ‘designable’ due to the internalization of some typical endogenous factors (i.e. Technological obsolescence / competition)
- Development of interaction in early stages of platform process
- Openness **organization structure or Governance principle?** Can be experienced on multiple levels of stakeholder groups
- Focus on early platform design phase. *Could be combined with evolutionary model*

Emerging incidents/themes/categories:

- Evolutionary paths
- Pricing as regulation instrument
- Alliance driven
- Platform design stages
- Design stage

(Hein & Schrieck, 2016) **Multi-case analysis on governance mechanisms of multi-sided platforms.**

Insights/takeaways:

- Not much to conceptualize. General findings on MSP's. Synthesis of multiple case study findings.
- Trade-offs effects in governance structures;
- A more closed and centralized governance model with high platform control and regulation leads to reduced user growth
- Open and decentralized allows to benefit from self-organizational effects

Emerging incidents/themes/categories

- Platform (ecosystem) architecture
- Platform openness <> centrality

(Jacobides et al., 2018) **Towards a theory of ecosystems**

Insights/takeaways

- First attempt at combining ecosystem theories into one usable theory. Keep the definitions very broad
- Modularity as critical facilitator of ecosystem emergence

Emerging incidents/themes/categories:

- value capturing
- Fungibility of complementors

(Trischler et al., 2021) **Digital Platform Tactics: How to implement strategy over time**

Insights/Takeaways:

- Builds on model of Teece(2017). Who introduces a 4 phase lifecycle on platforms: Birth, expansion, leadership, renewal. Mostly strategic perspective. No governance principles mentioned.
- Governance discussed as 'Setting and enforcing rules or collective action on the platform'
- Involves tactical decisions in the realm of platform attributes, core product, governance mechanisms and the surrounding ecosystem

Emerging incidents/themes/categories:

- Platform regulations
- Temporality (evolutionary path)

(Asadullah et al., 2018) **Evolution mechanisms for digital platforms**

Insights/Takeaways:

- Three levels of openness:
 - At the provider level, openness refers to the ability of new providers to join the platform with limited constraints.

- At the technology level, openness refers to the interoperability and compatibility of the platform with other platforms using different technologies. A
- t the user level, openness refers to making the platform accessible in a non-discriminatory way to all potential users
- *Openness can lead to favourable network effects (and increased market potential)*

Emerging incidents/themes/categories:

- Fairness
- Network Effects
- Platform Network Effects
- Strategic partnerships

(Fürstenau et al., 2019) A process perspective on platform design

Insights/Takeaways:

- Case analysis of the development of a health care service platform. Shares notion of other digital platforms. Basically consists of an ecosystem of health care related apps.
- Started through consortium of important actors
- Present overview of development of a healthcare service platform consortium.
- Distinguish three distinct phases of platform development: Pre-formation, formation and HSPC. During the development there is a clear shift from internal focus to external focus. Pre-formation: Need specification of the system
- Governance includes roles definition (and related mandates)

Emerging incidents/themes/categories:

- Regard ecosystem / platform architecture as one. Design of the platform facilitates the development of the ecosystem

(Teixeira, 2015) On the openness of digital platforms / ecosystems

Insights/Takeaways:

- Not necessarily written to add to literature on governance. Only partly talks about governance structure of digital platforms. Is more about the practicalities of being open sourced. More to get academics on the same page. Lots of useful interpretations of openness discussed.
- Openness does not refer to software alone
- *How could openness be interpreted when used in final framework?*

Emerging incidents/themes/categories:

- Openness as governance perspective (Not just software type)

(Teece, 2017) Dynamic capabilities and (digital) platform life cycles

Insights/Takeaways:

- Build on Moore's four stage evolutionary ecosystem lifecycle.
 - Birth: Value proposition devised

- Expansion: Scaling of ecosystem: Decide on platform governance (openness/control)
- Leadership: Ensure ecosystem engagement while maintaining a controlling position
- Self-renewal: Maturing of ecosystem (bringing new additions)
- Openness adds to power of alliances > reduces value capturing through direct means
- Vertical integration of platform leader

Emerging incidents/themes/categories

- Platform introduction
- Dynamic capabilities

8.5 Research proposal

Problem statement

Recently, Mobility-as-a-Service (MaaS) has been emerging as one of the most promising answers to 21st century mobility problems (UN, 2015a; 2016). The term MaaS was first popularized during the 10th European Congress on Intelligent Transport Systems in Helsinki in 2014, where MaaS is described as a mobility distribution model that delivers users' transport needs through a single interface of a service provider (Hietanen, 2014). Since then, many different contributions have been made to the definition of MaaS and its envisioned future (Smith, 2020). Even though research on MaaS is in a relatively early stage, a lot can currently be learned from (smaller) scale MaaS initiatives and schemes, of which many are being tested or initially deployed (Jittrapirom et al., 2017). Early research, however, does already seem to agree on one thing: MaaS will deliver its integrated services through a single digital service platform. As the initial potential and future of MaaS seems very promising (Kamargianni et al., 2016), it is expected that large scale MaaS initiatives will soon make its entry to the market. This poses new challenges to the concept of MaaS. One of these challenges is the one of platform governance (Jittrapirom et al., 2017).

Platform governance is a well-studied topic within information science (IS) and is referred to as the sum of activities carried out by platform owners that seek to influence the behavior and outcomes of complementors (Halckenhäusser et al., 2020). It is seen as a key challenge in the launch of successful platforms (Foerderer et al., 2018). Prior research takes an extensive look at the mechanisms deployed to govern platforms, like openness (Boudreau, 2010), control (Tiwana et al., 2010) and resourcing (Afzal & Strande, 2015; Ahmad; Ghazawneh & Henfridsson, 2010).

Research on platform resourcing seems to be particularly focussed on boundary resources (Halckenhäusser et al., 2020), the resources that enable complementors of platforms to develop complements and extend platform functionality (Bianco et al., 2014; Ahmad Ghazawneh & Henfridsson, 2013). Other platform resources received considerably less attention. Something

that would be expected, as they could potentially be strategically leveraged to increase the chance of platform success

To deliver a comprehensive overview of platform related resources, this research will draw on service-dominant (S-D) logic (Vargo & Lusch, 2004). S-D logic is an alternative to goods-dominant (G-D) logic, and takes a service ecosystems perspective to provide a more holistic framework for explaining value creation. Within S-D logic two broad streams of resources are recognized; operand and operant resources (Akaka & Vargo, 2014). S-D logic focuses on the primacy of operant resources, the resources that are able to act upon other resources, in the co-creation of value. Considering that in one of foundational premises of S-D logic, operant resources are named the fundamental source of strategic benefit (Vargo & Lusch, 2016), a synthesized overview of platform governance resources in the mobility domain is expected to be beneficial for MaaS development.

Research Significance

The goal of the proposed research is to take a closer look at the resource dimension of platform governance in an attempt to identify, classify and structure important resources. The goal is to structure them in a way that they can guide future MaaS development. In order to do so it will pay particular attention to the questions: What different kind of platform resources exist? How do platform resources relate to the actors in the mobility ecosystem? And: how can these resources be classified/structured to guide MaaS development?

Research objectives

The proposed output of the research is a framework on which platform governance resources have been identified, classified and structured. The goal of the framework is to structure these resources in a way that can help guide MaaS development. It should also serve as a first step in using resources in platform governance strategy development.

Research design

This research will adopt a design science research methodology in order to design an artifact that aims to guide the structured development of the resource dimension of platform governance in the context of MaaS. It will follow the guidelines presented by Peffers et al. (2007). These guidelines assists research by providing a structure for conducting DSR research including objectives, processes and outputs. The DSR process is not necessarily expected to be a sequential process (Peffers et al., 2007). However, as it is hard to predict whether or not multiple

iterations must be followed, the research design is described as such. The following six steps will be followed in order to apply DSR:

- (1) Problem Identification & Motivation
- (2) Define the objectives for a solution
- (3) Design and development
- (4) Demonstration
- (5) Evaluation
- (6) Communication

During the first step; **problem identification & motivation**, the context of the earlier identified problem will be elaborated and the value of a solution will be verified. During this step, existing platform governance and MaaS literature will be reviewed and synthesized to define the problem.

During the second step; **Define the objectives for a solution**, the boundaries for the development of the artifact will be set. The proposed framework will follow the hierarchy model of operant resources proposed by Madhavaram & Hunt (2008) to structure the identified resources. Their model follows the service-dominant logic to extend on the concept of operant resources (Vargo & Lusch, 2004).

During the **Design and development** step, an artifact will be constructed. In order to reach a thorough and theoretical relevant analysis of the topic, the grounded theory method proposed by Wolfswinkel et al. (2013) will be used. They propose a five-step method for reviewing literature: (1) define (2) search (3) select (4) analyse and (5) present. This review will focus on existing MaaS and platform governance literature (specifically focussing on the resource dimension). It will pay specific attention for the needs of the different actors in the mobility domain.

The **Demonstration** step consists of demonstrating the artefact within context. The proposed artifact, in this case a framework, will be demonstrated within the context of a MaaS initiative (UMOS Alliance)

During the **Evaluation** step the solution objectives will be measured against the results of the demonstration within context. This activity addresses the question: How well does the artefact solve the explicated problem and fulfil the defined requirements? (Johannesson & Perjons, 2014).

The **Communication** step *formally* concludes the DSR process. The goal of this step is to document on findings and illustrate them in a way that is clear to the relevant scientific community. This research will be presented according to the formulated steps